The Value of π

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Before you begin:

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Understand that learning happens best when the learner puts in **real effort**.

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That's you!

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The Value of π

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One definition for the number pi (π)

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Step 1: Draw a circle with any convenient radius.

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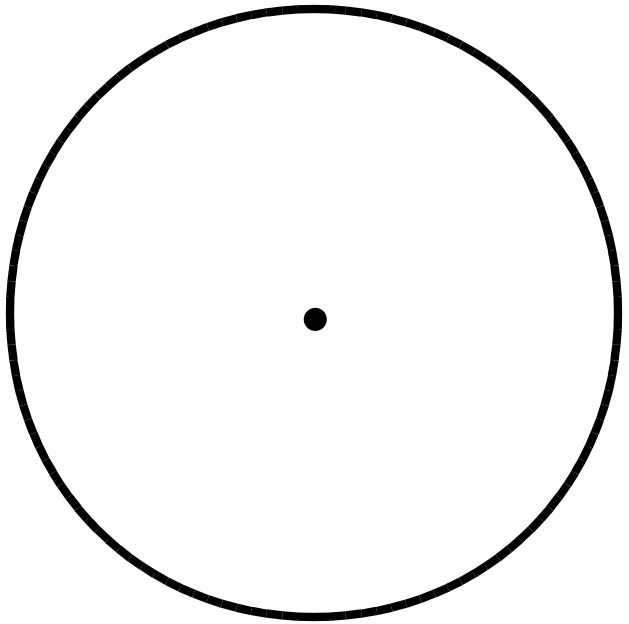

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Step 1: Draw a circle with any convenient radius.

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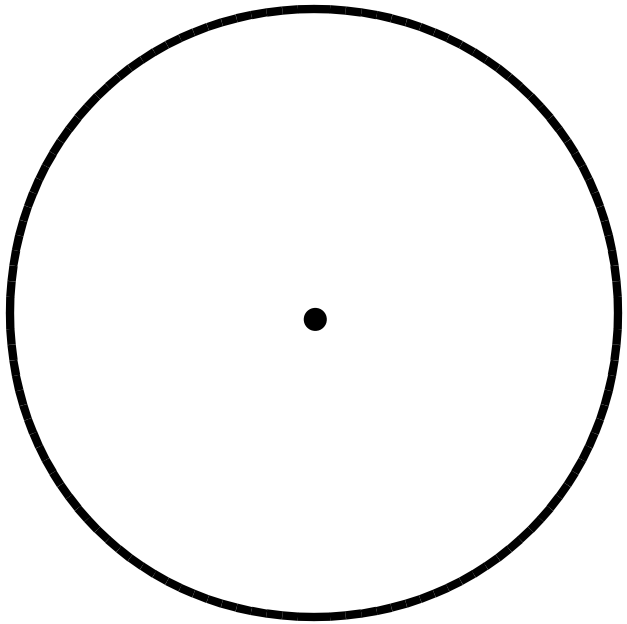

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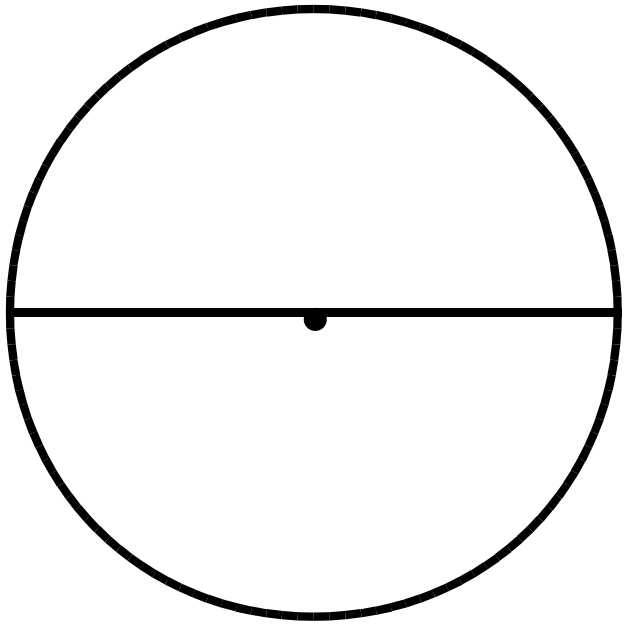

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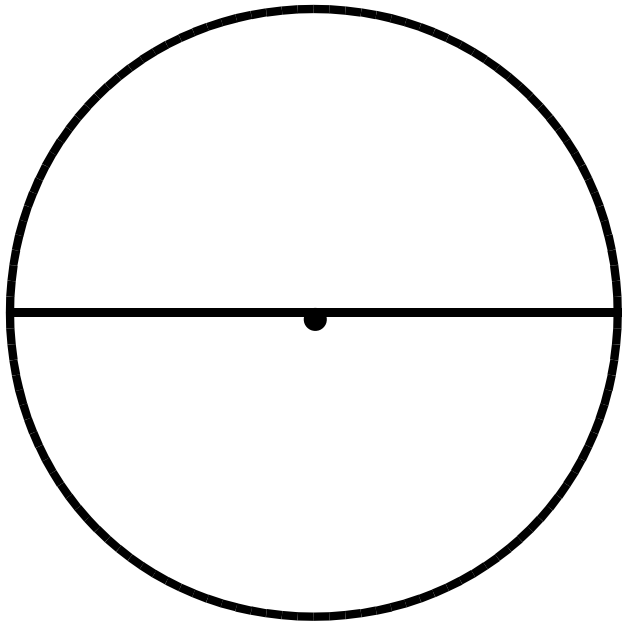

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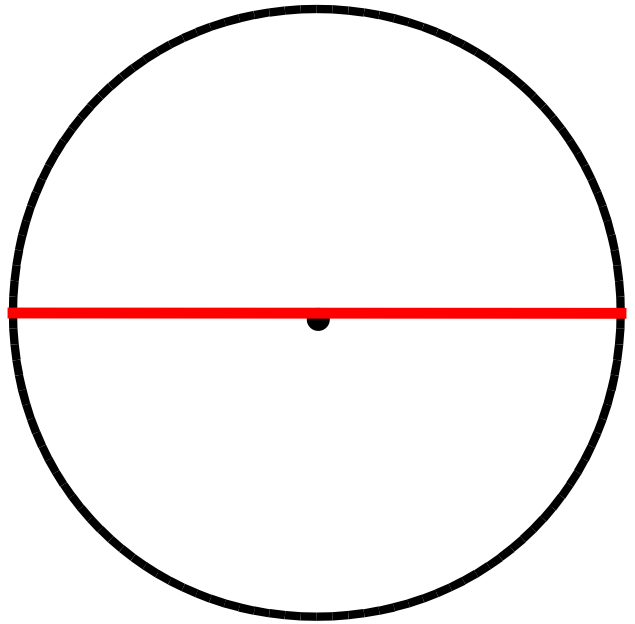

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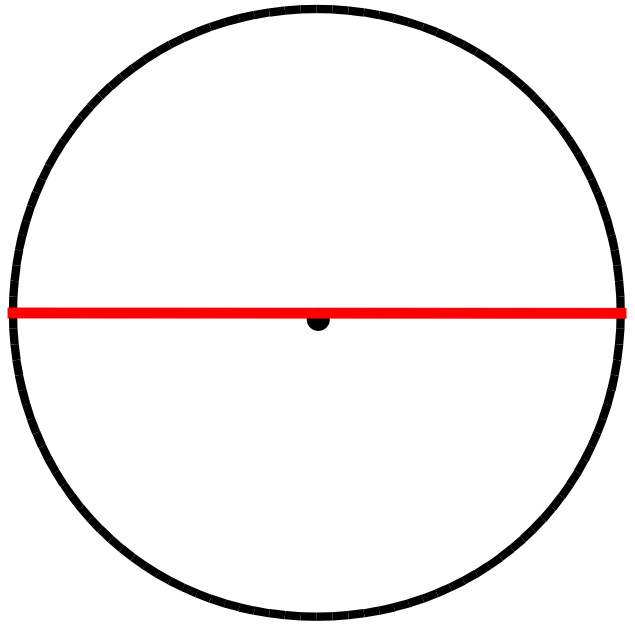

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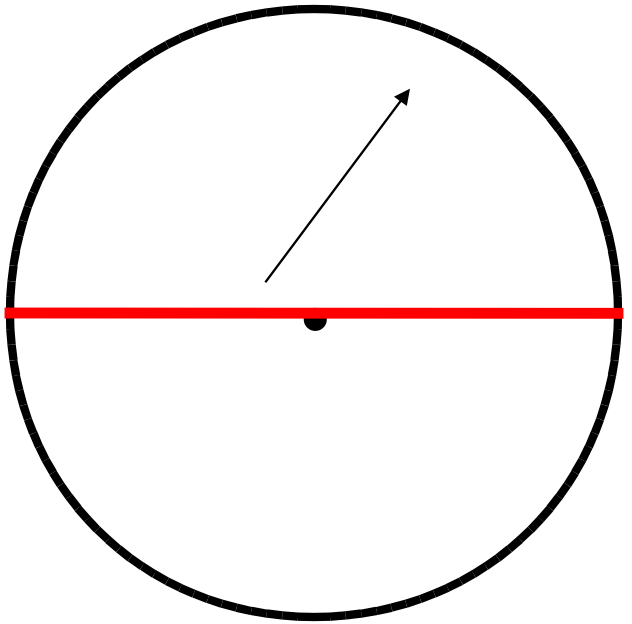

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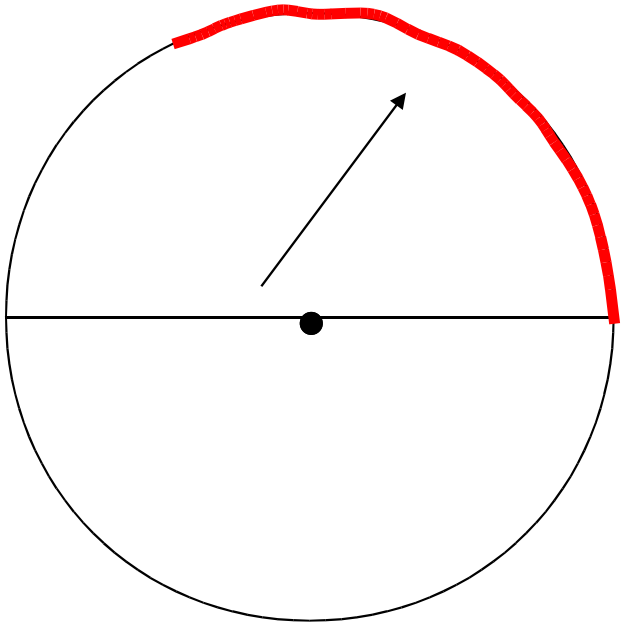

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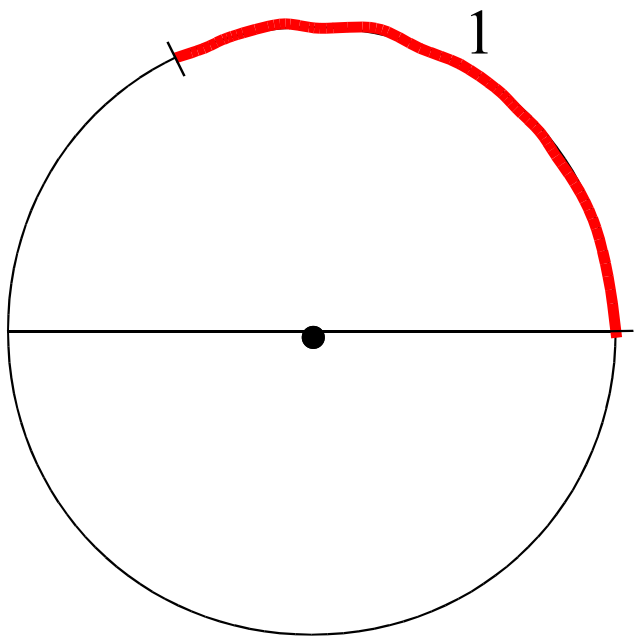

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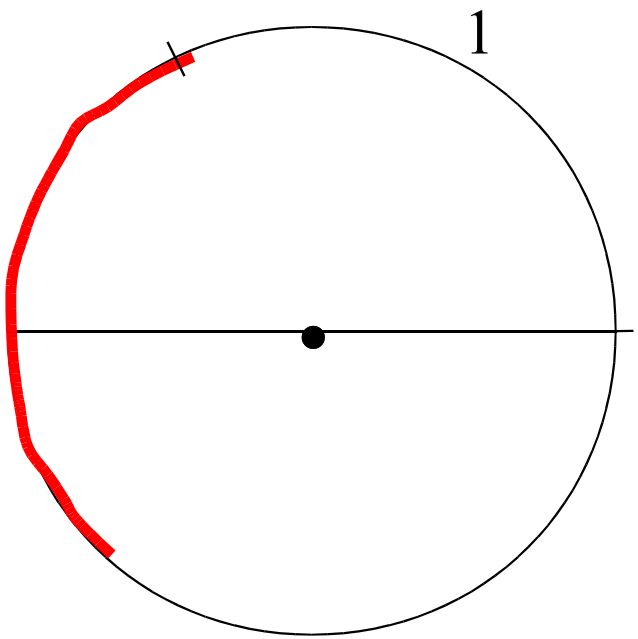

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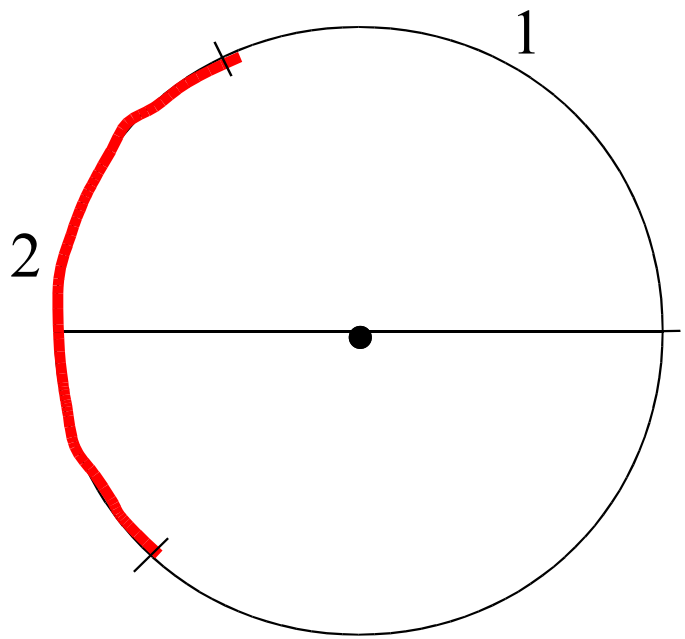

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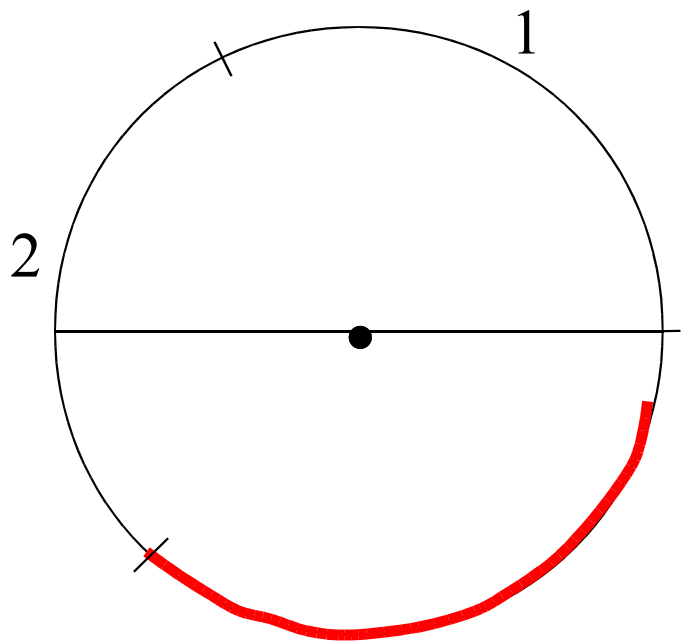

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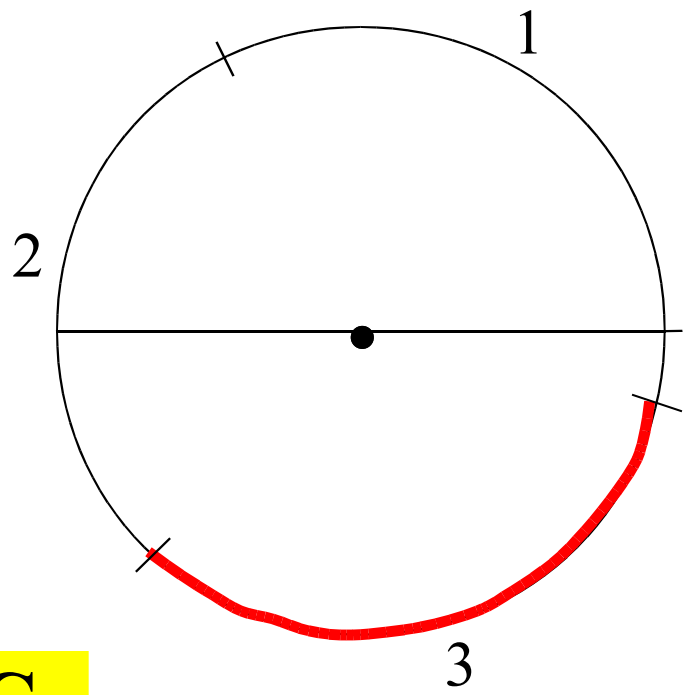

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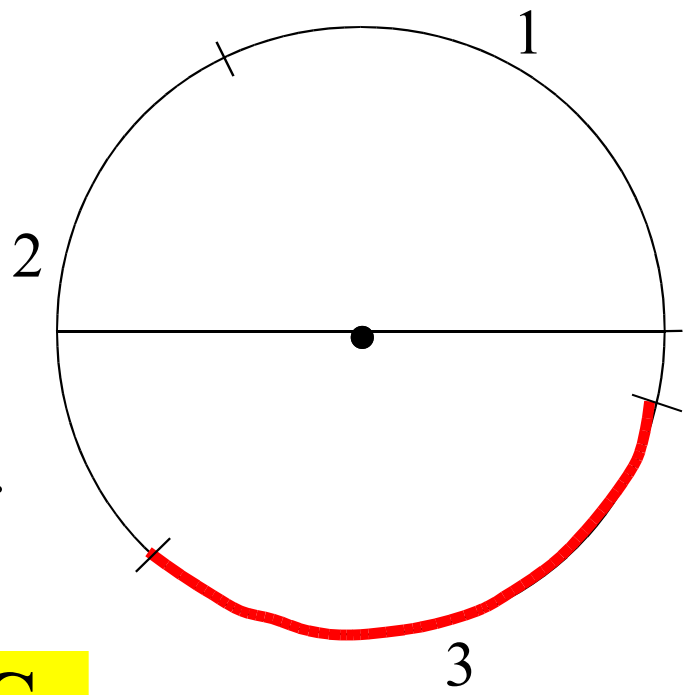

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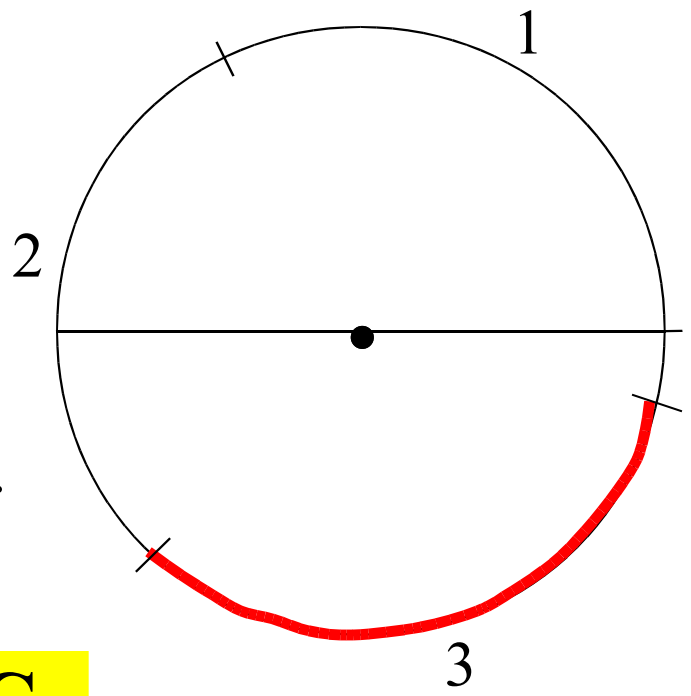

Clearly, π is a little more than 3.

We can be more precise.

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Given circle A with
radius r.

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I will do four.

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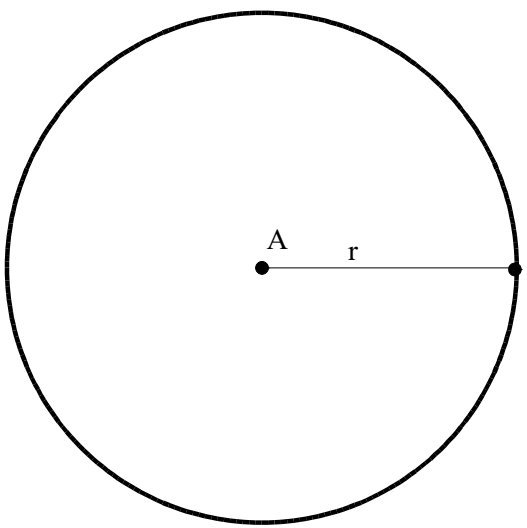

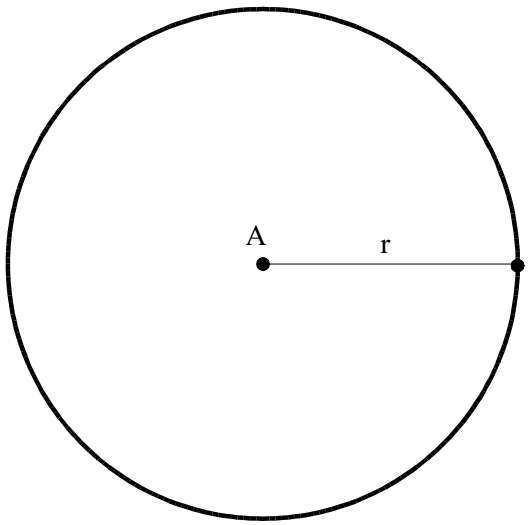

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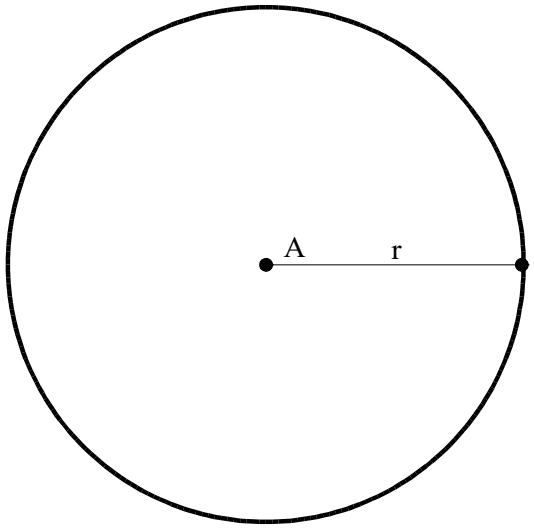

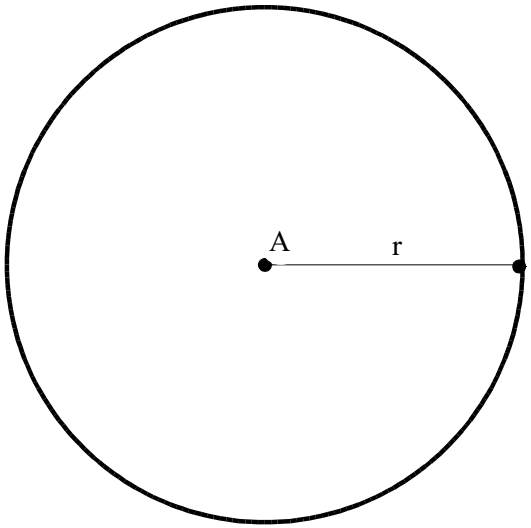

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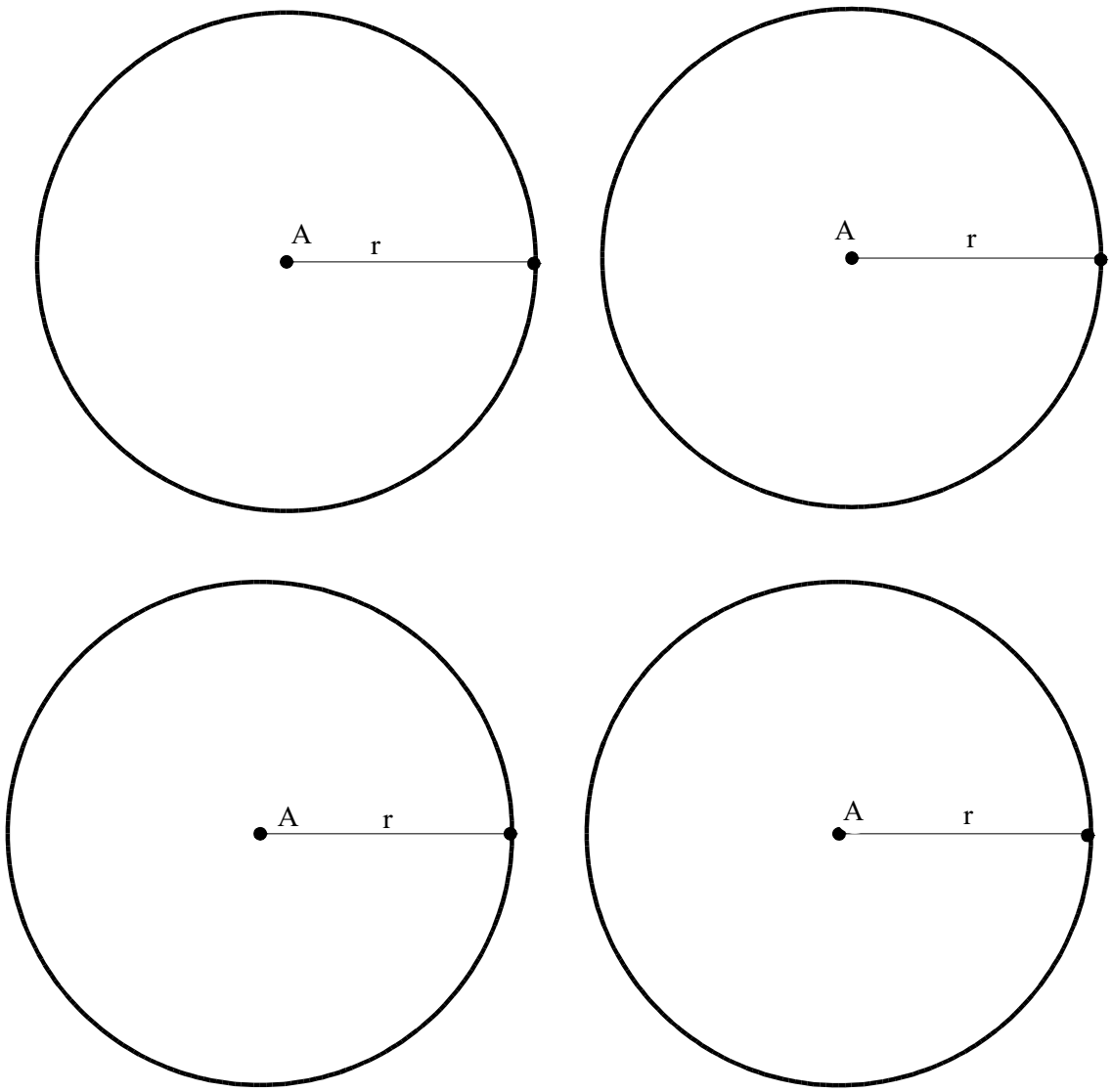

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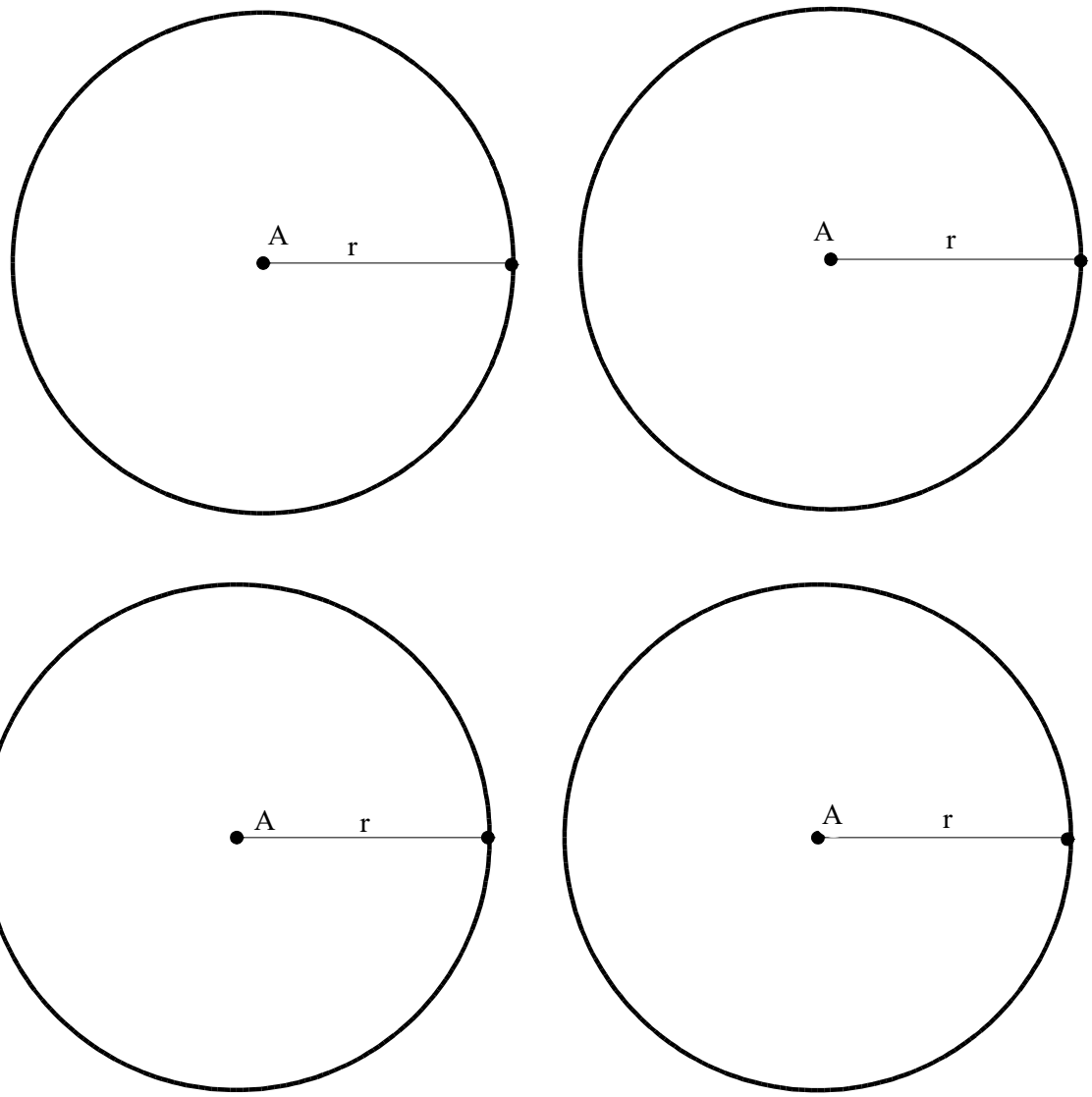
Given circle A with radius r.

Inscribe an n-sided **regular polygon** in the circle.



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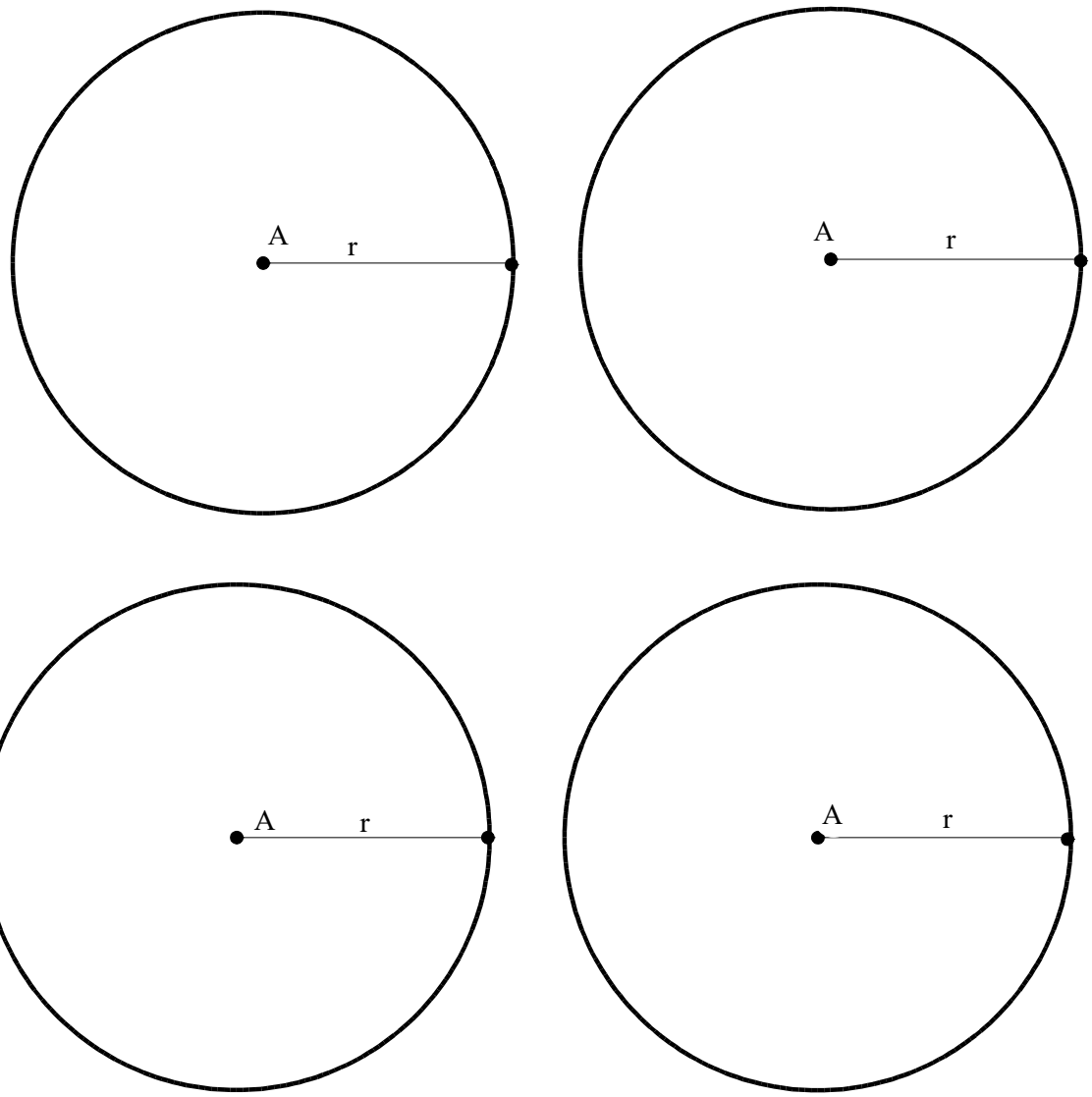

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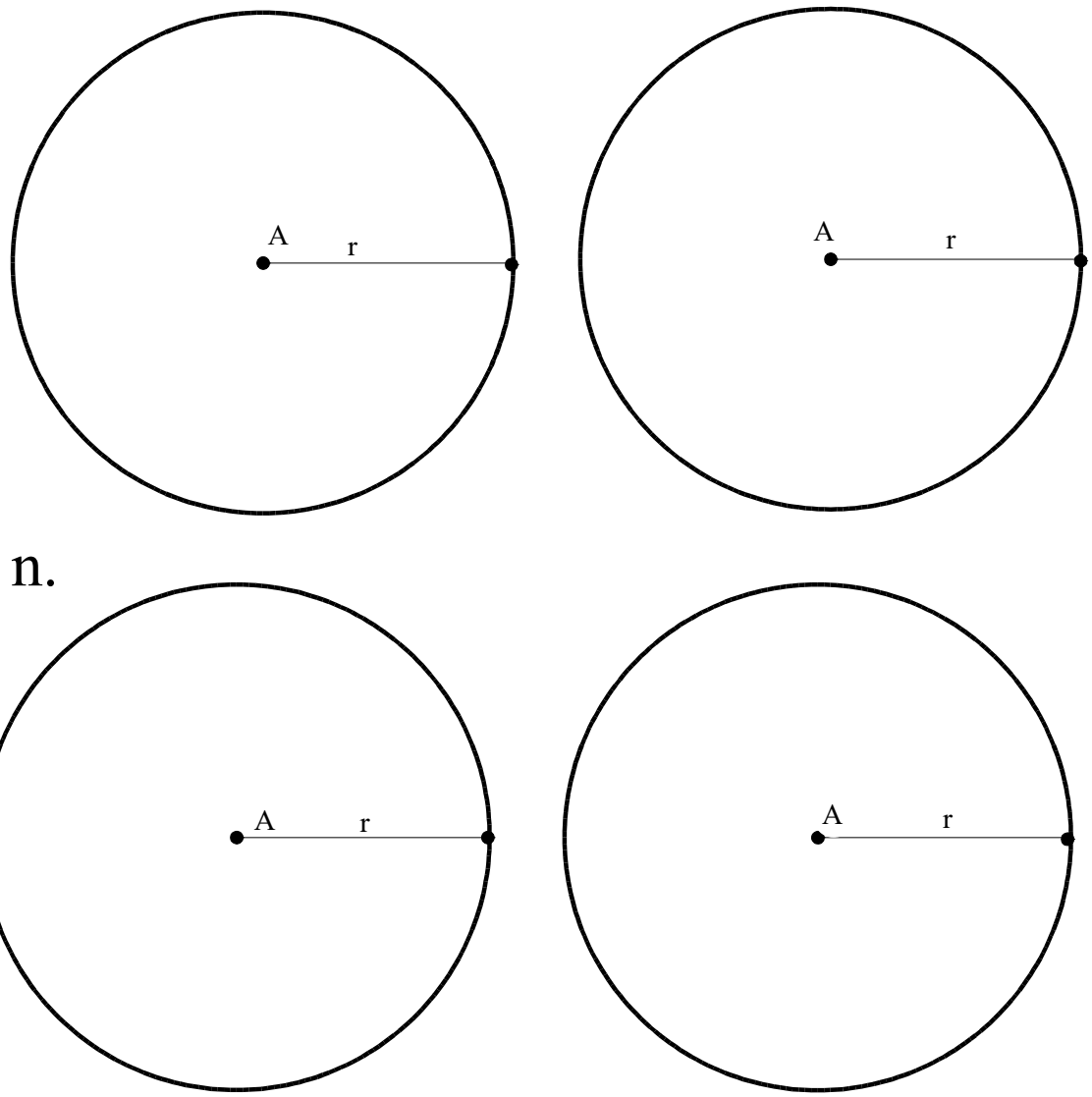

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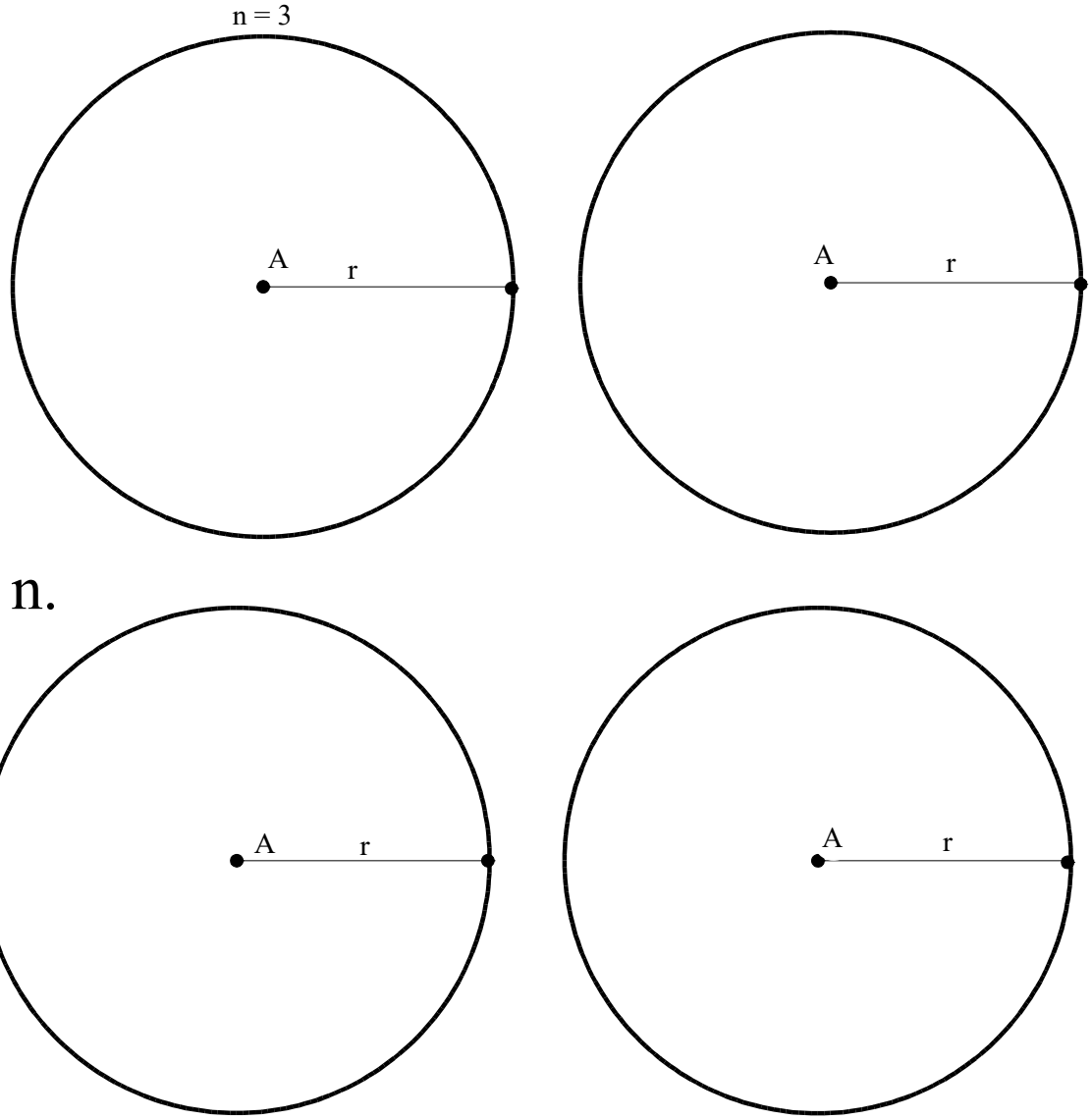

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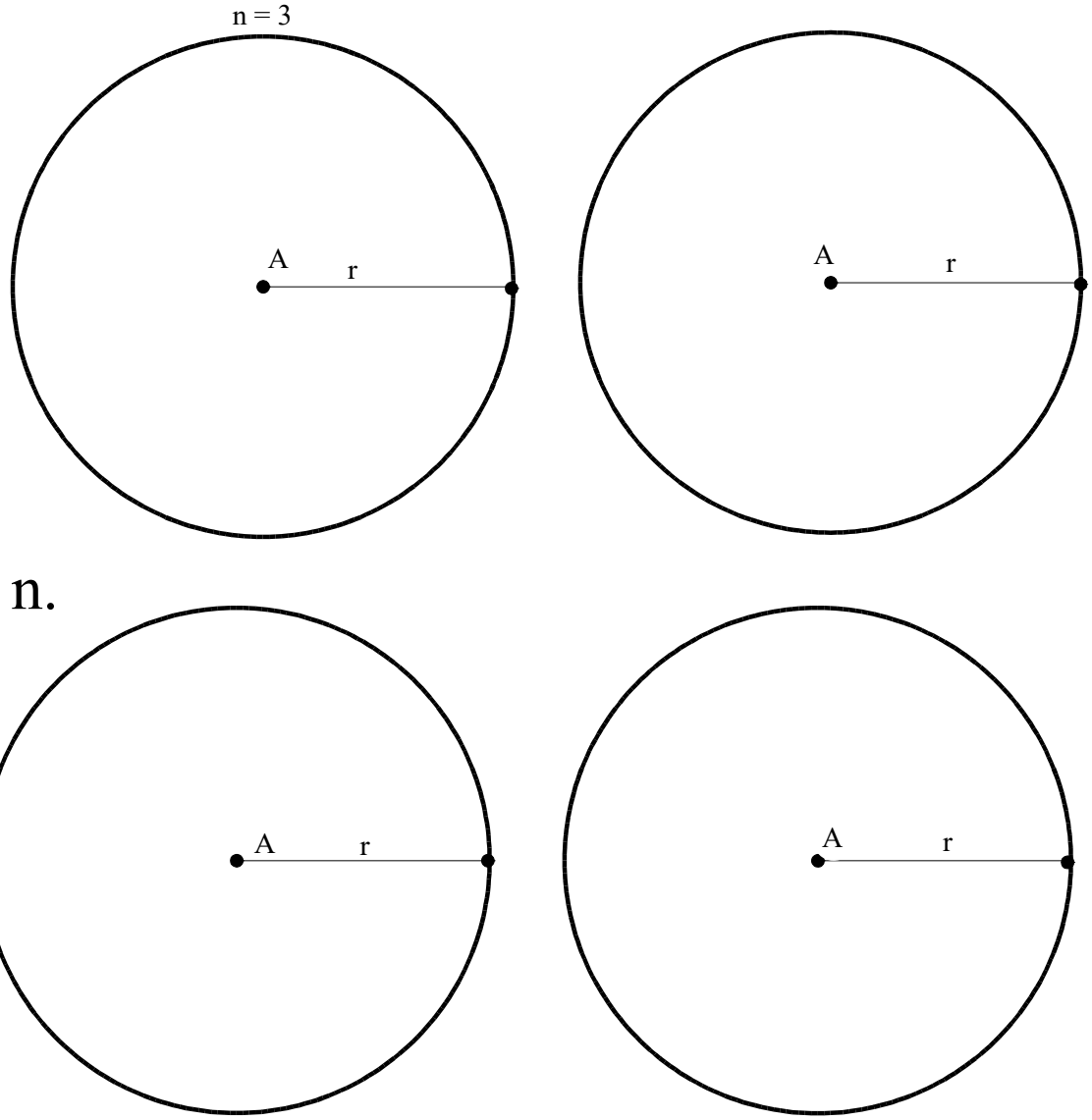

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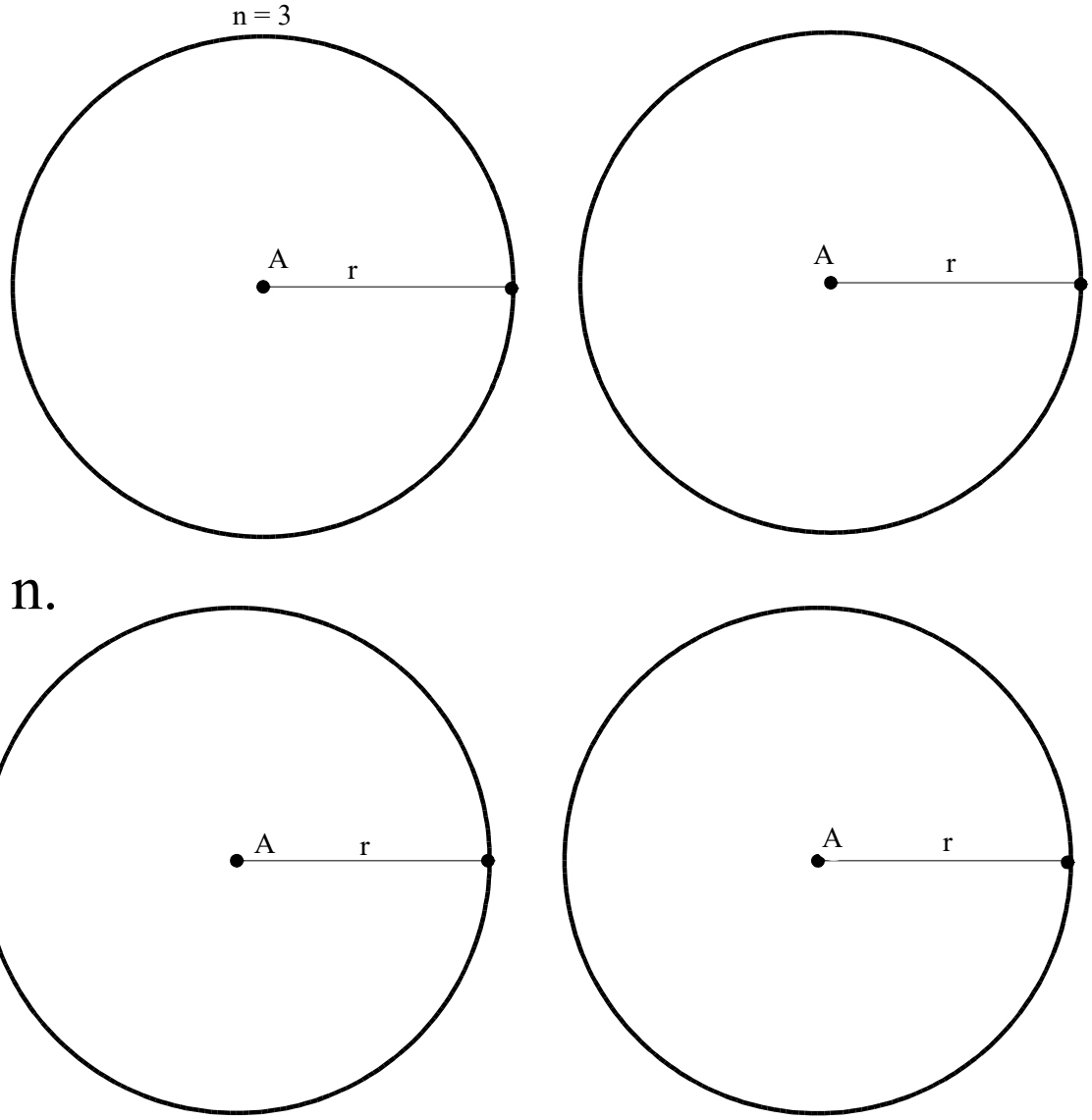

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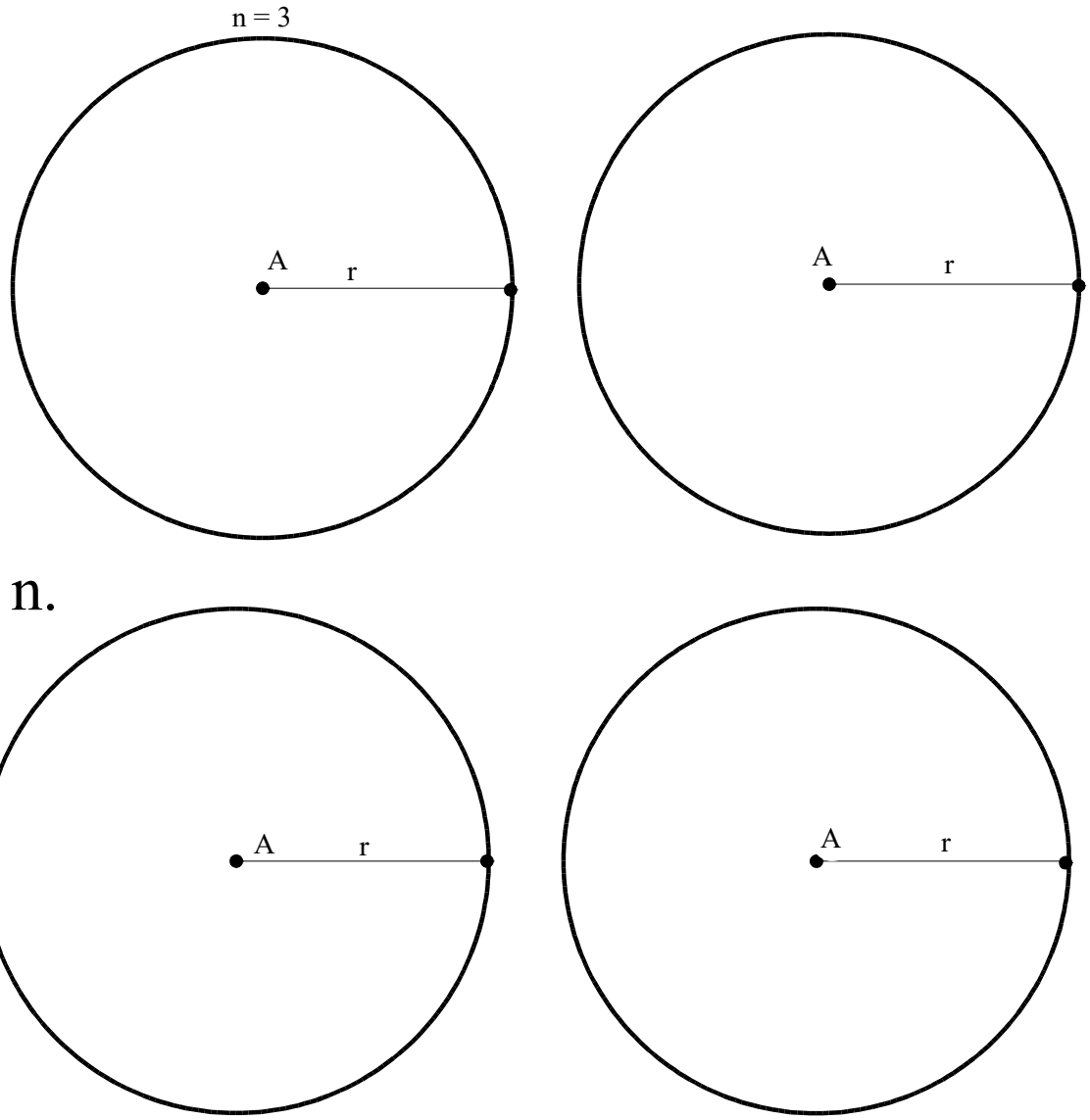

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$$\frac{360^o}{3} = 120^o$$

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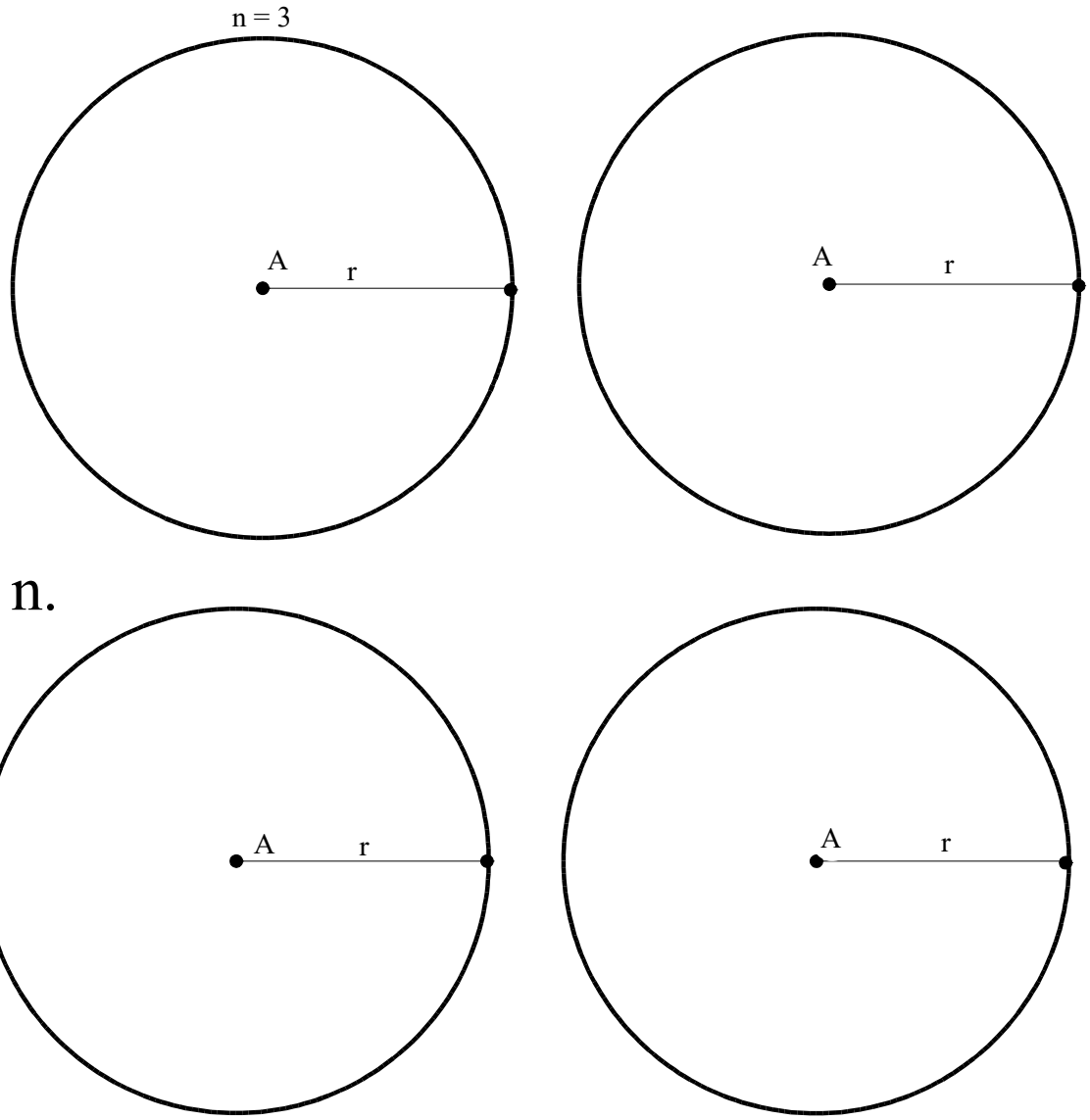

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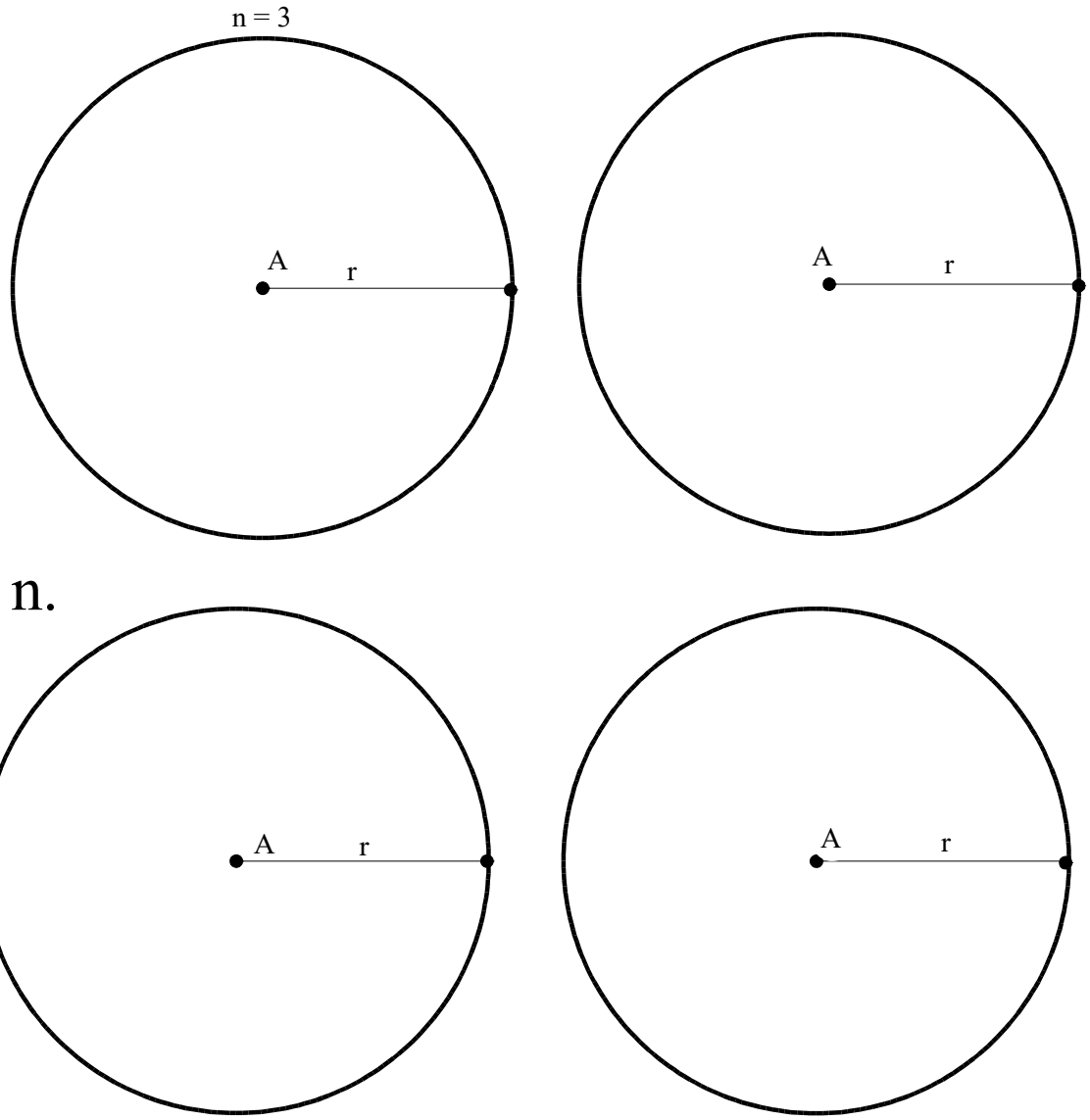

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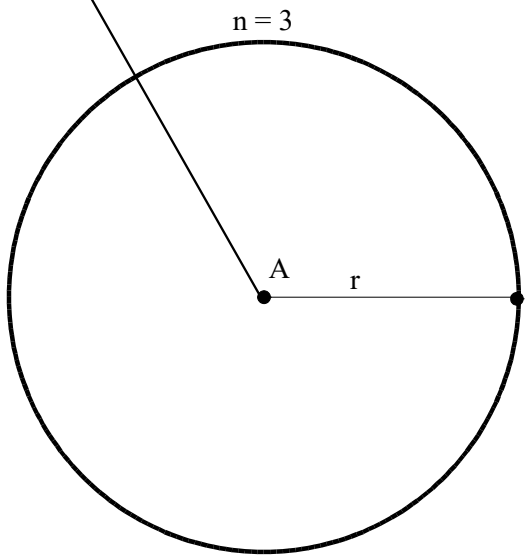

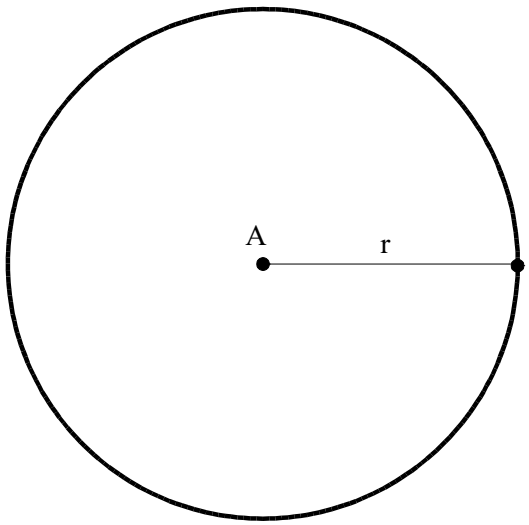

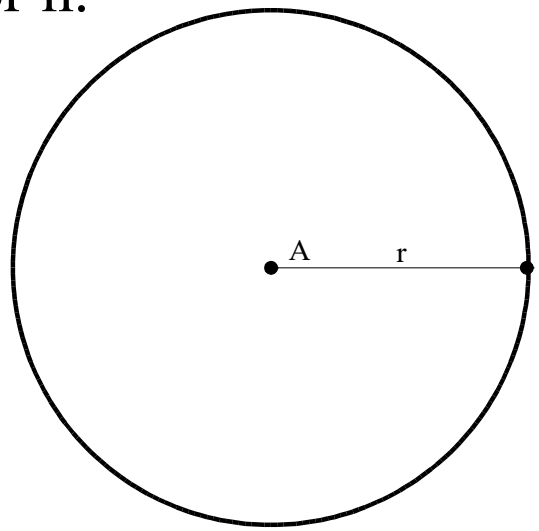

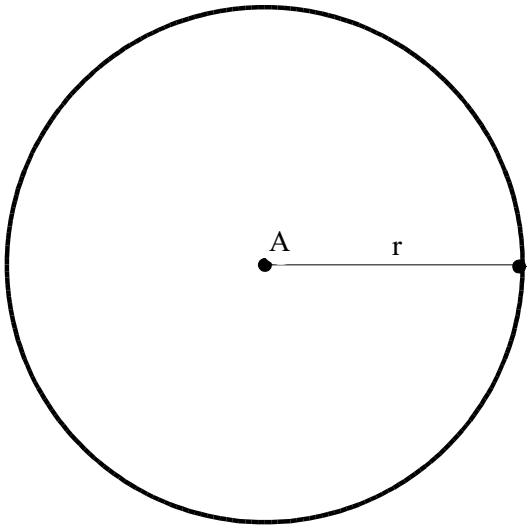

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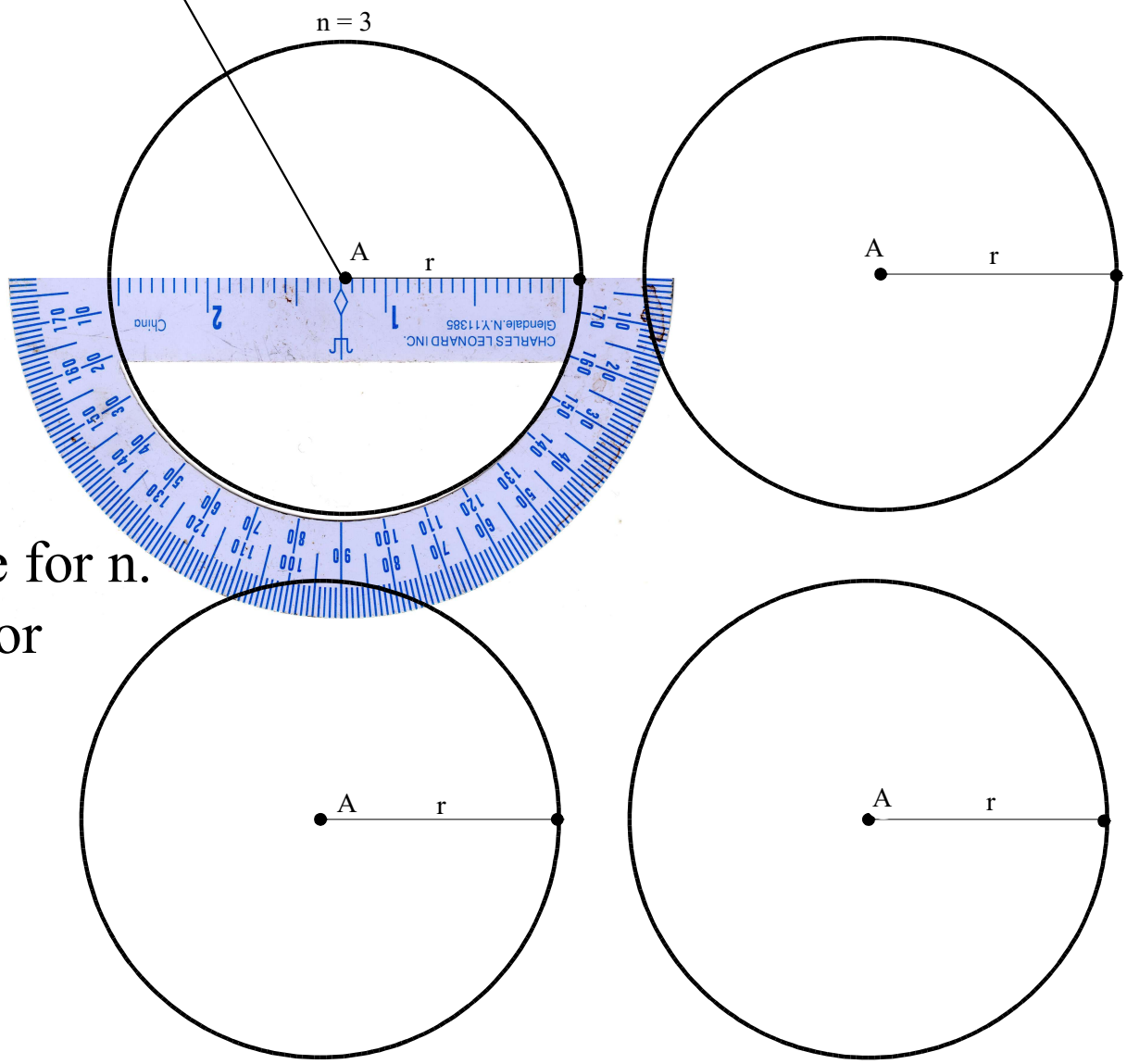

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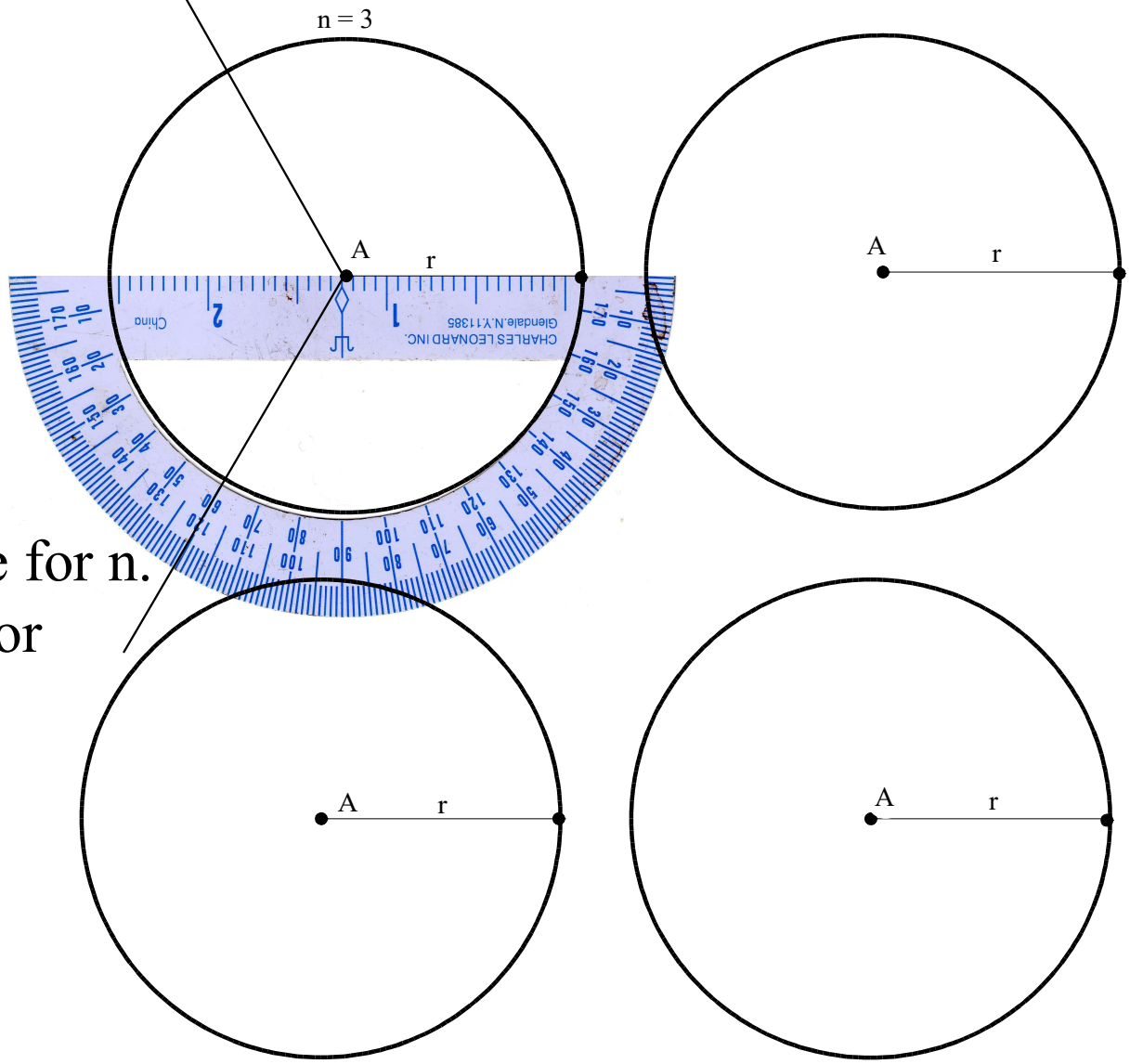

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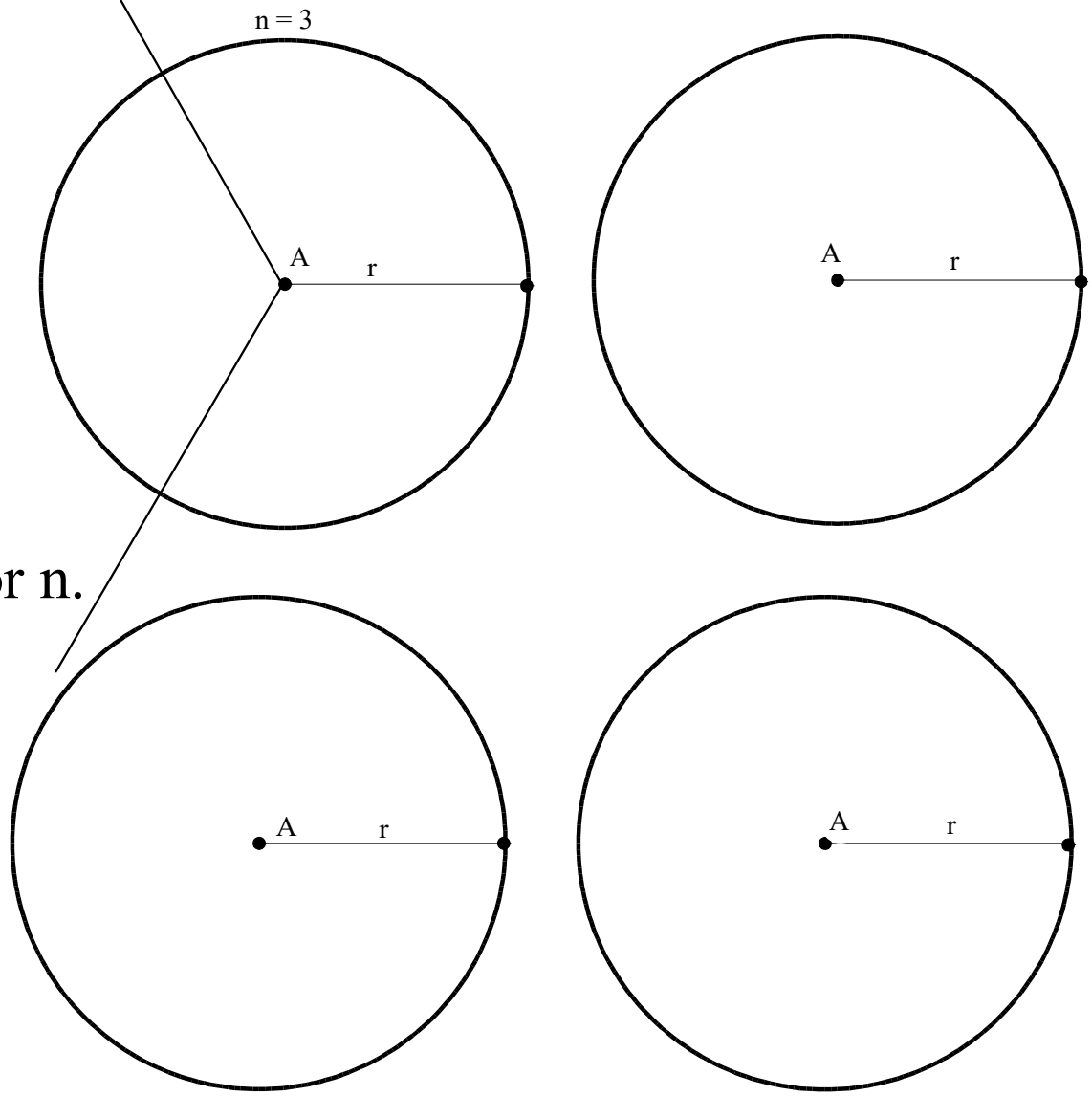

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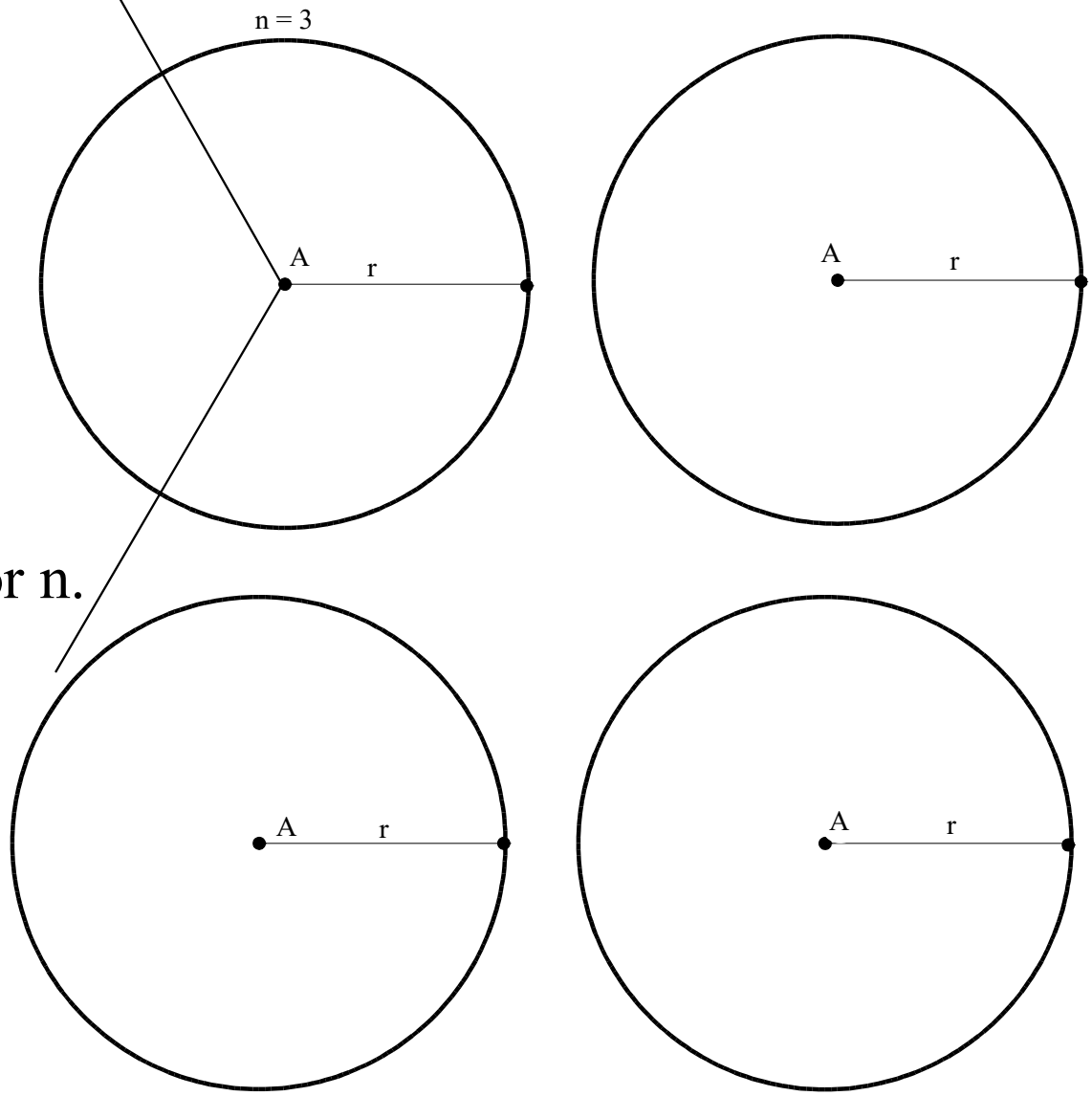
Given circle A with radius r.

Inscribe an n-sided **regular polygon** in the circle.

This is not as ‘easy’ as it sounds.

First, choose a value for n.

Then, use a protractor to locate the n ‘equally spaced’ points around the circle.



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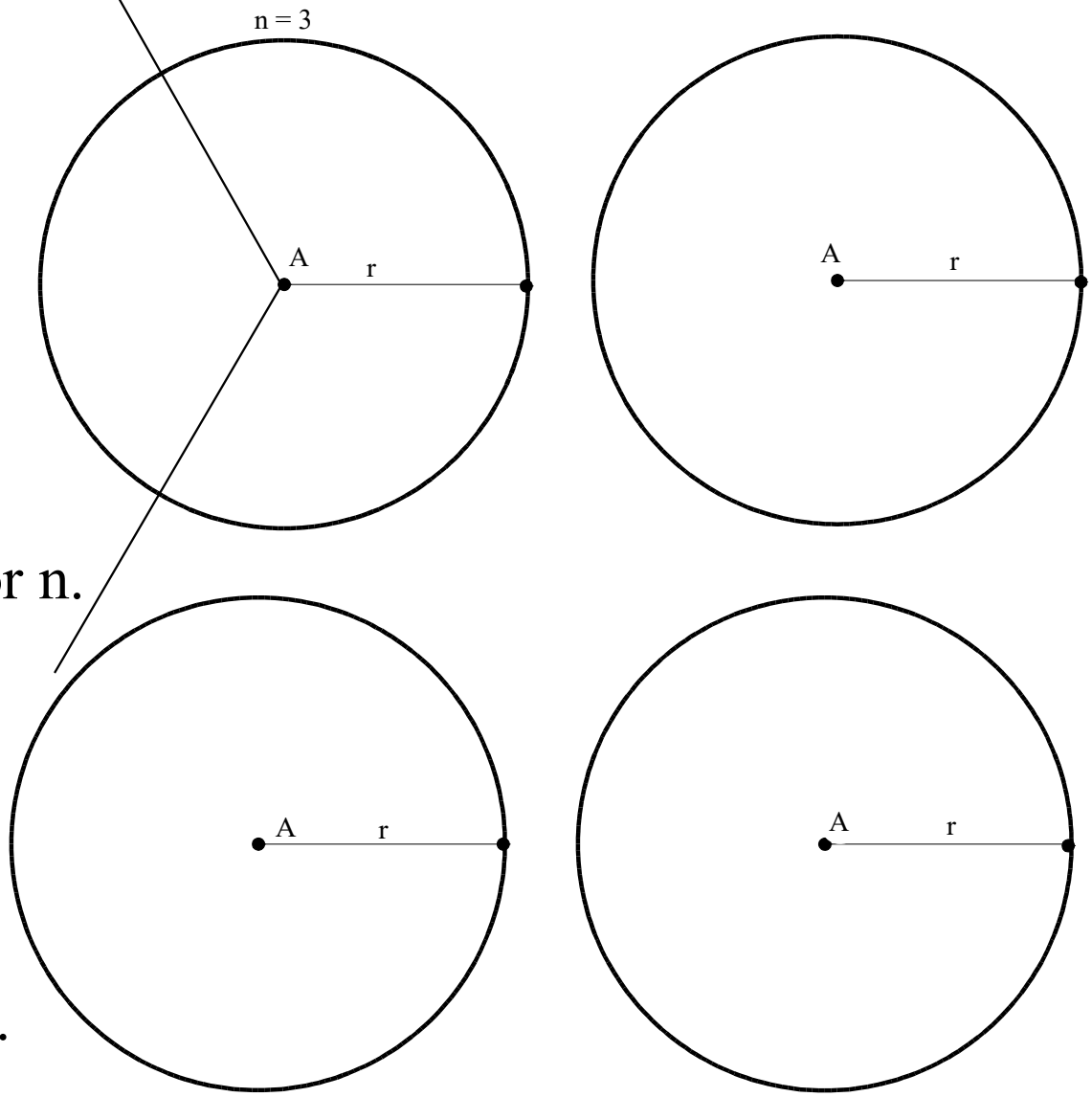

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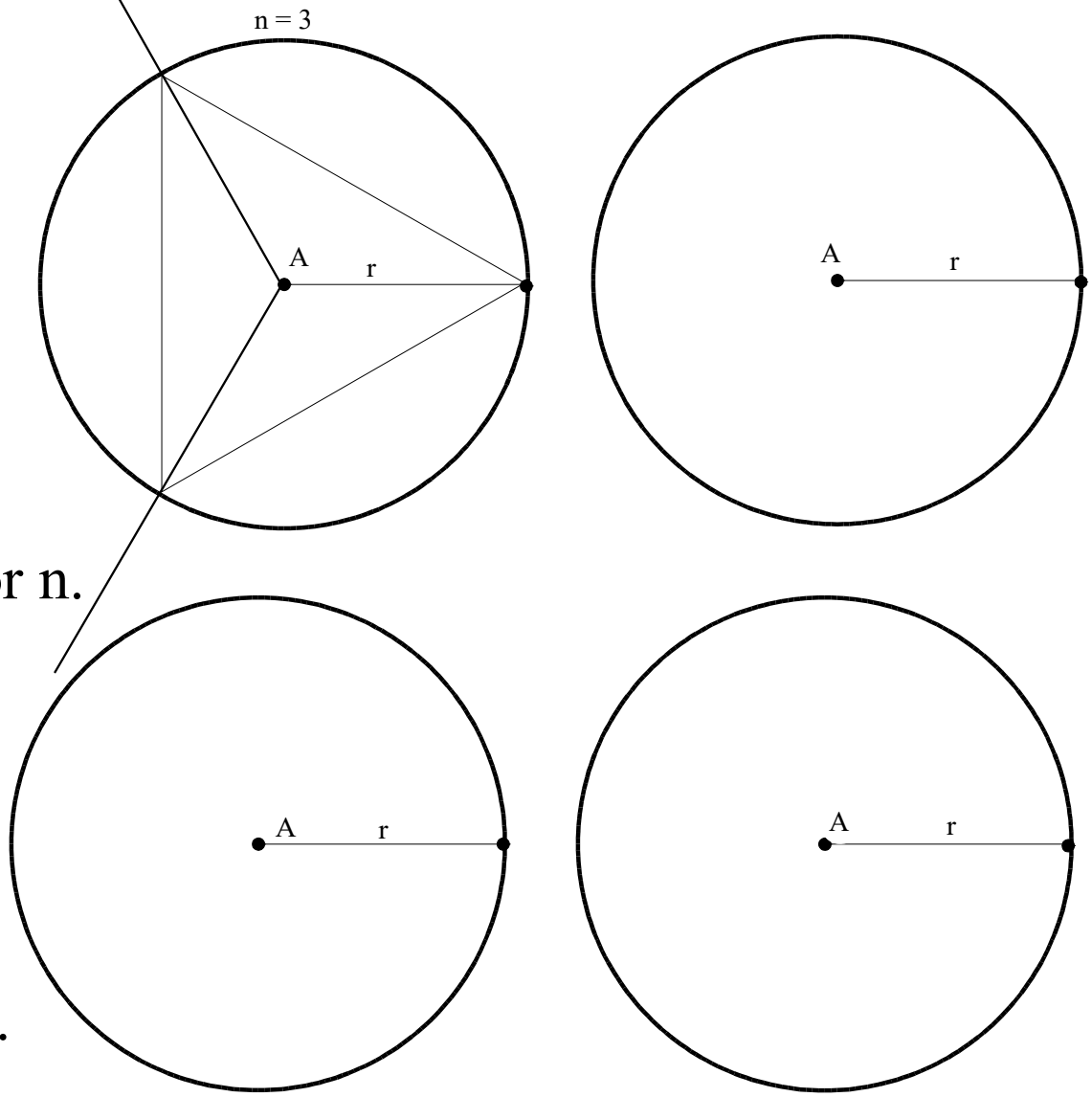

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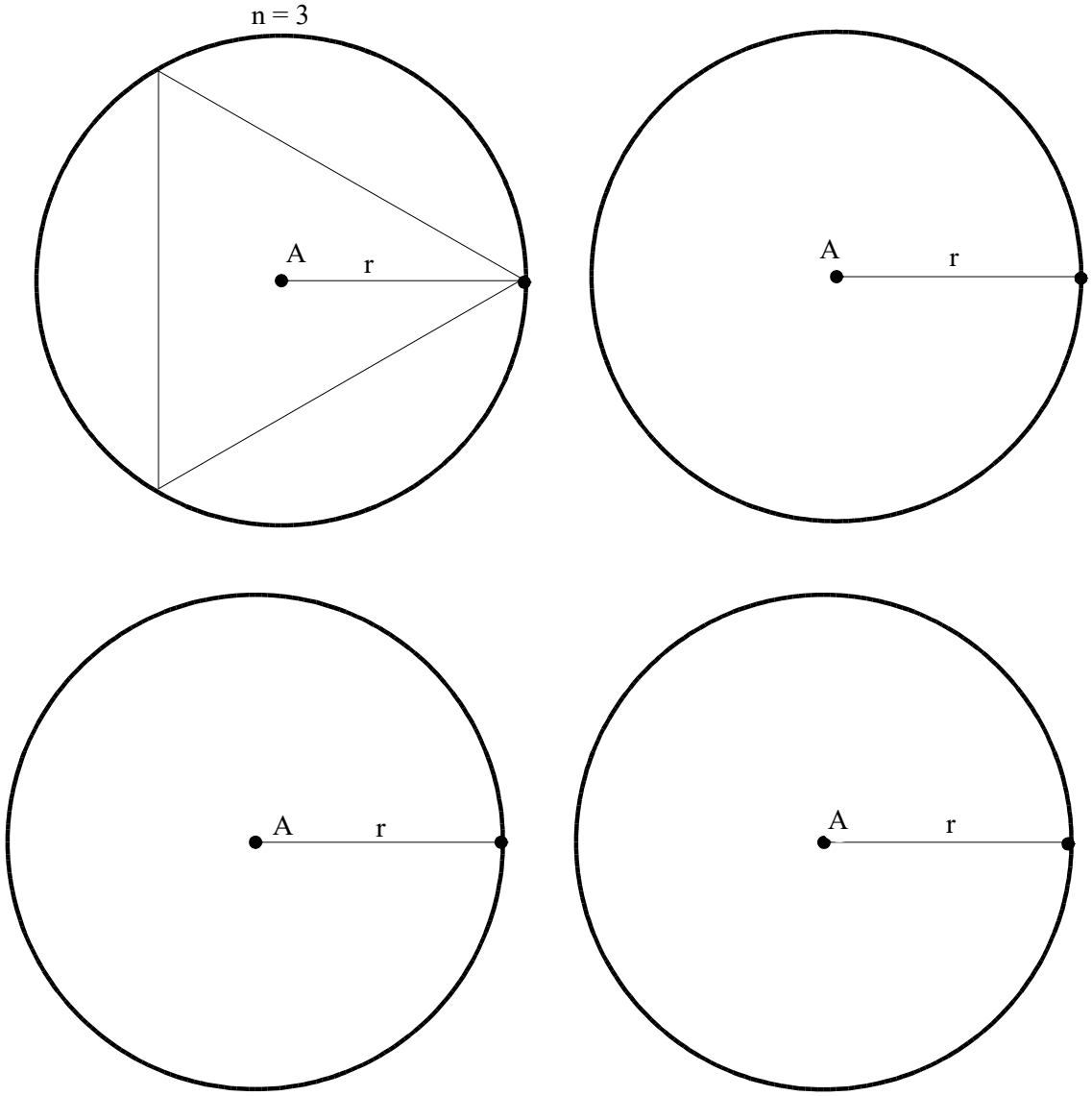

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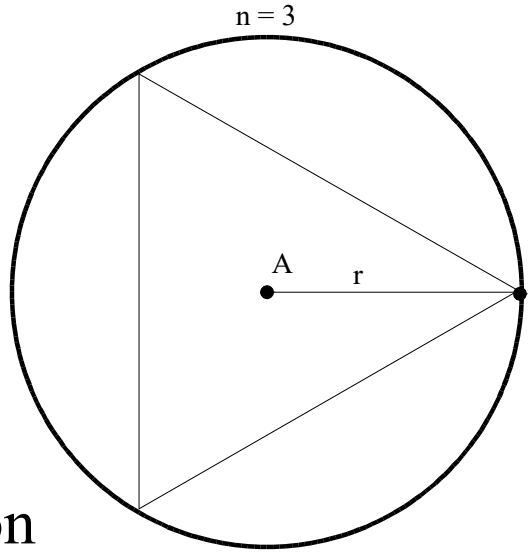

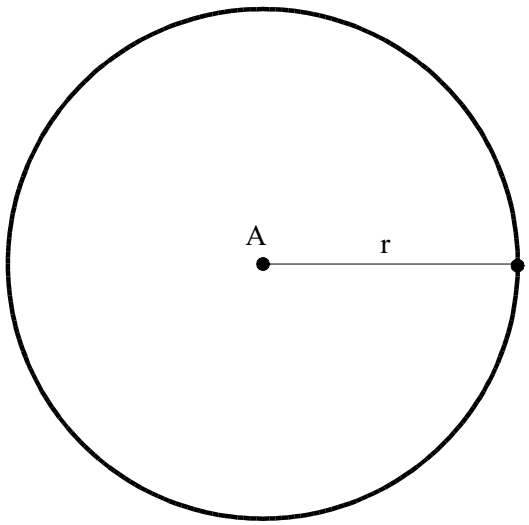

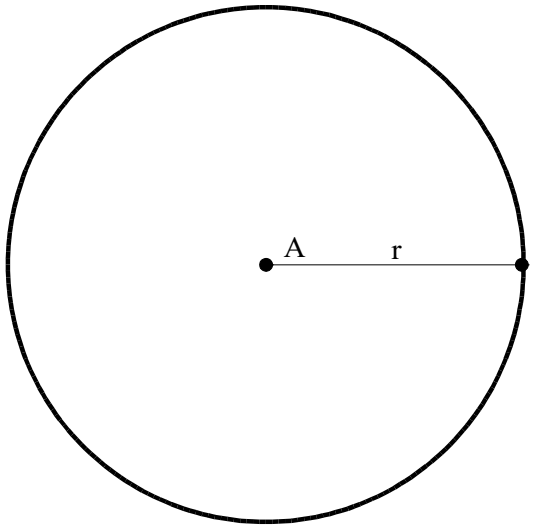

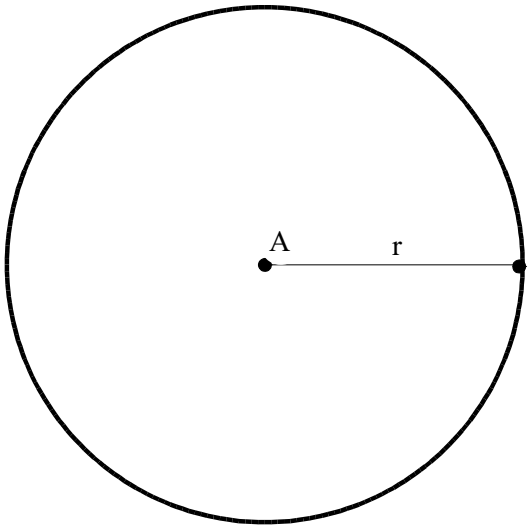

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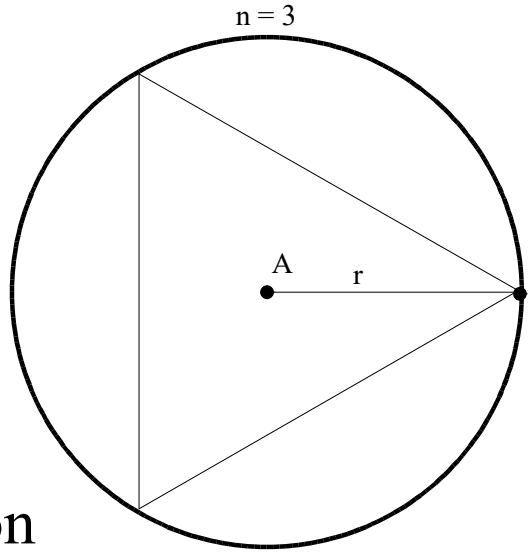

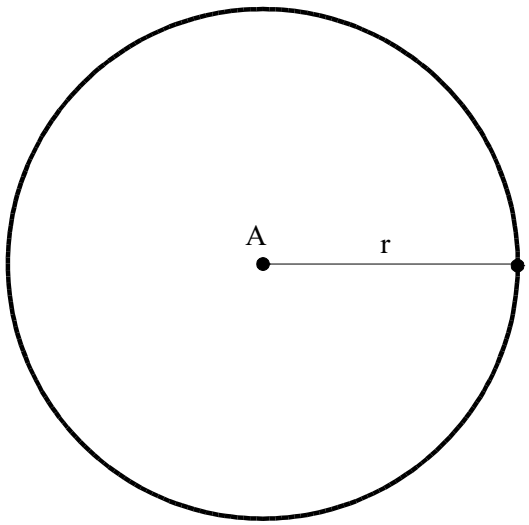

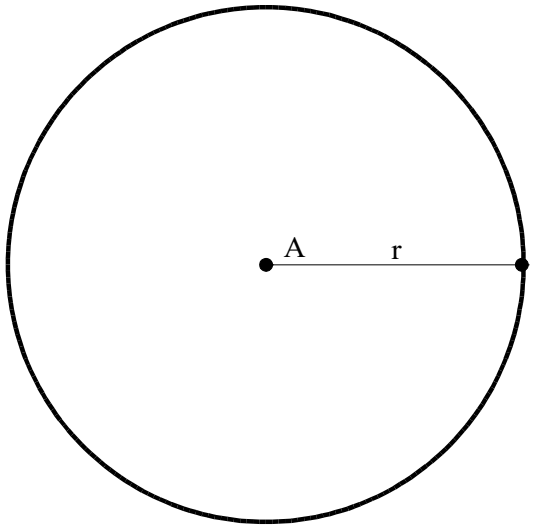

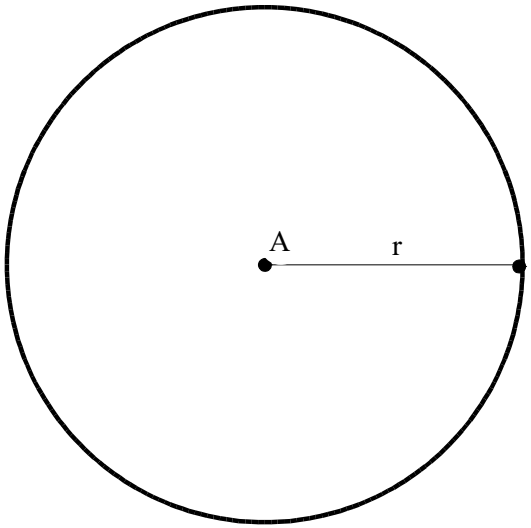

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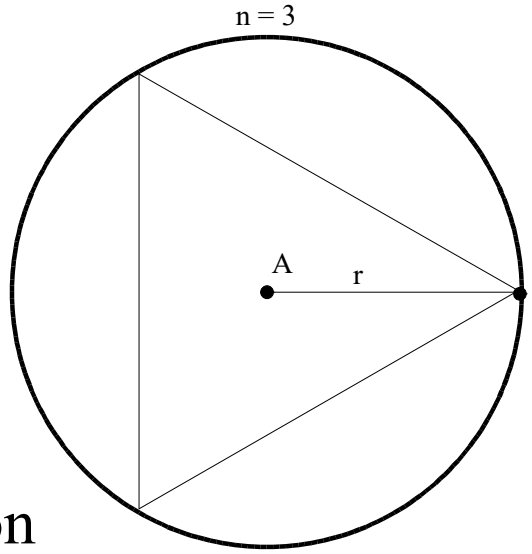

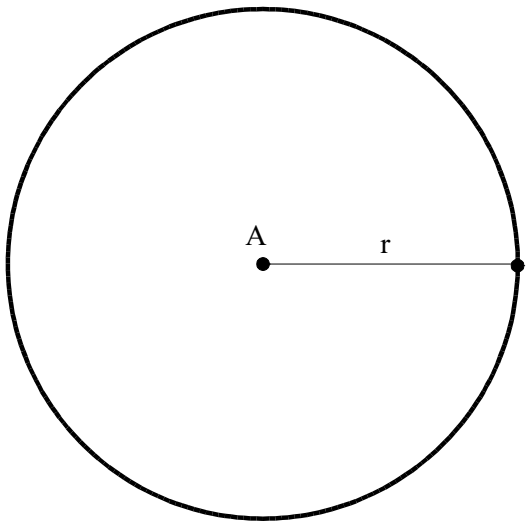

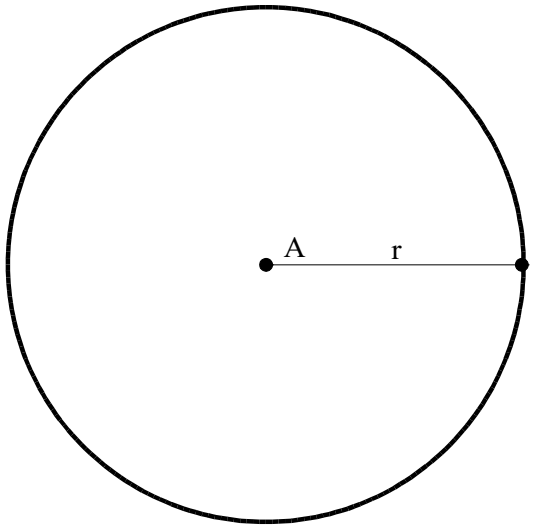

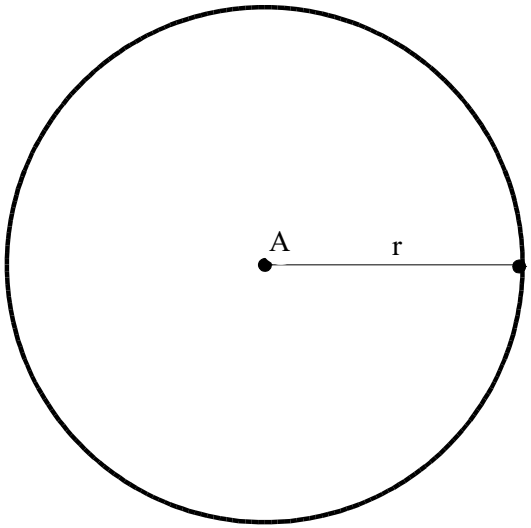

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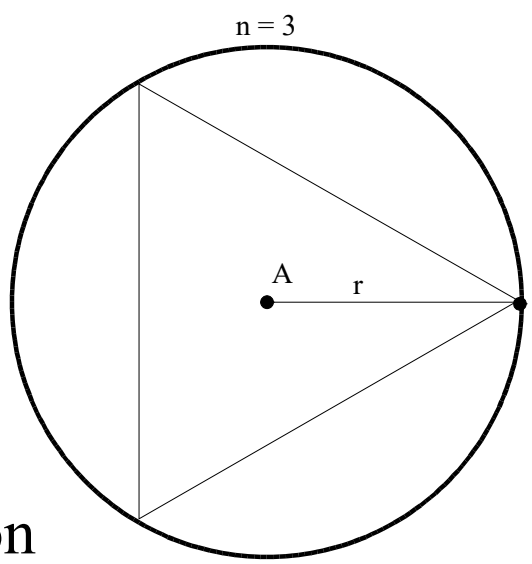

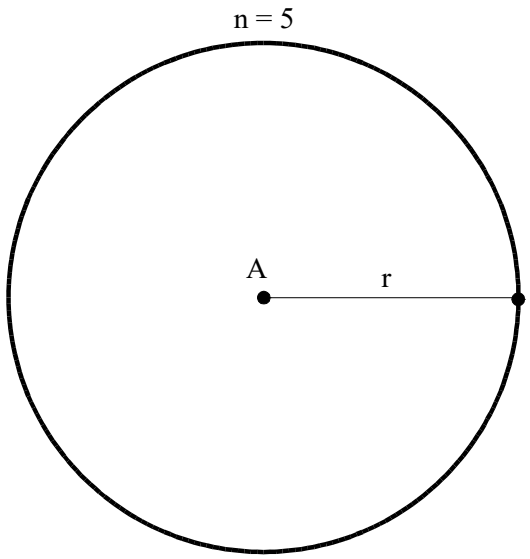

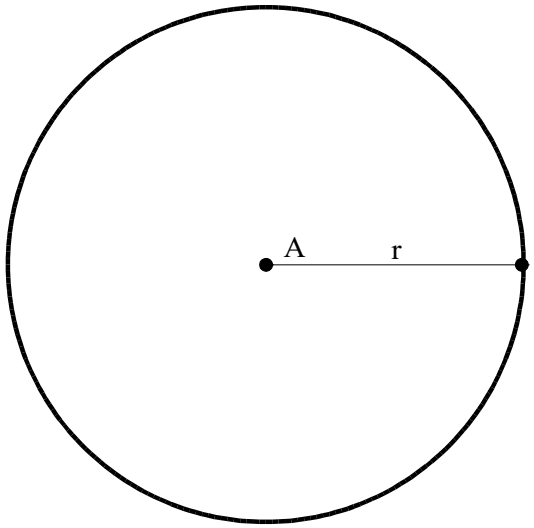

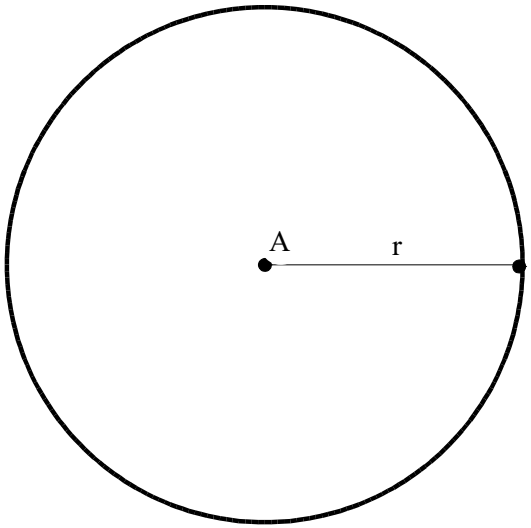

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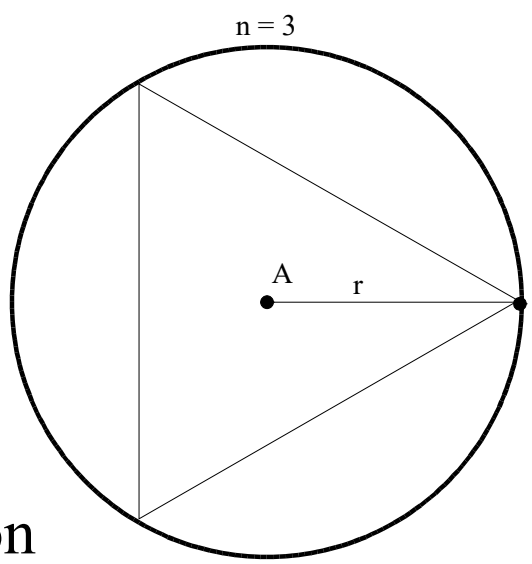

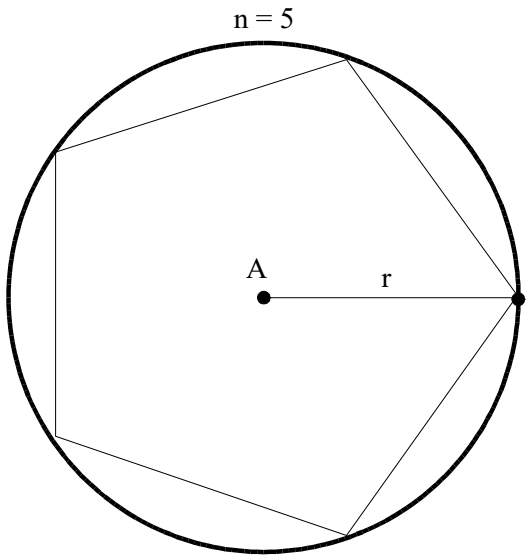

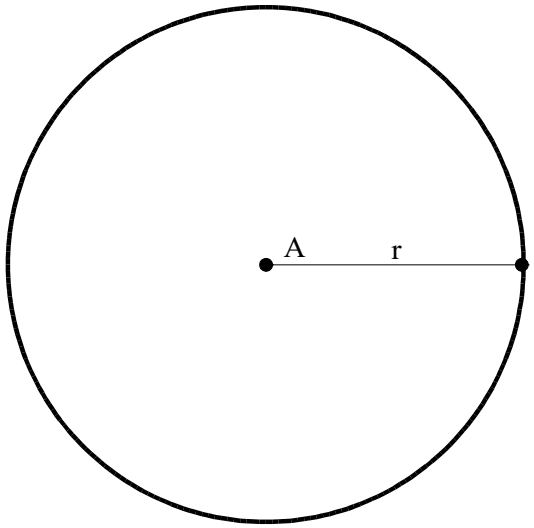

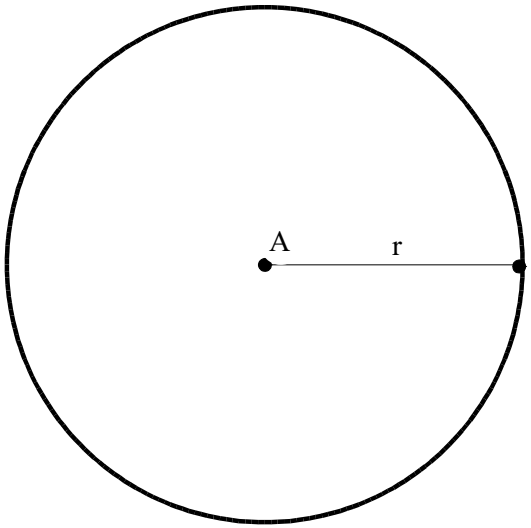

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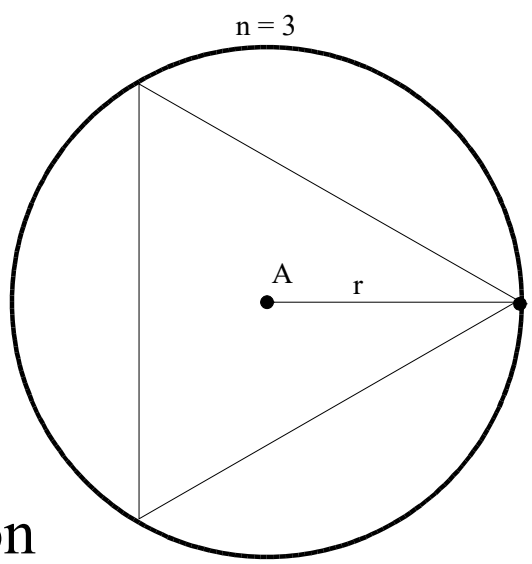

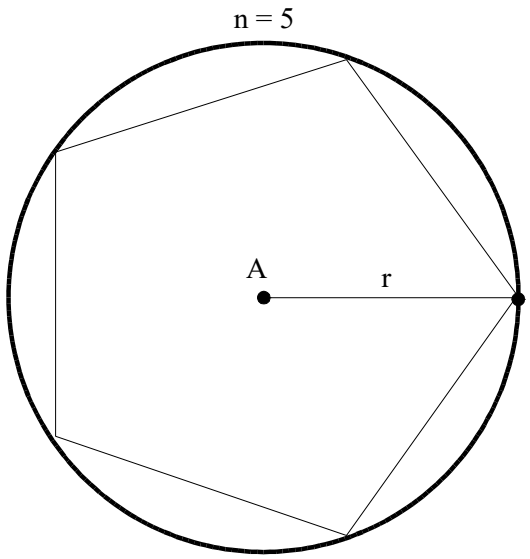

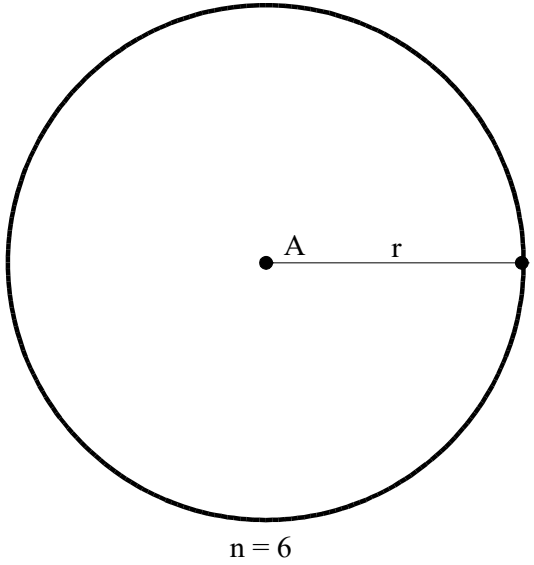

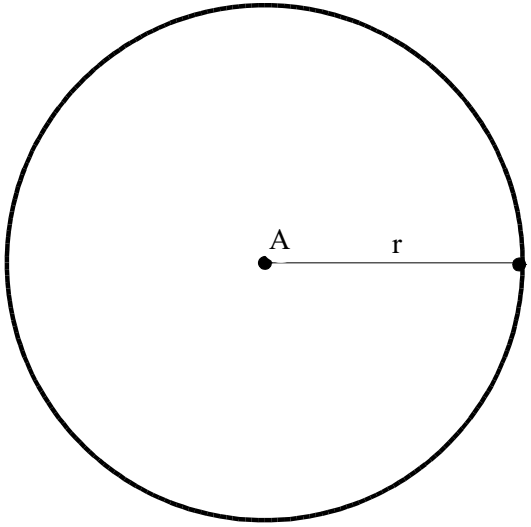

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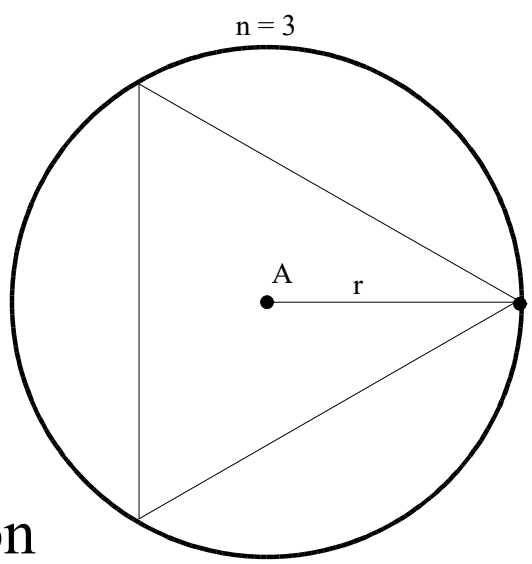

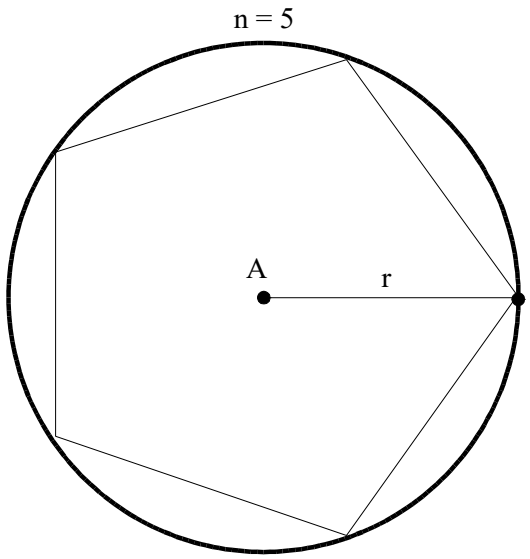

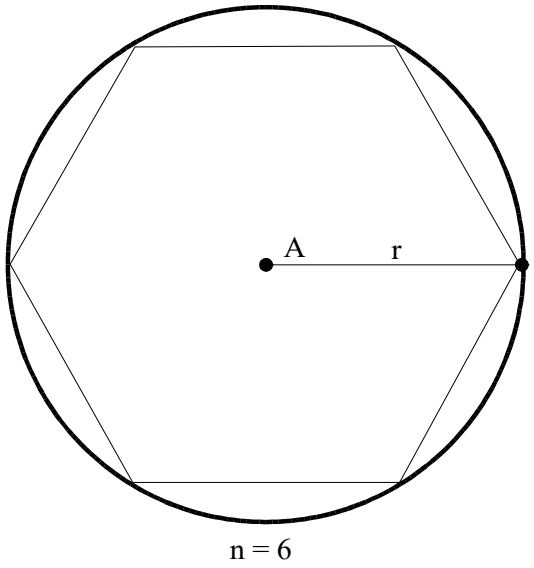

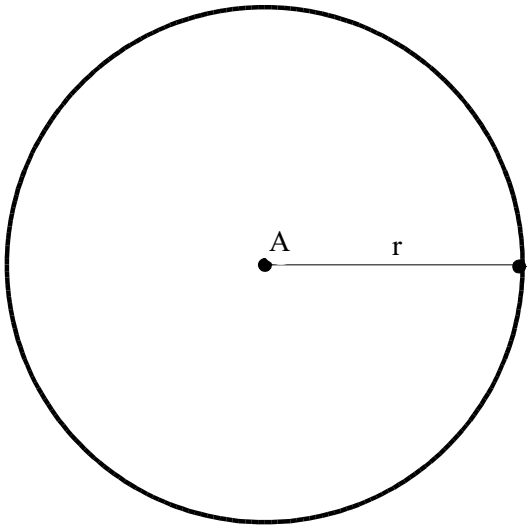

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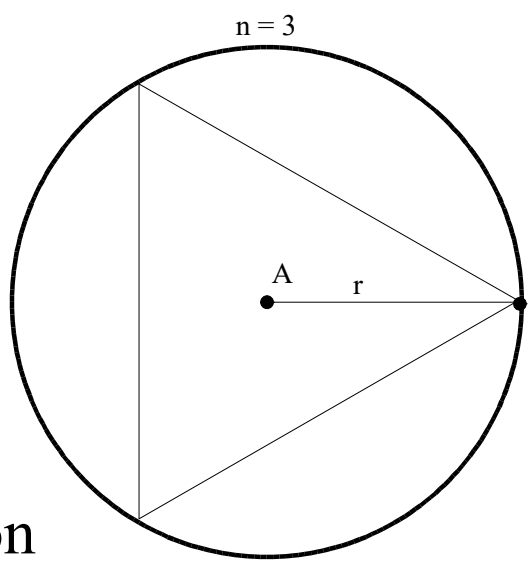

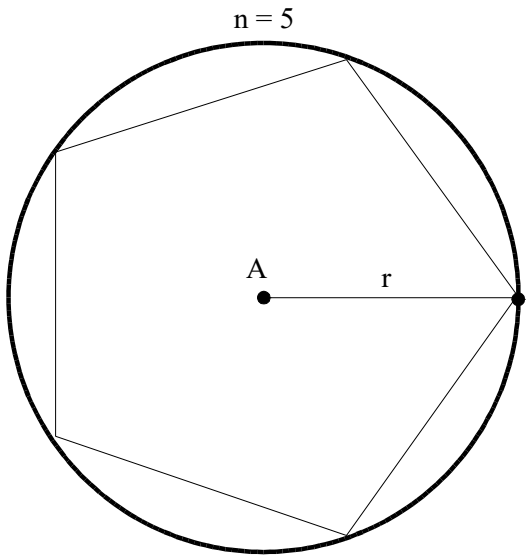

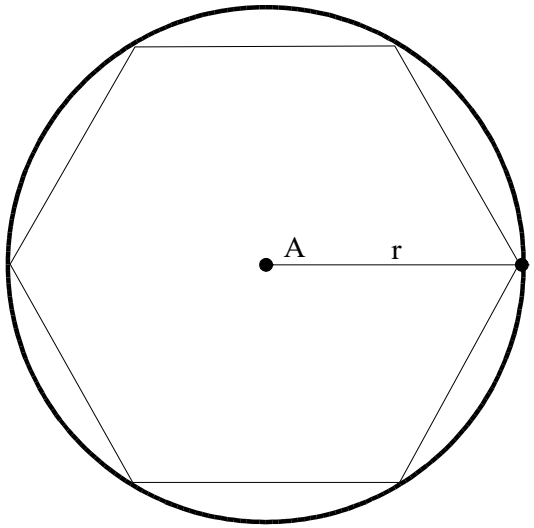

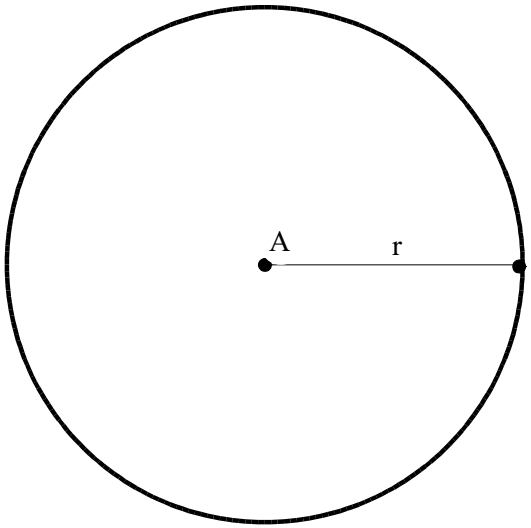

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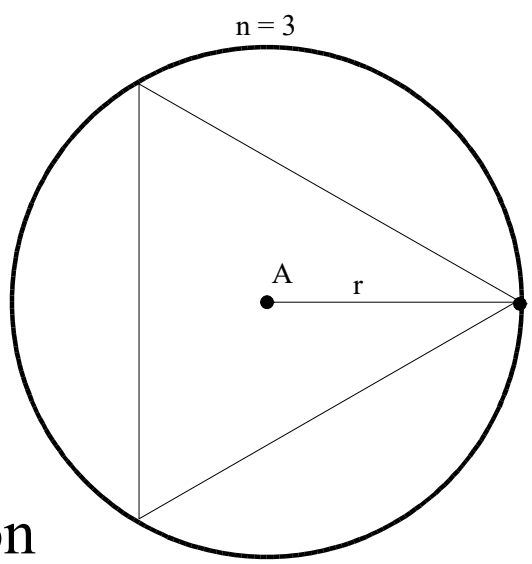

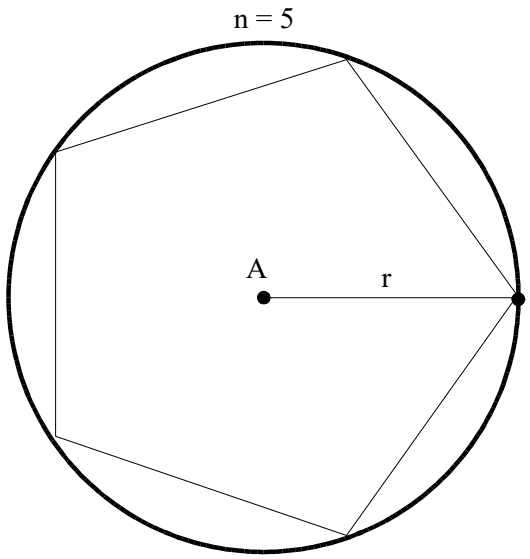

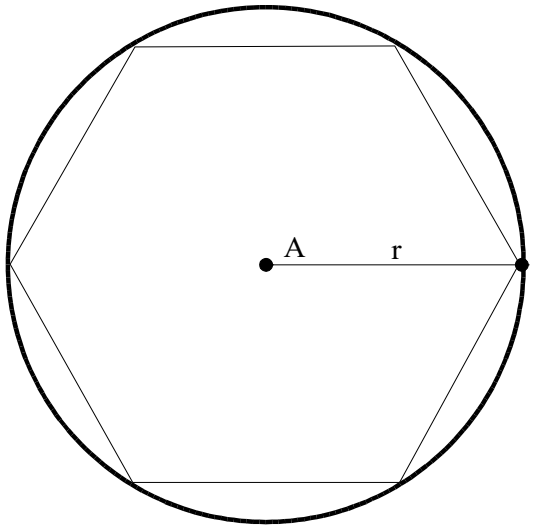

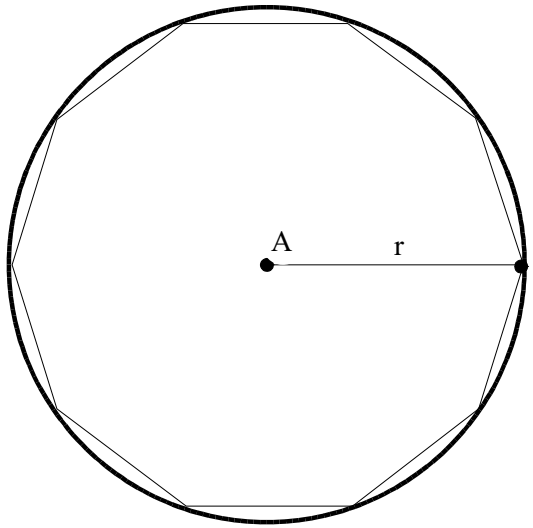

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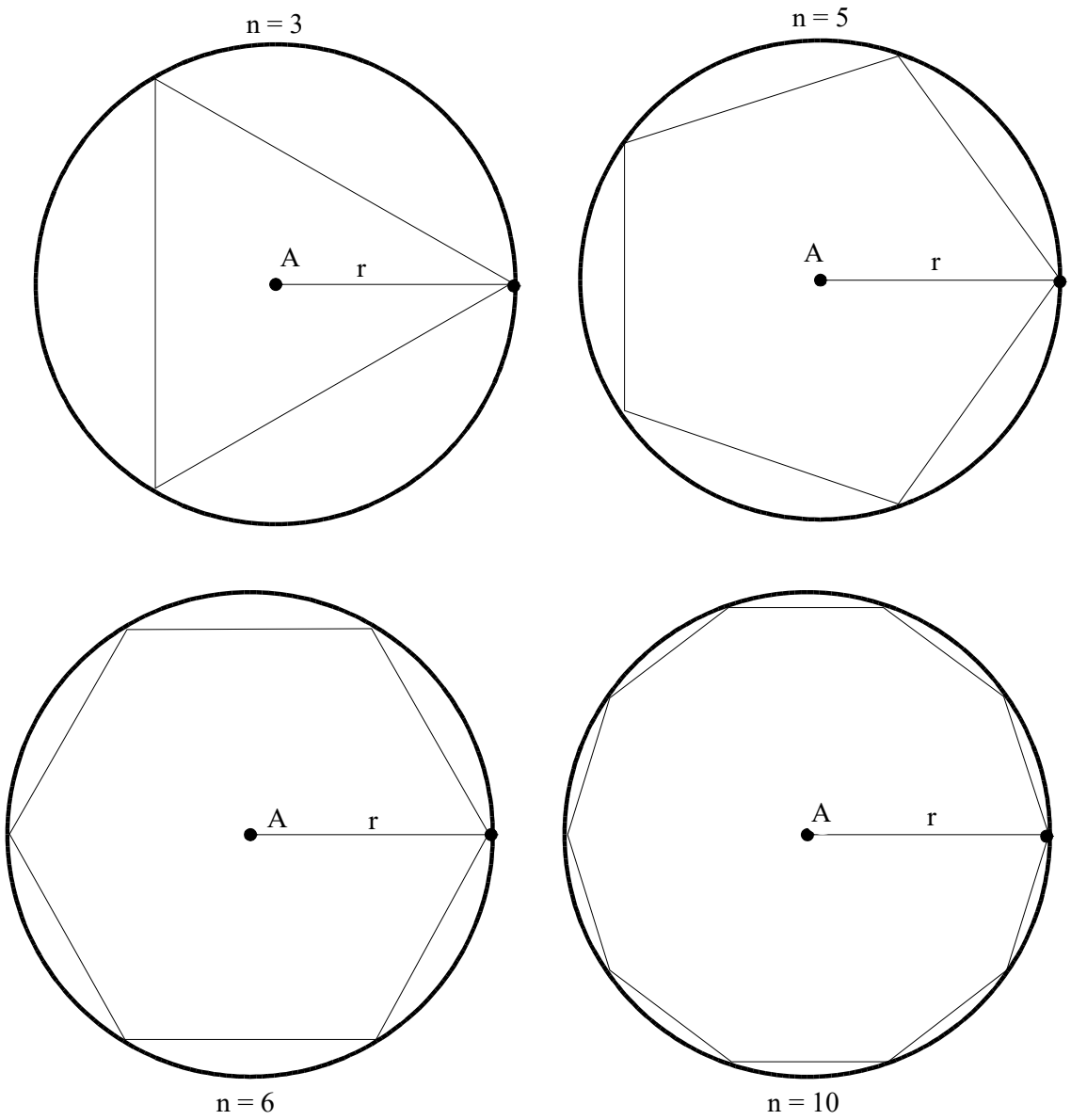

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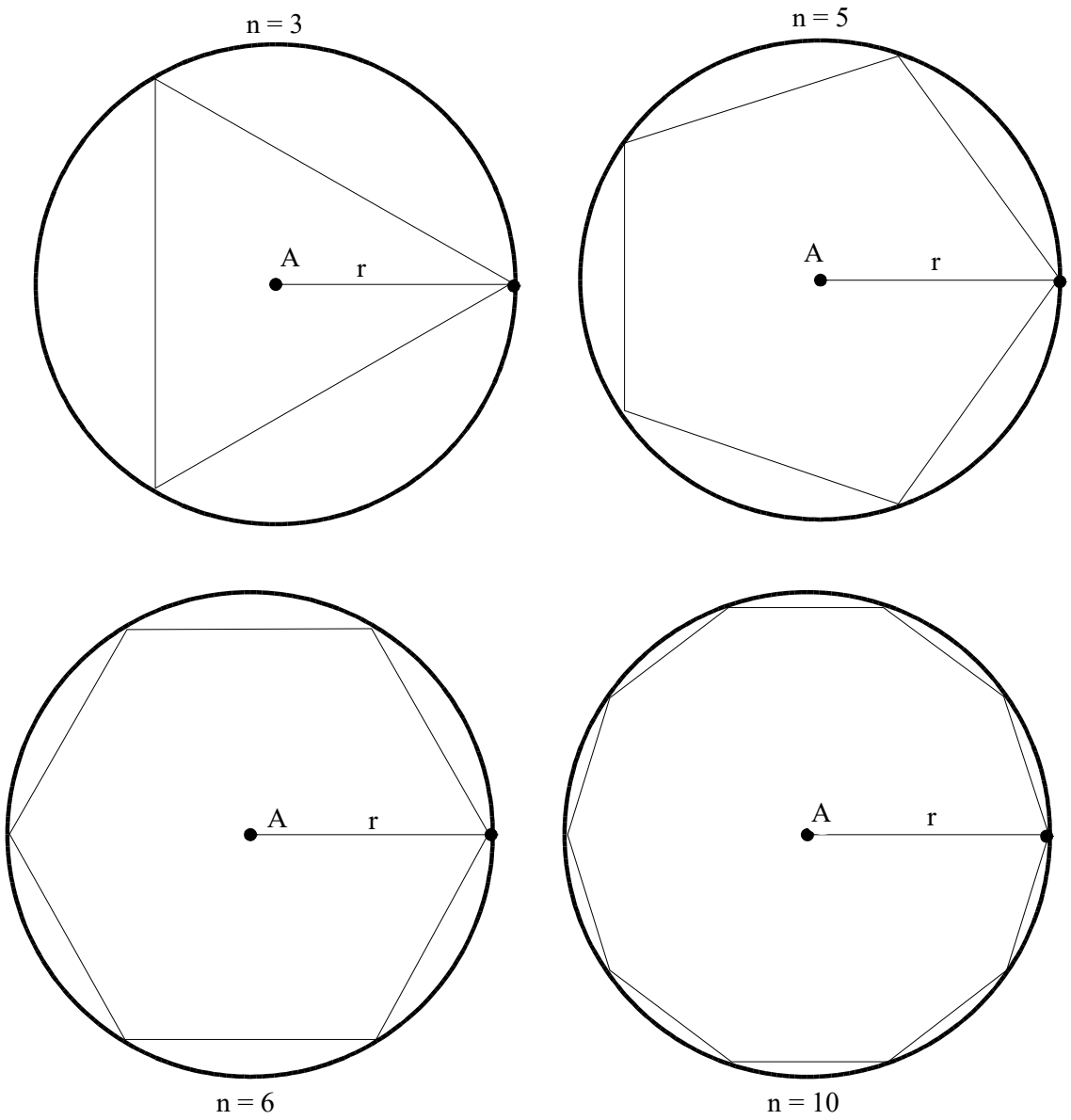

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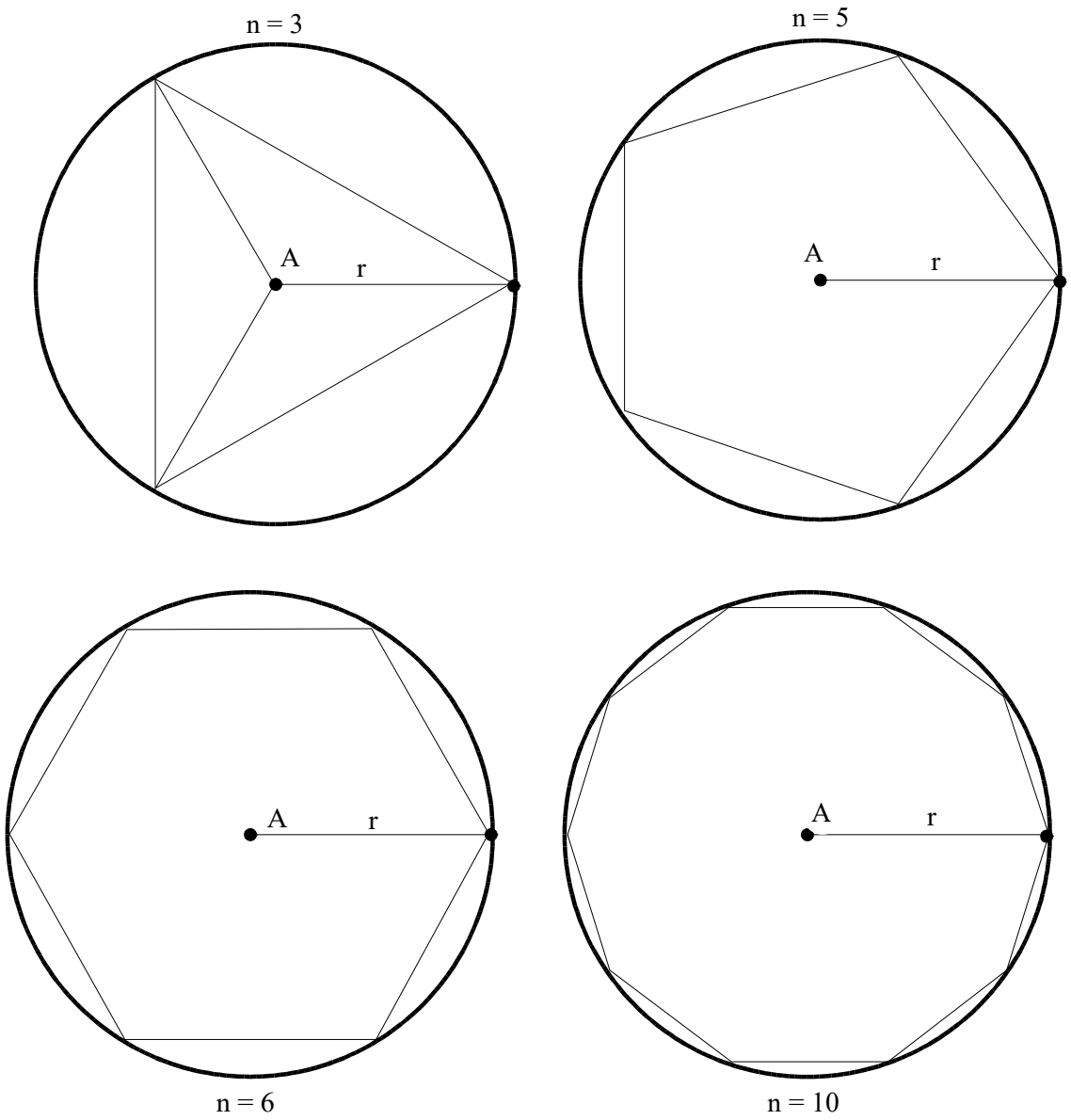

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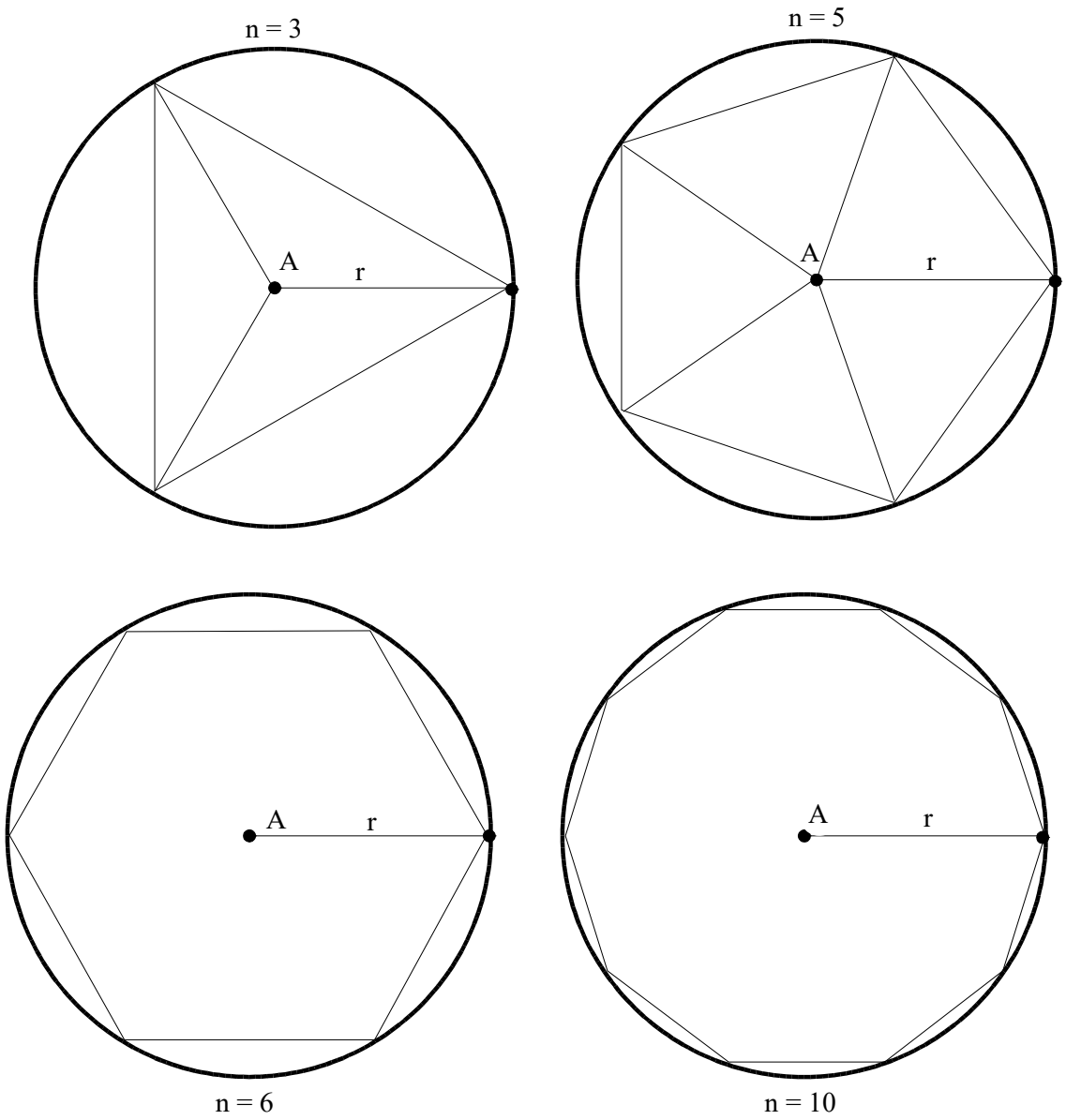

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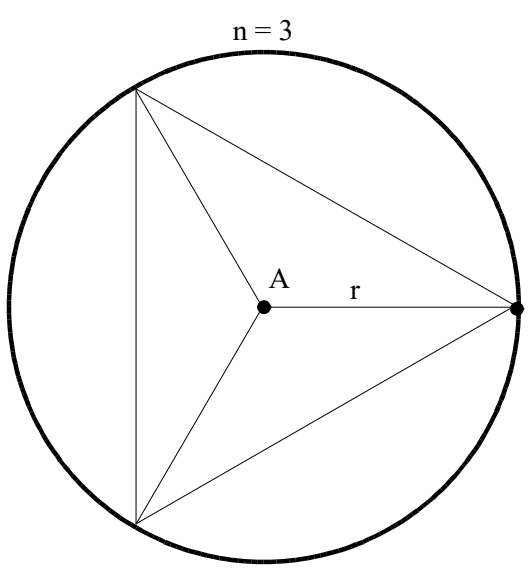

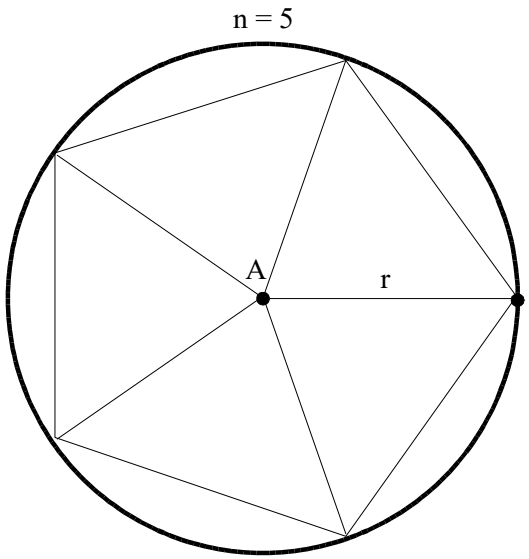

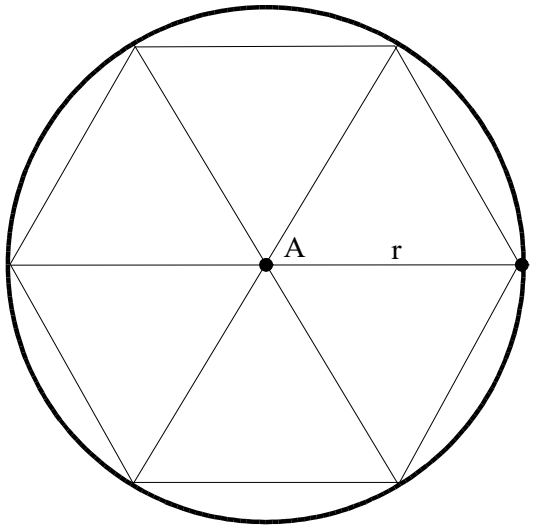

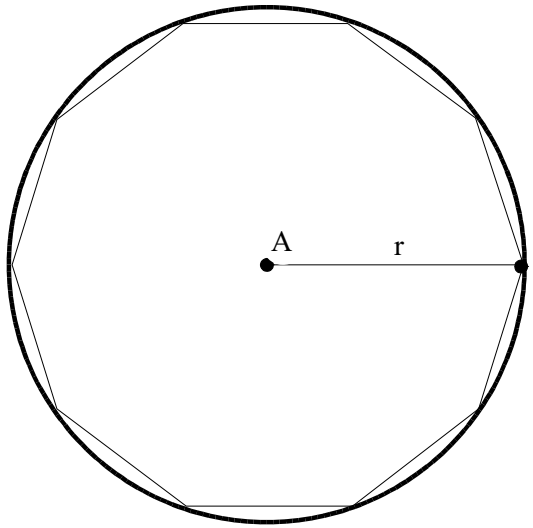

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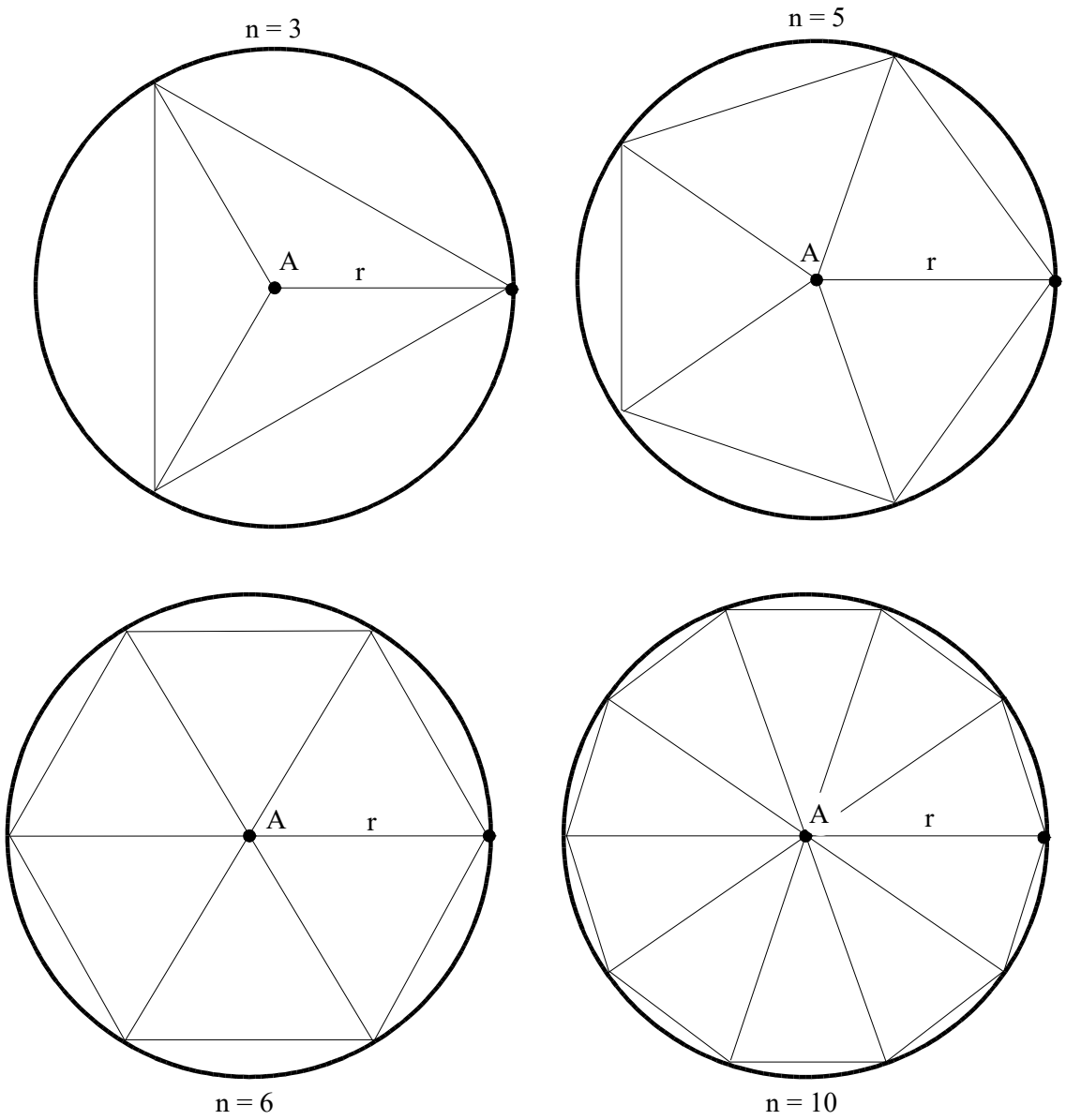

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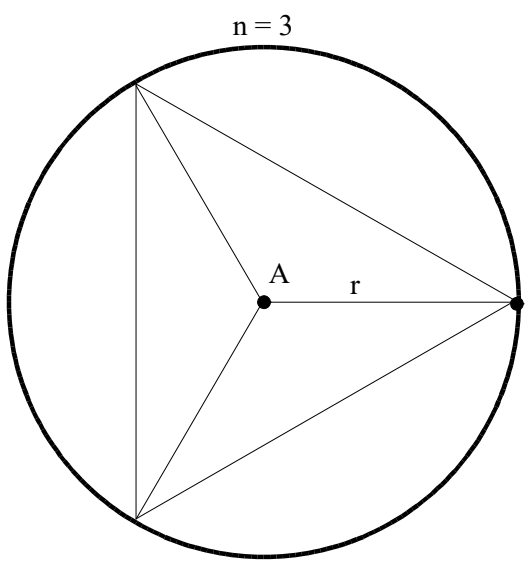

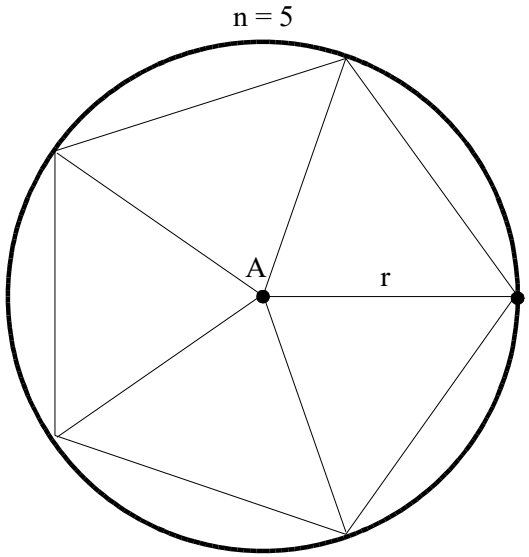

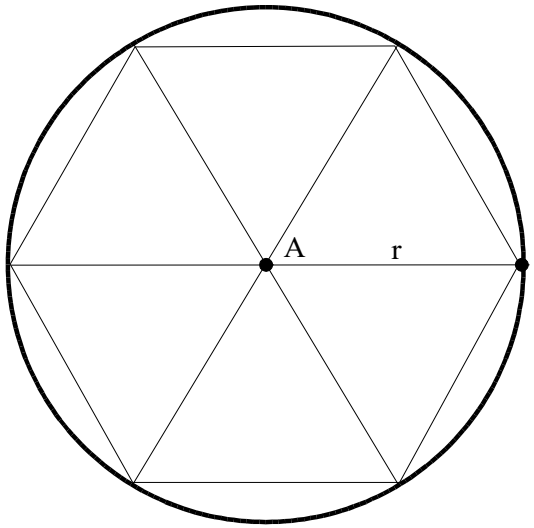

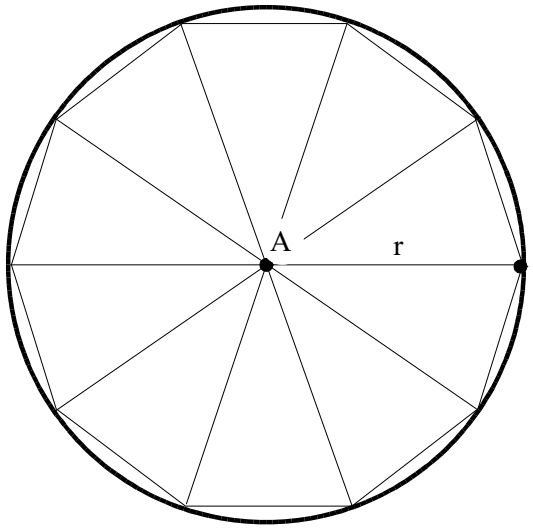

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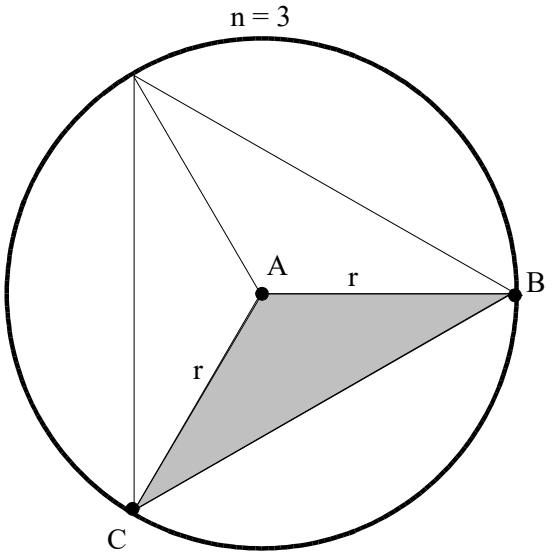

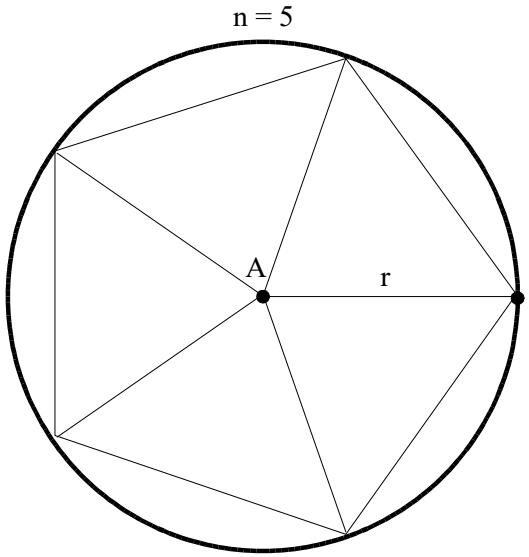

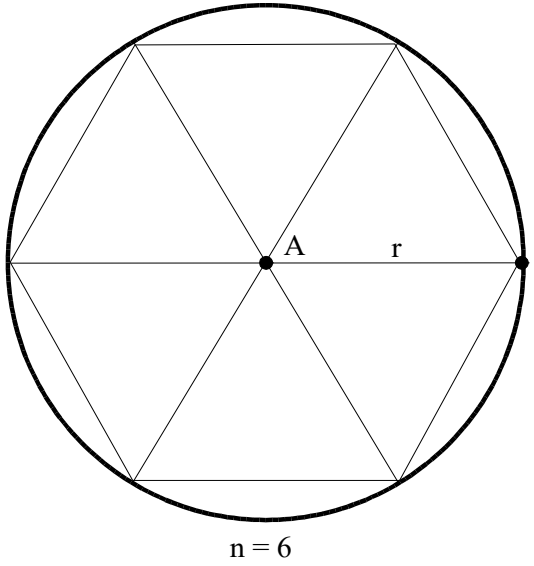

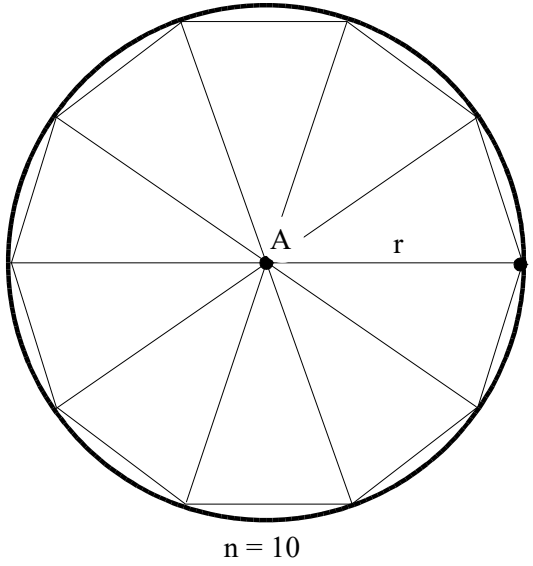

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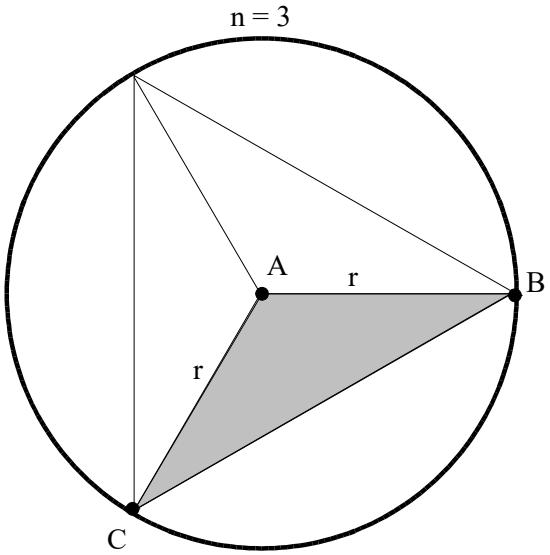

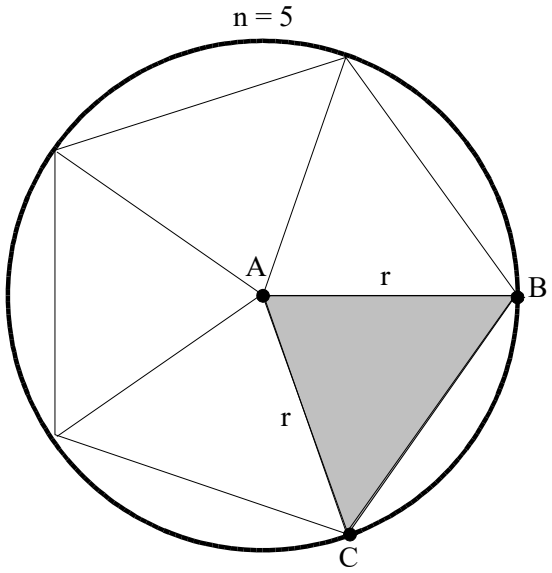

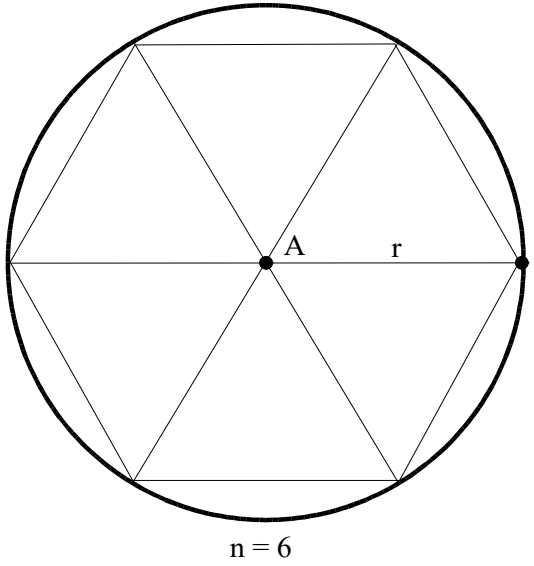

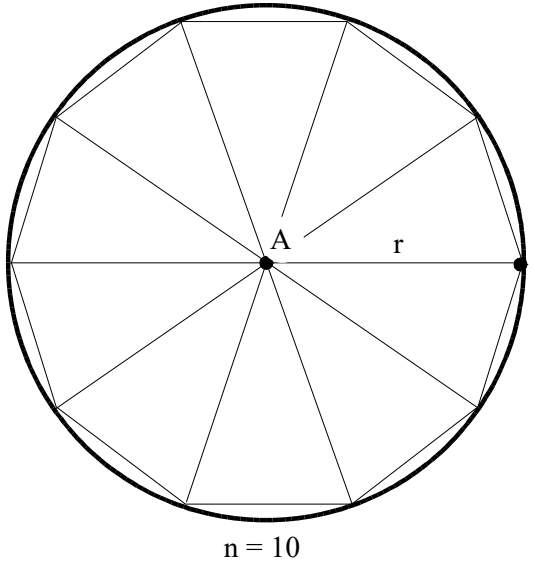

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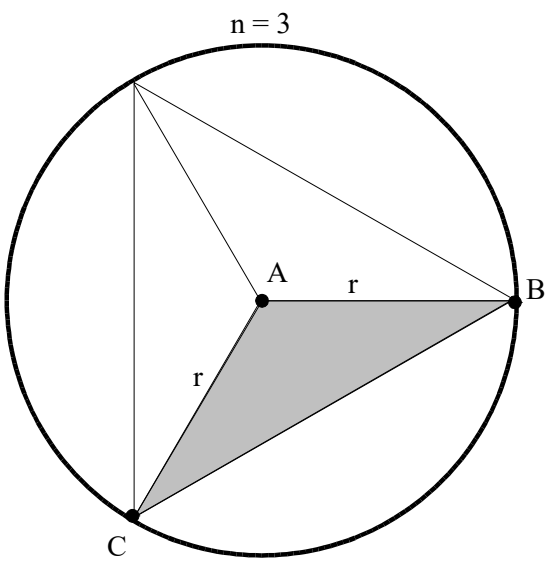

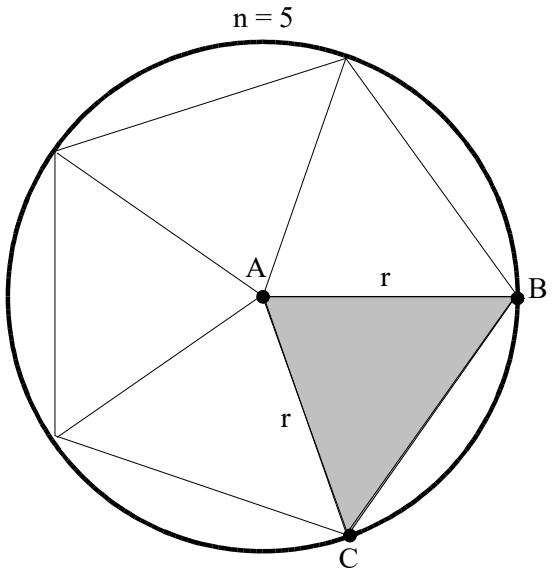

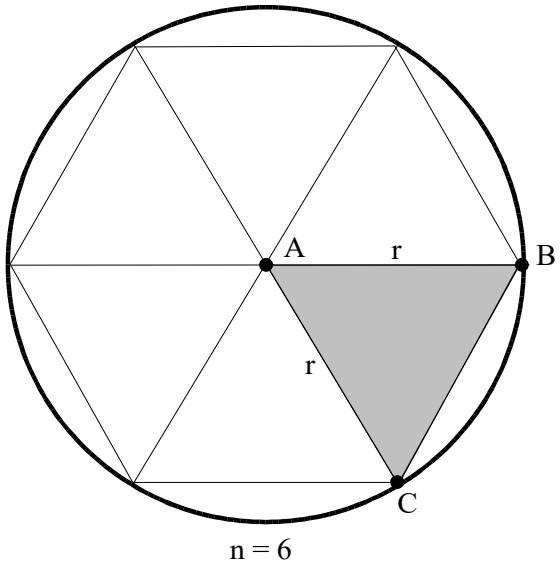

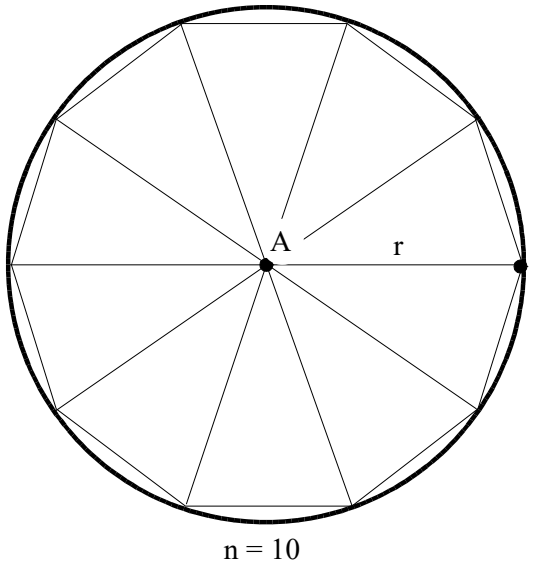

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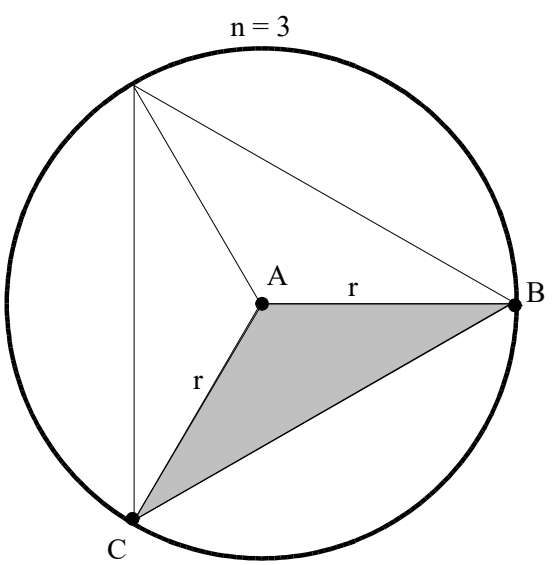
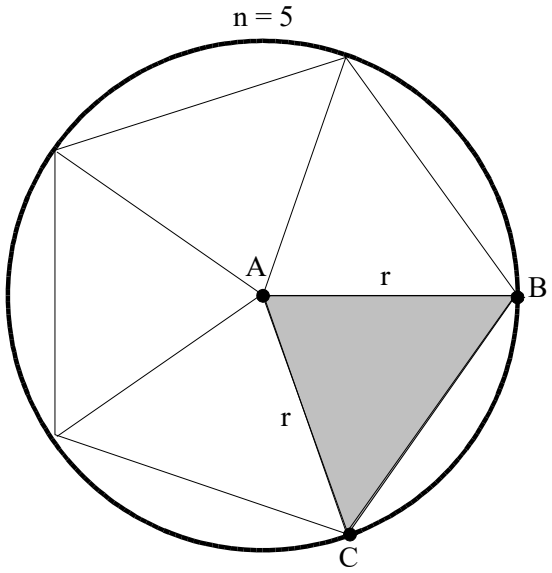
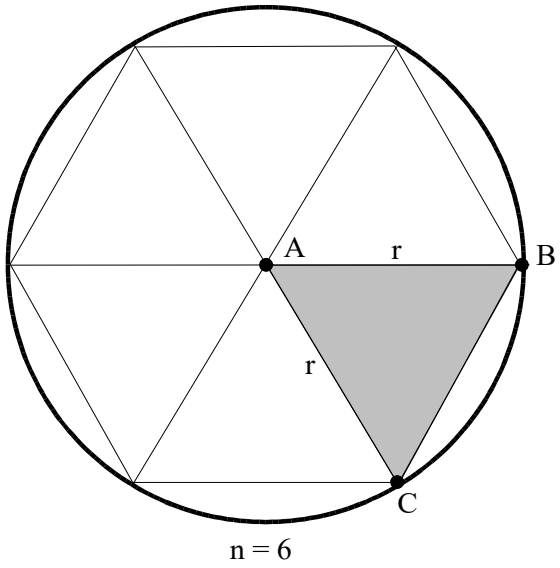
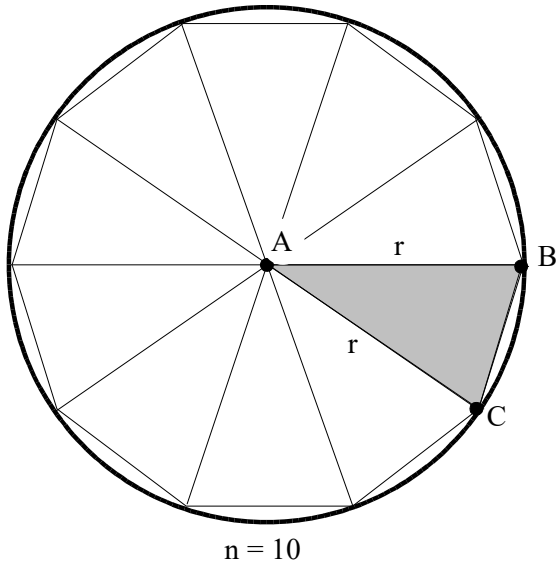
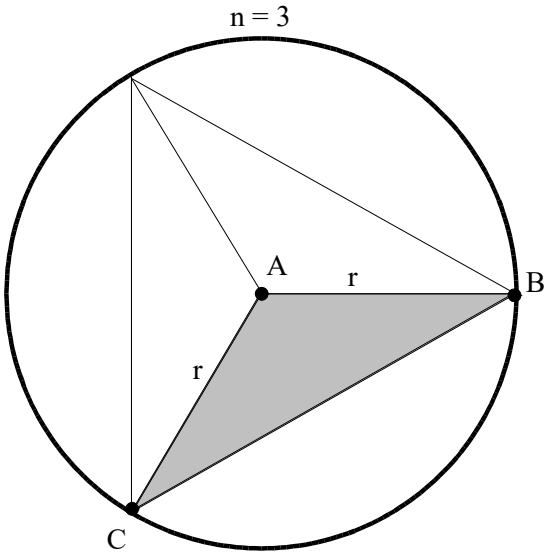


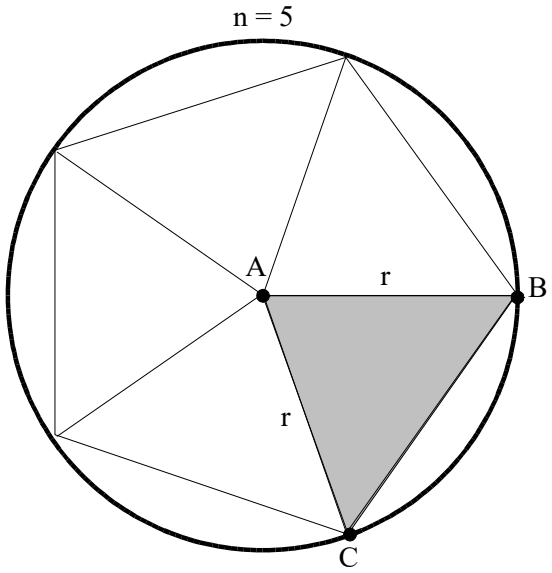


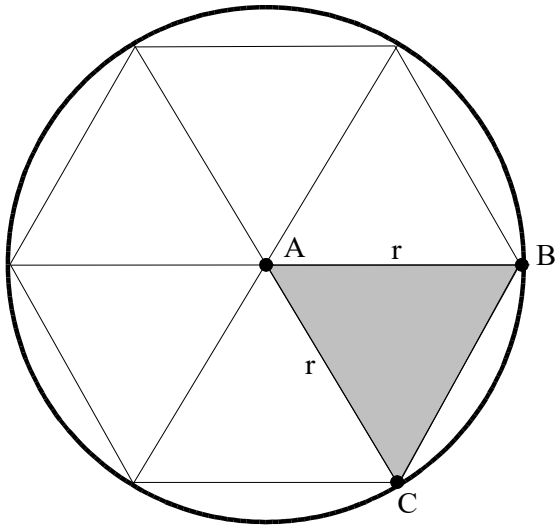




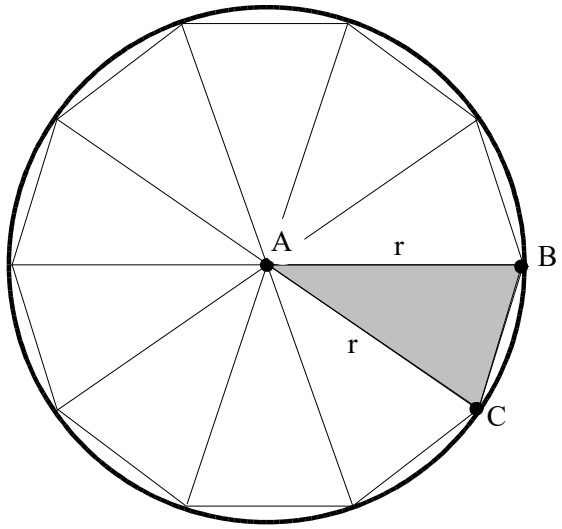
The Value of π







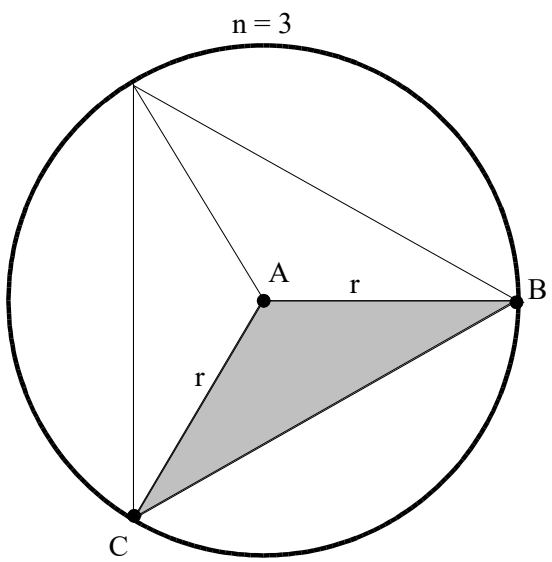
n = 6

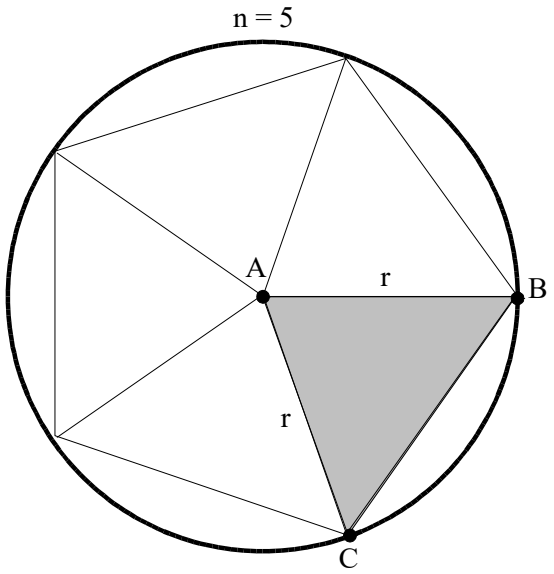


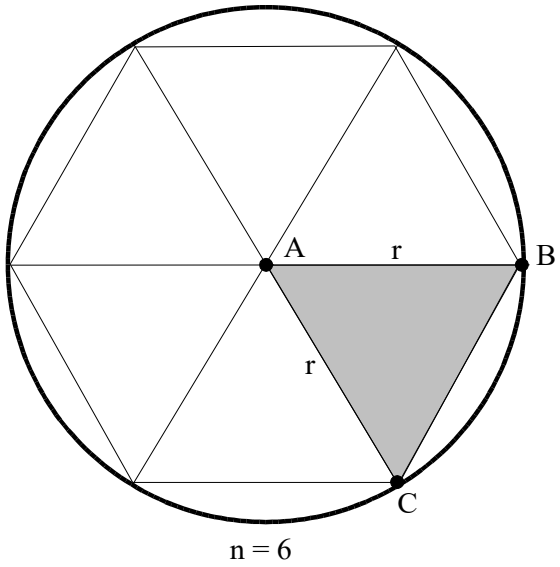
n = 10

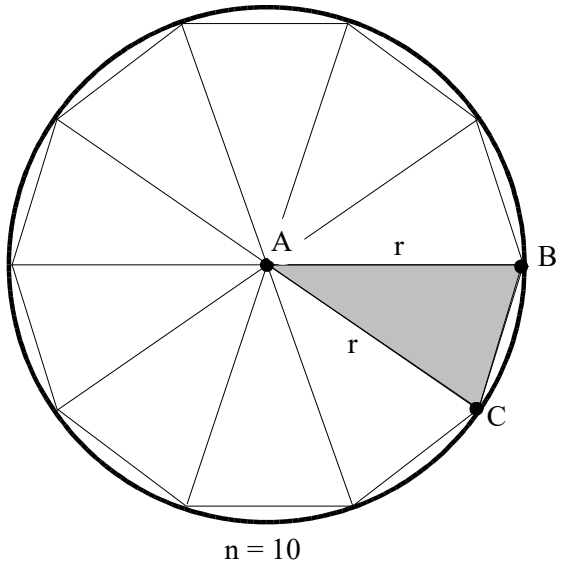
The Value of π

Draw altitude AD of triangle ABC.









The Value of π

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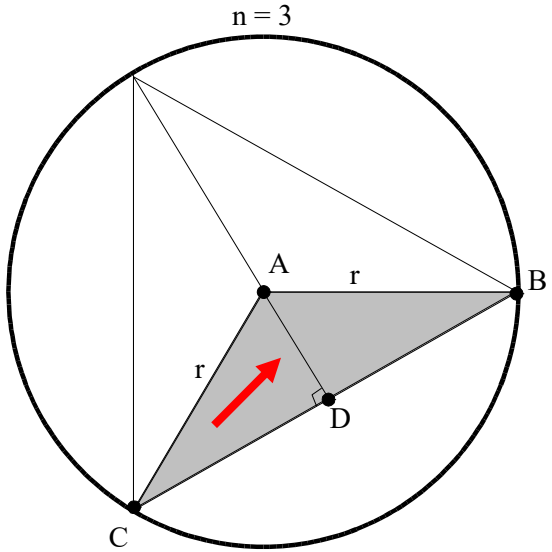

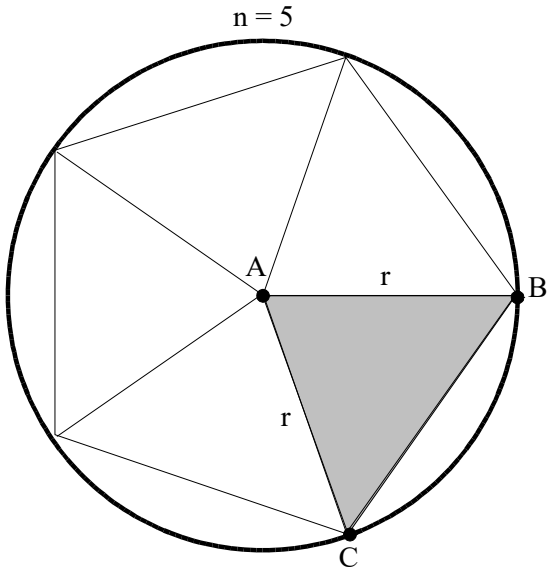

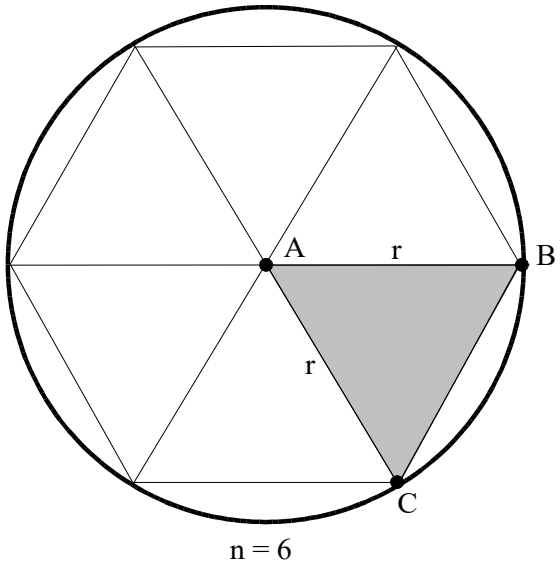

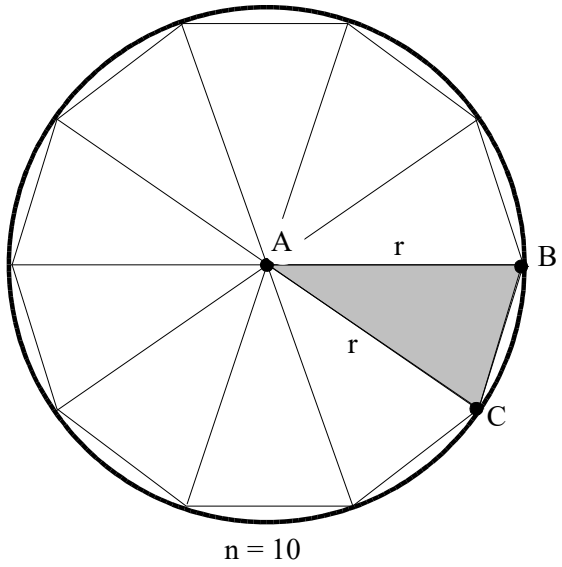

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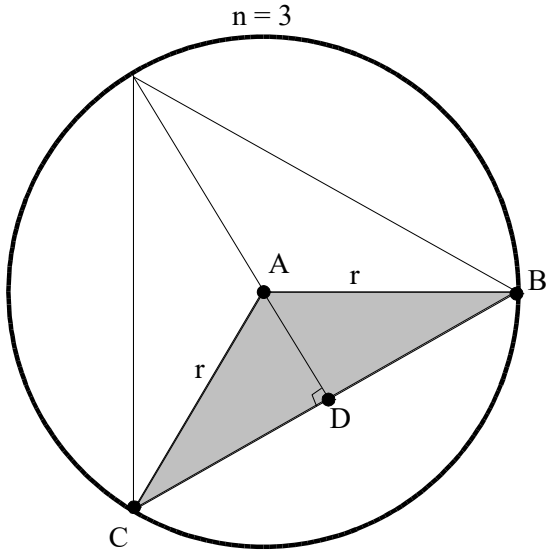

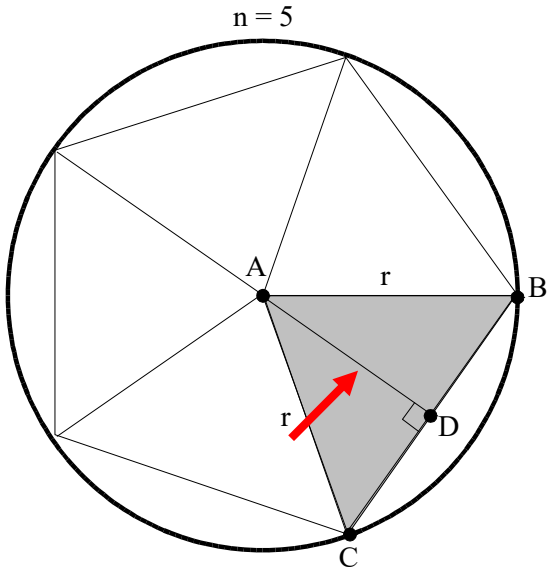

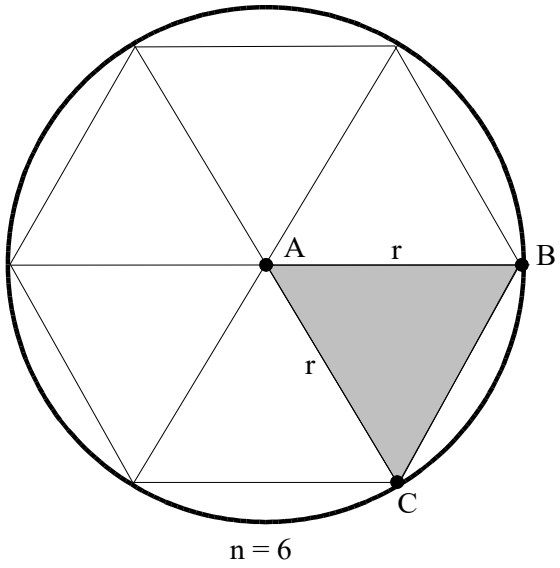

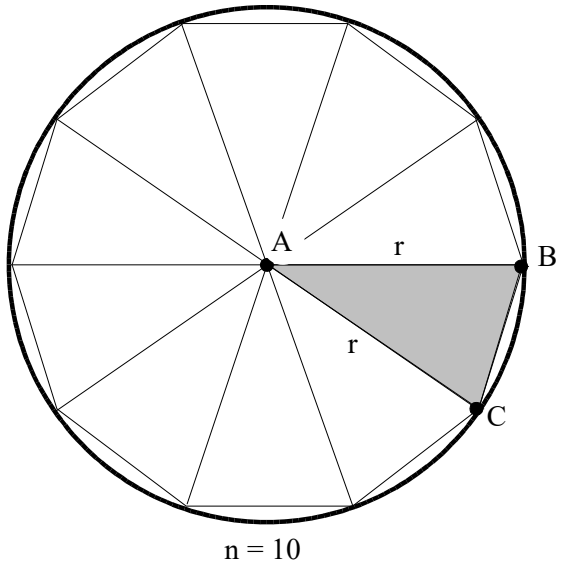

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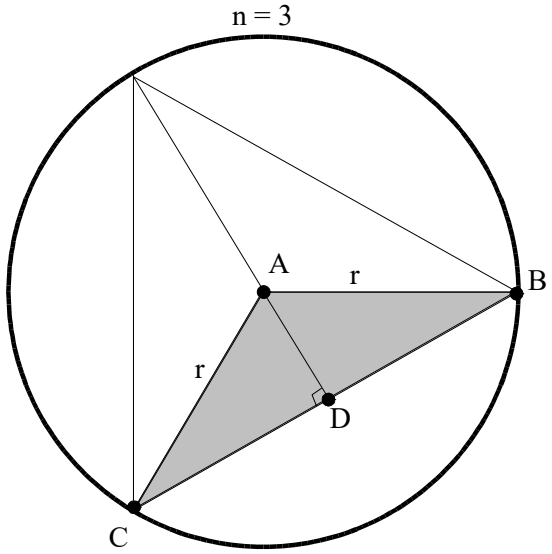

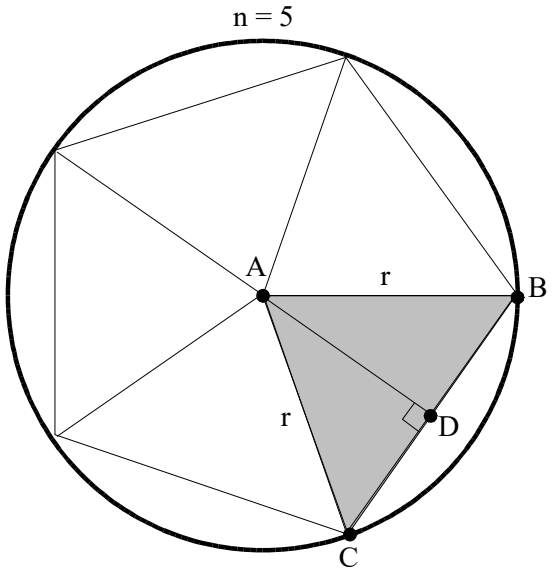

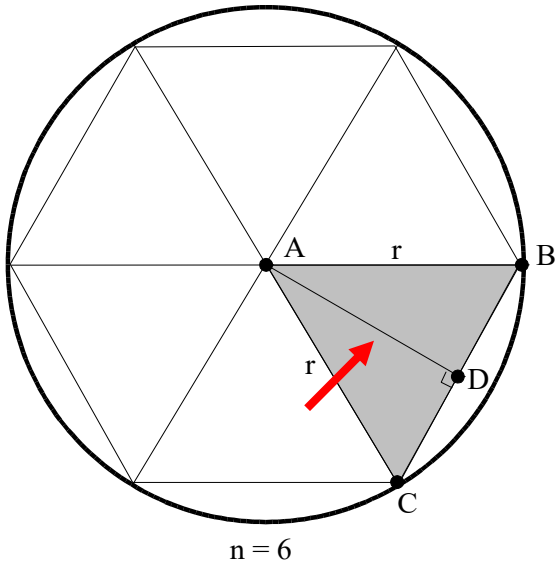

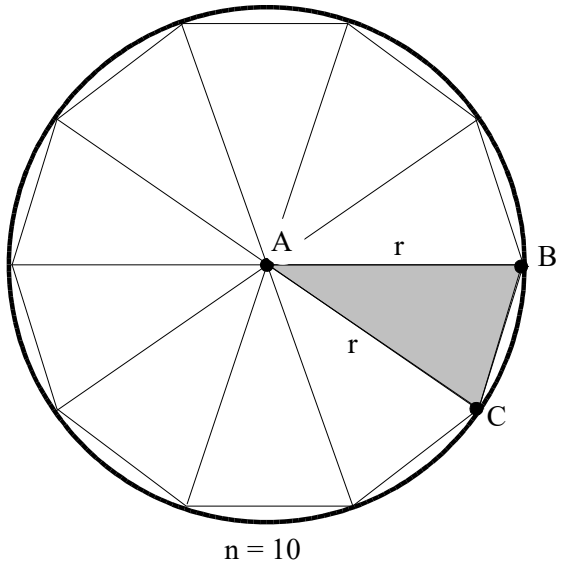

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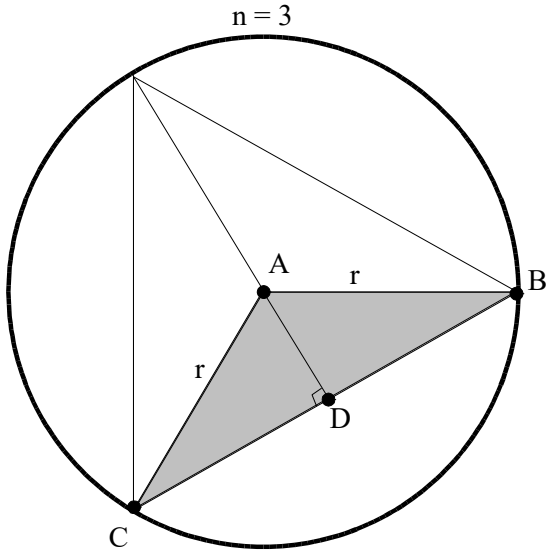
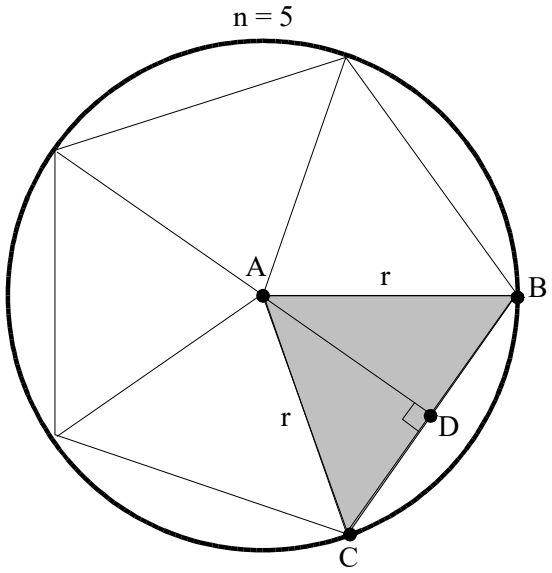
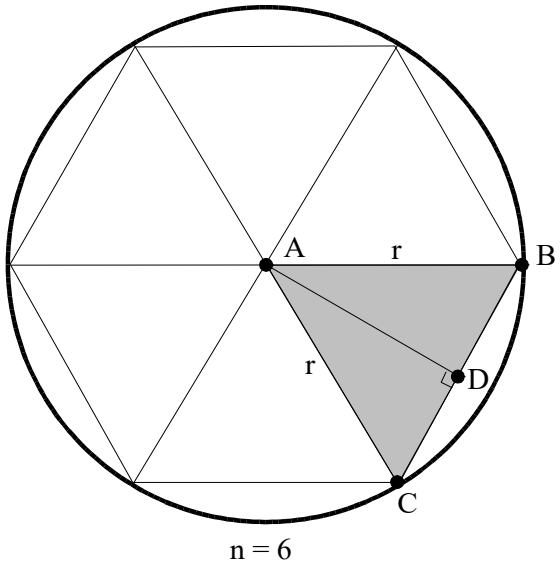
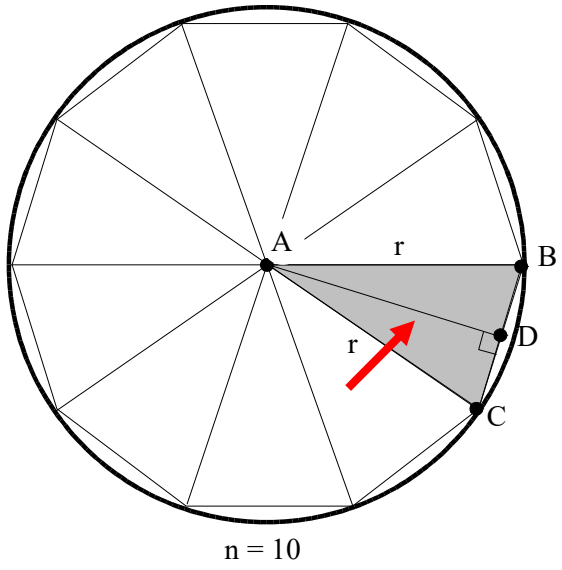




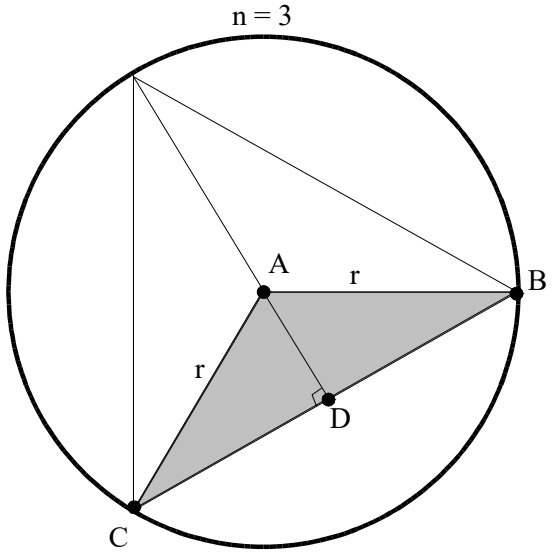


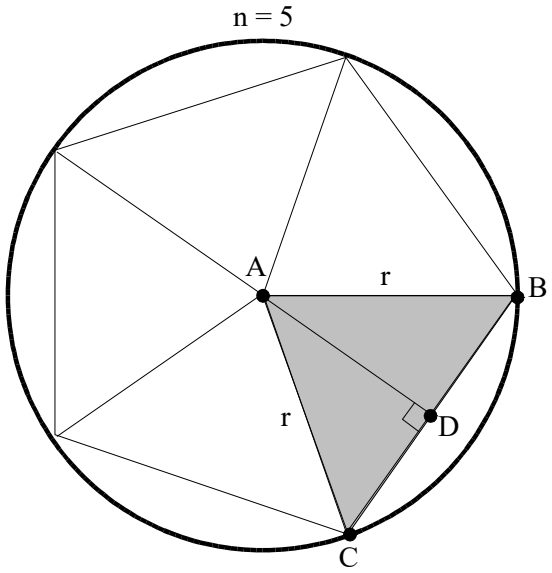


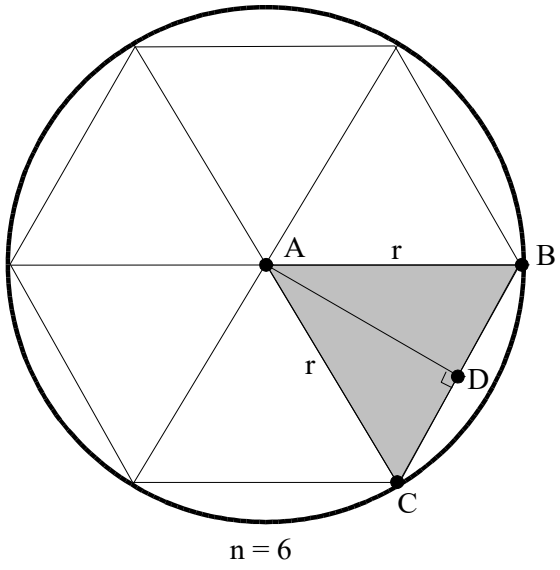
The Value of π

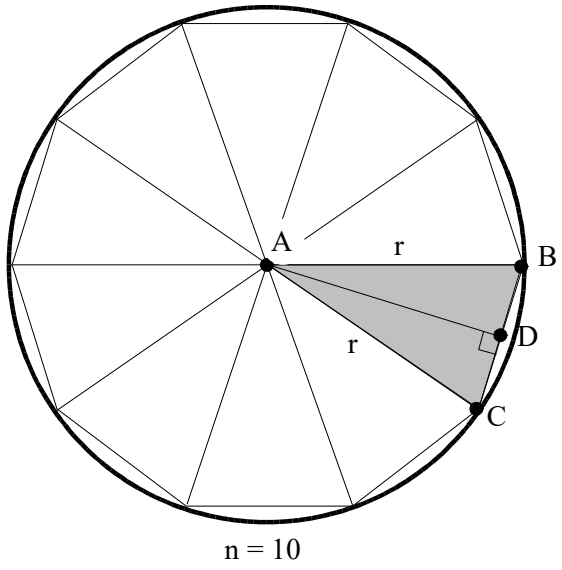
Draw altitude AD of triangle ABC.

Let **a** represent the length of segment AD









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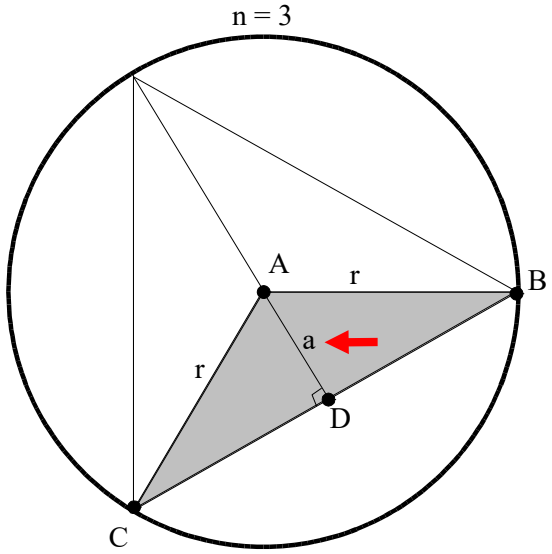

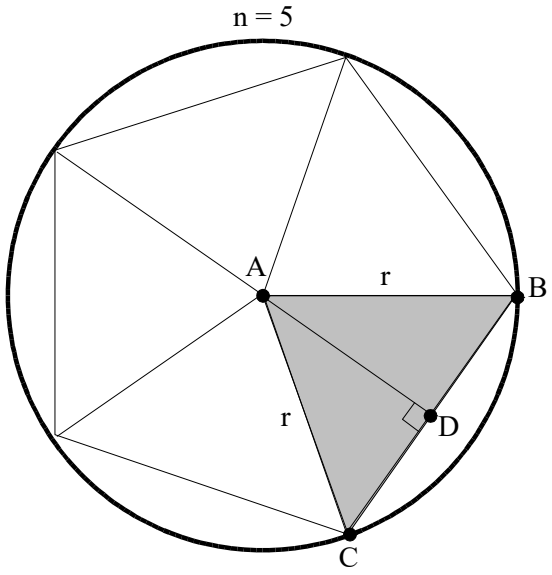

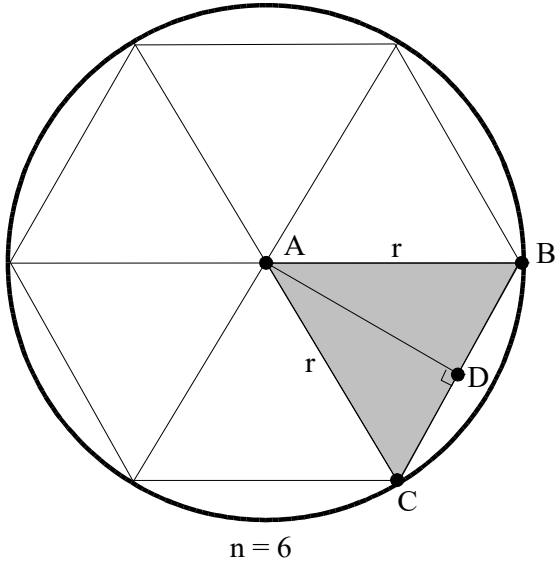

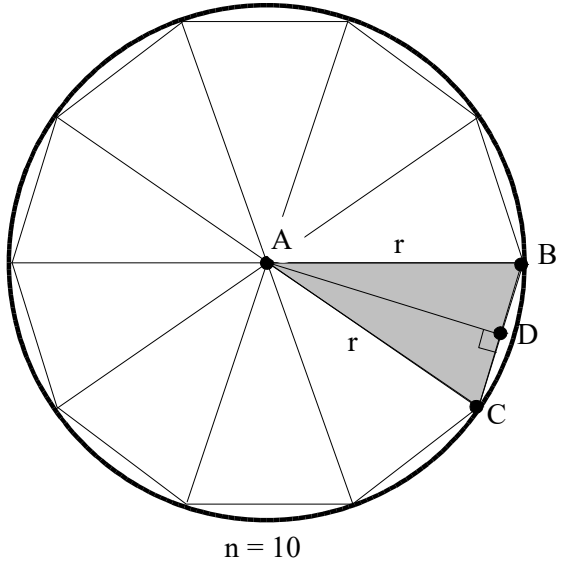

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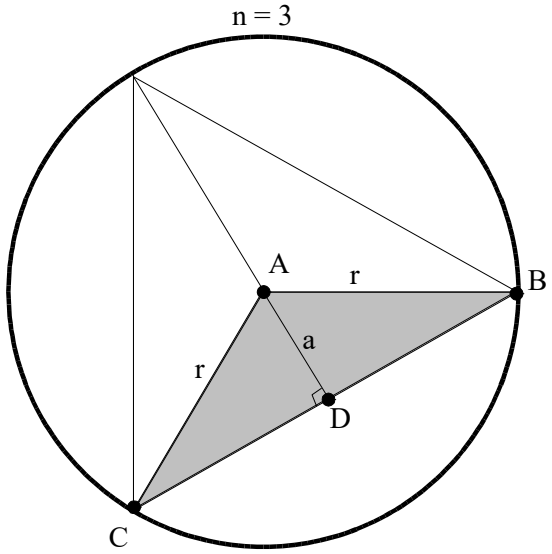
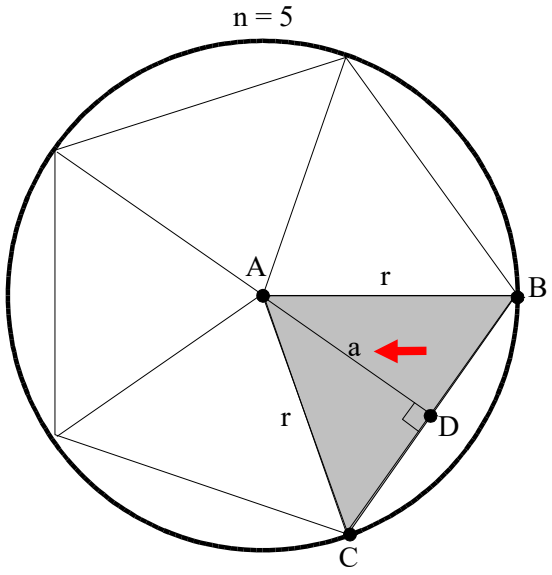
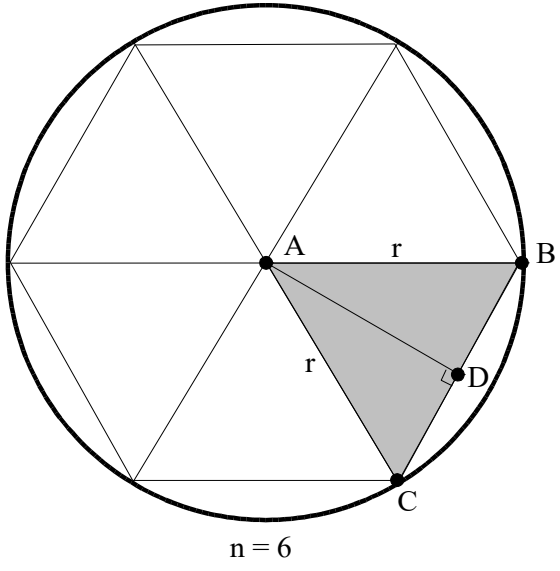
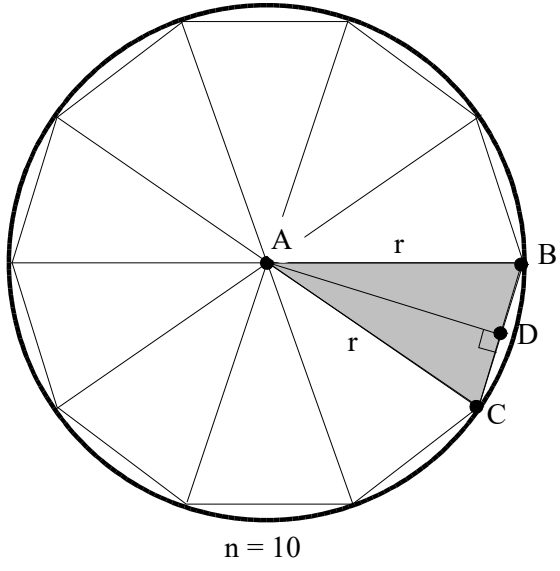




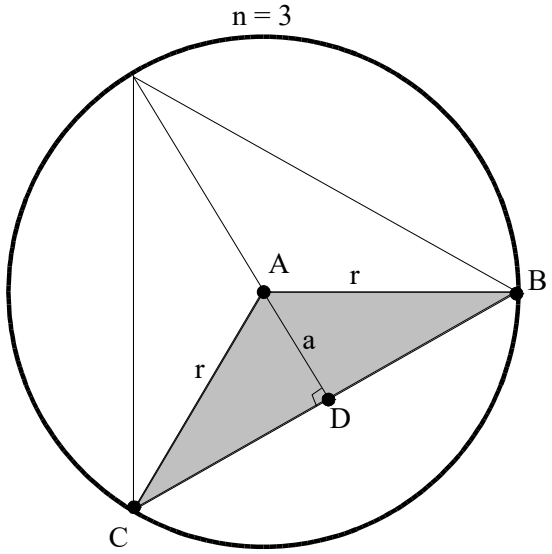


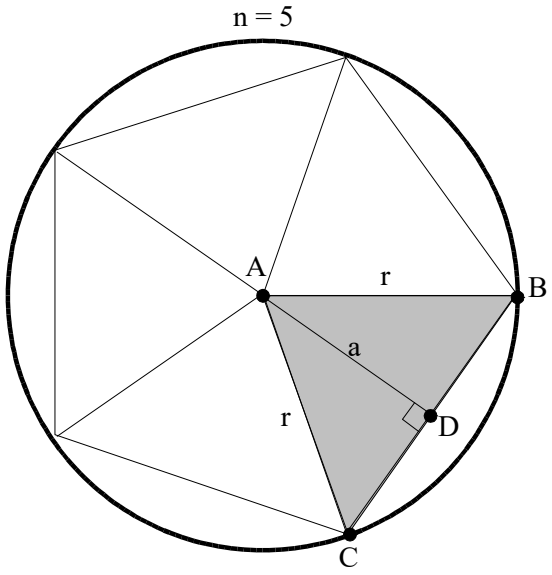


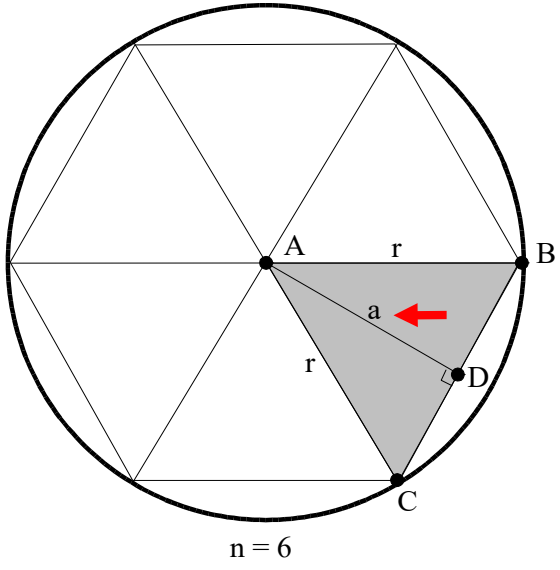
The Value of π

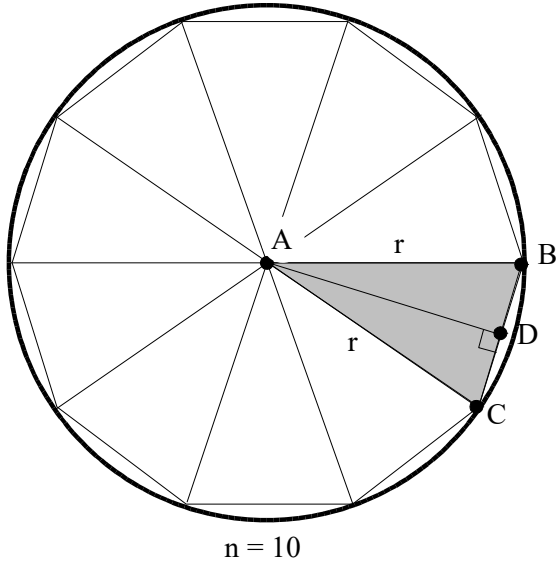
Draw altitude AD of triangle ABC.

Let **a** represent the length of segment AD









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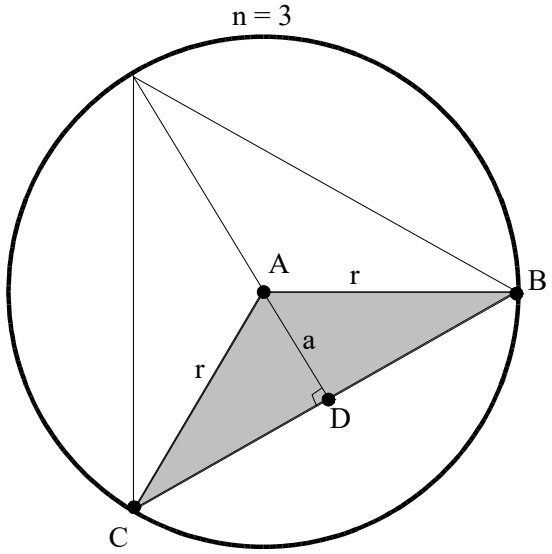

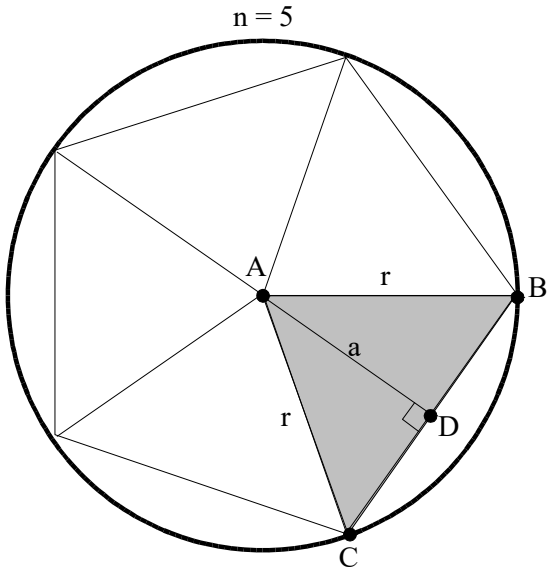

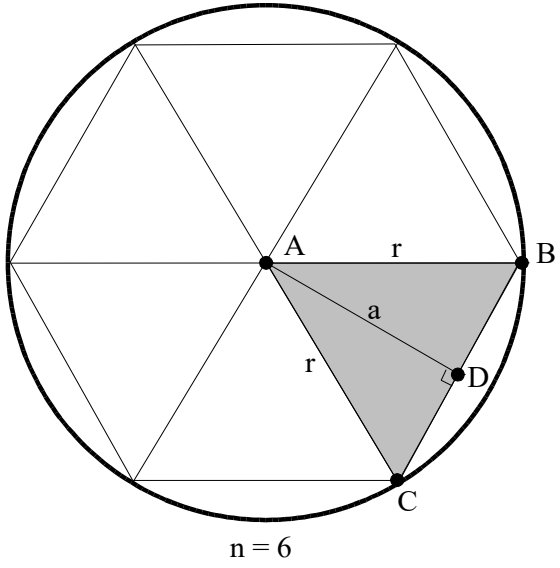

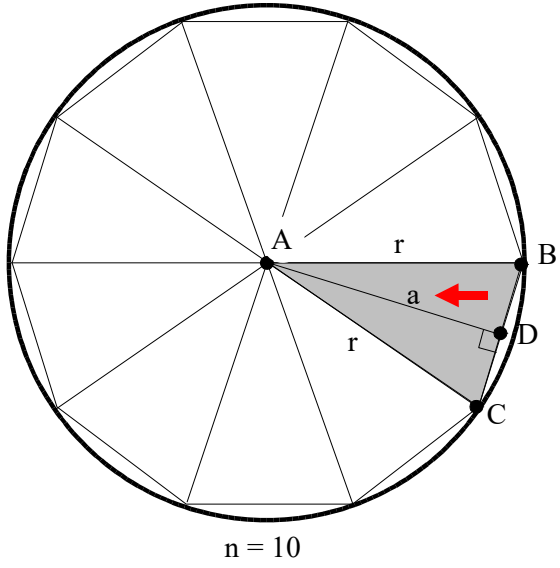

The Value of π

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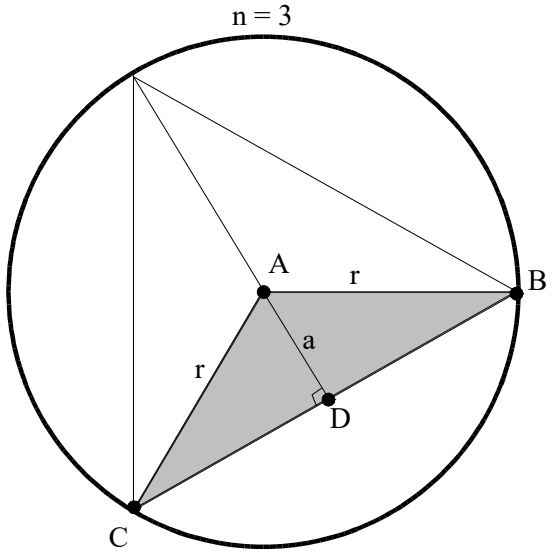
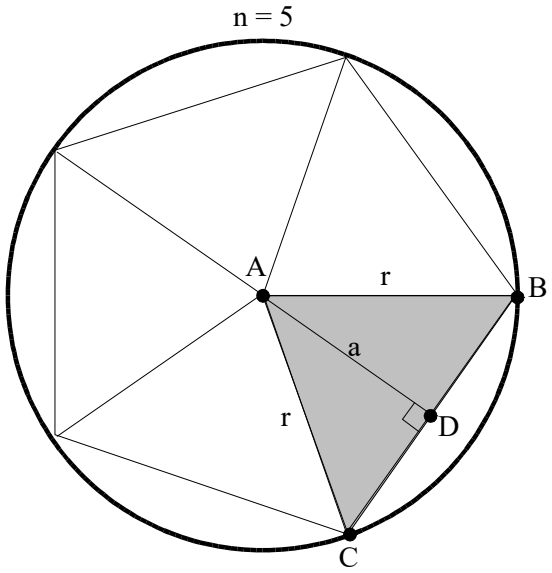
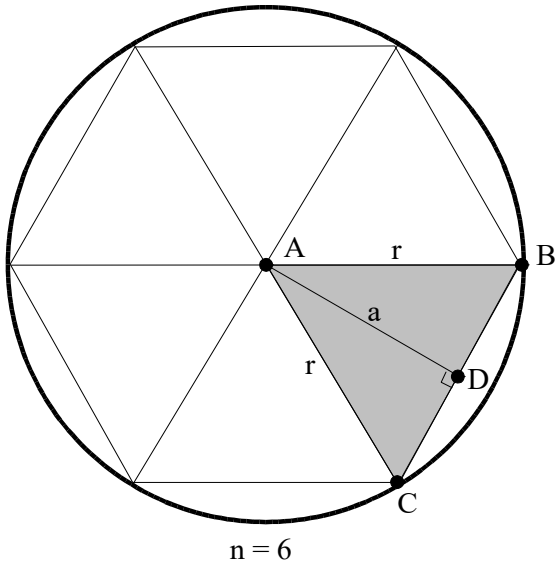
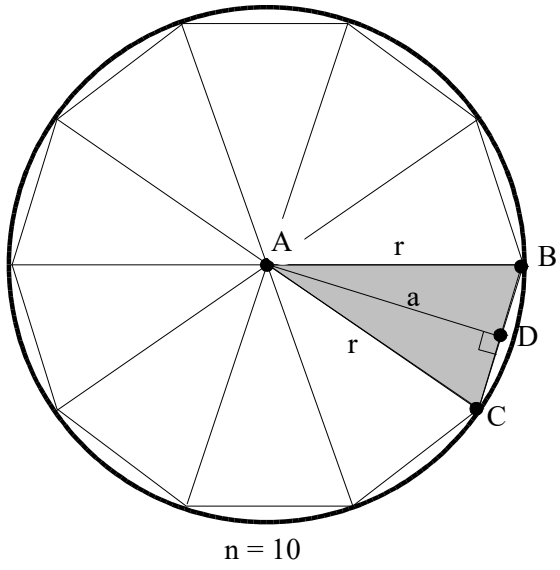
Label angle CAD θ.









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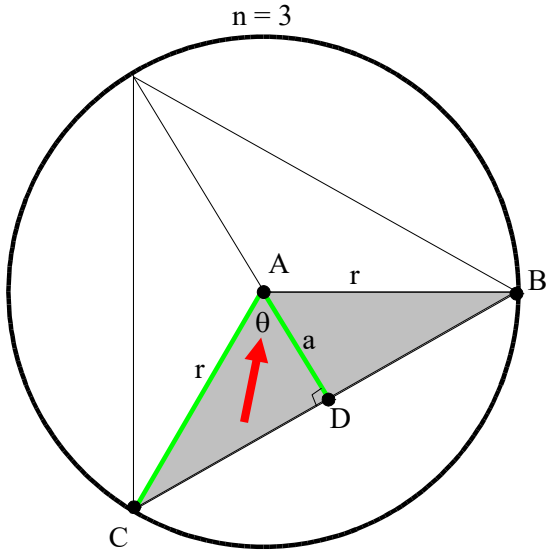

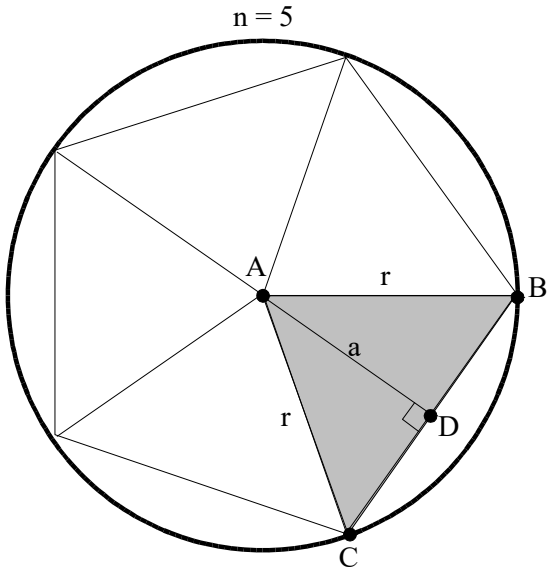

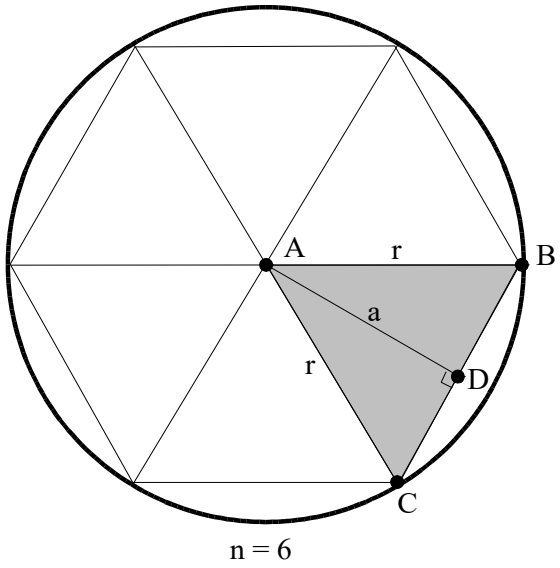

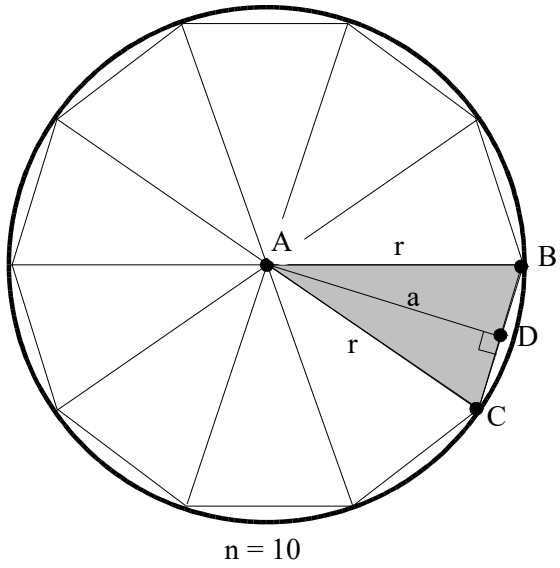

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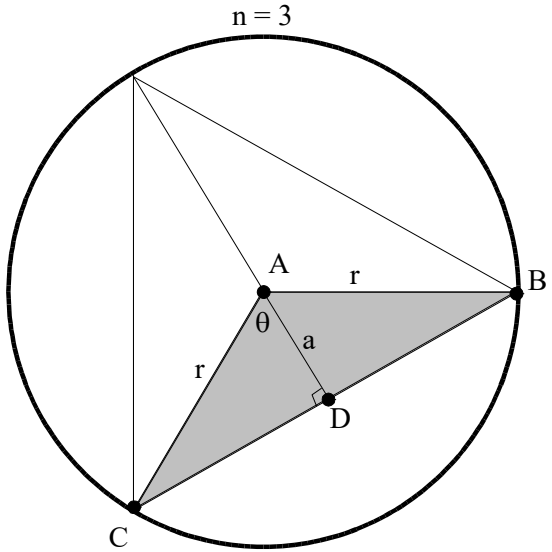

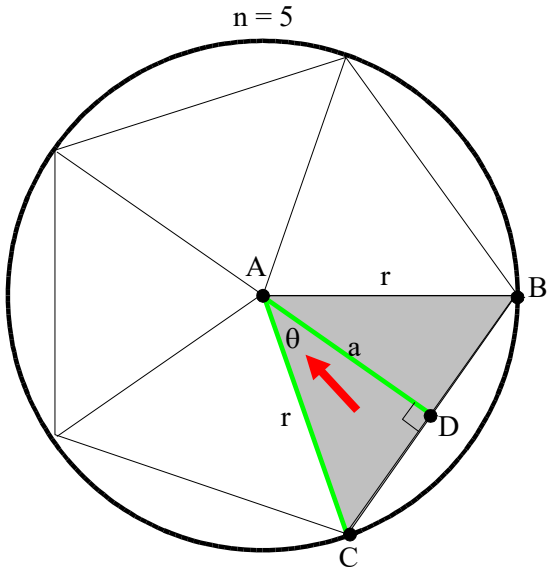

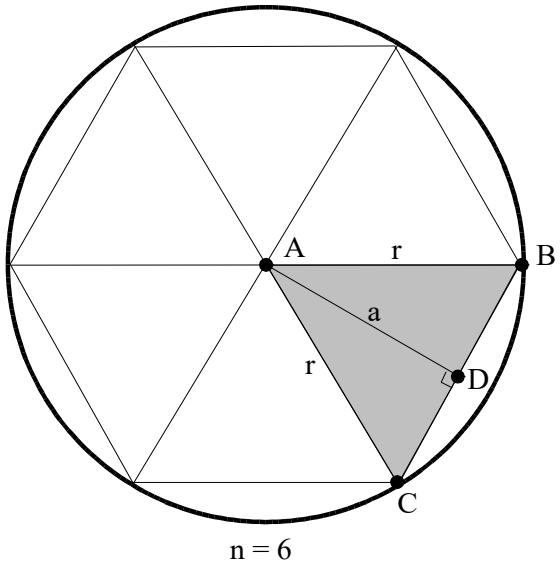

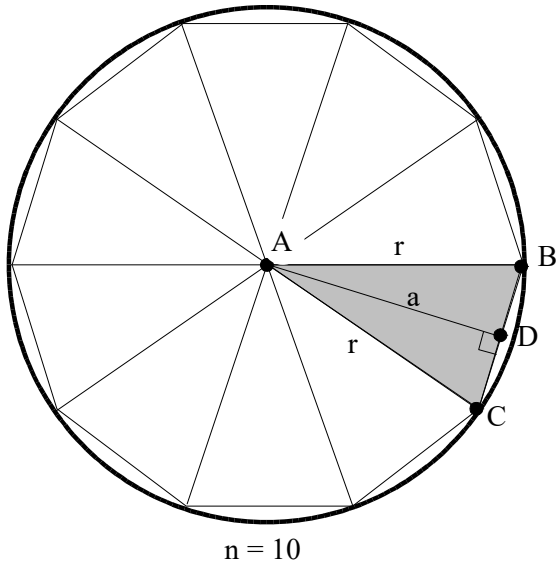

The Value of π

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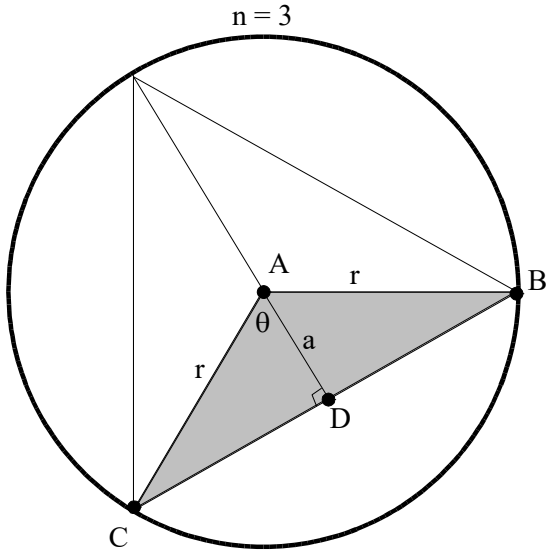

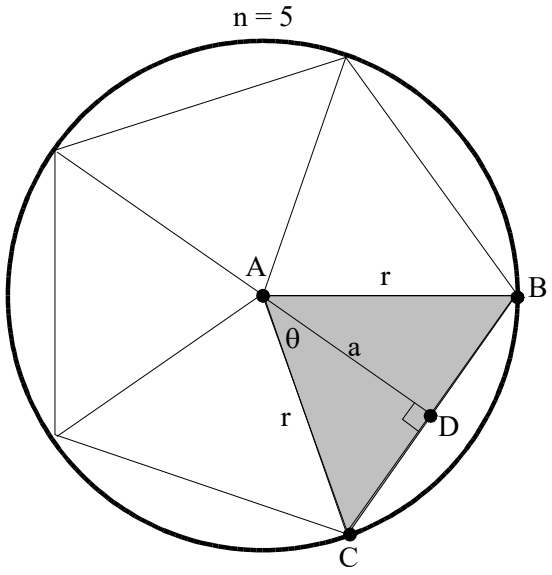

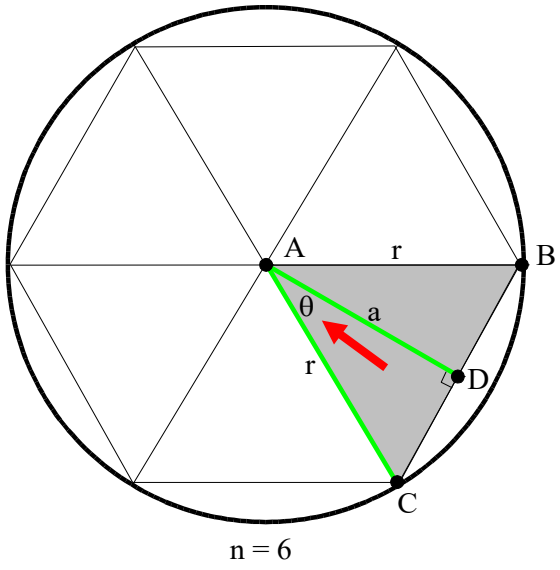

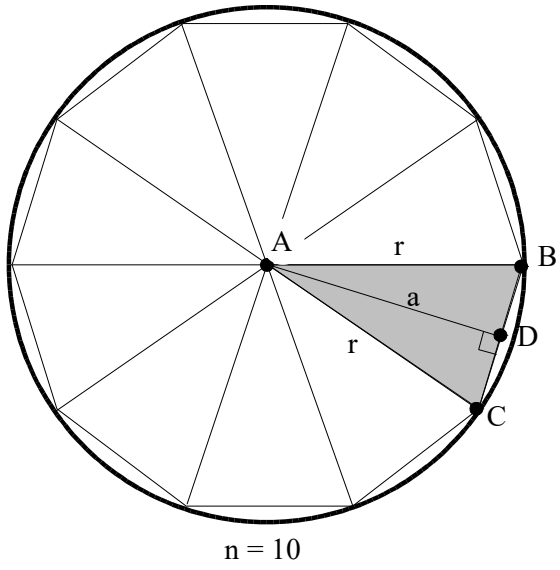

The Value of π

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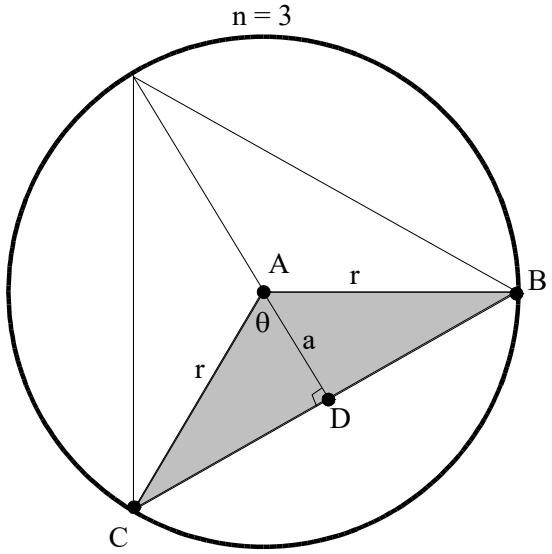
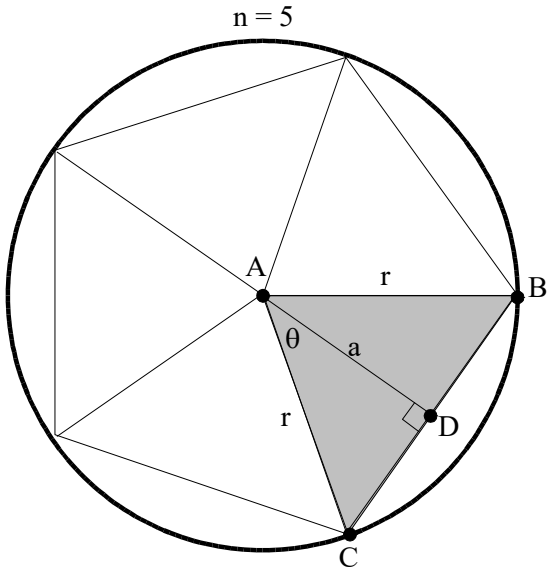
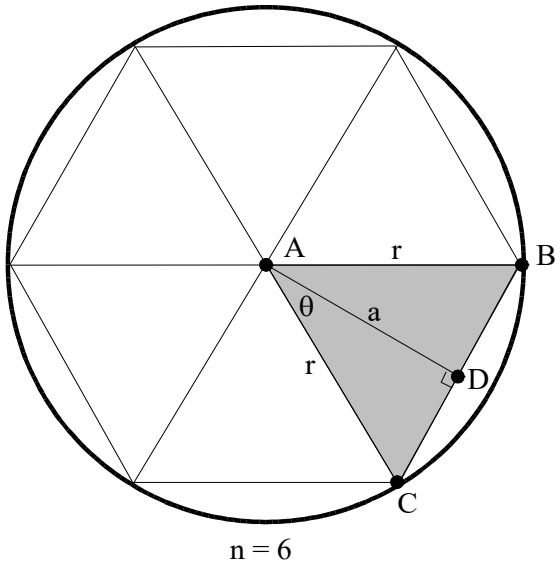
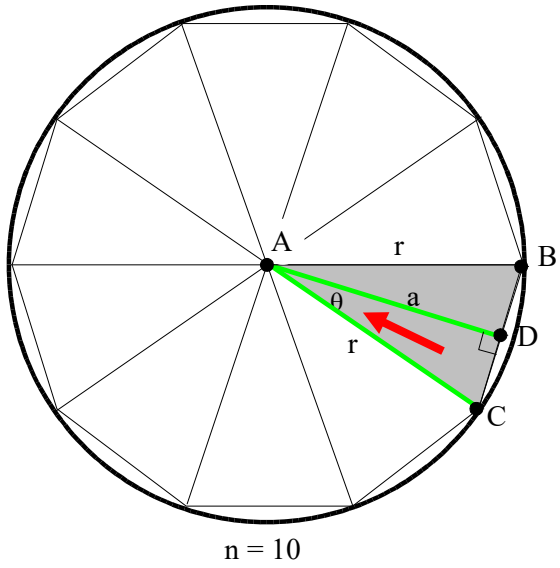








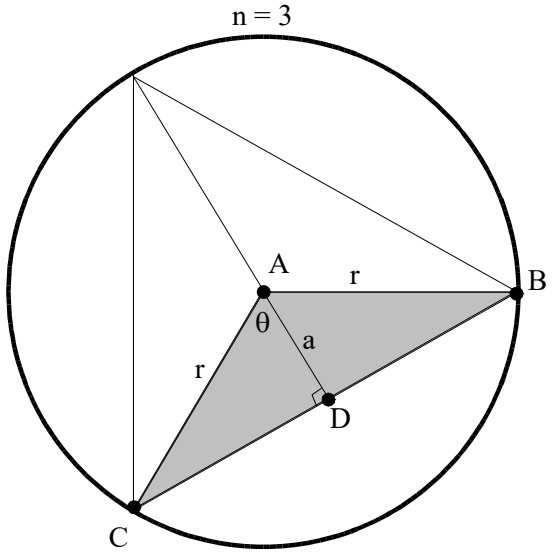
The Value of π

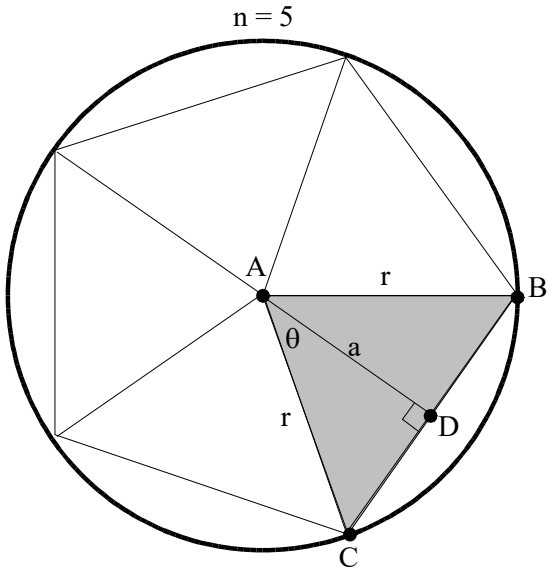
Draw altitude AD of triangle ABC.

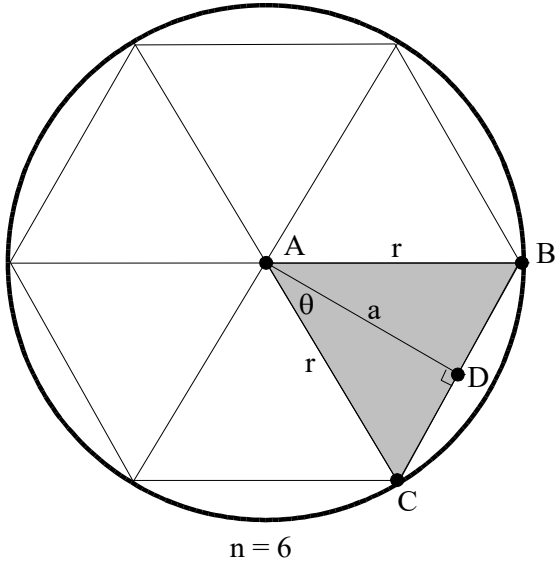
Let **a** represent the length of segment AD

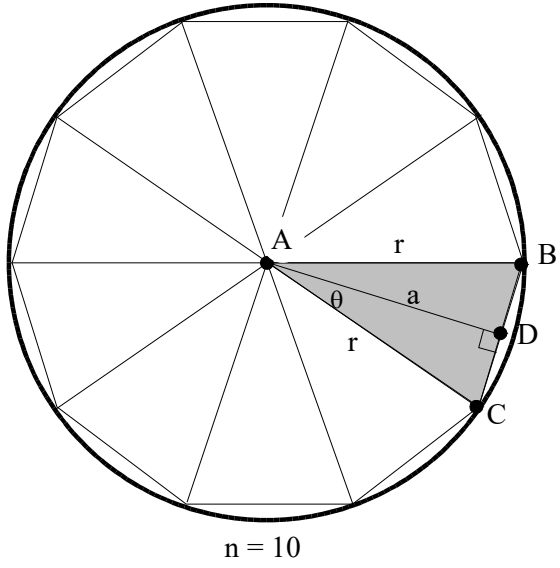
Label angle CAD θ.

Let **x** represent the length of segment CD









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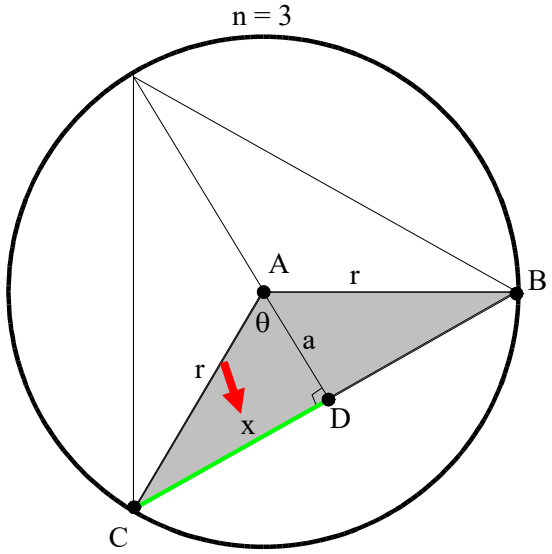

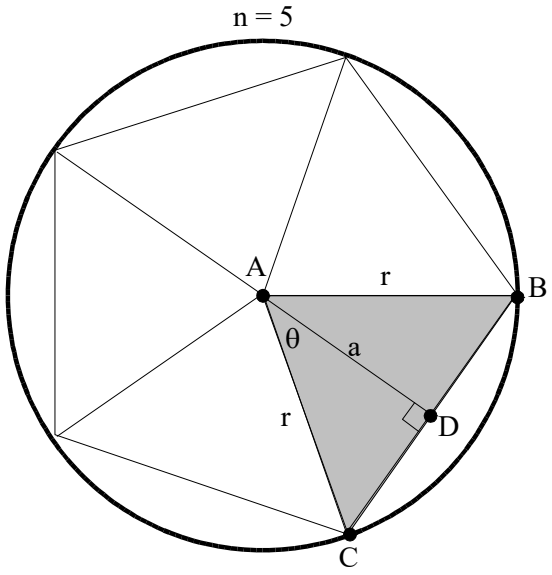

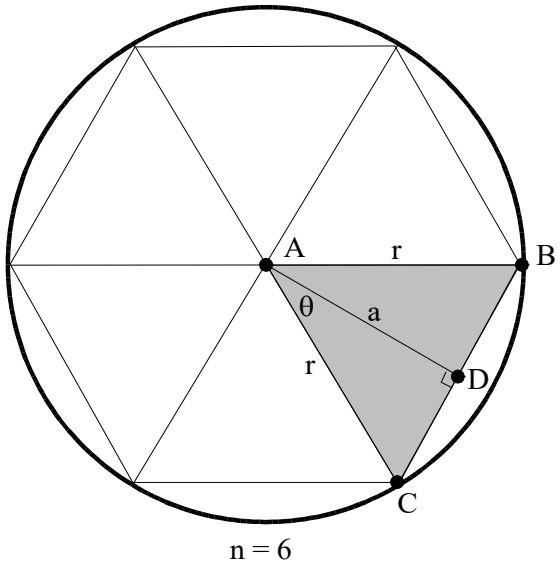

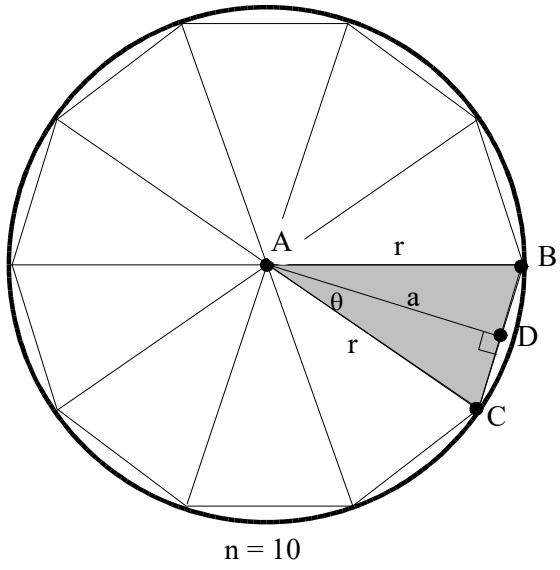

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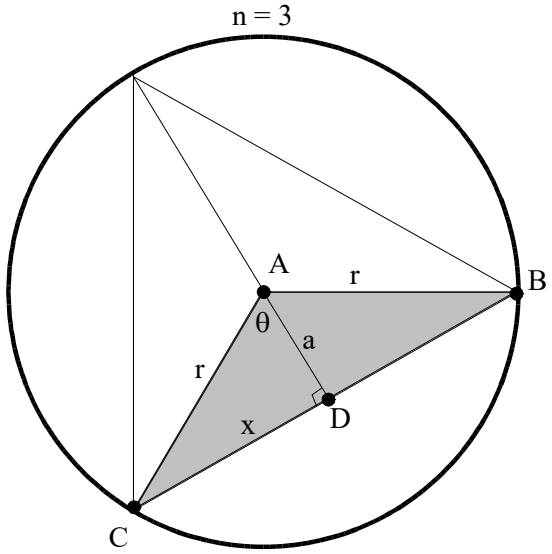

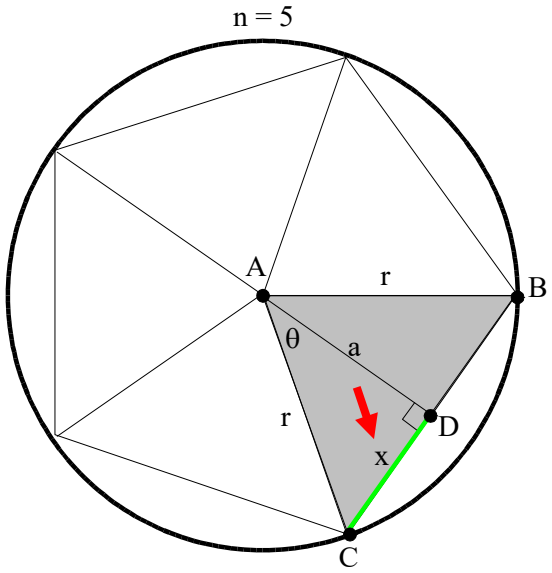

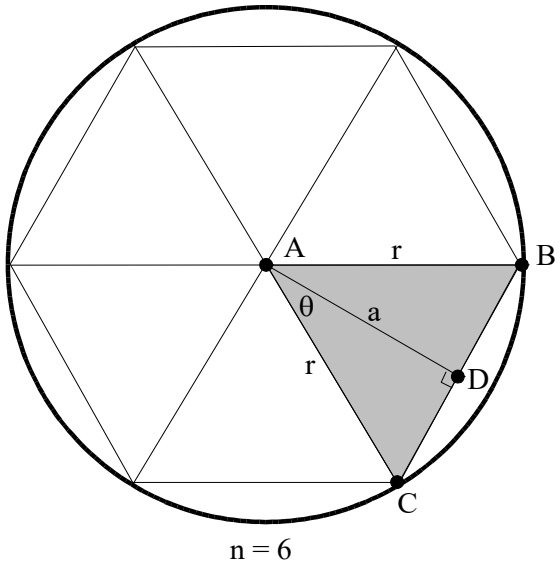

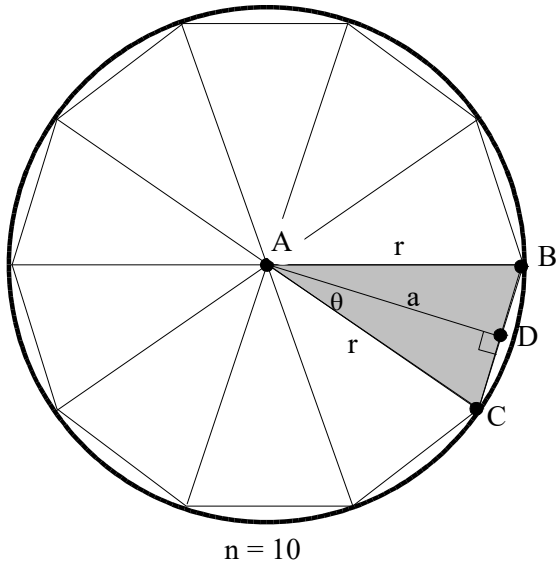

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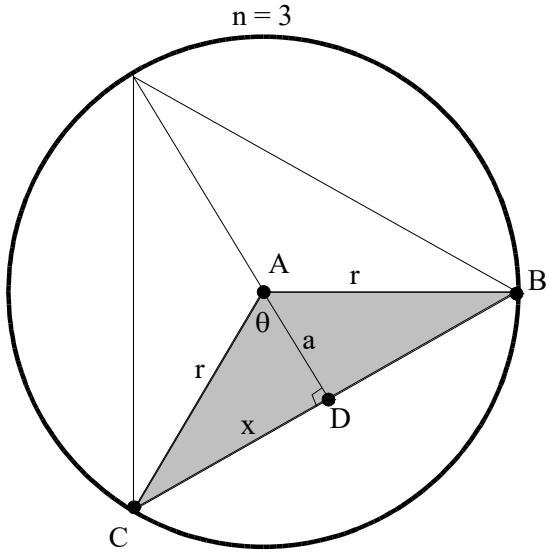

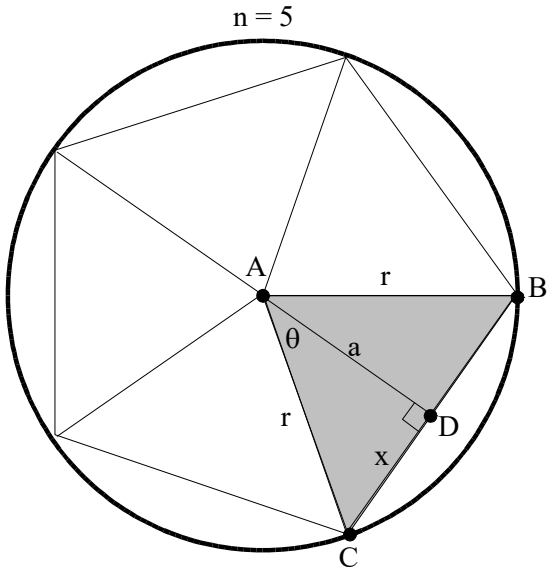

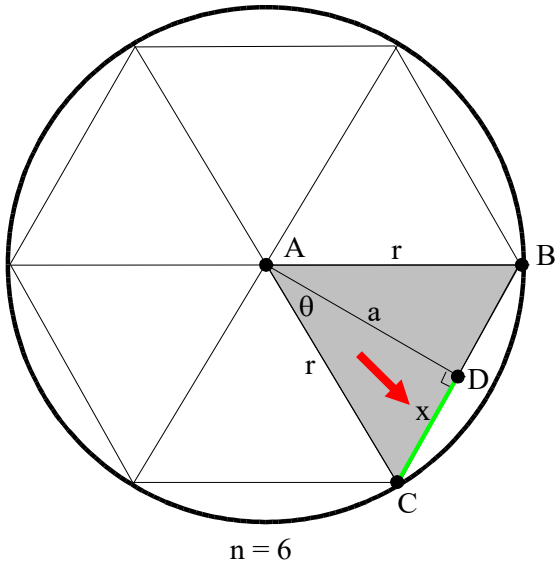

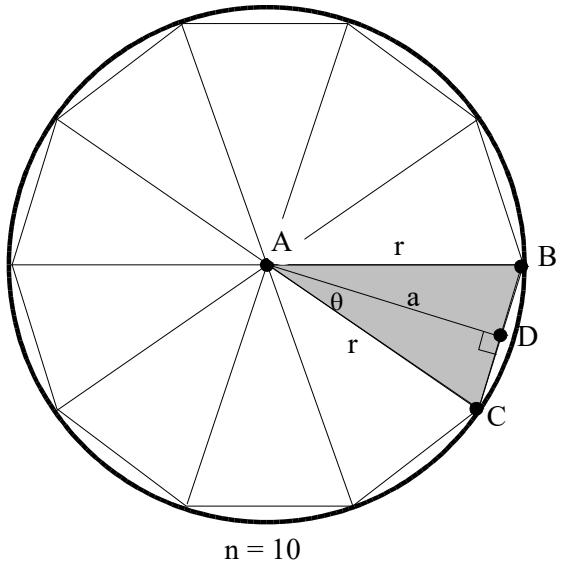

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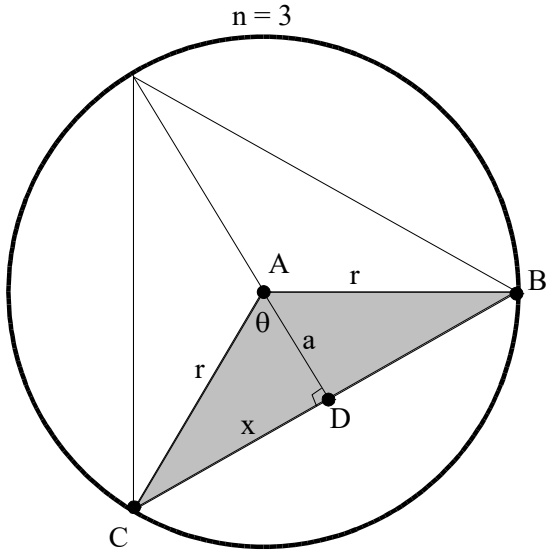
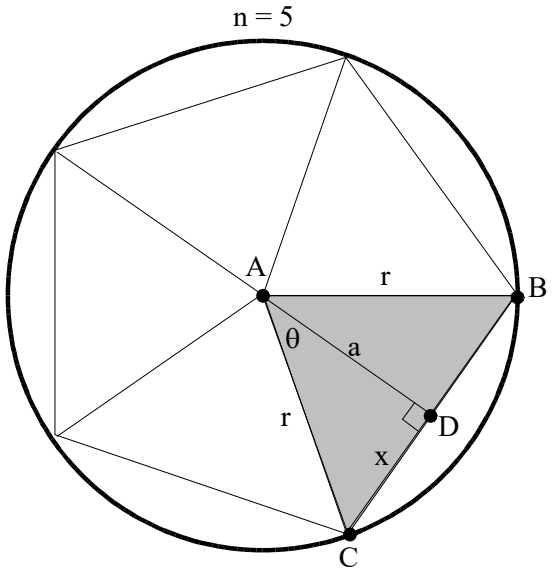
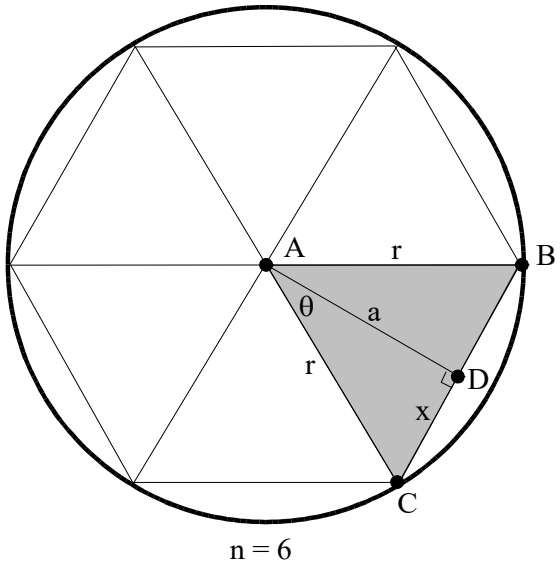
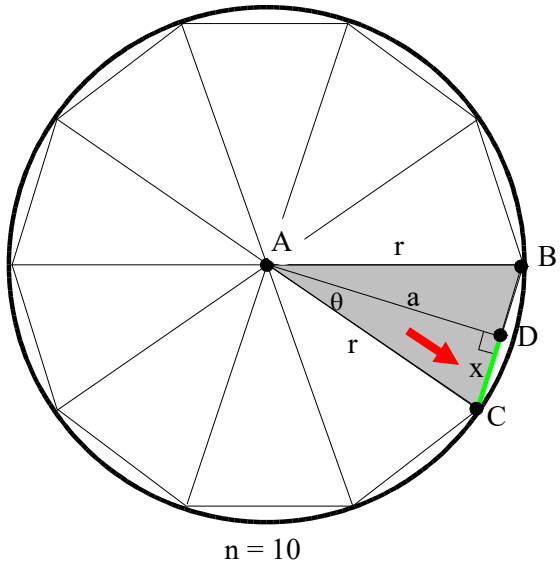
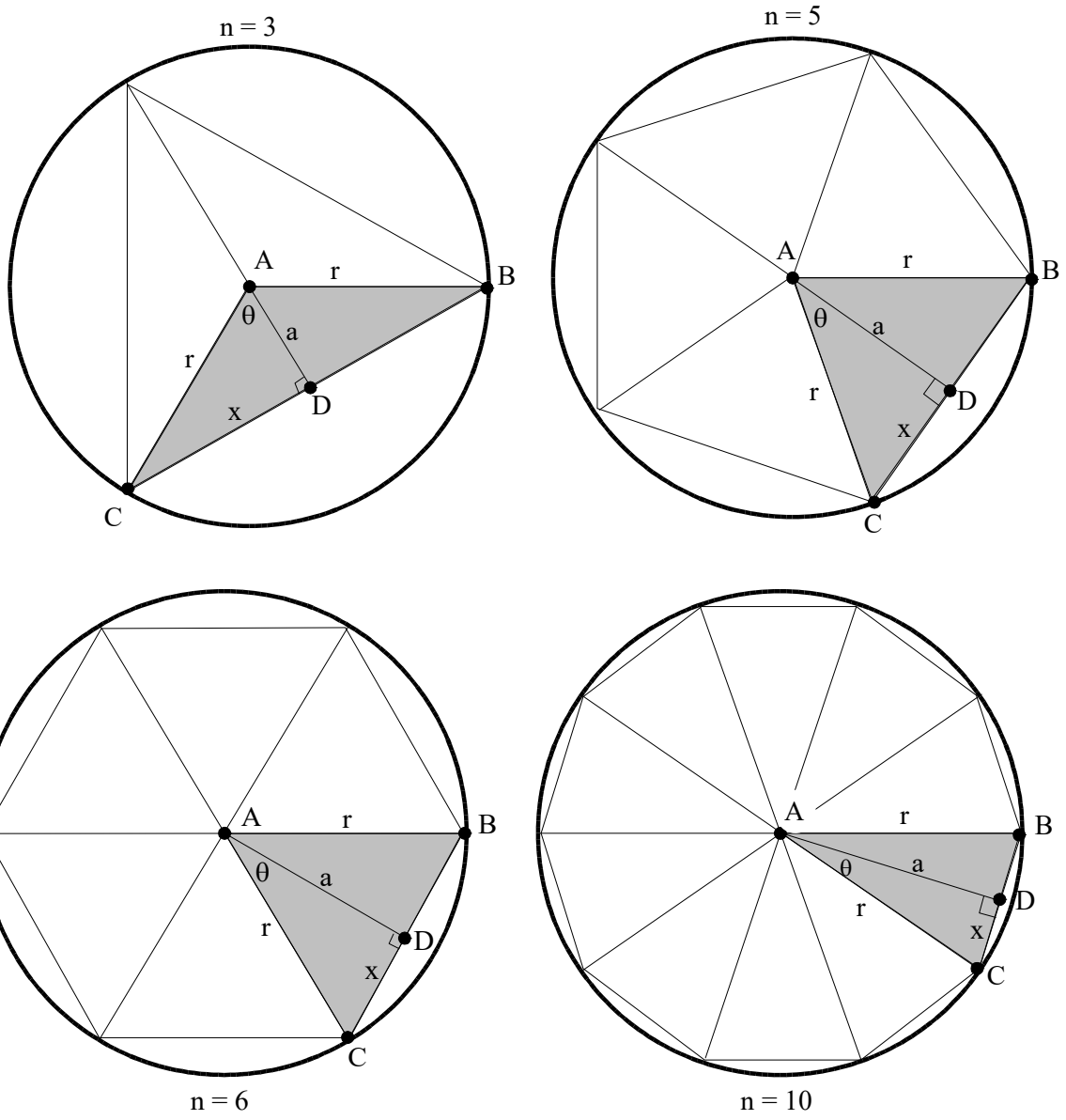






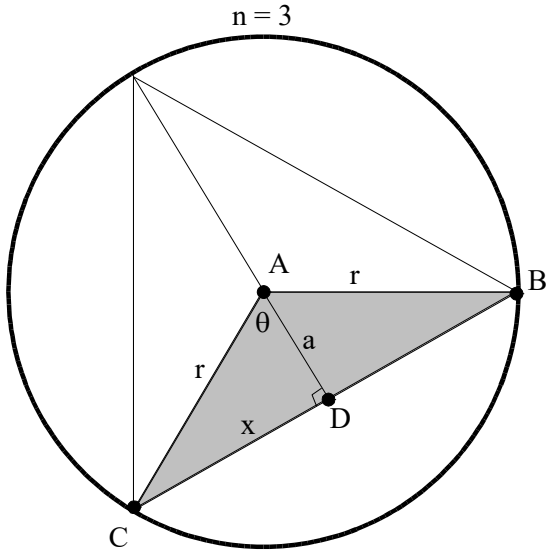


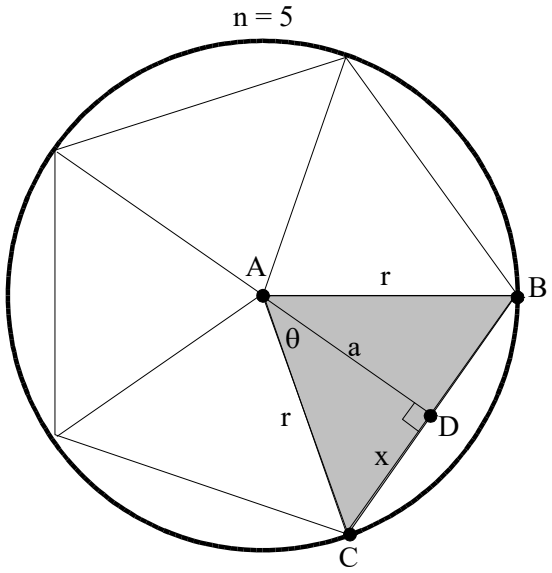
The Value of π

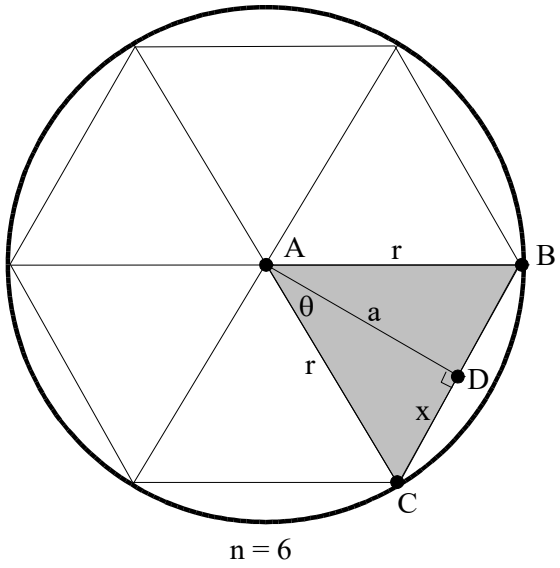


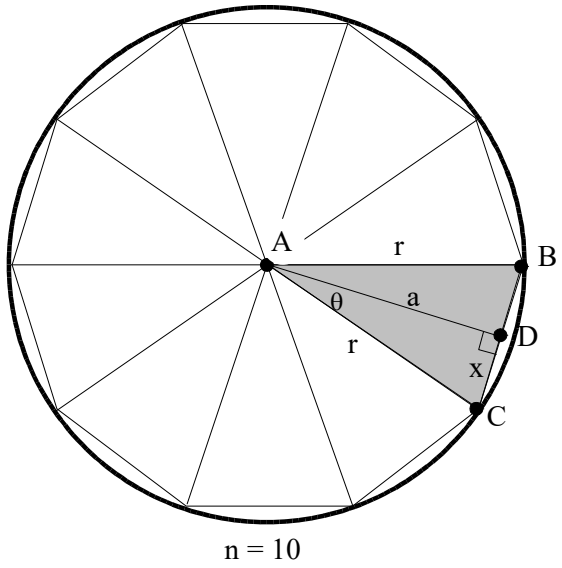
The Value of π

Clearly, **Sin θ =**



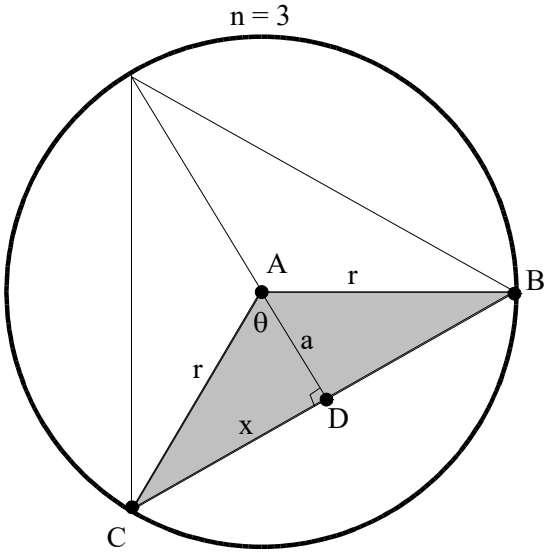


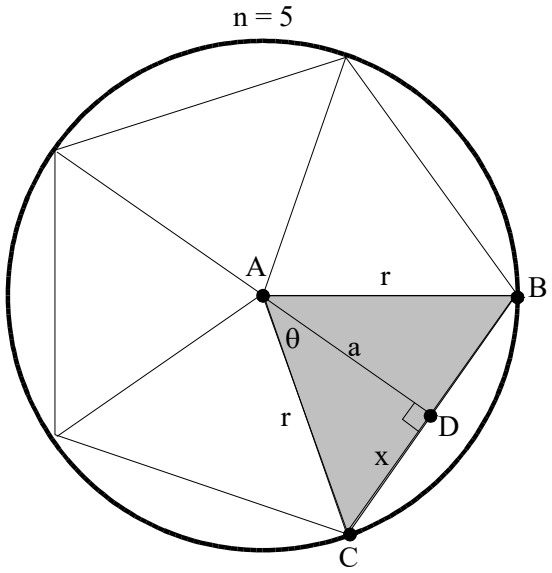


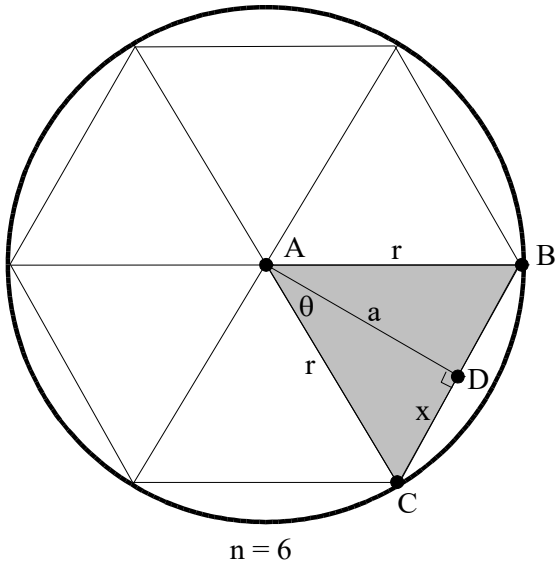


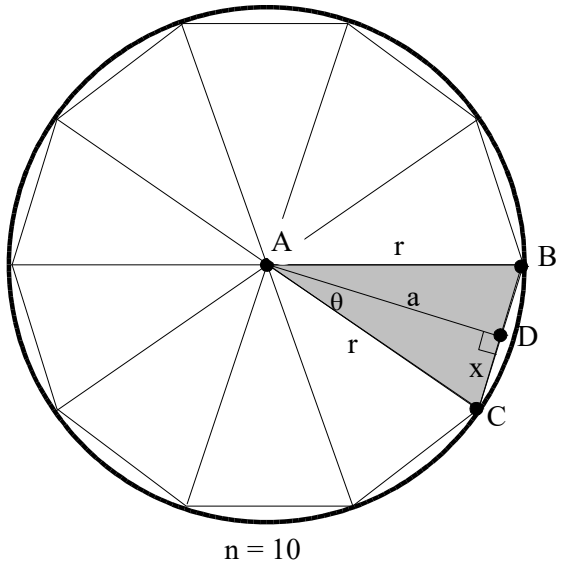
The Value of π

Clearly, **Sin θ = x/r**



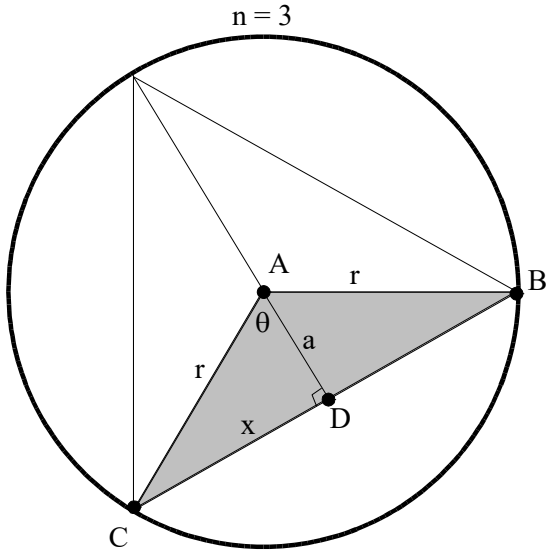


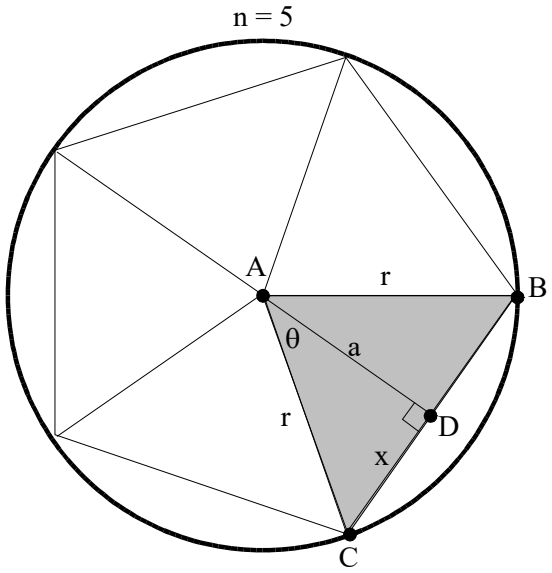


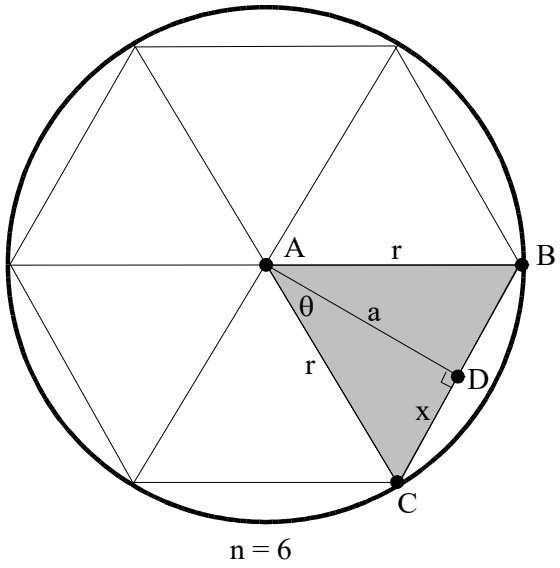


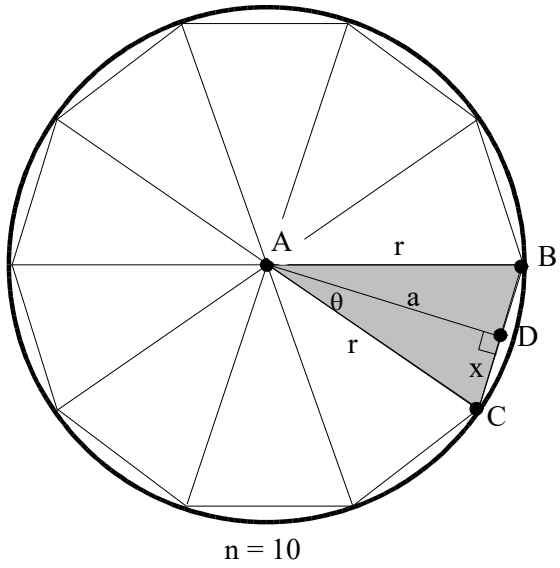
The Value of π

Clearly, **Sin θ = x/r** and **Cos θ =**



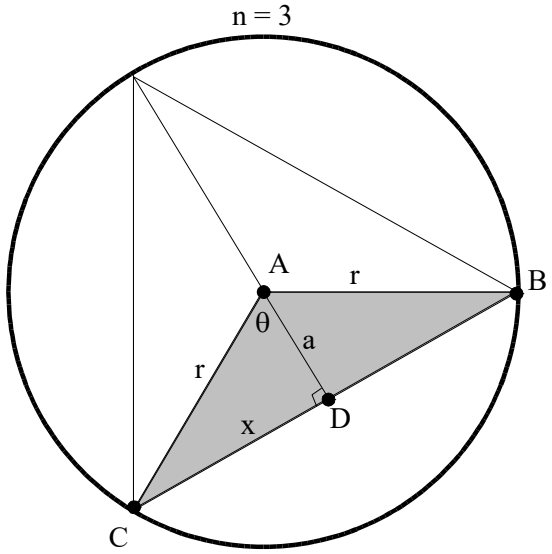


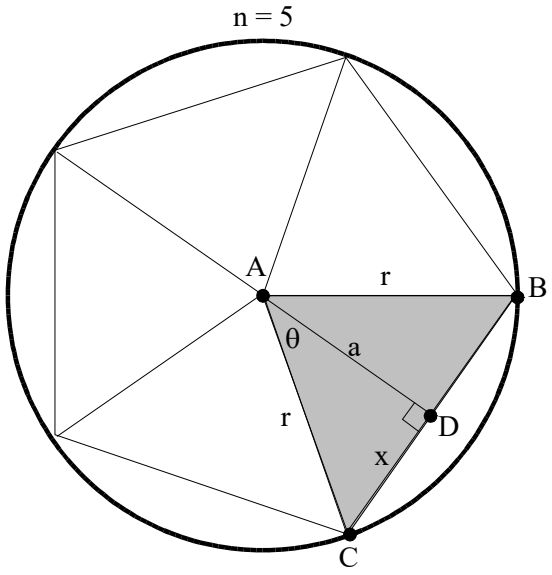


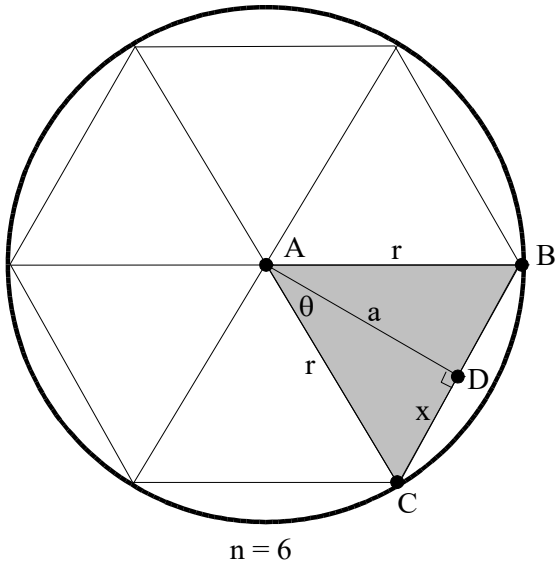


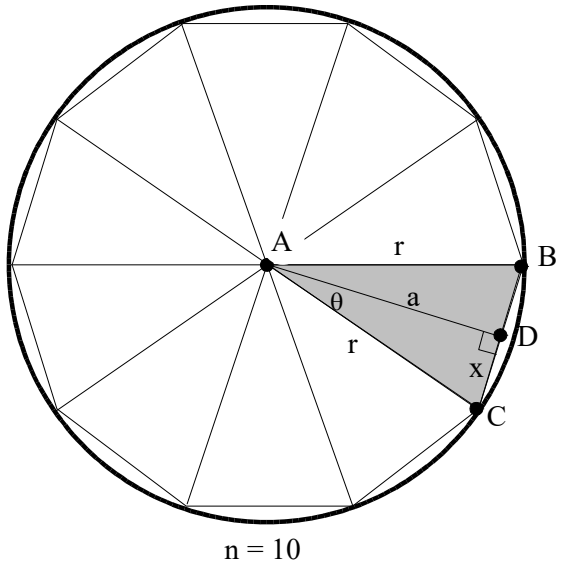
The Value of π

Clearly, **Sin θ = x/r** and **Cos θ = a/r**.





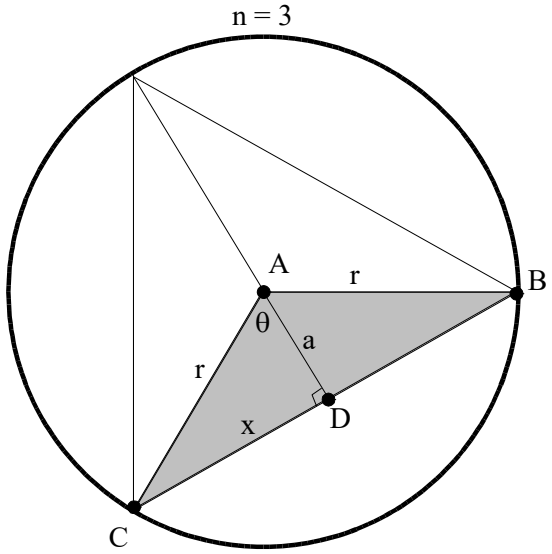


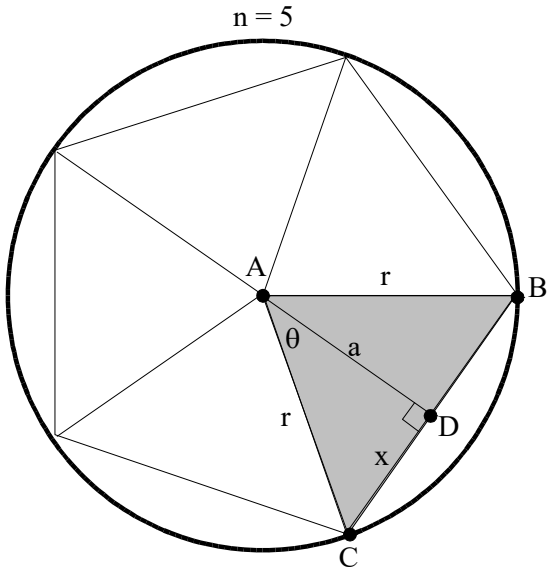


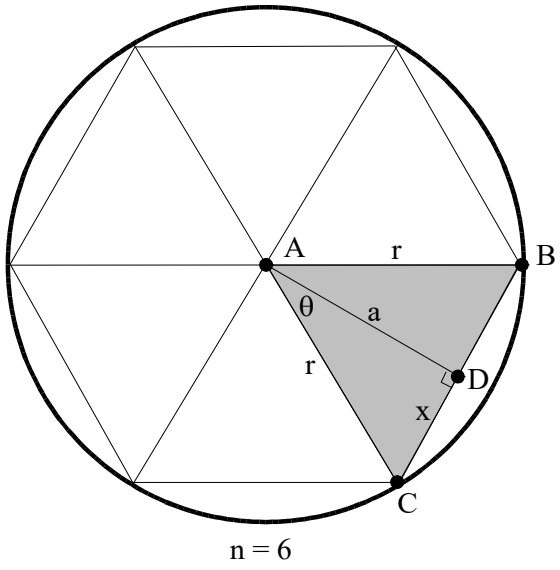
The Value of π

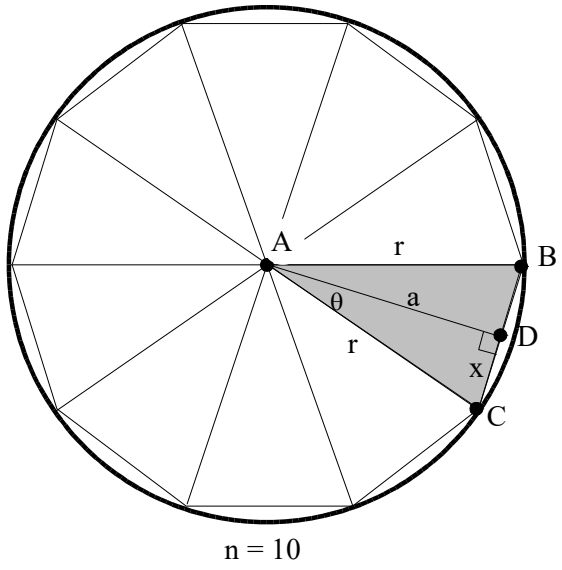
Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

Therefore, **x =**





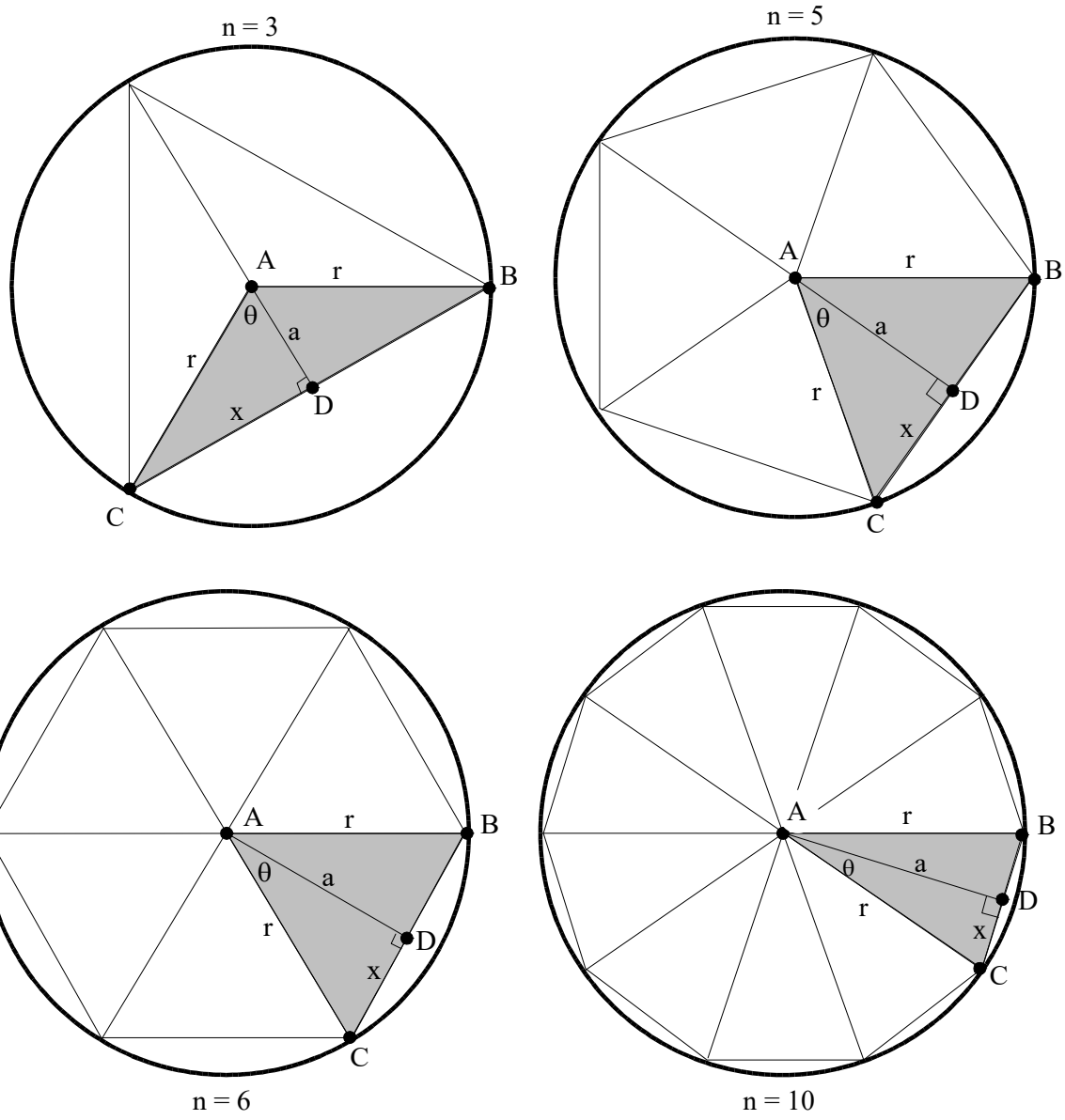




The Value of π

Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

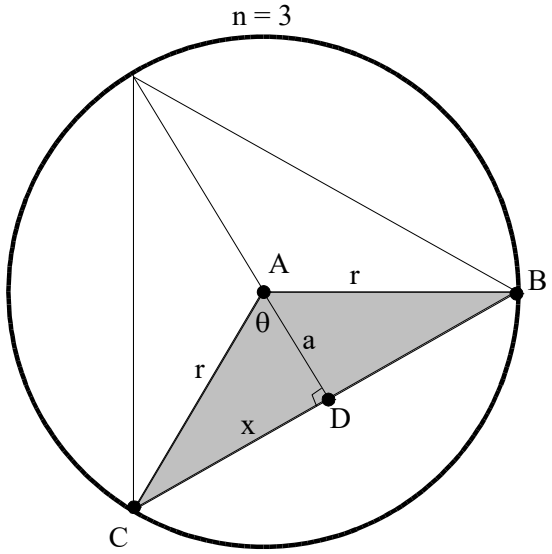
Therefore, **x = rSinθ**

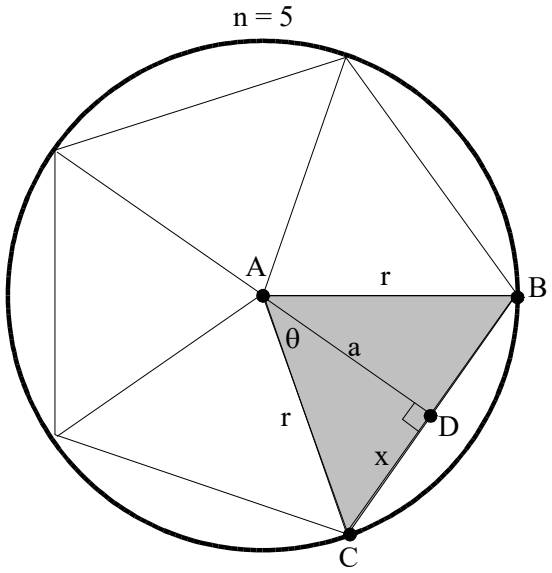


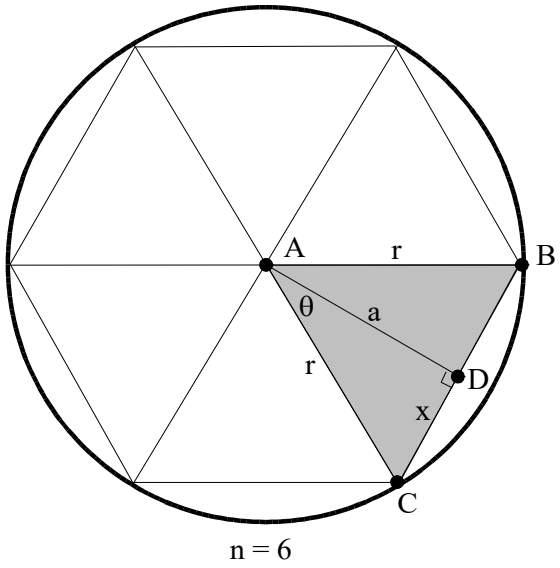
The Value of π

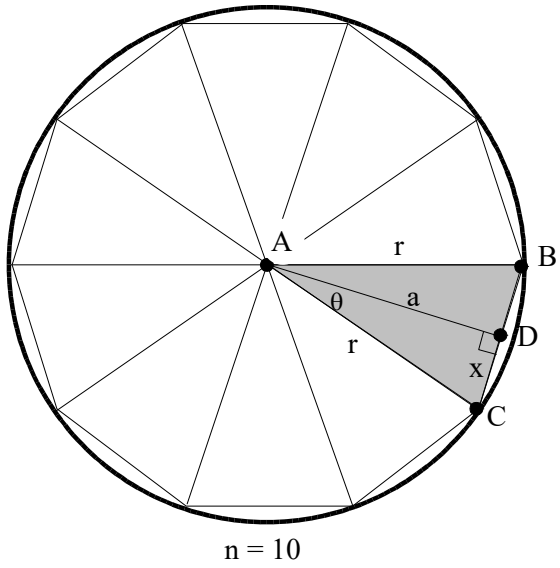
Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

Therefore, **x = rSinθ** and **a =**





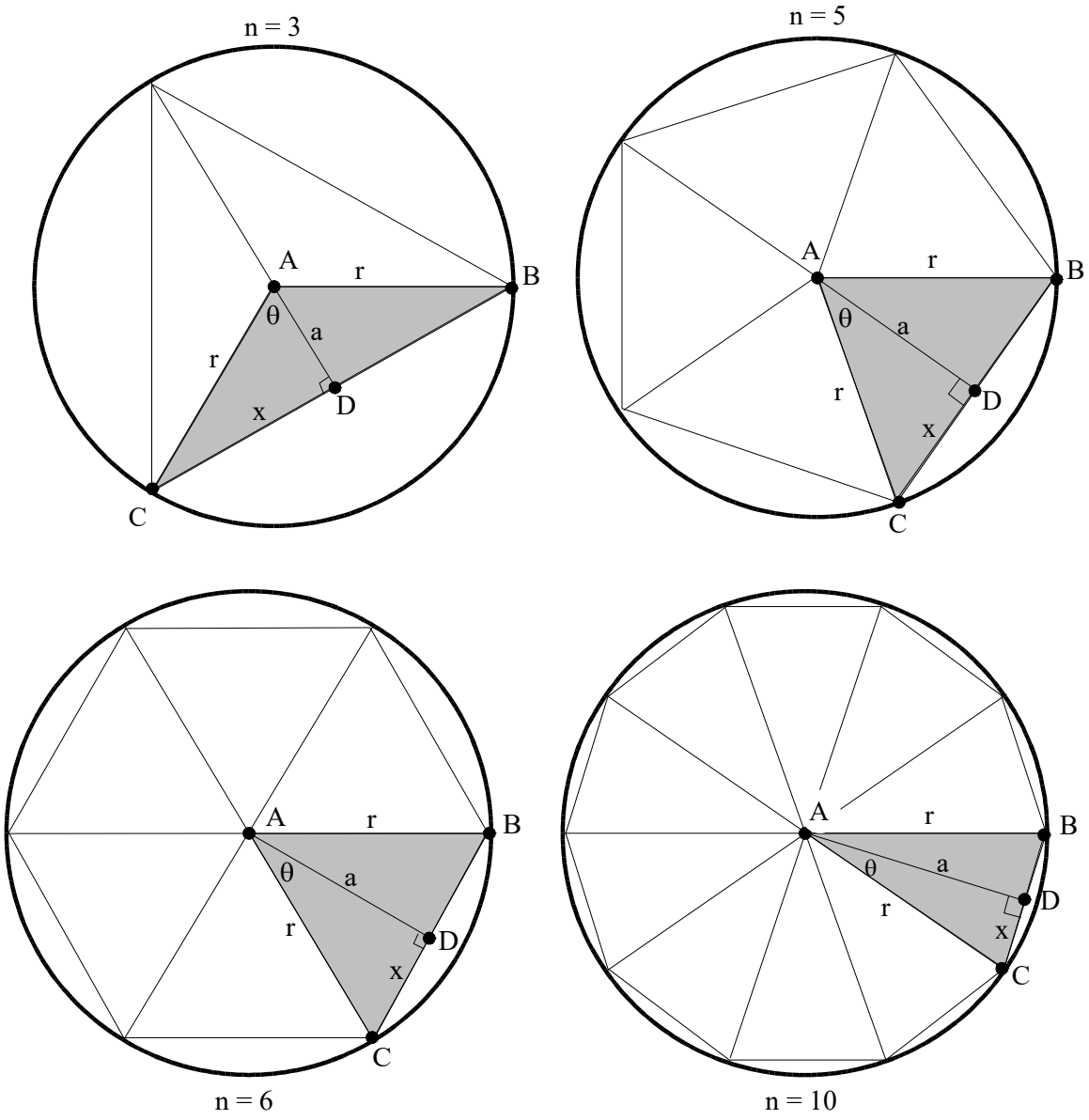




The Value of π

Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

Therefore, **x = rSinθ** and **a = rCos θ**.

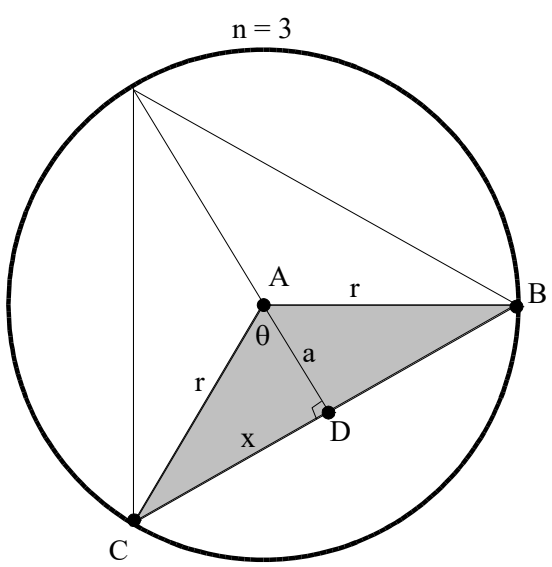


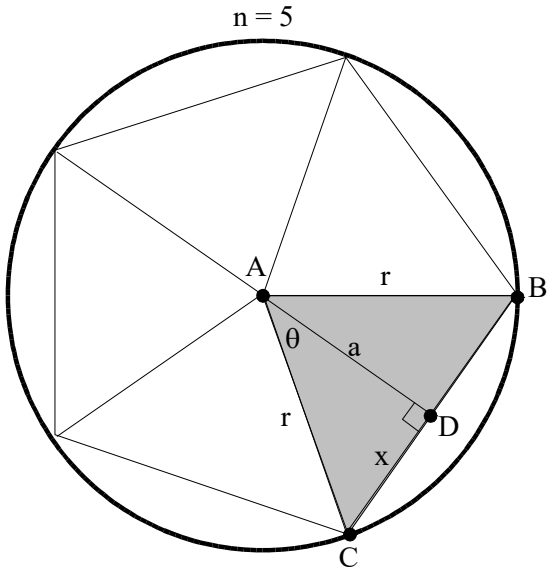
The Value of π

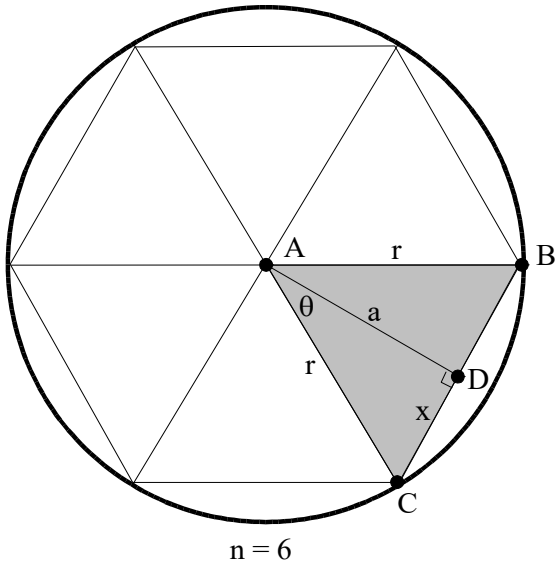
Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

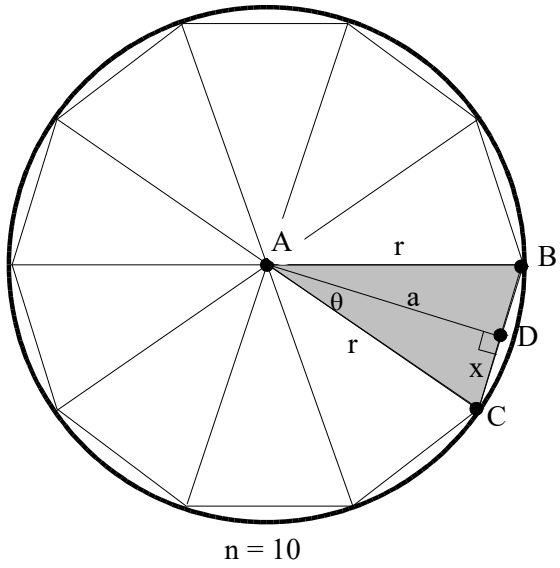
Therefore, **x = rSinθ** and **a = rCos θ**.

The degree measure of angle CAB =







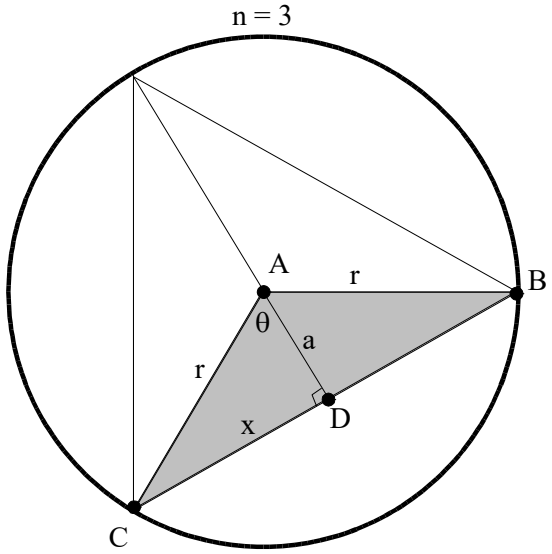


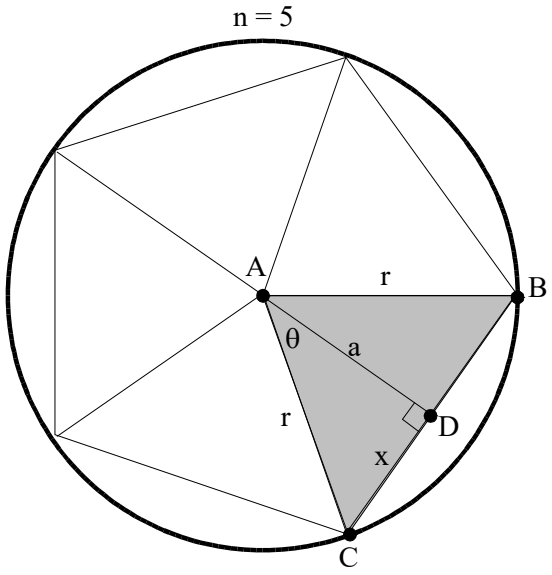
The Value of π

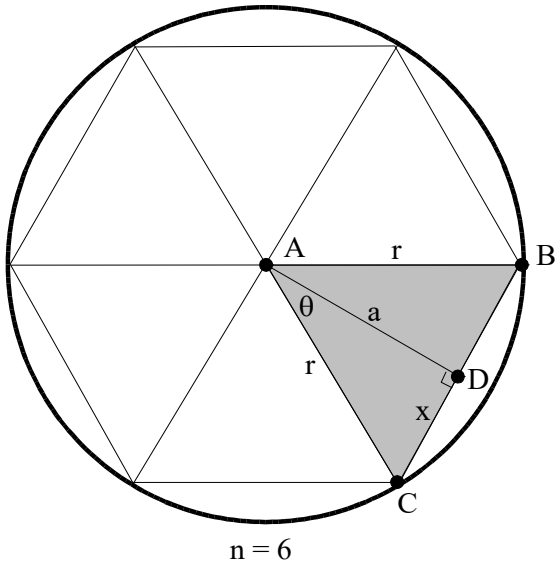
Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

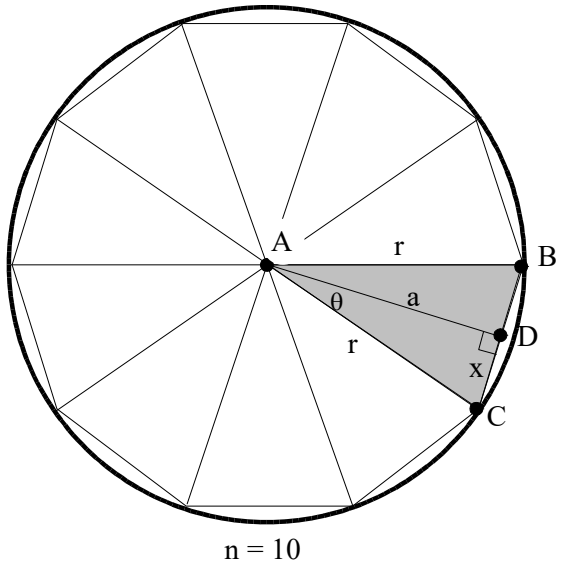
Therefore, **x = rSinθ** and **a = rCos θ**.

The degree measure of angle CAB = 360/n.







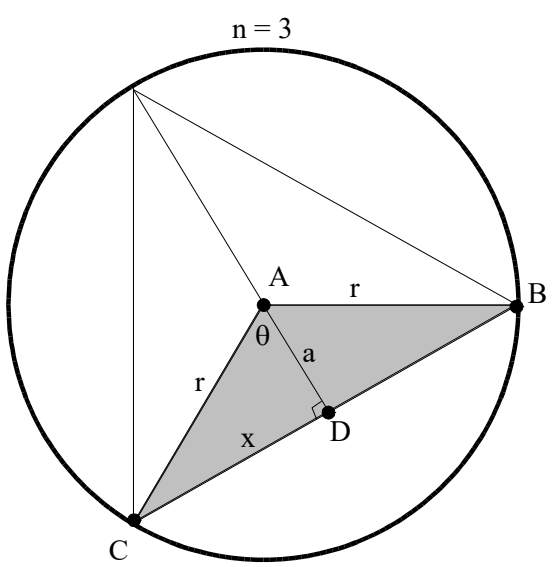


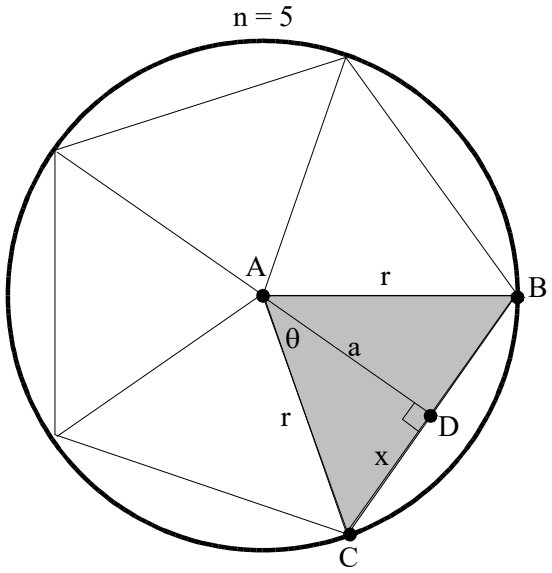
The Value of π

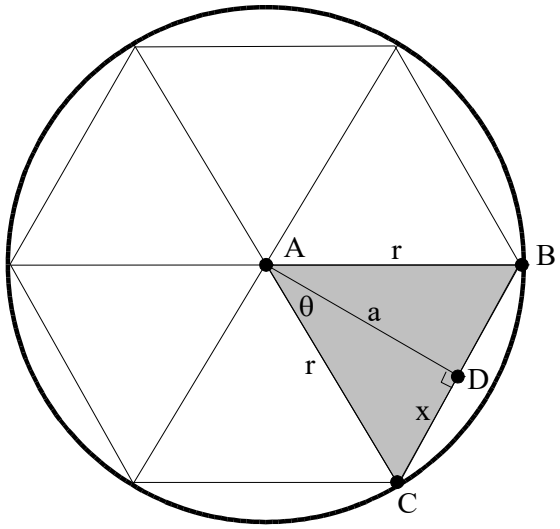
Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

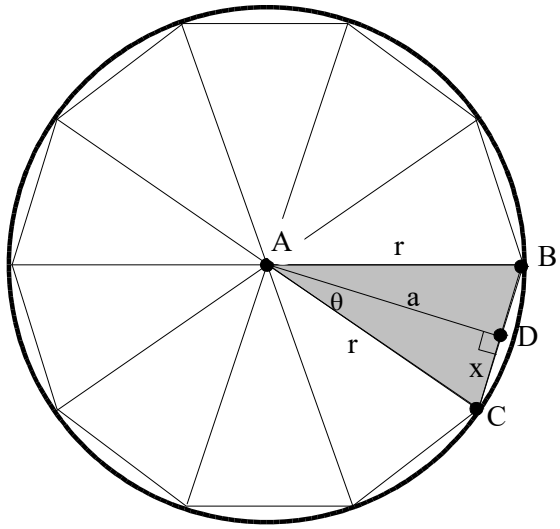
Therefore, **x = rSinθ** and **a = rCos θ**.

The degree measure of angle CAB = 360/n. Since segment AD bisects angle CAB,







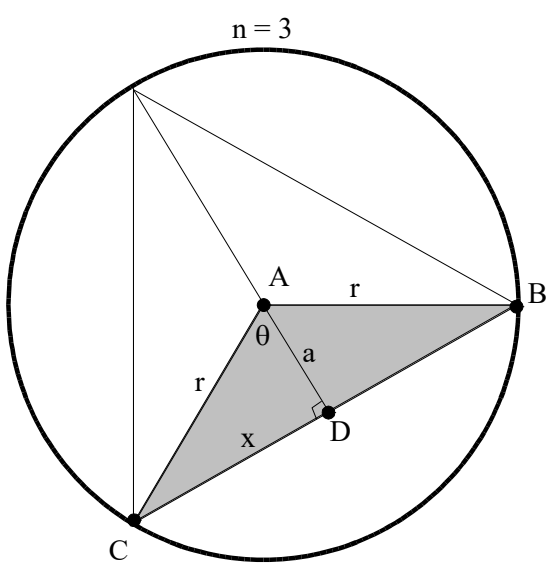


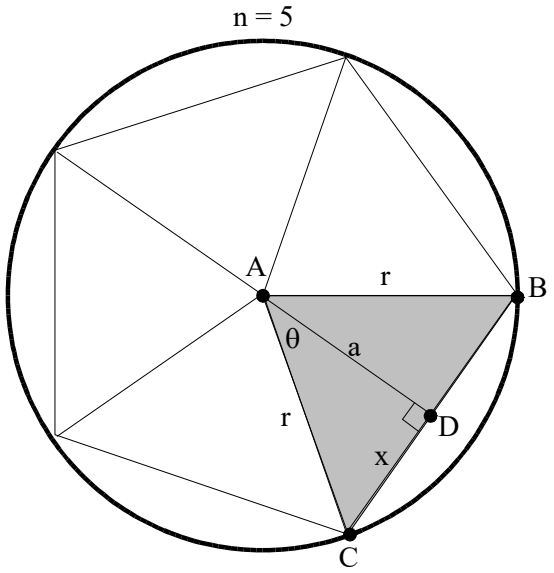
The Value of π

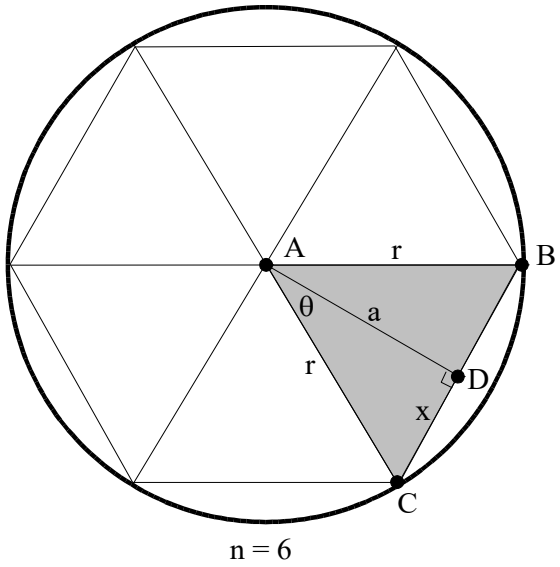
Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

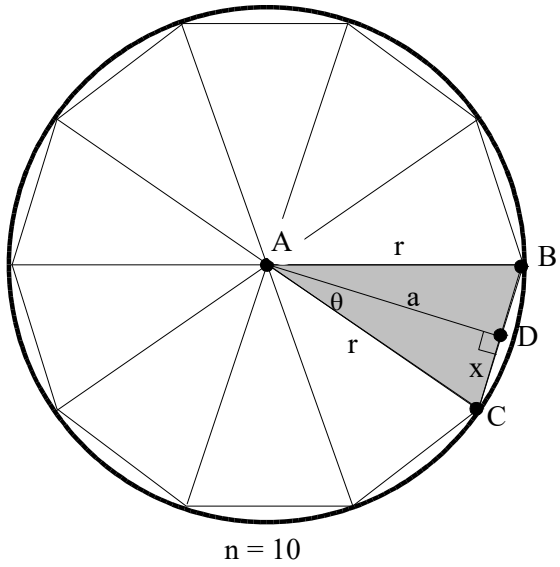
Therefore, **x = rSinθ** and **a = rCos θ**.

The degree measure of angle CAB = 360/n. Since segment AD bisects angle CAB, **θ = 180/n** (degrees).









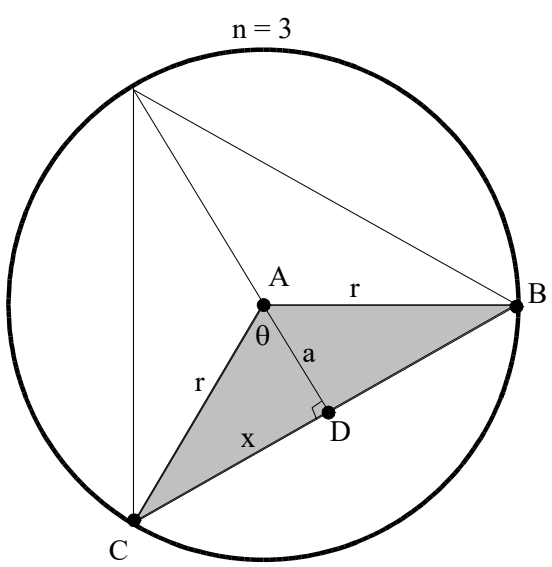
The Value of π

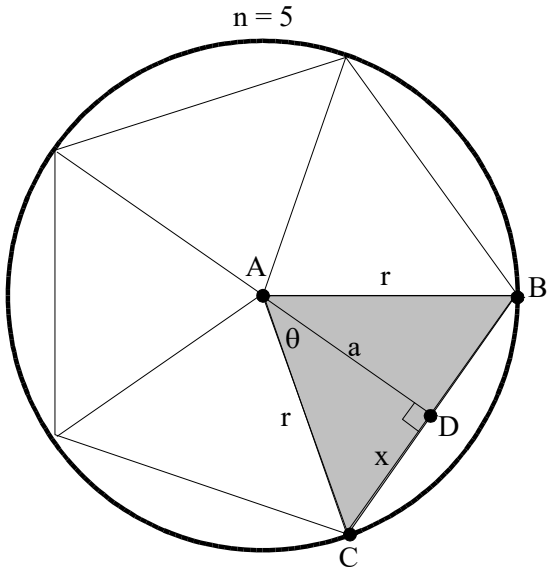
Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

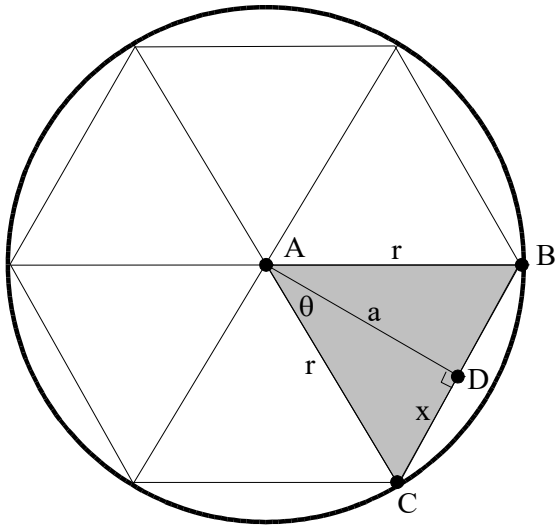
Therefore, **x = rSinθ** and **a = rCos θ**.

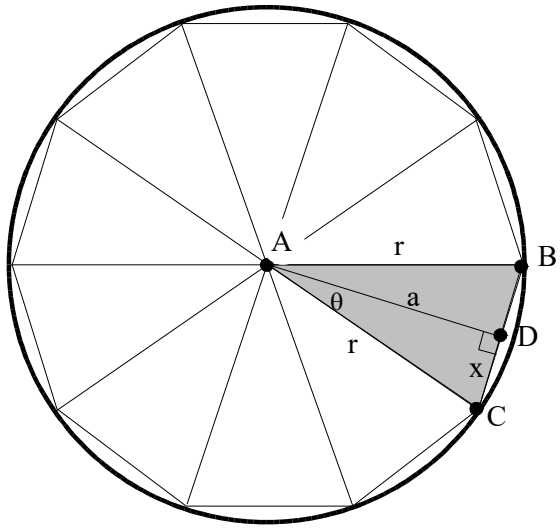
The degree measure of angle CAB = 360/n. Since segment AD bisects angle CAB, **θ = 180/n** (degrees).

Therefore,
x =









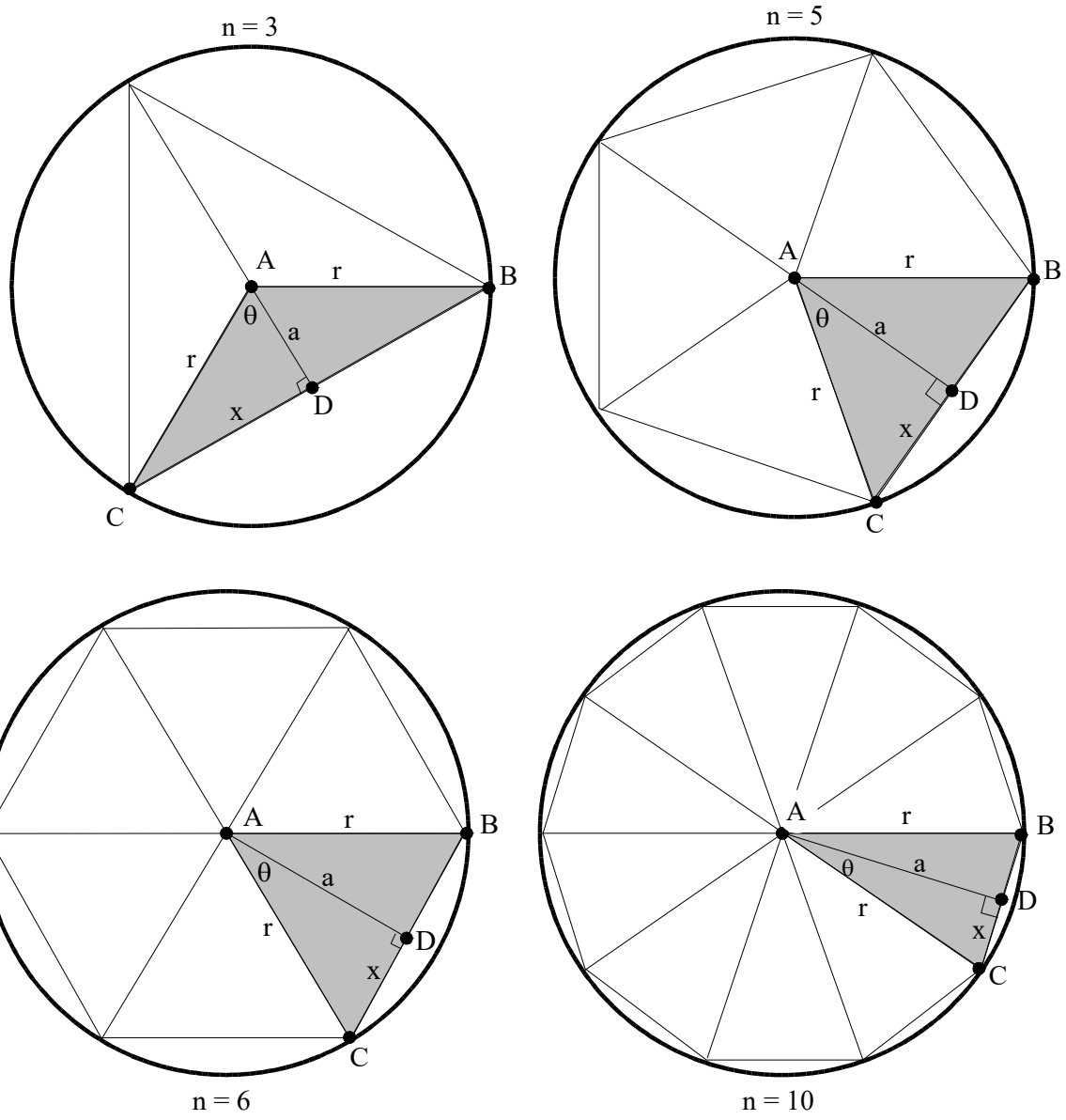
The Value of π

Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

Therefore, **x = rSinθ** and **a = rCos θ**.

The degree measure of angle CAB = 360/n. Since segment AD bisects angle CAB, **θ = 180/n** (degrees).

Therefore, **x = rSin(180º/n)**



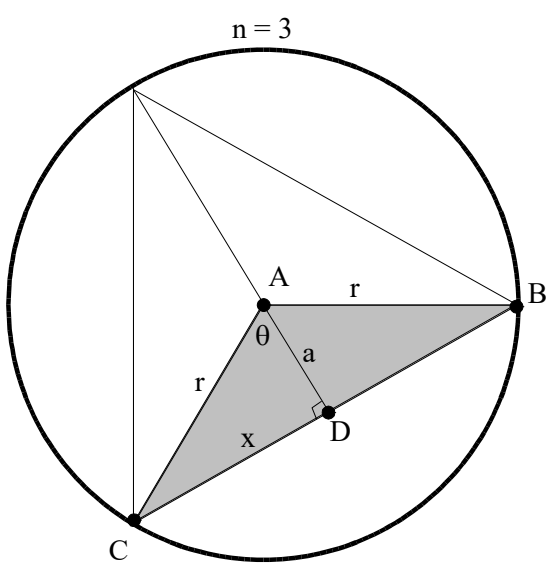
The Value of π

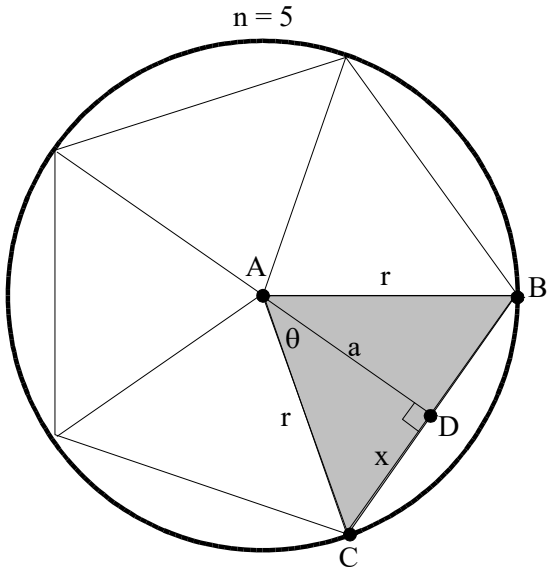
Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

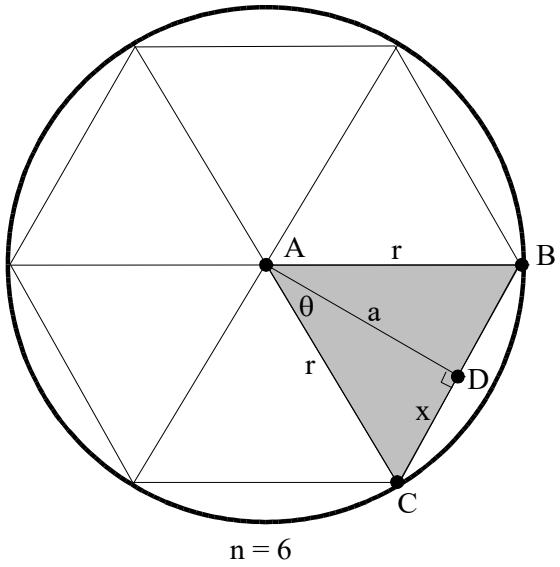
Therefore, **x = rSinθ** and **a = rCos θ**.

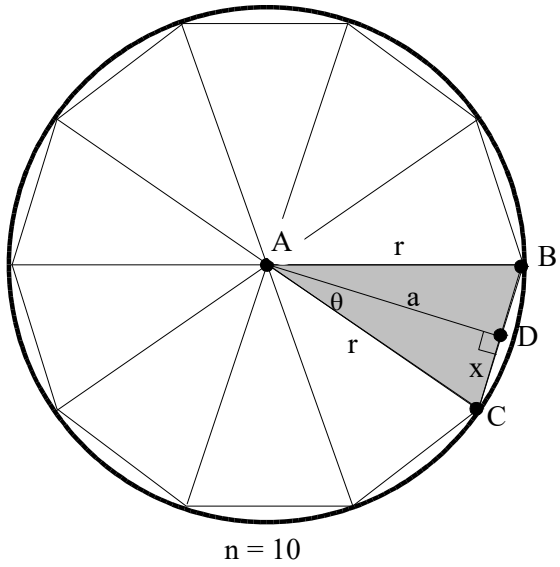
The degree measure of angle CAB = 360/n. Since segment AD bisects angle CAB, **θ = 180/n** (degrees).

Therefore, **x = rSin(180º/n)** and **a =**









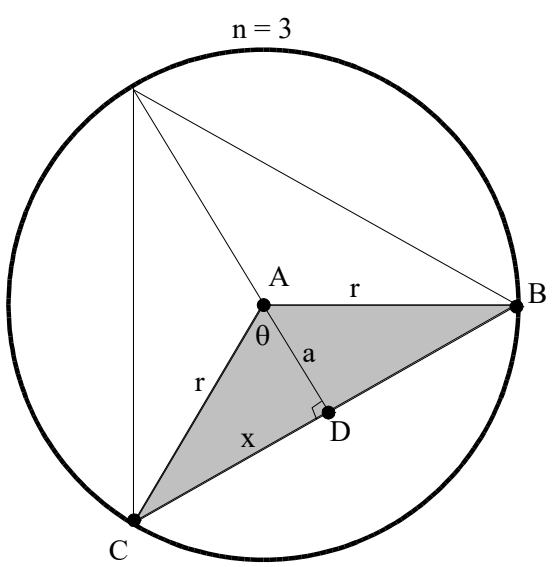
The Value of π

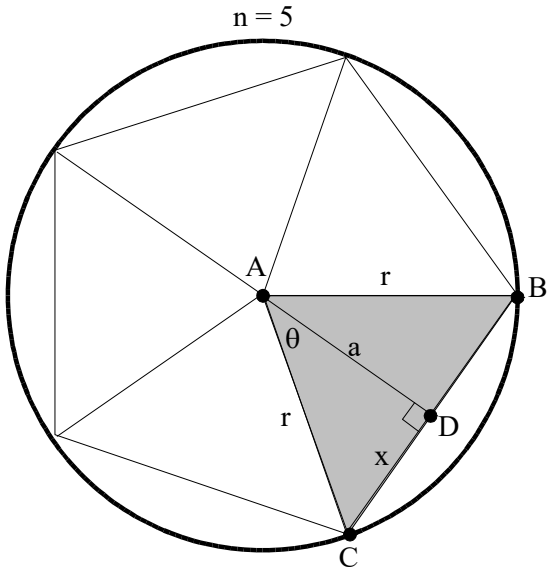
Clearly, **Sin θ = x/r** and **Cos θ = a/r**.

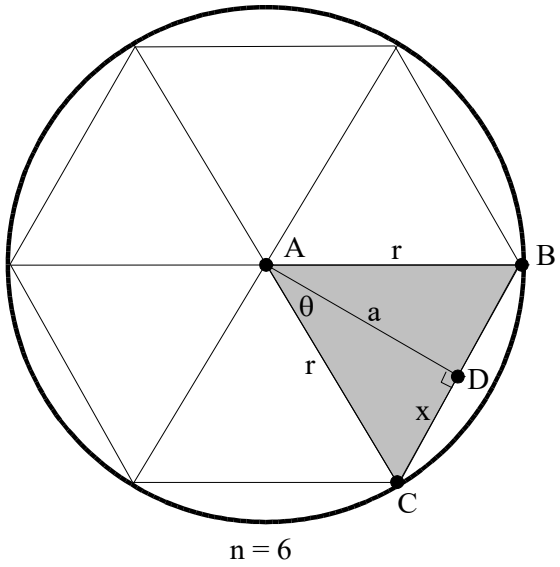
Therefore, **x = rSinθ** and **a = rCos θ**.

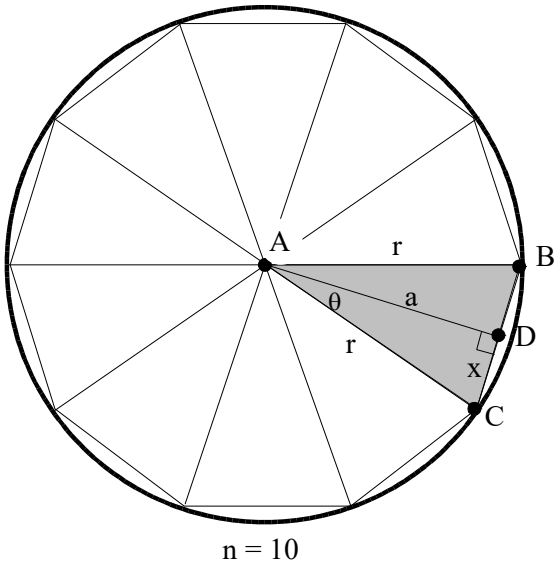
The degree measure of angle CAB = 360/n. Since segment AD bisects angle CAB, **θ = 180/n** (degrees).

Therefore, **x = rSin(180º/n)** and **a = rCos(180º/n)**.





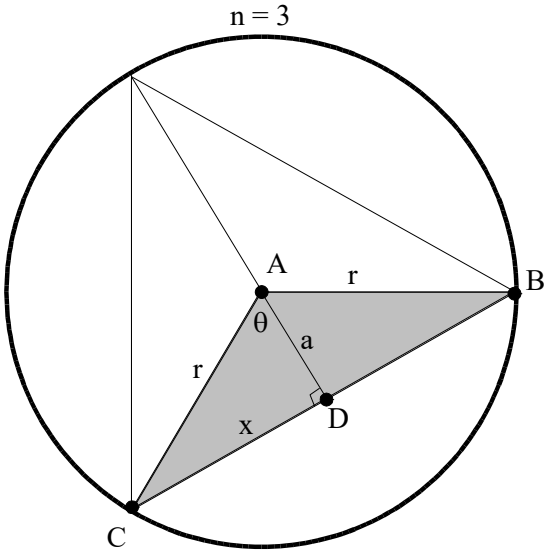


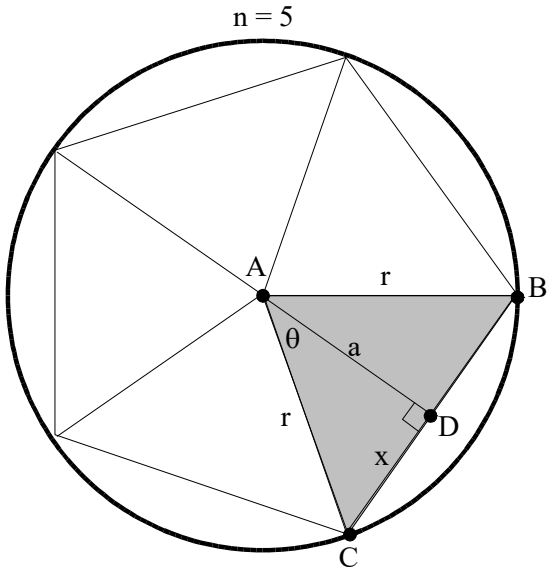


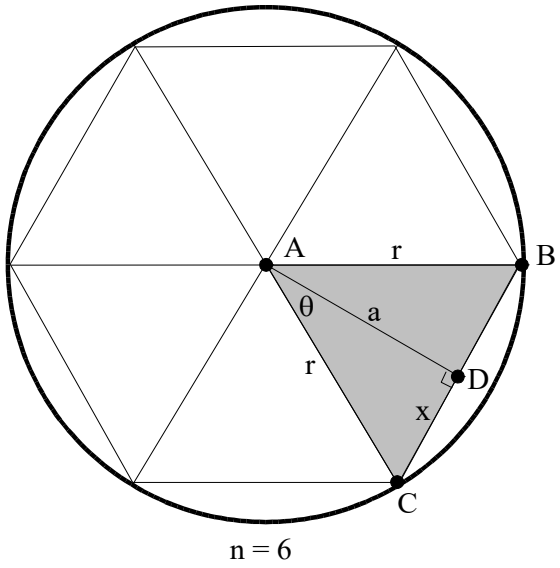
The Value of π

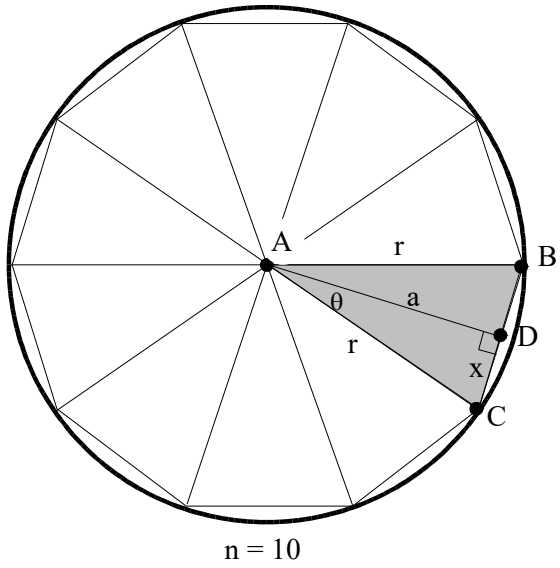
$x = r\sin(180^\circ/n)$

$a = r\cos(180^\circ/n)$





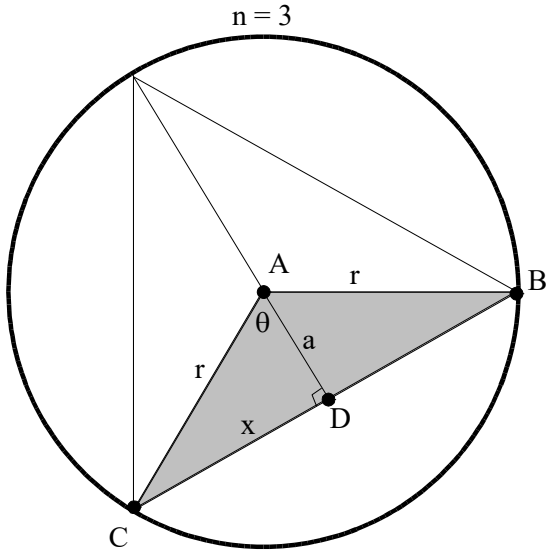


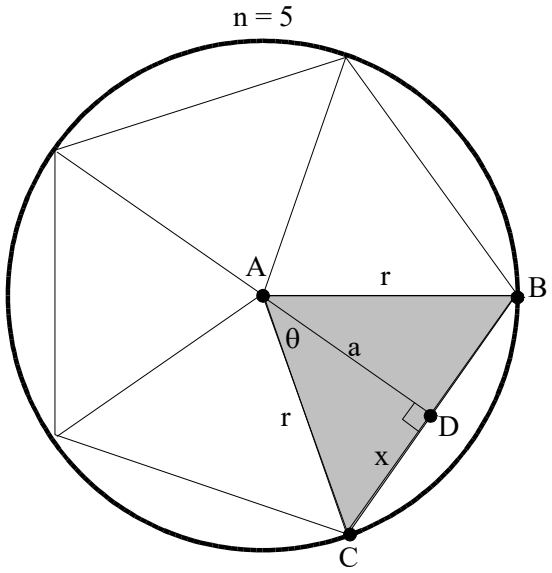


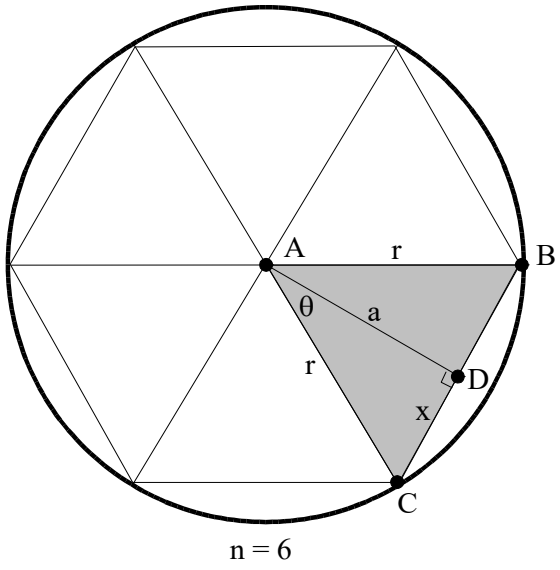
The Value of π

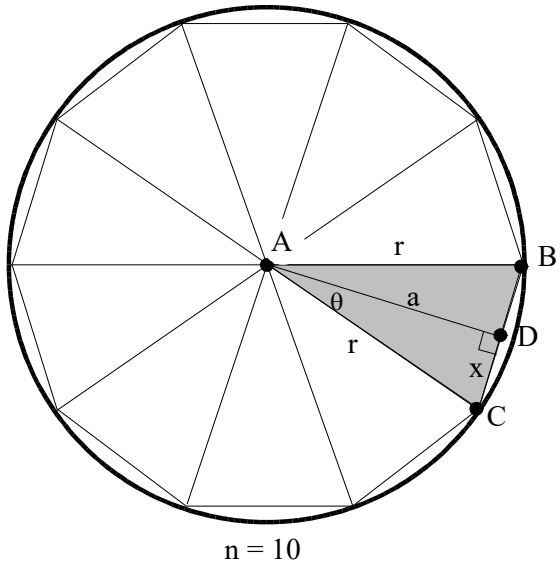
x = rSin(180º/n)
a = rCos(180º/n)

The area of triangle ABC =





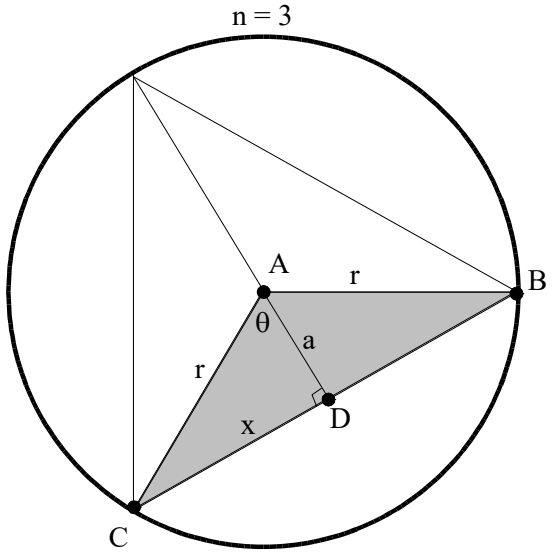


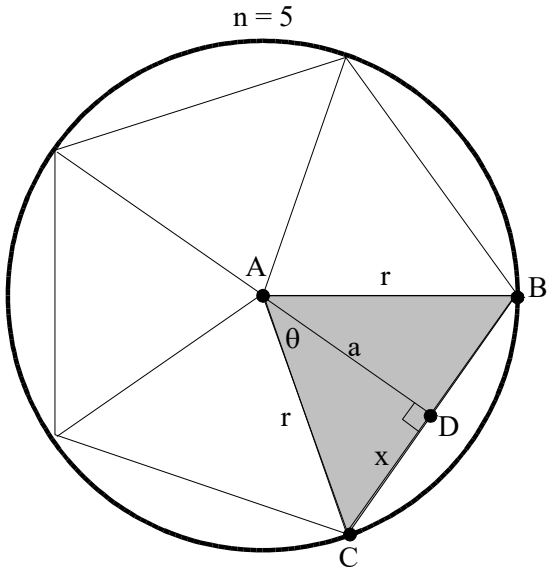


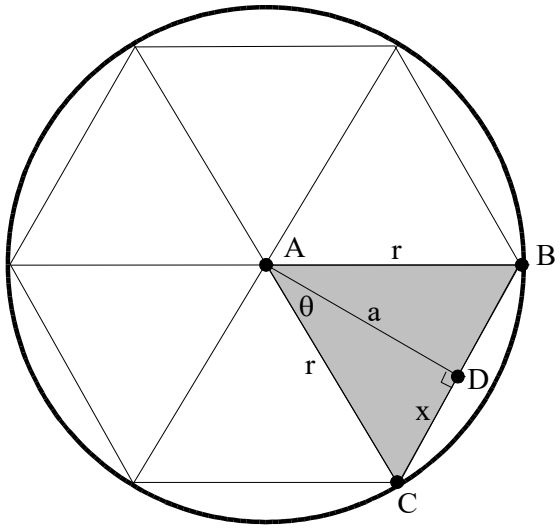
The Value of π

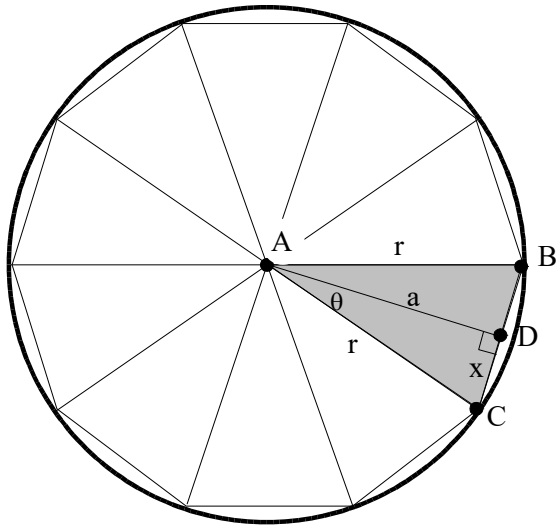
x = rSin(180º/n)
a = rCos(180º/n)

The area of
triangle ABC = xa





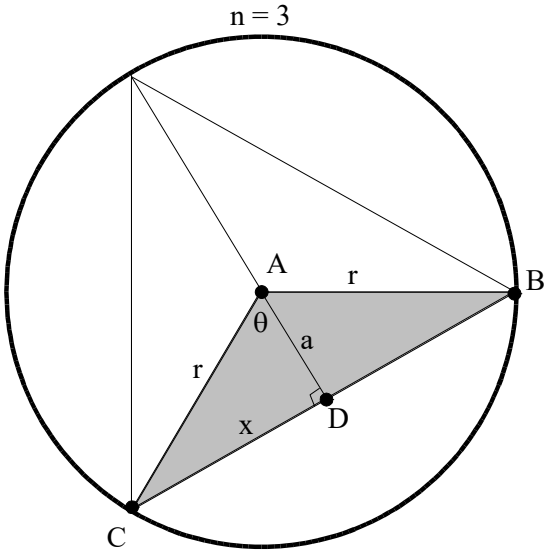


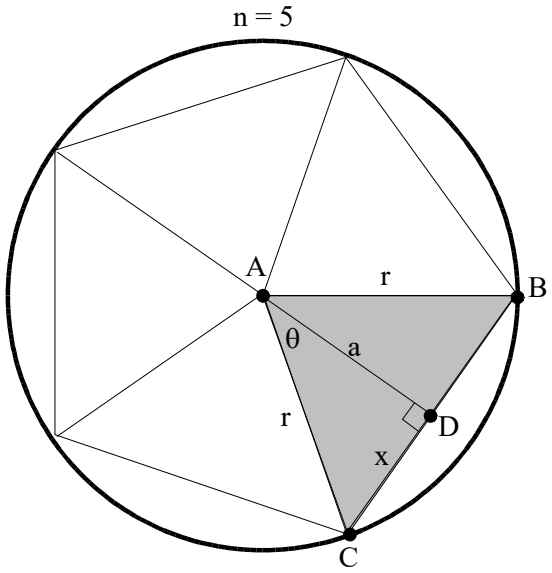


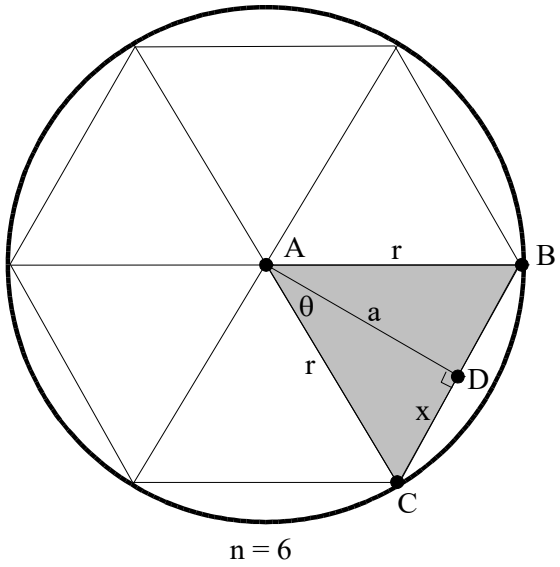
The Value of π

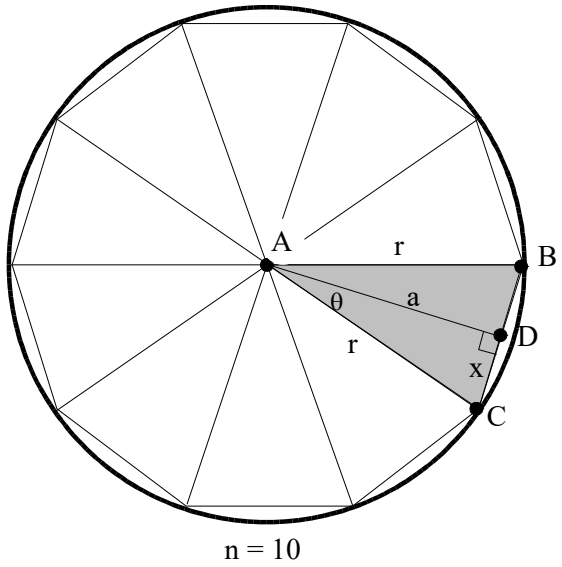
x = rSin(180º/n)
a = rCos(180º/n)

The area of
triangle ABC = xa
[(1/2)(base)(height)]





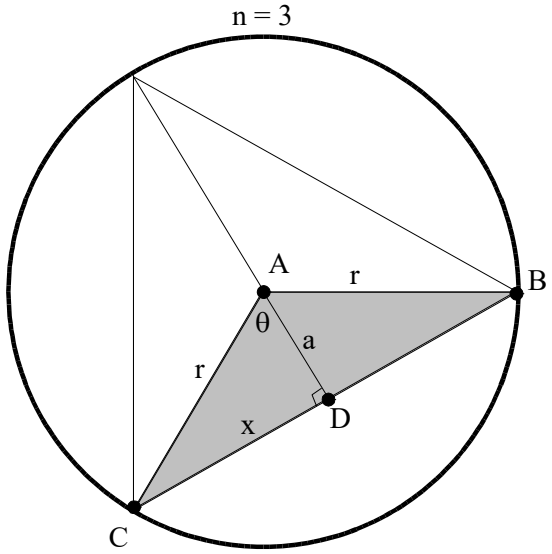


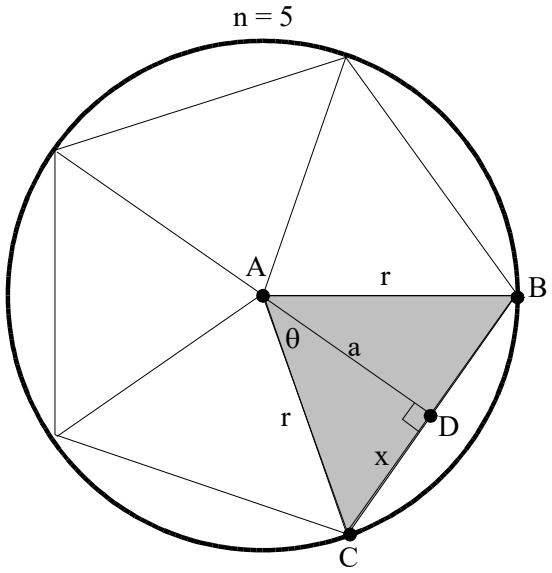


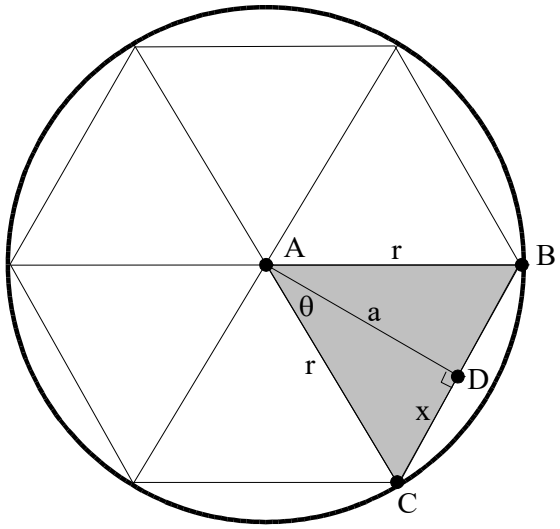
The Value of π

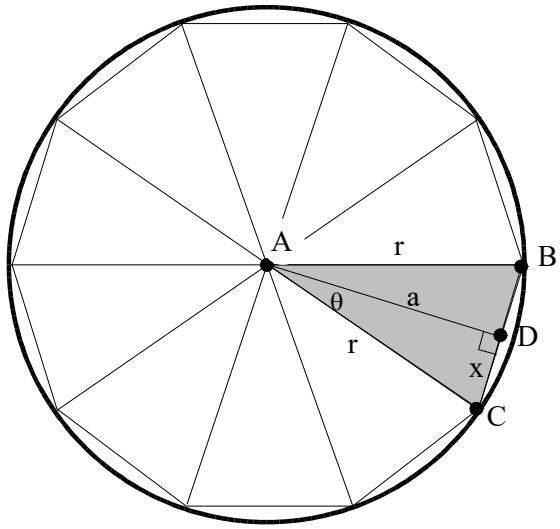
x = rSin(180º/n)
a = rCos(180º/n)

The area of
triangle ABC = xa





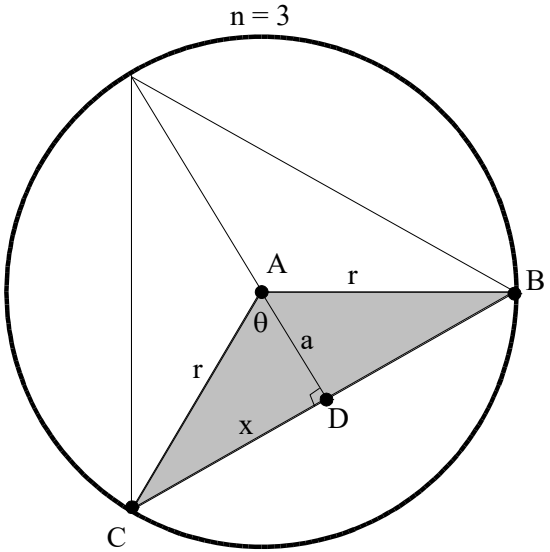


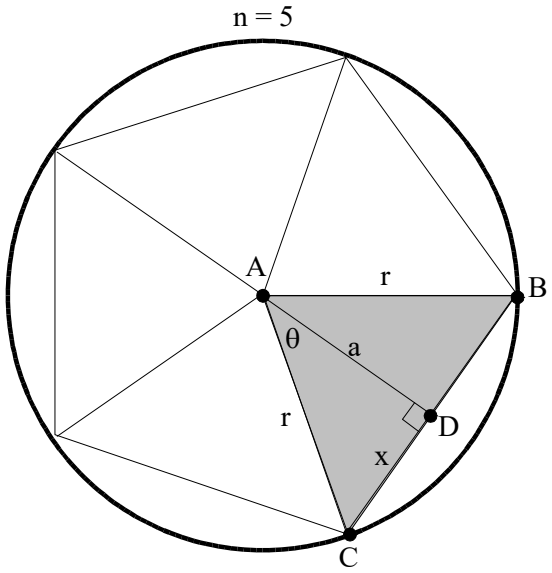


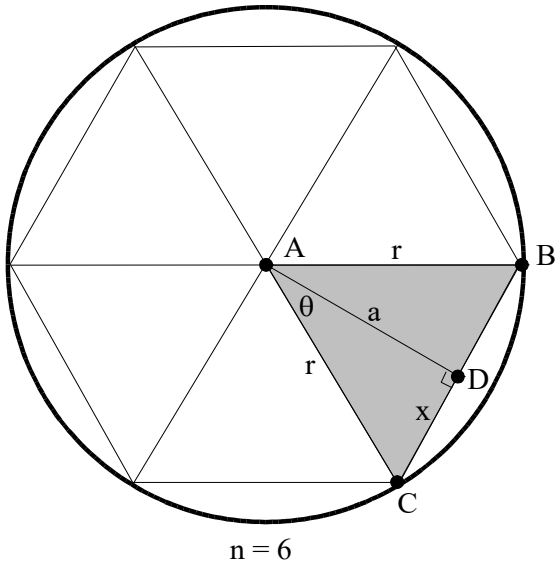
The Value of π

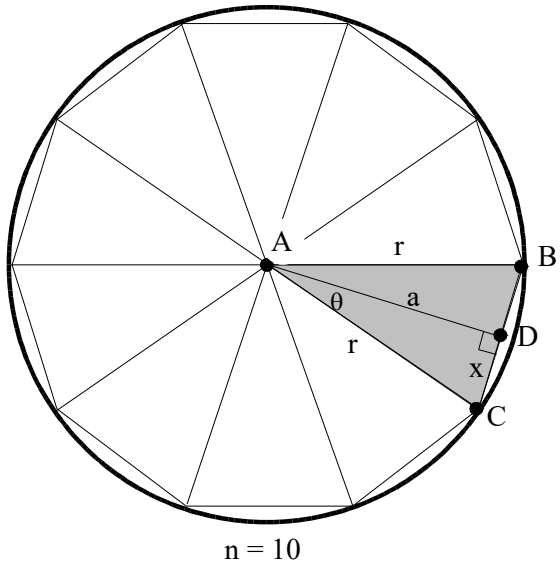
x = rSin(180º/n)
a = rCos(180º/n)

The area of triangle ABC = xa = [rSin(180º/n)]





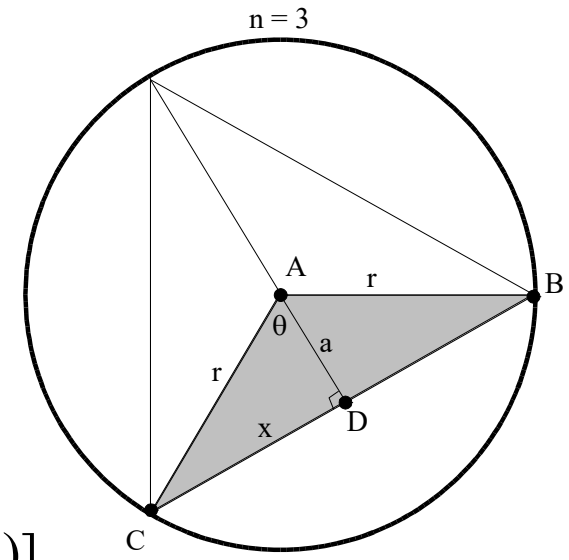


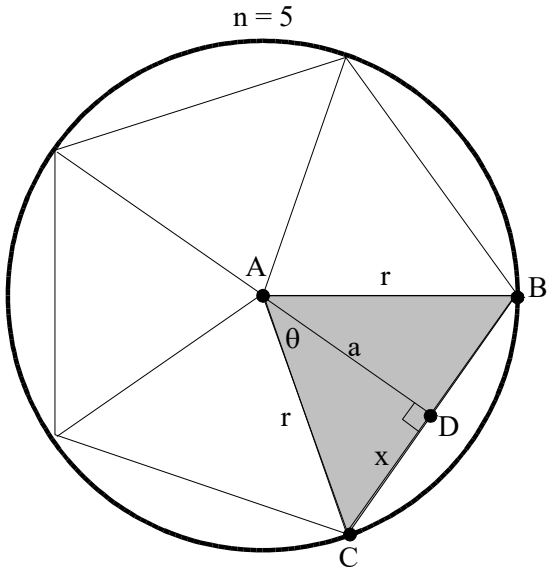


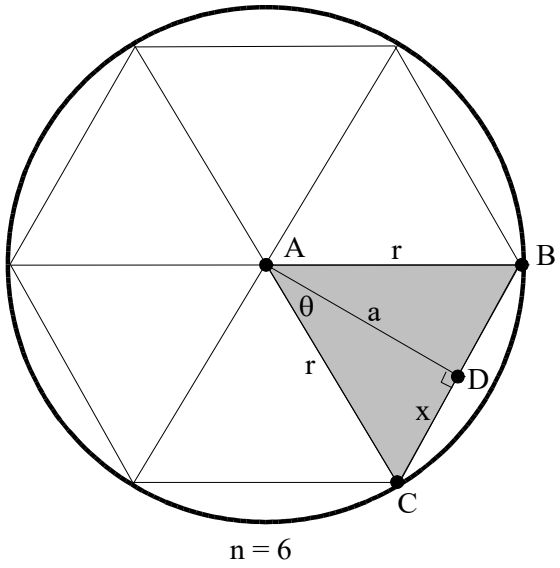
The Value of π

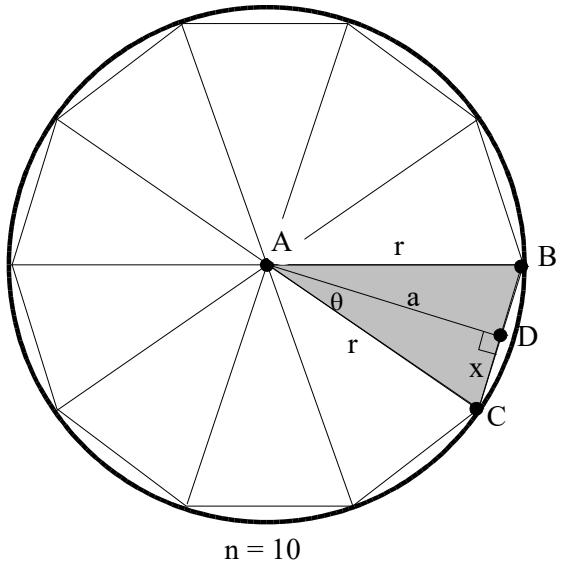
x = rSin(180º/n)
a = rCos(180º/n)

The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]





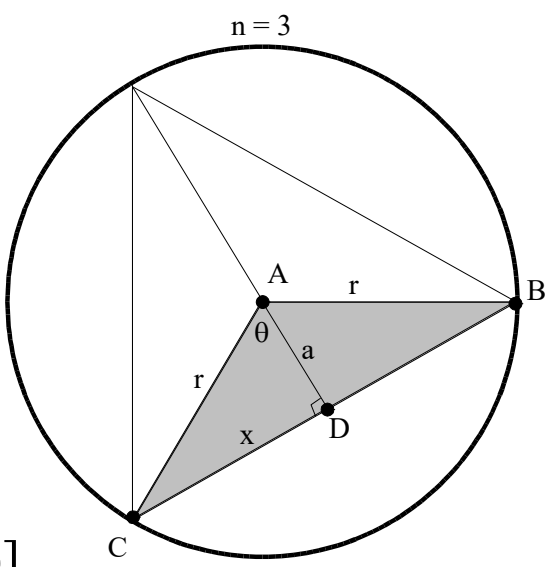


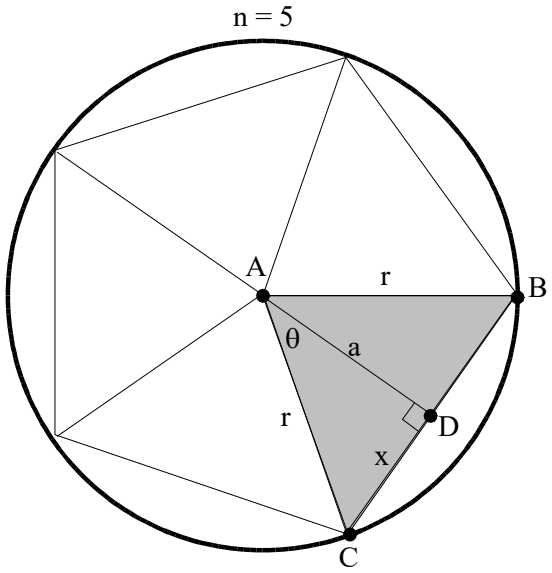


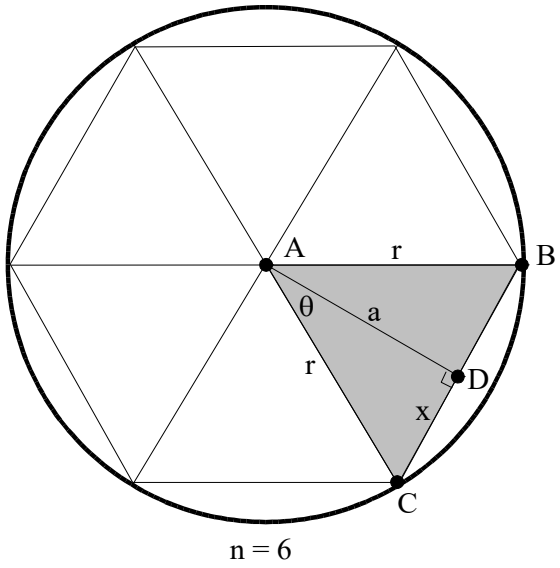
The Value of π

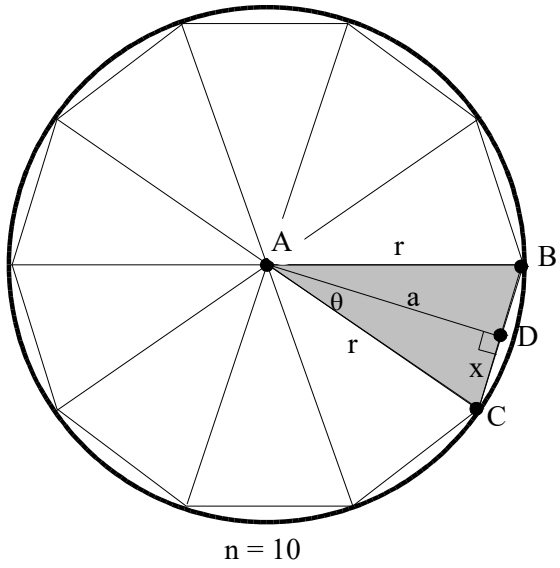
x = rSin(180º/n)
a = rCos(180º/n)

The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
=





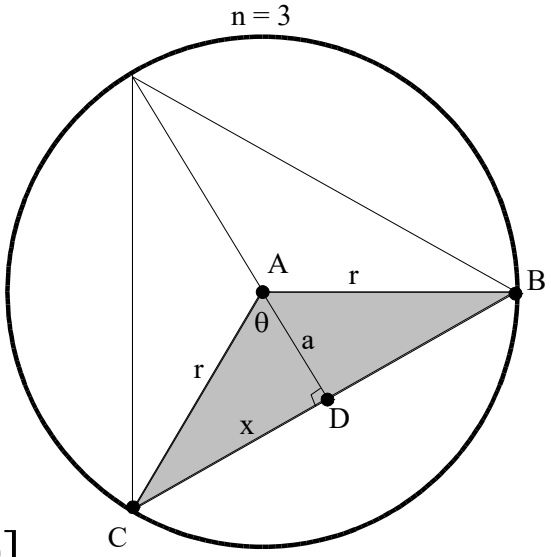


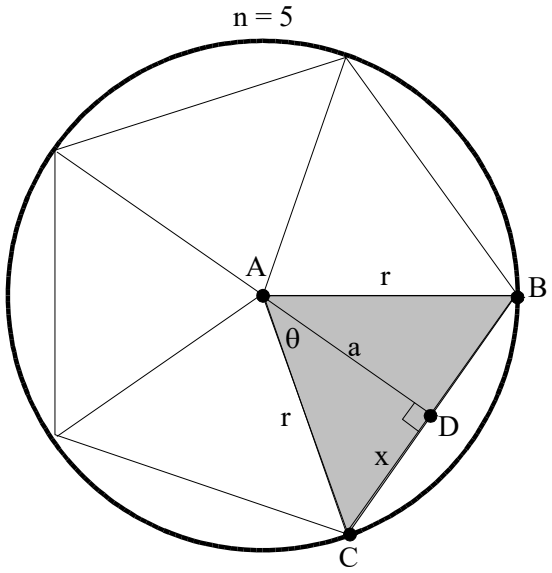


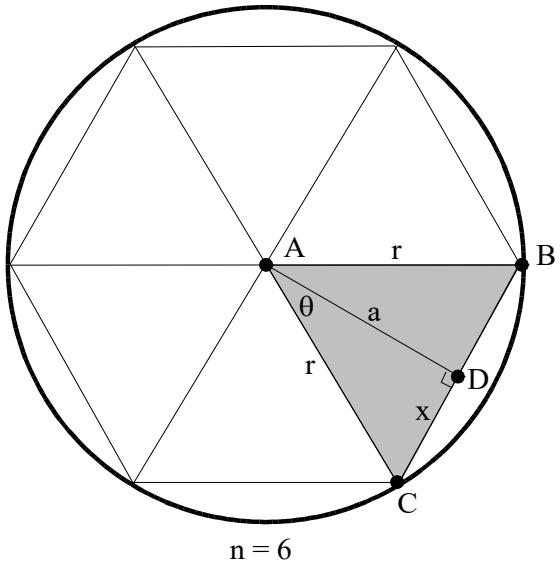
The Value of π

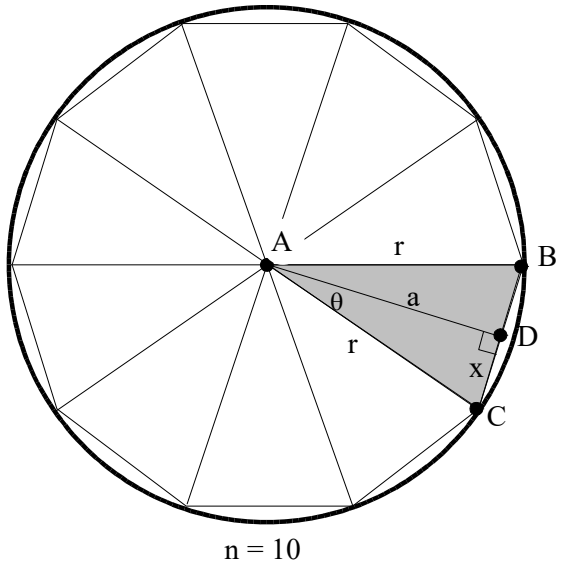
x = rSin(180º/n)
a = rCos(180º/n)

The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2





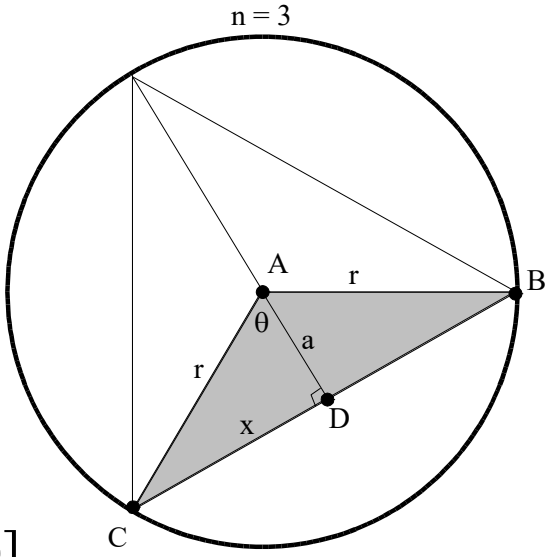


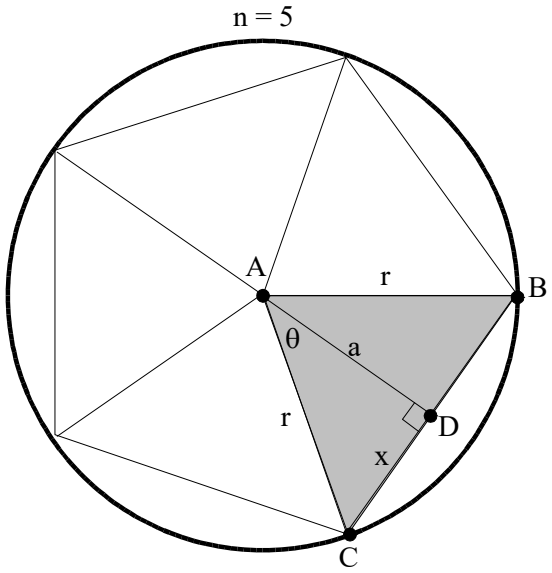


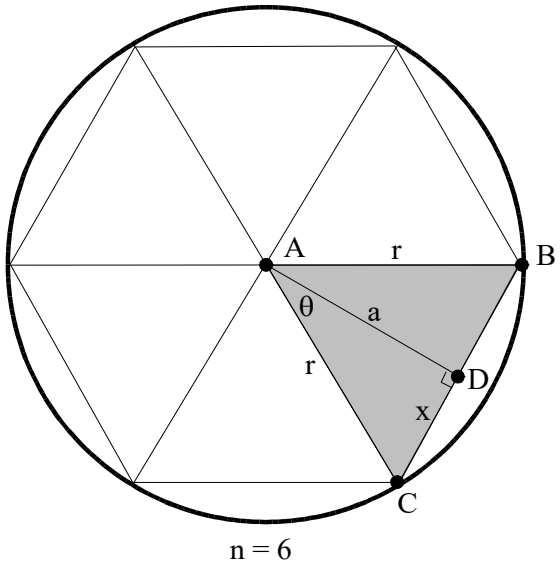
The Value of π

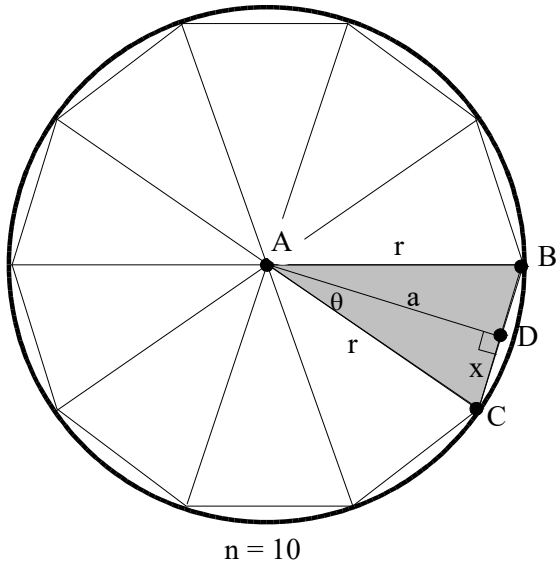
x = rSin(180º/n)
a = rCos(180º/n)

The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2Sin(180º/n)





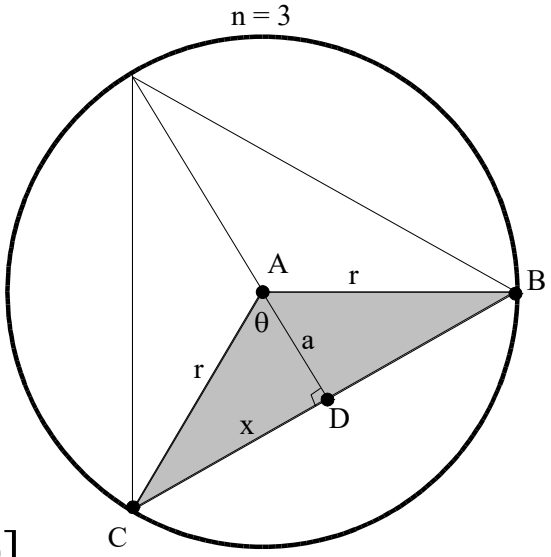


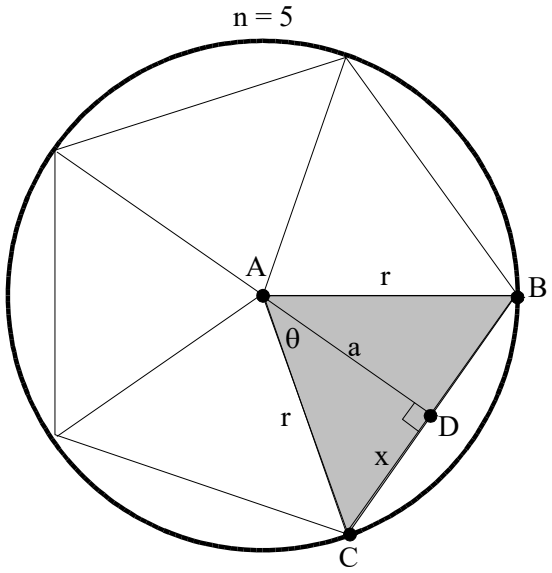


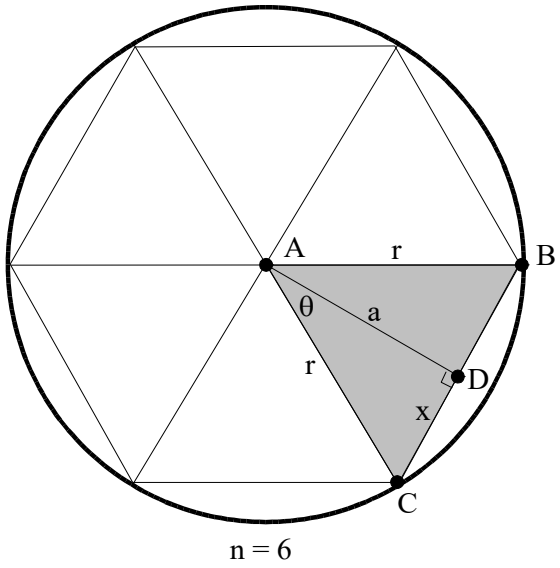
The Value of π

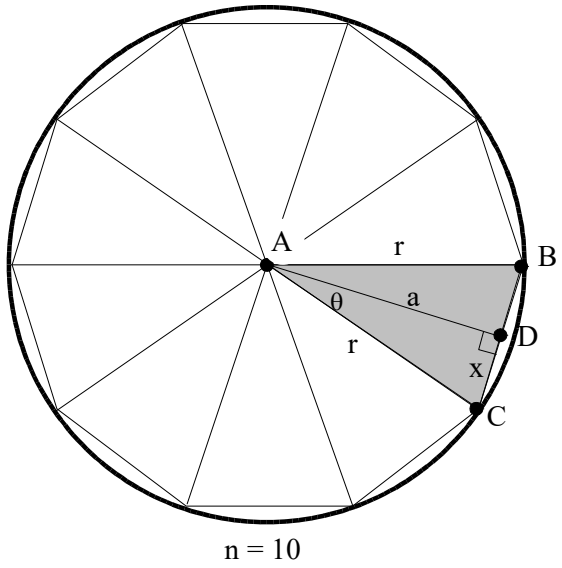
x = rSin(180º/n)
a = rCos(180º/n)

The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2Sin(180º/n) Cos(180º/n)







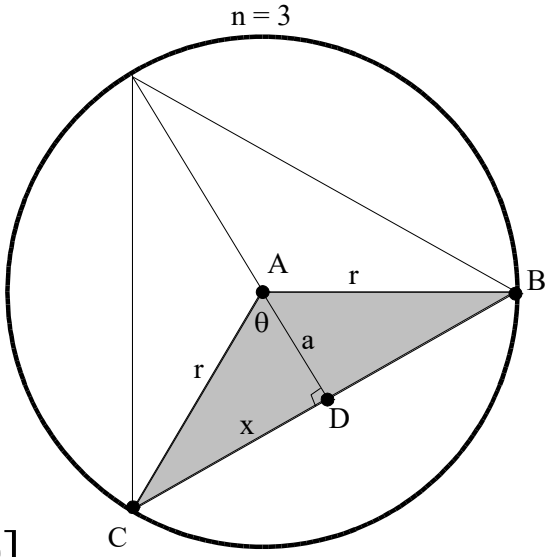


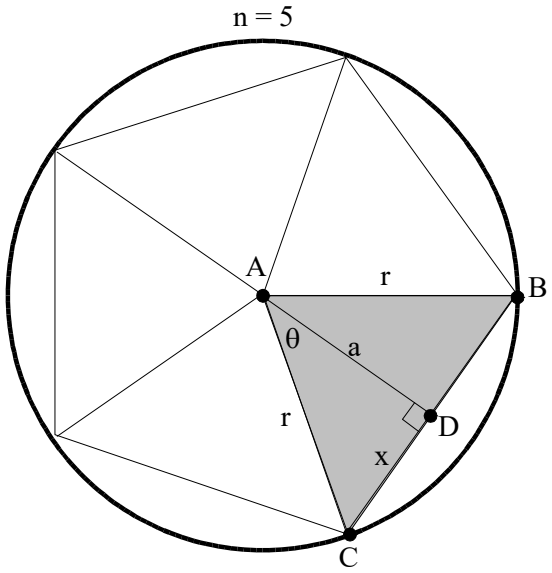
The Value of π

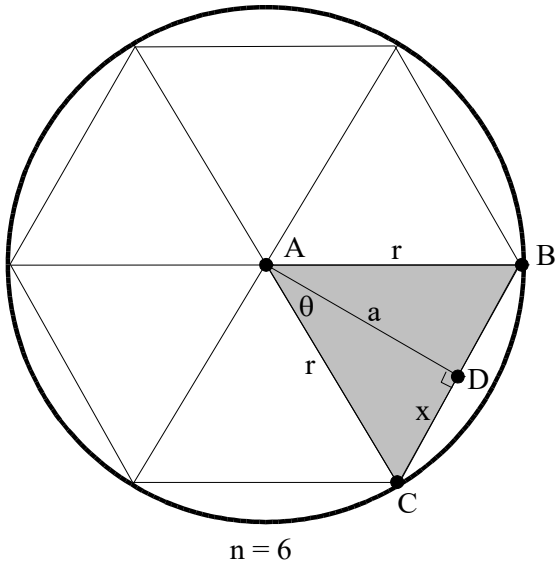
x = rSin(180º/n)
a = rCos(180º/n)

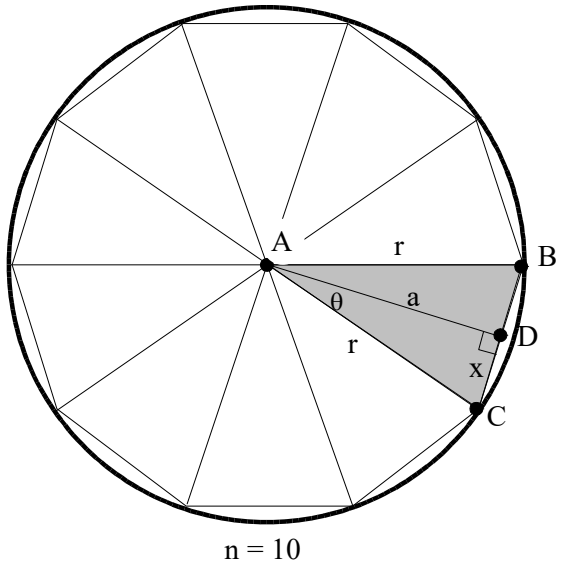
The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2Sin(180º/n) Cos(180º/n)

The area of each regular polygon







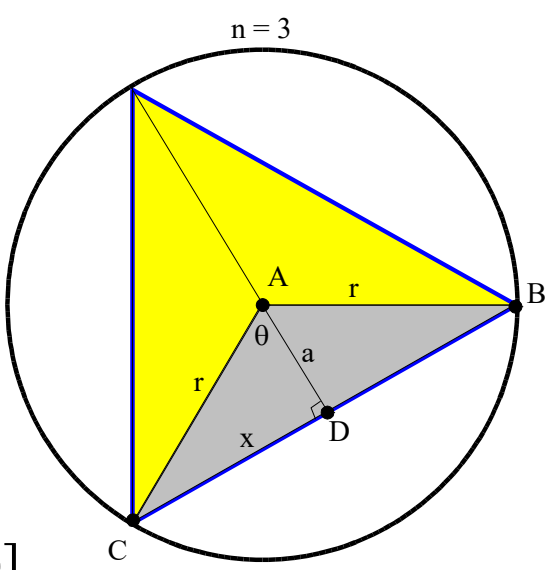


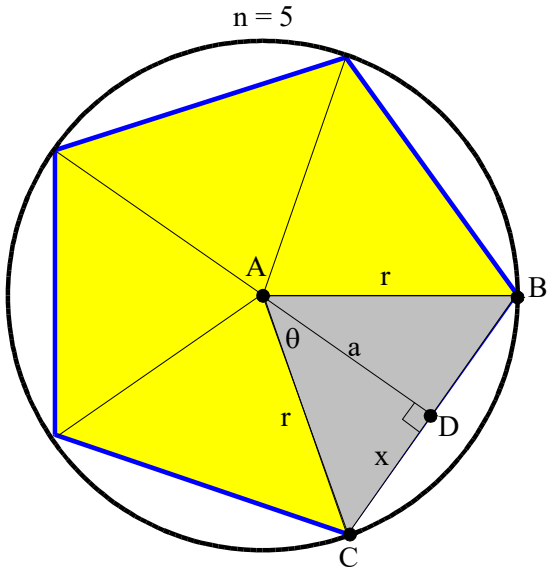
The Value of π

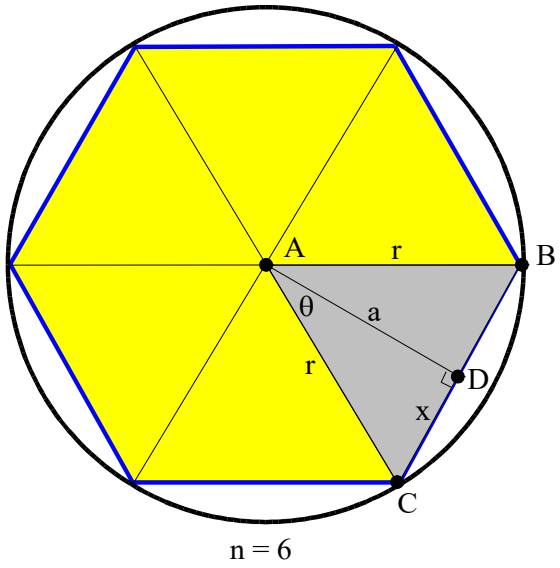
x = rSin(180º/n)
a = rCos(180º/n)

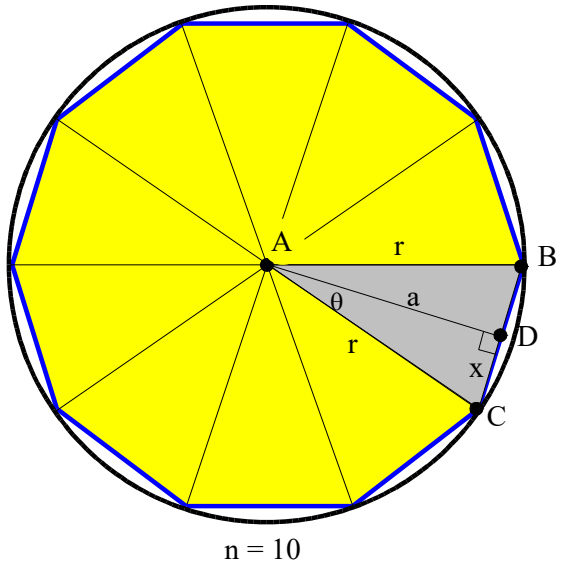
The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2Sin(180º/n) Cos(180º/n)

The area of each regular polygon







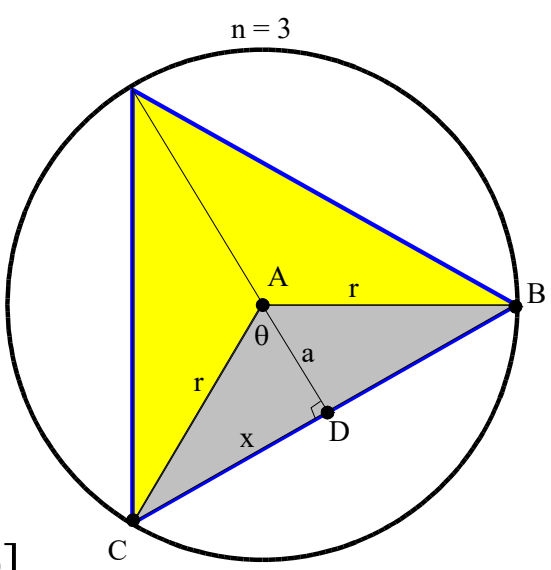


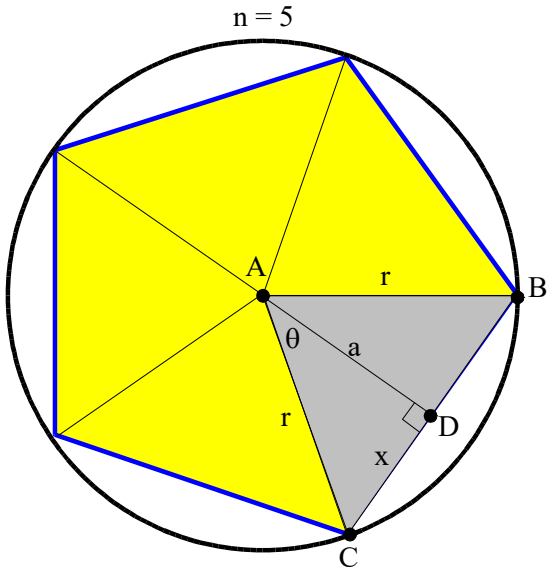
The Value of π

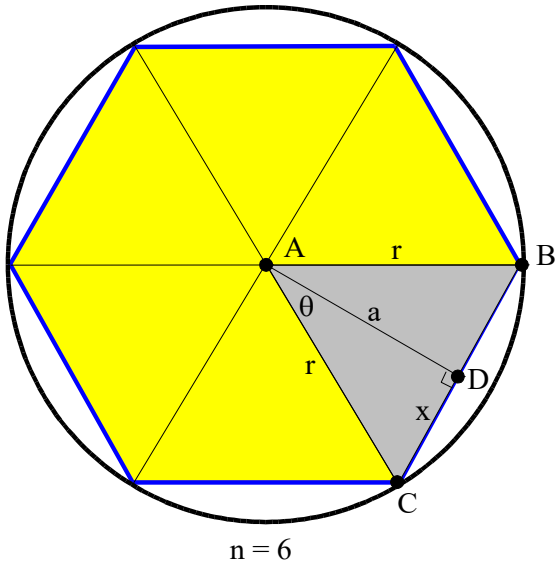
x = rSin(180º/n)
a = rCos(180º/n)

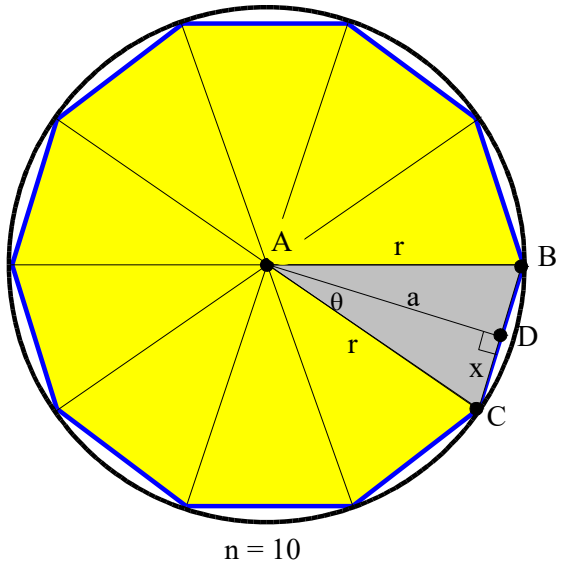
The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2Sin(180º/n) Cos(180º/n)

The area of each regular polygon is **n times**







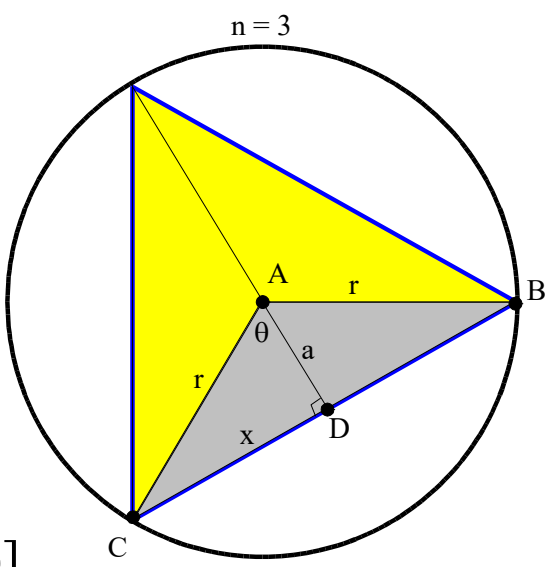


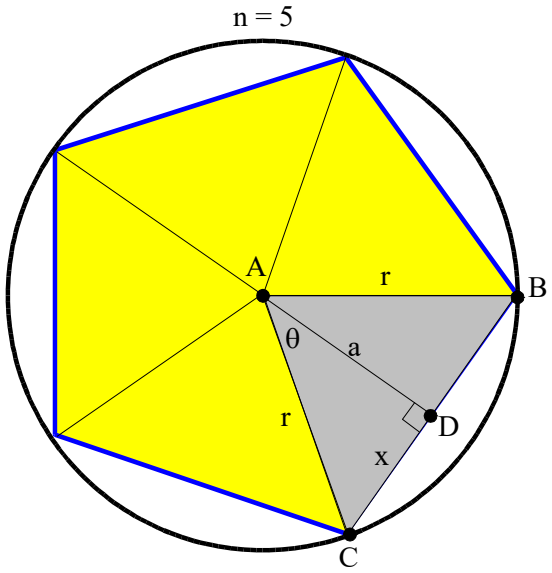
The Value of π

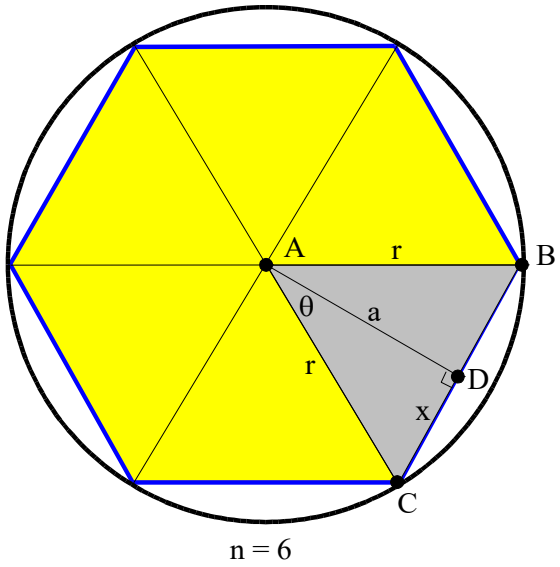
x = rSin(180º/n)
a = rCos(180º/n)

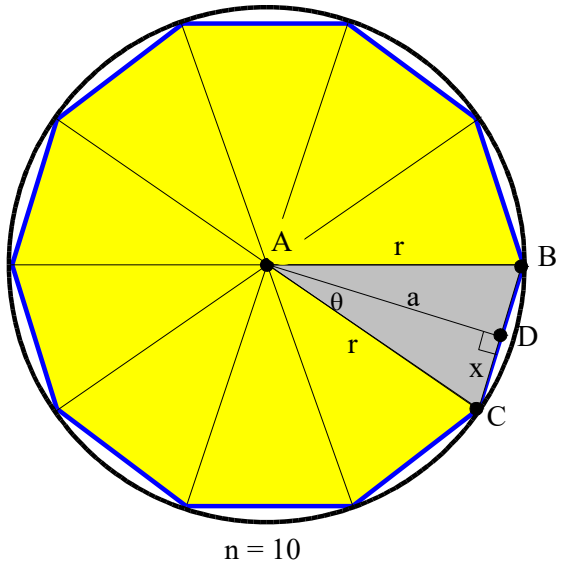
The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2Sin(180º/n) Cos(180º/n)

The area of each regular polygon is **n times** the area of triangle ABC.







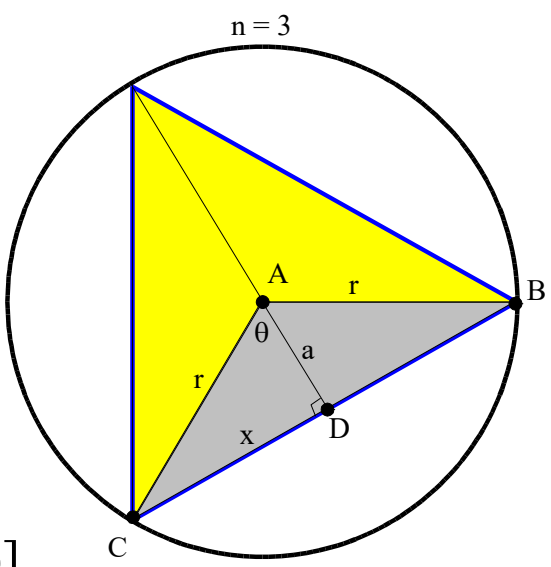


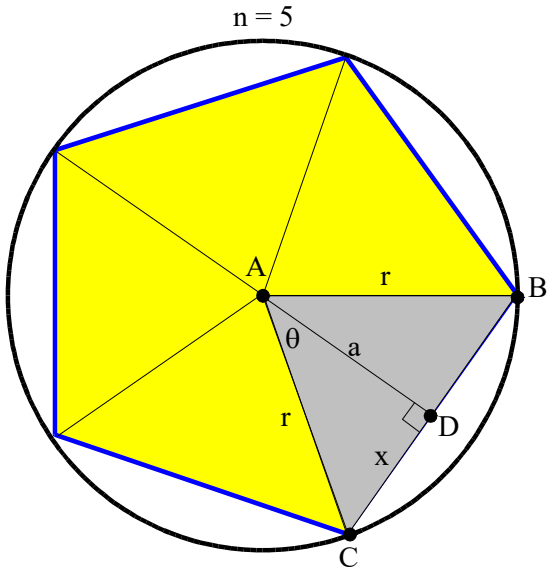
The Value of π

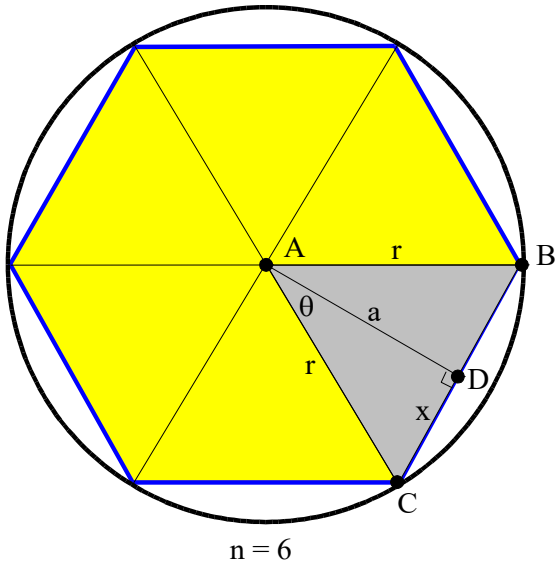
x = rSin(180º/n)
a = rCos(180º/n)

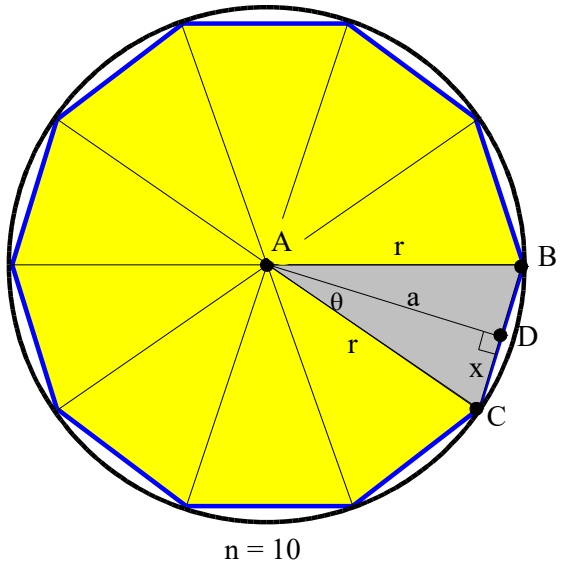
The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2Sin(180º/n) Cos(180º/n)

The area of each regular polygon is **n times** the area of triangle ABC =







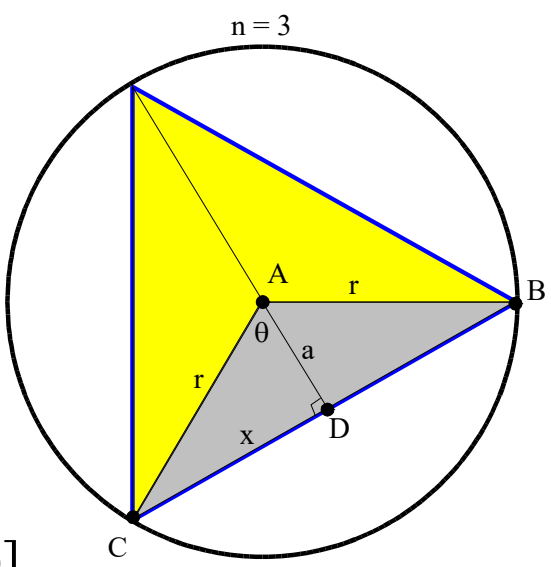


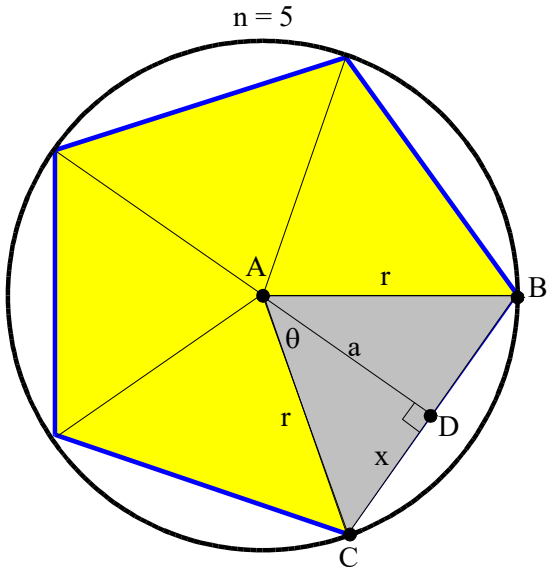
The Value of π

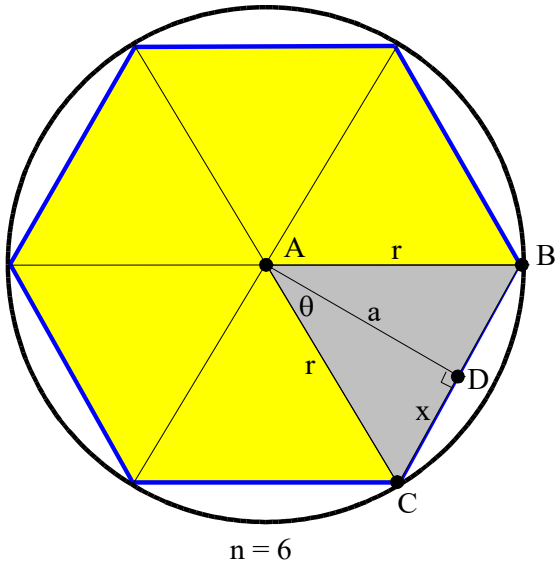
x = rSin(180º/n)
a = rCos(180º/n)

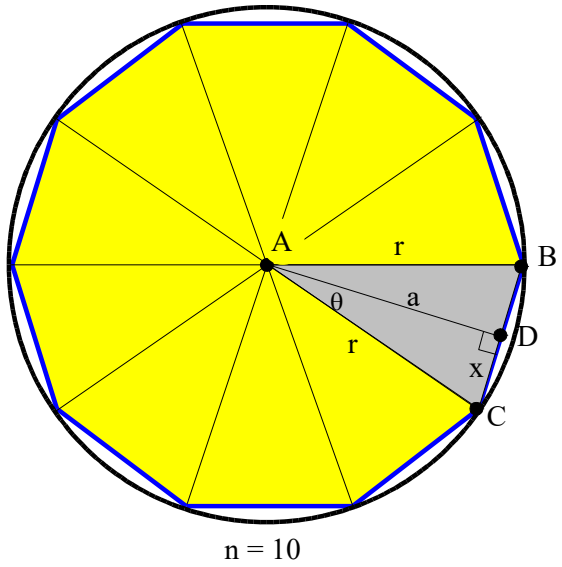
The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2Sin(180º/n) Cos(180º/n)

The area of each regular polygon is **n times** the area of triangle ABC =
n







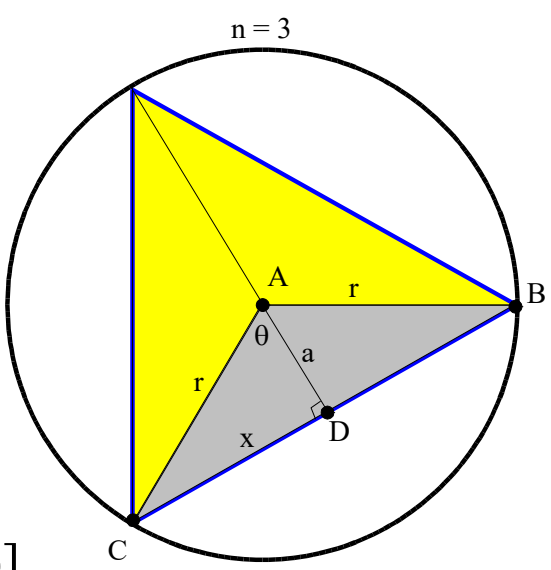


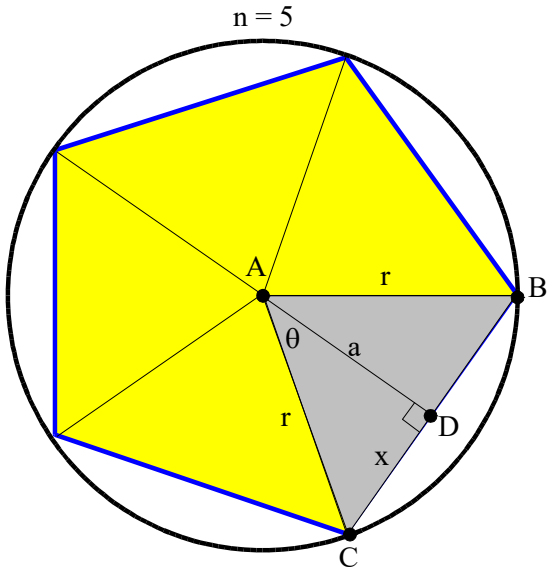
The Value of π

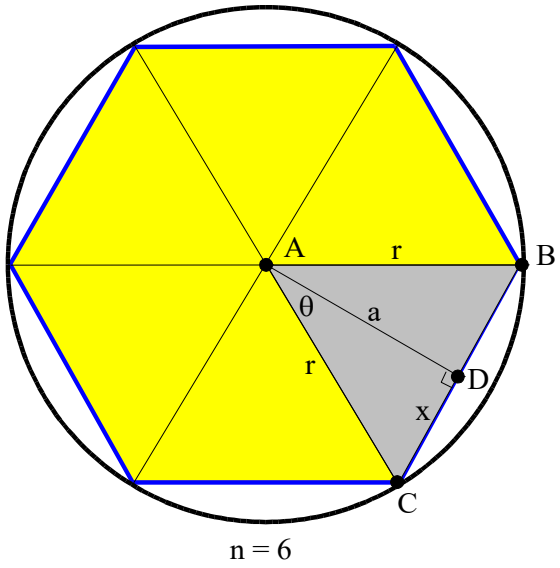
x = rSin(180º/n)
a = rCos(180º/n)

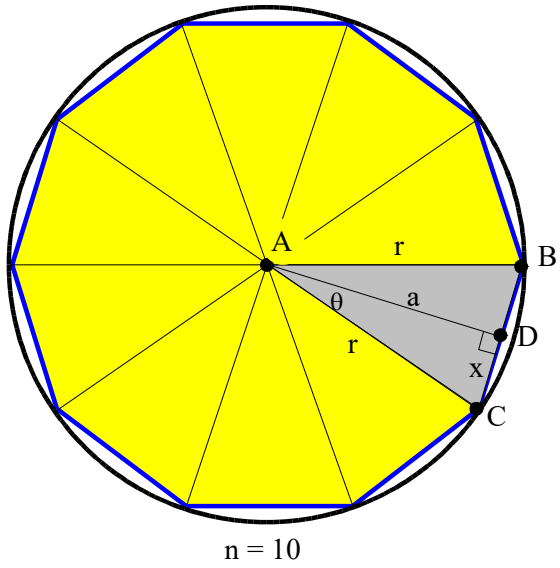
The area of
triangle ABC = xa
= [rSin(180º/n)][rCos(180º/n)]
= r^2Sin(180º/n) Cos(180º/n)

The area of each regular polygon is **n times** the area of triangle ABC =
nr^2Sin(180º/n)Cos(180º/n)









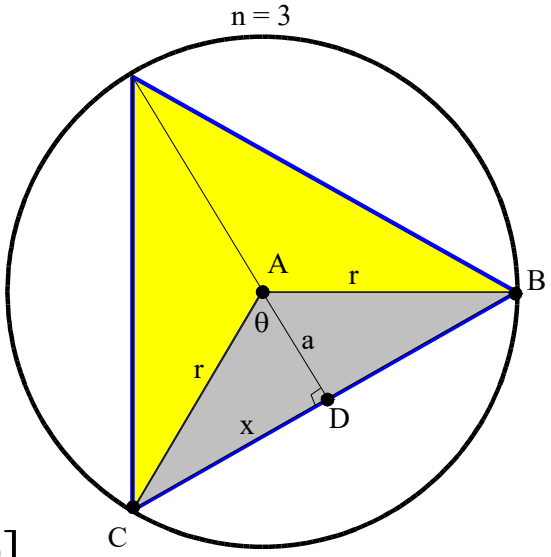
The Value of π

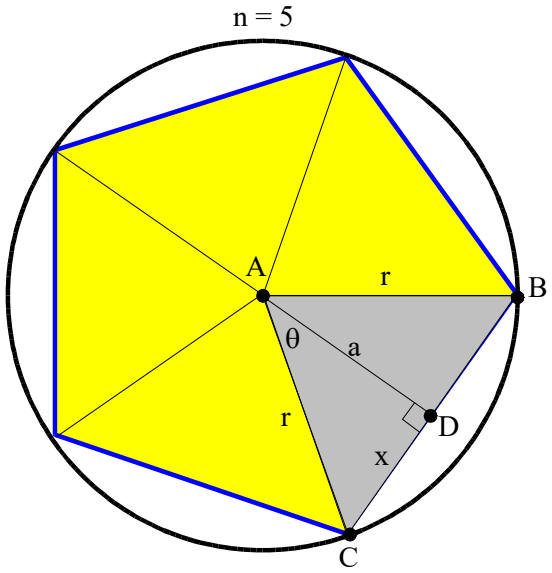
x = rSin(180º/n)
a = rCos(180º/n)

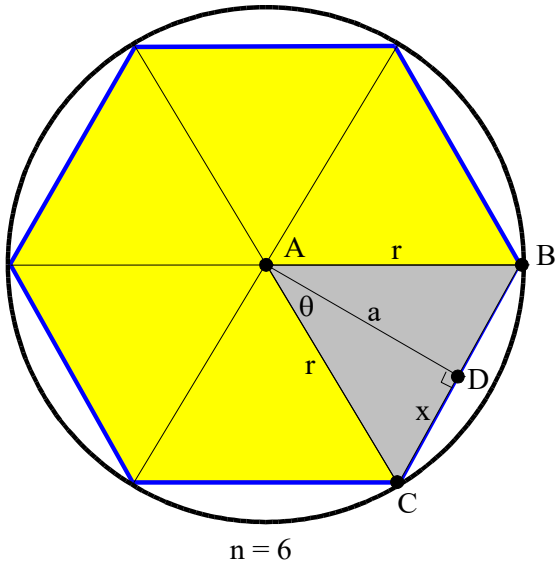
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

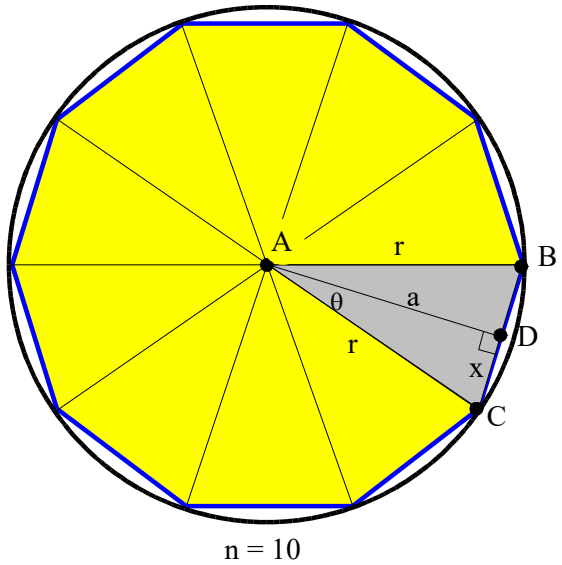
The area of
triangle ABC = xa
$= [rSin(180º/n)][rCos(180º/n)]$
$= r^2Sin(180º/n)\ Cos(180º/n)$

The area of each regular polygon is **n times** the area of triangle ABC =
$nr^2Sin(180º/n)Cos(180º/n)$





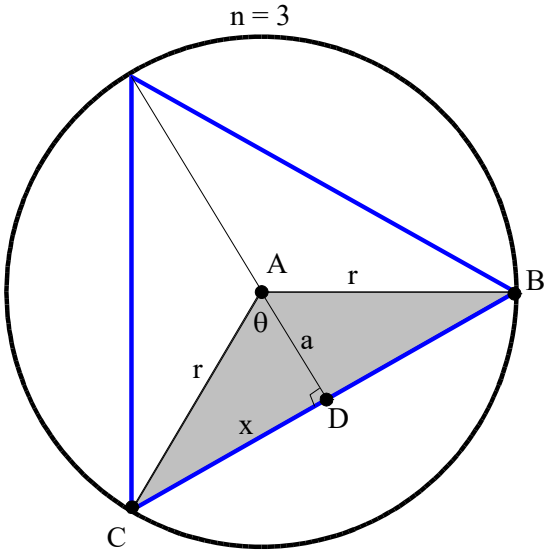


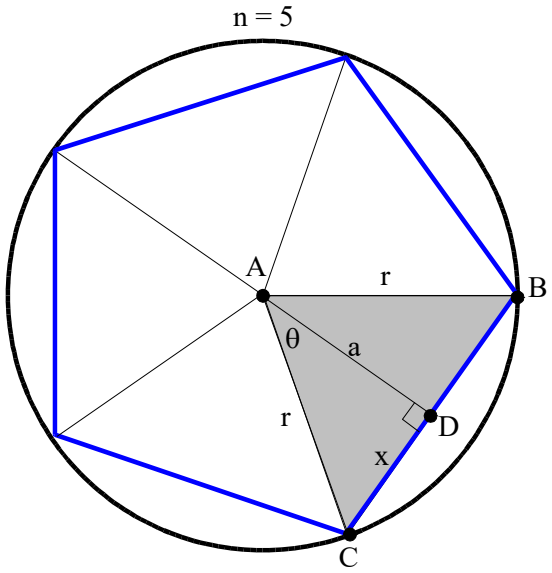


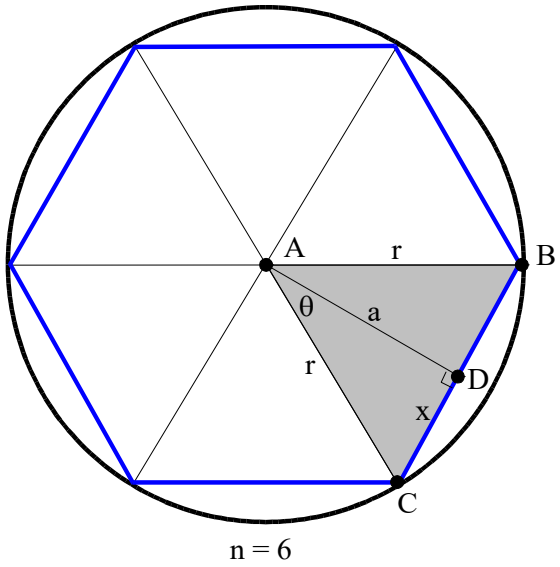
The Value of π

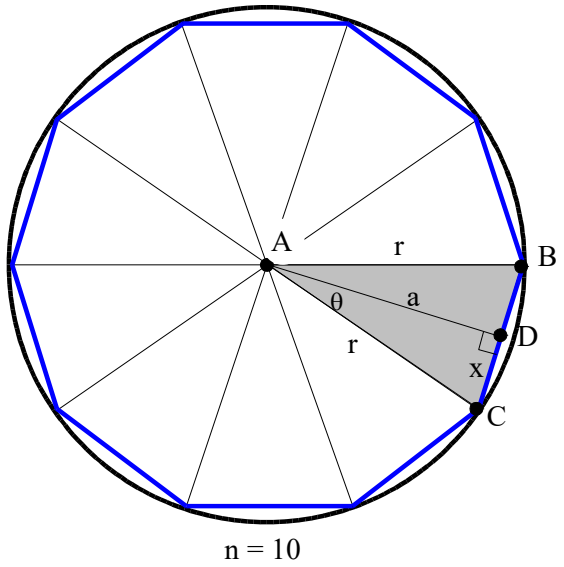
x = rSin(180º/n)
a = rCos(180º/n)

Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$







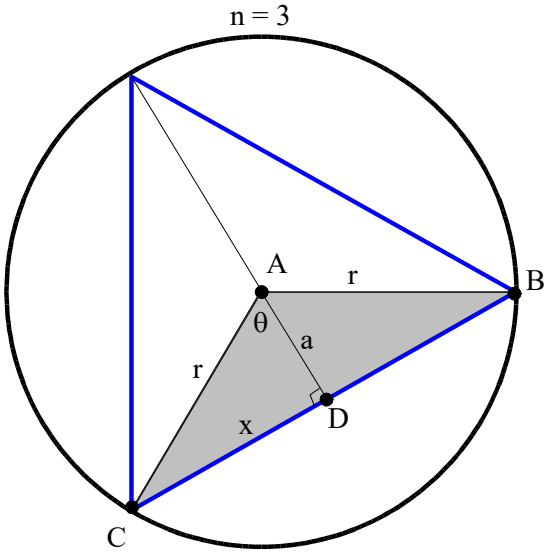


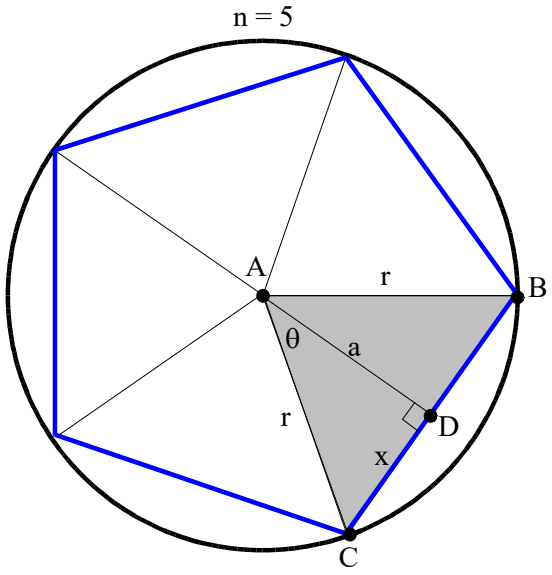
The Value of π

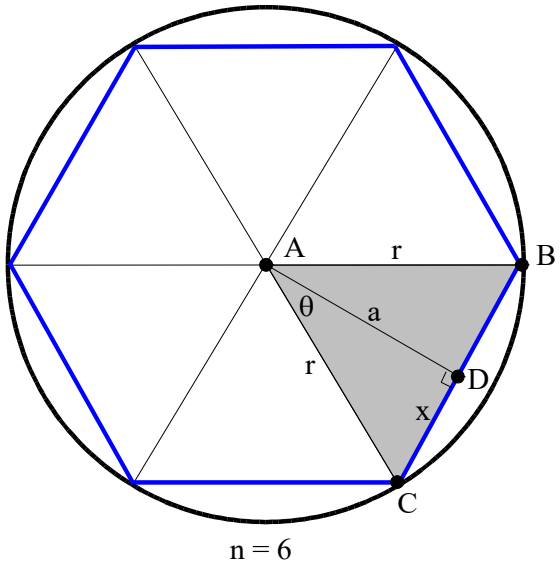
x = rSin(180º/n)
a = rCos(180º/n)

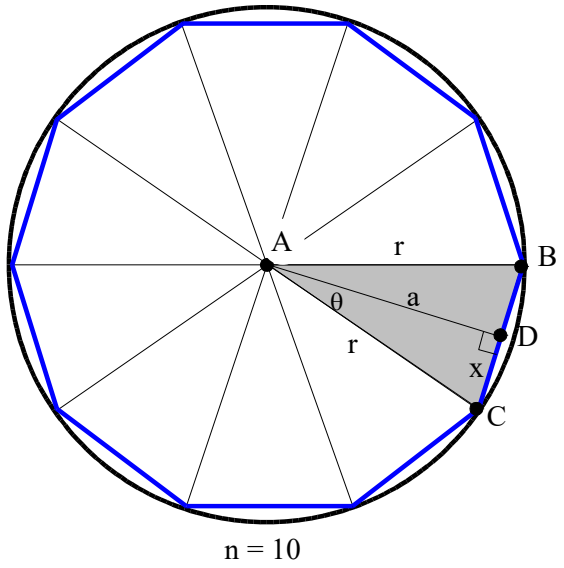
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

The length of segment CB







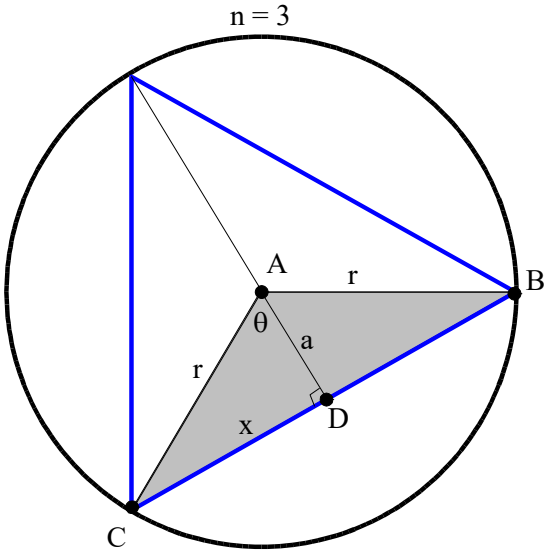


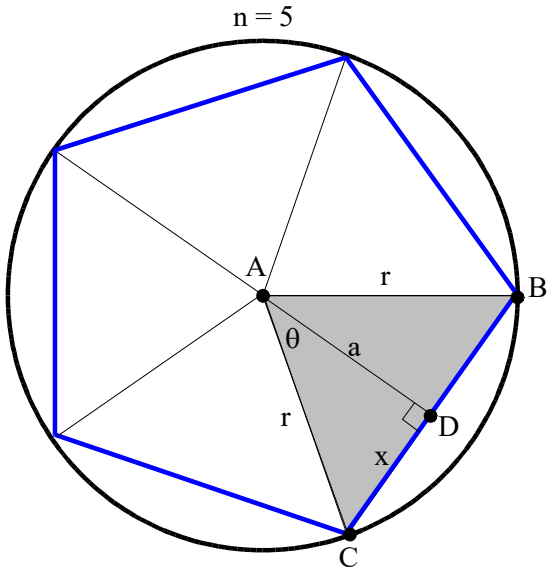
The Value of π

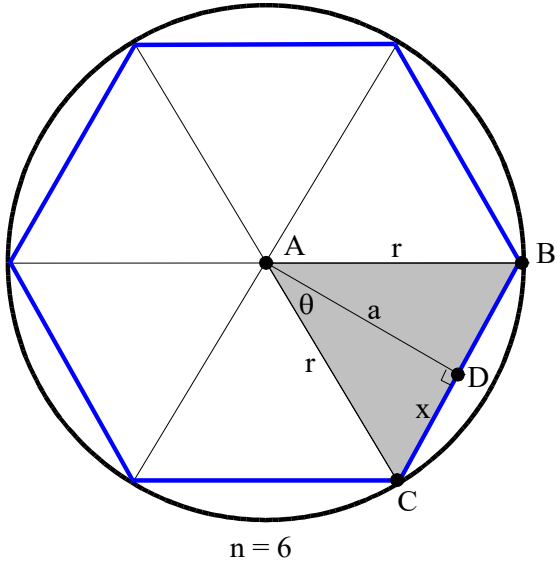
x = rSin(180º/n)
a = rCos(180º/n)

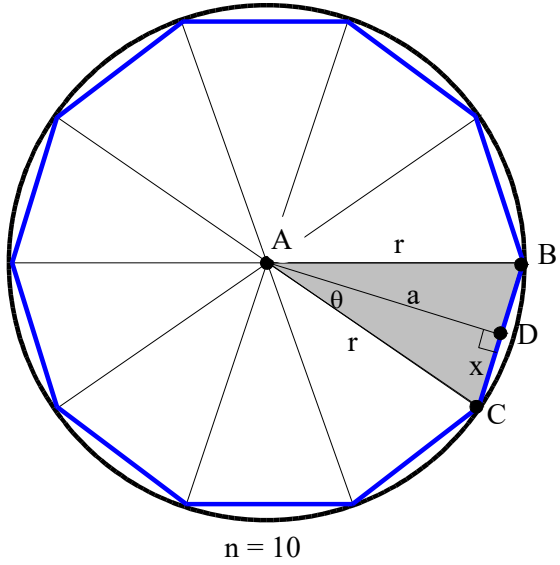
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

The length of segment CB is 2 times the length of segment CD.







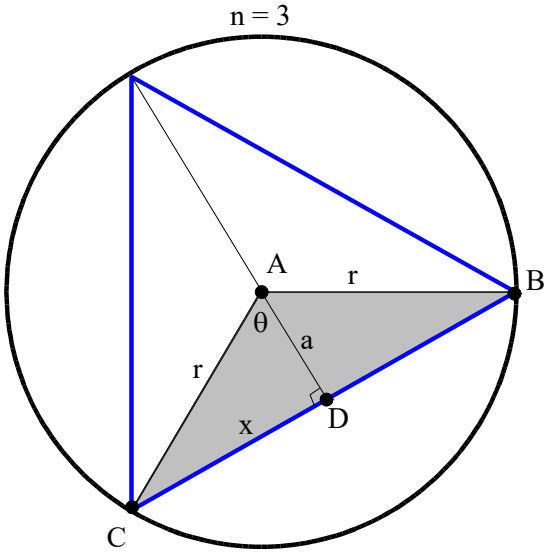


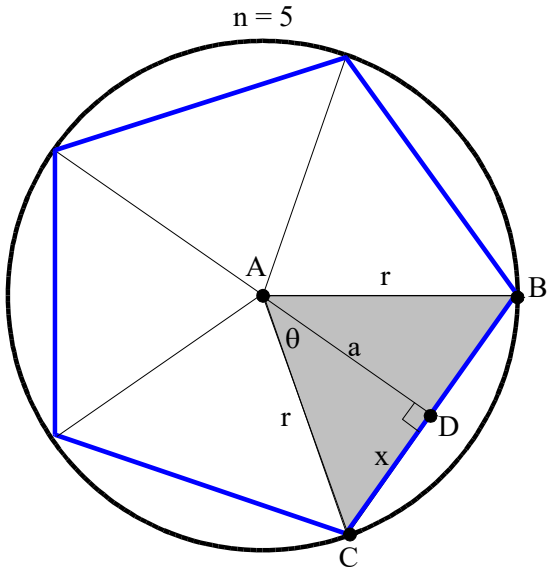
The Value of π

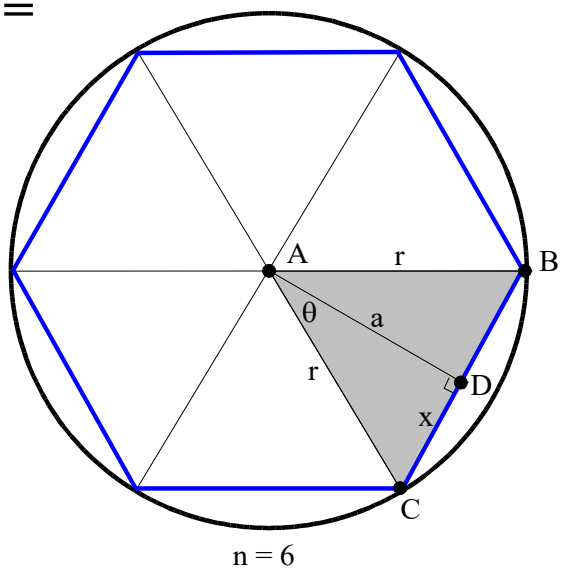
x = rSin(180º/n)
a = rCos(180º/n)

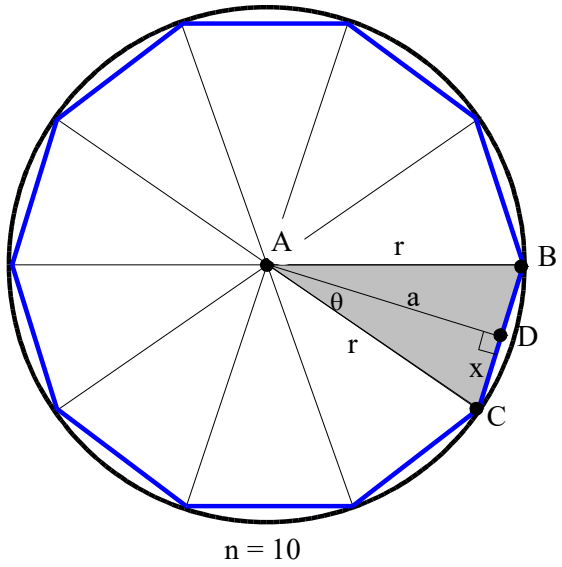
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

The length of
segment CB is 2 times
the length of segment CD.
The length of segment CB =







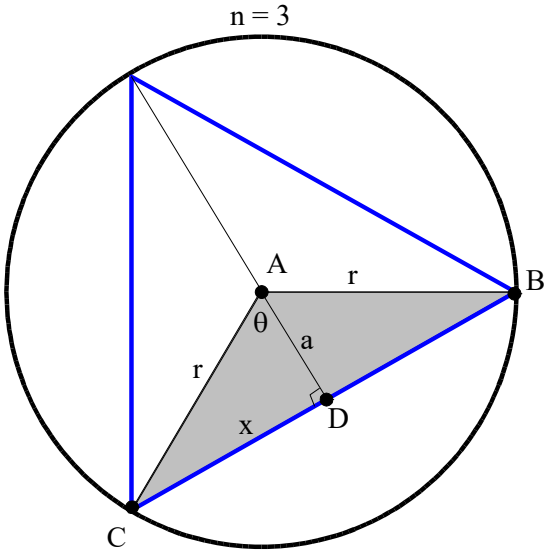


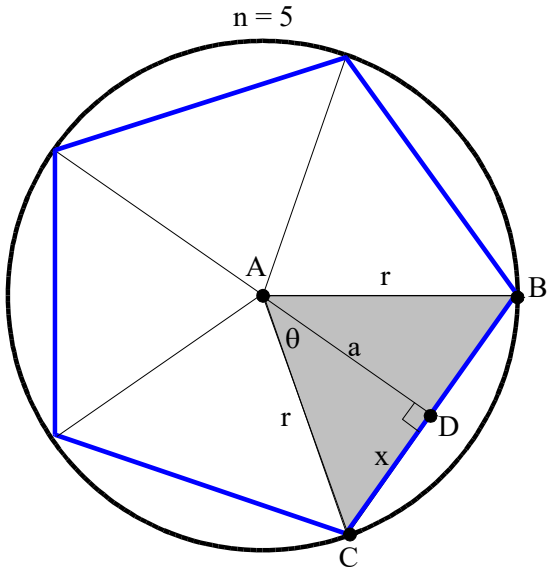
The Value of π

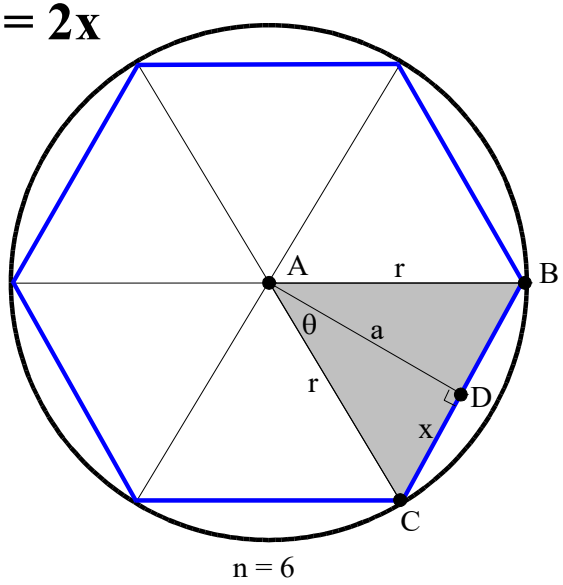
x = rSin(180º/n)
a = rCos(180º/n)

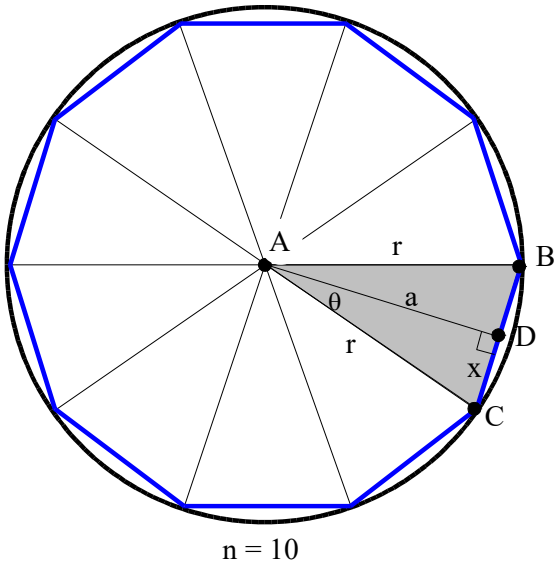
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

The length of
segment CB is 2 times
the length of segment CD.
The length of segment CB = 2x









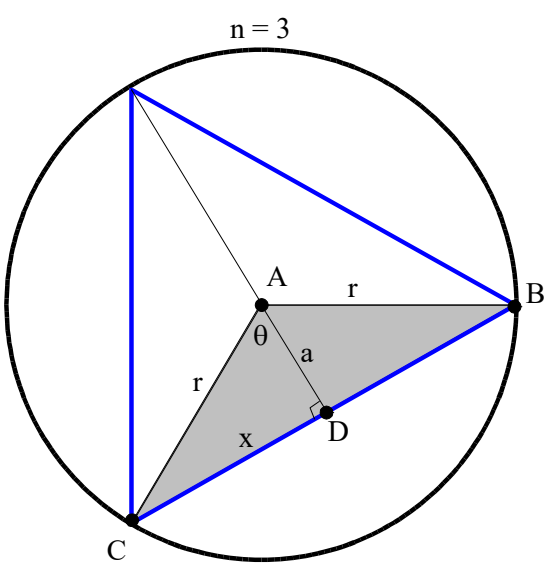
The Value of π

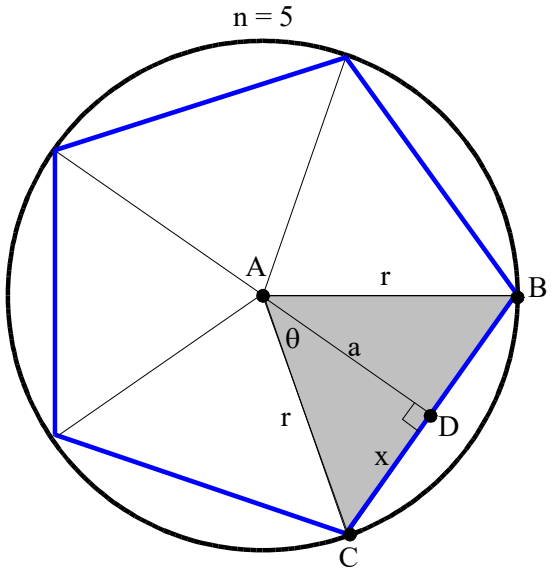
x = rSin(180º/n)
a = rCos(180º/n)

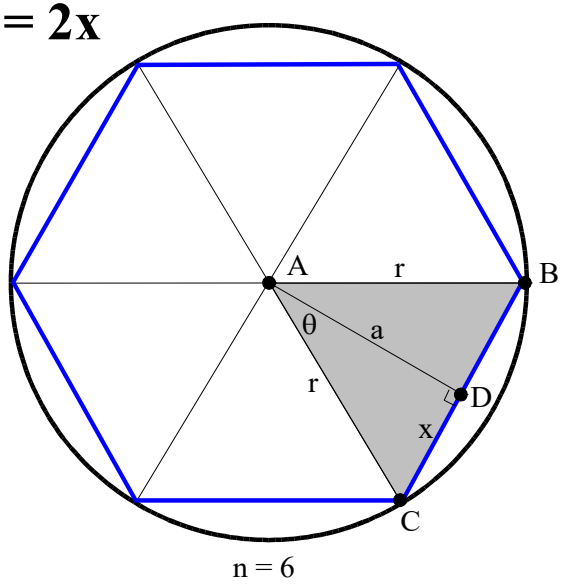
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

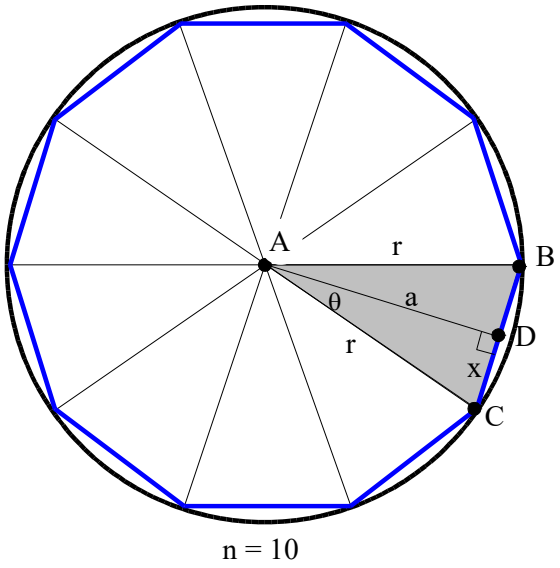
The length of segment CB is 2 times the length of segment CD.
The length of segment CB = 2x

The **perimeter** of each regular polygon









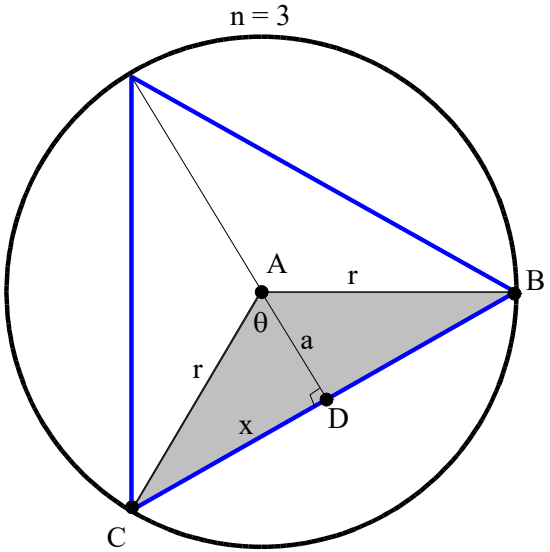
The Value of π

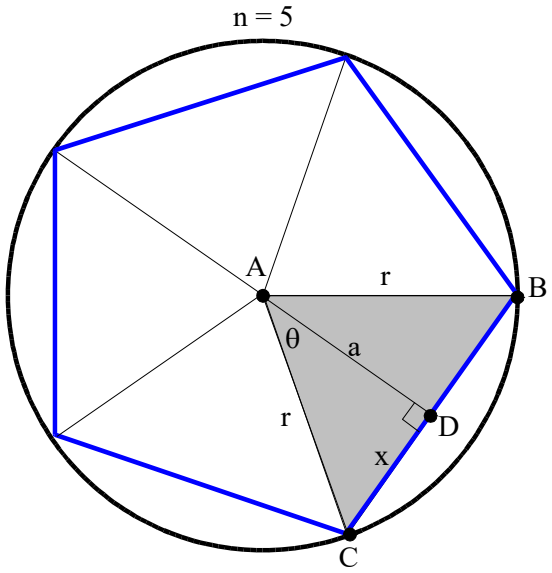
x = rSin(180º/n)
a = rCos(180º/n)

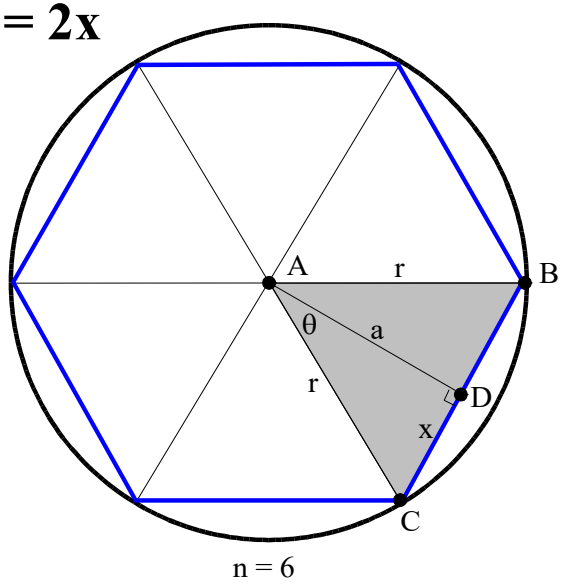
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

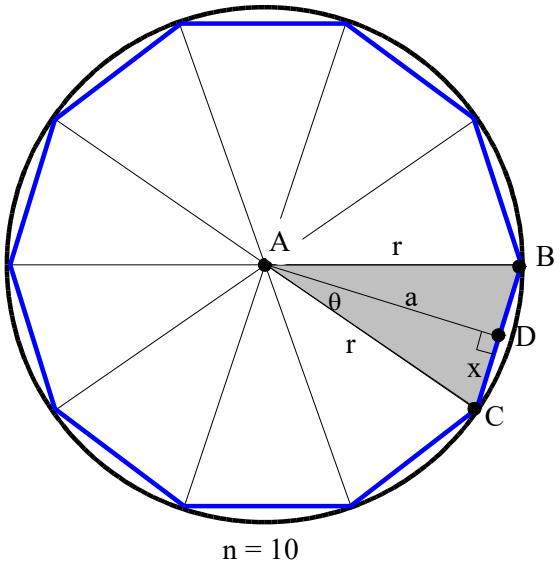
The length of segment CB is 2 times the length of segment CD.
The length of segment CB = 2x

The **perimeter** of each regular polygon is **n times** the length of segment CB.









The Value of π

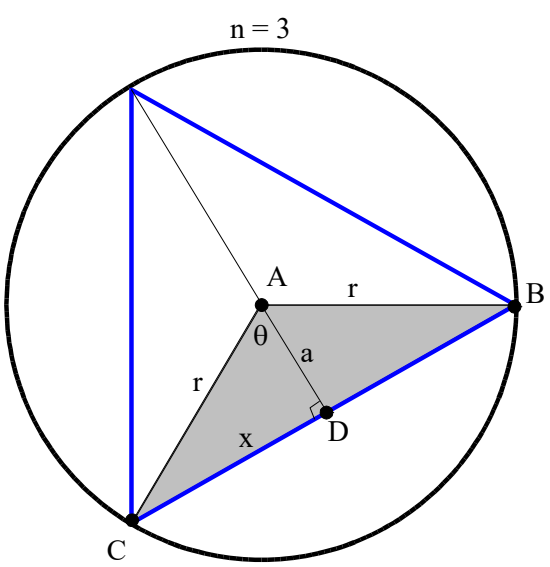
x = rSin(180º/n)
a = rCos(180º/n)

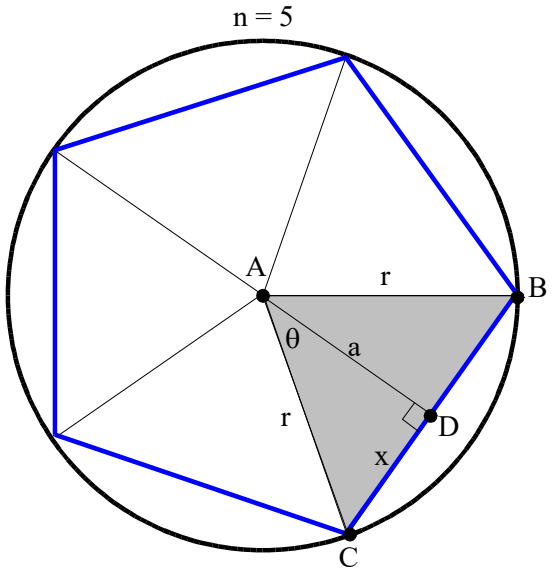
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

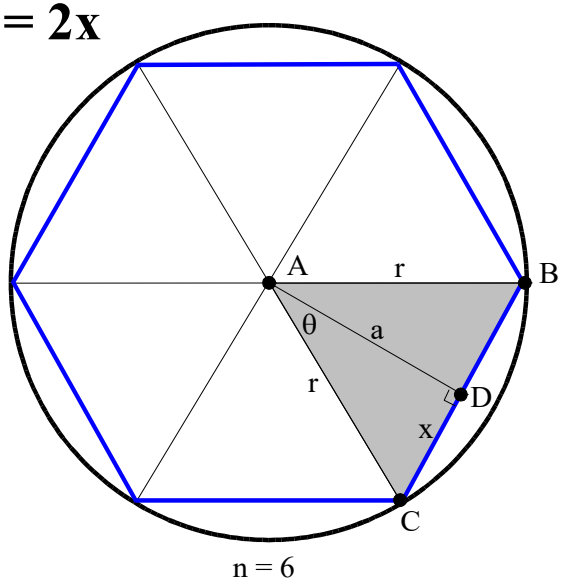
The length of segment CB is 2 times the length of segment CD.
The length of segment CB = 2x

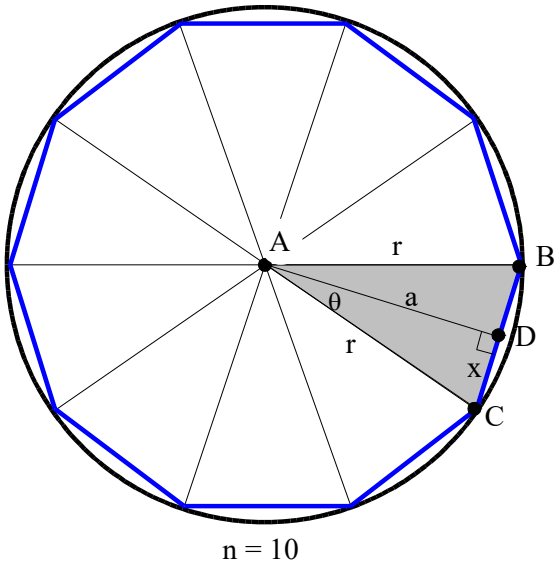
The **perimeter** of each regular polygon is **n times** the length of segment CB.

The **perimeter** of each regular polygon is









The Value of π

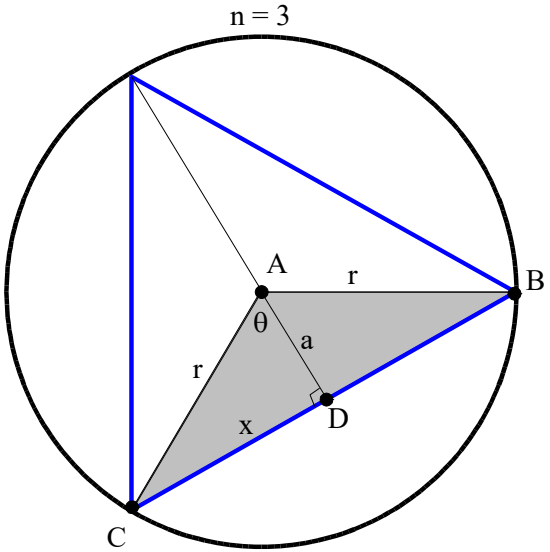
x = rSin(180º/n)
a = rCos(180º/n)

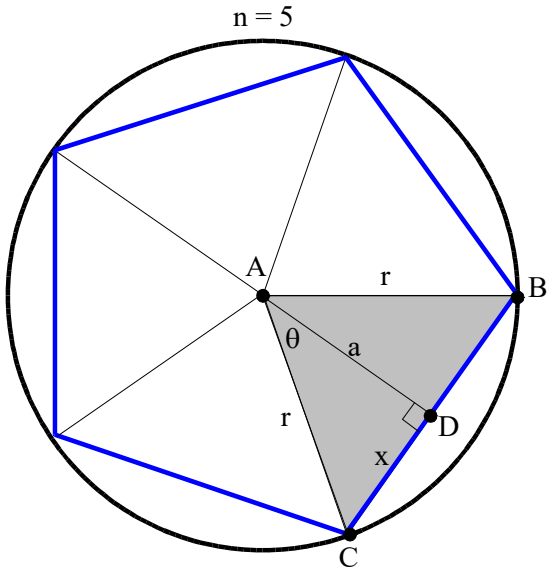
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

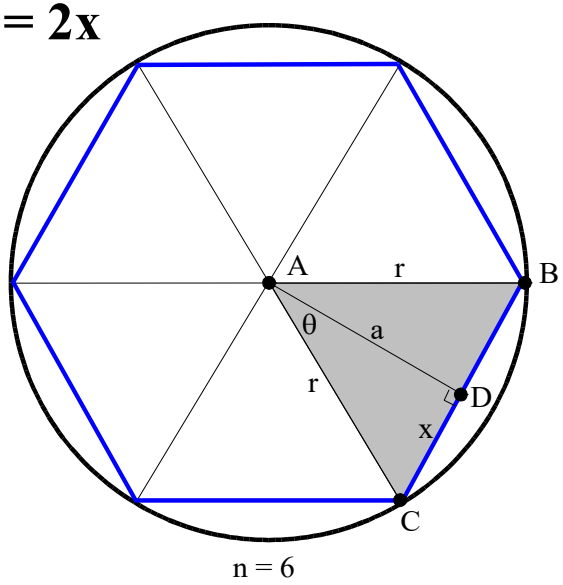
The length of segment CB is 2 times the length of segment CD.
The length of segment CB = 2x

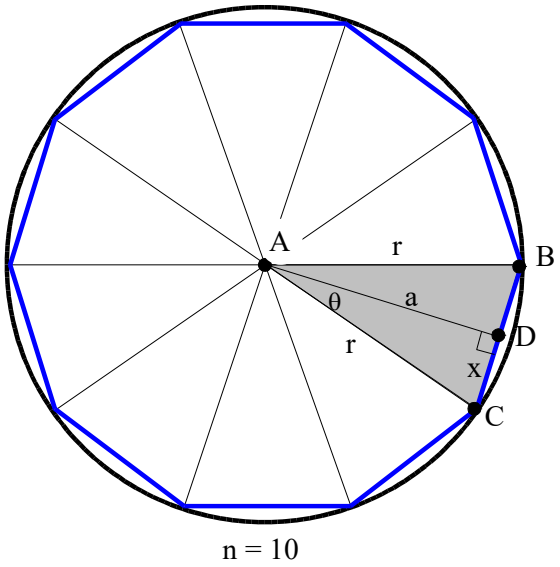
The **perimeter** of each regular polygon is **n times** the length of segment CB.

The **perimeter** of each regular polygon is **n(**









The Value of π

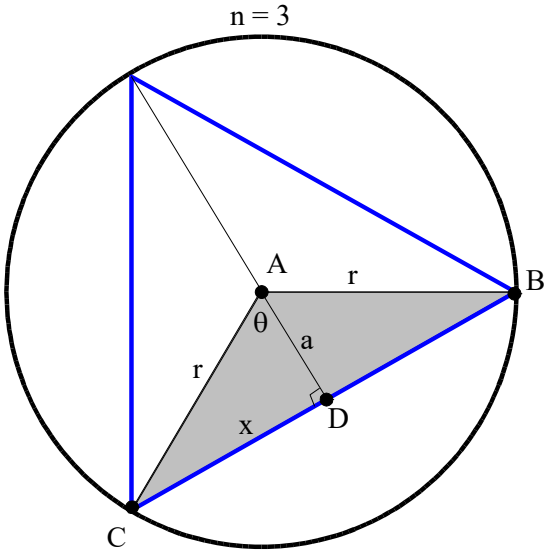
x = rSin(180º/n)
a = rCos(180º/n)

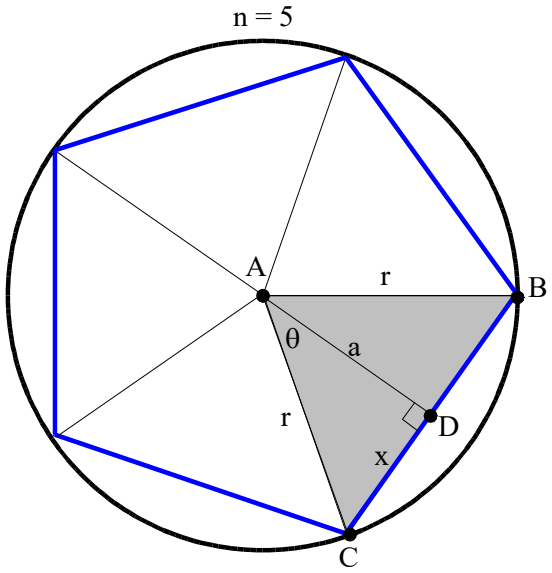
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

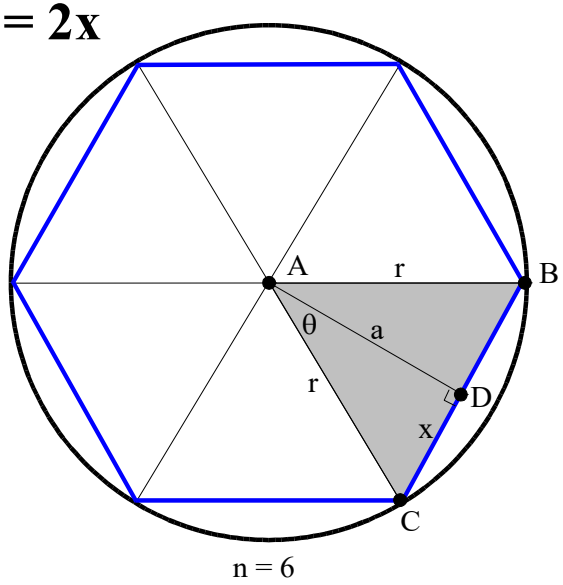
The length of segment CB is 2 times the length of segment CD.
The length of segment CB = 2x

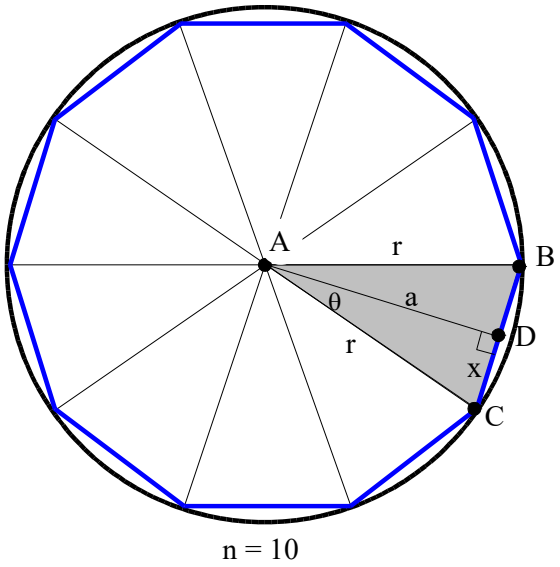
The **perimeter** of each regular polygon is **n times** the length of segment CB.

The **perimeter** of each regular polygon is **n(2x)**









The Value of π

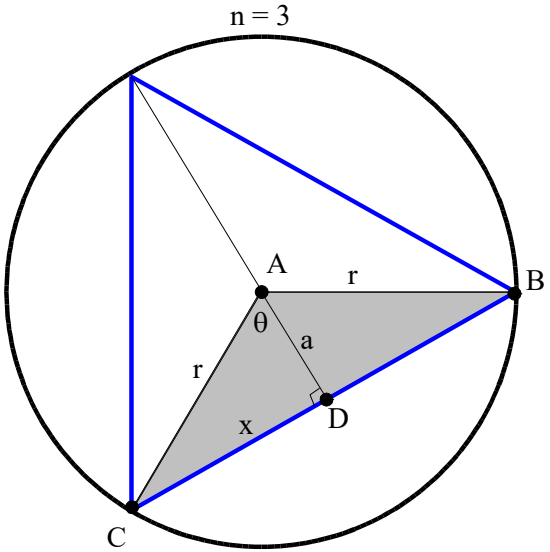
x = rSin(180º/n)
a = rCos(180º/n)

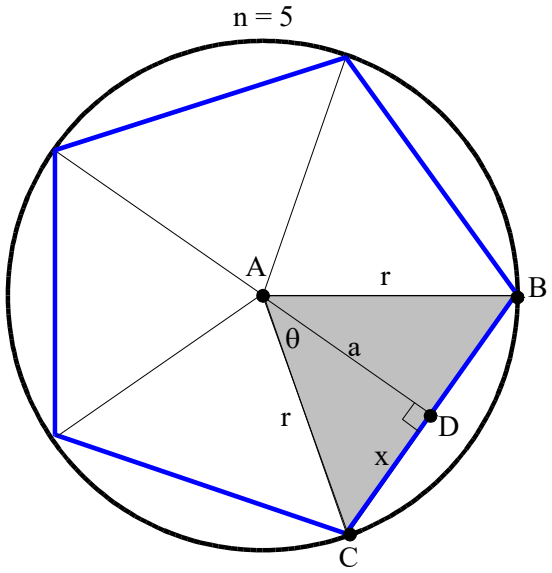
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

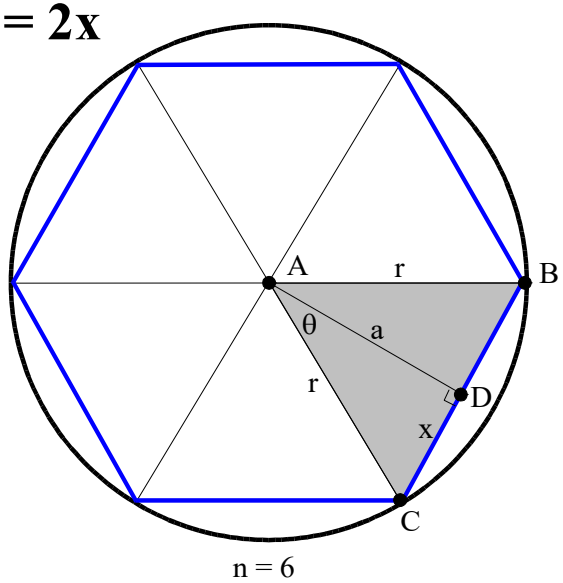
The length of segment CB is 2 times the length of segment CD.
The length of segment CB = 2x

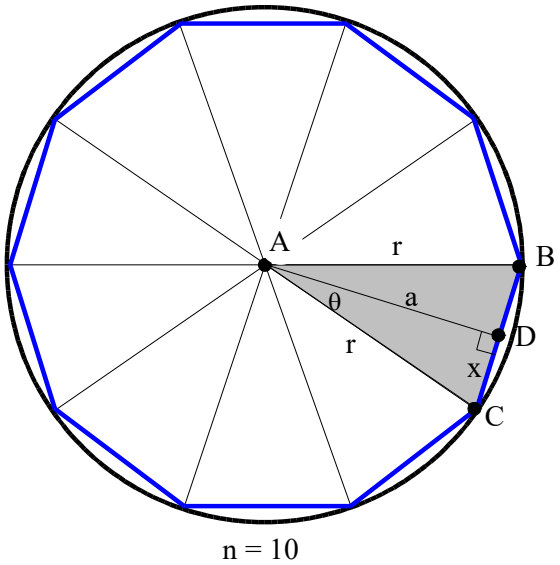
The **perimeter** of each regular polygon is **n times** the length of segment CB.

The **perimeter** of each regular polygon is **2nx**









The Value of π

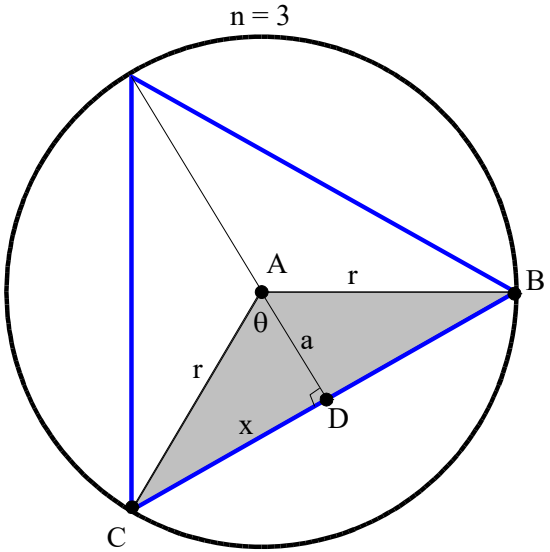
x = rSin(180º/n)
a = rCos(180º/n)

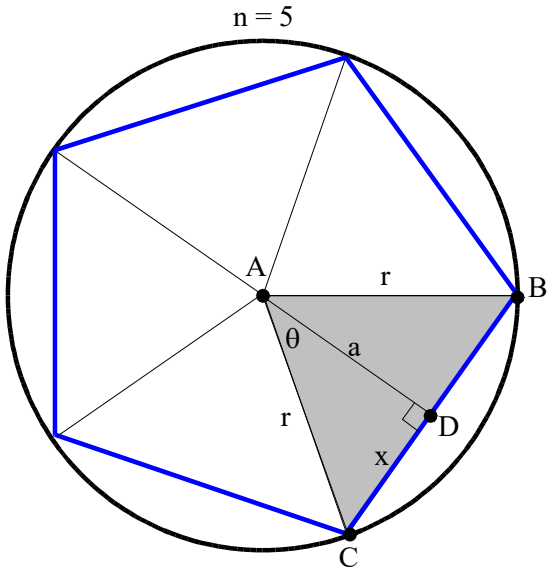
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

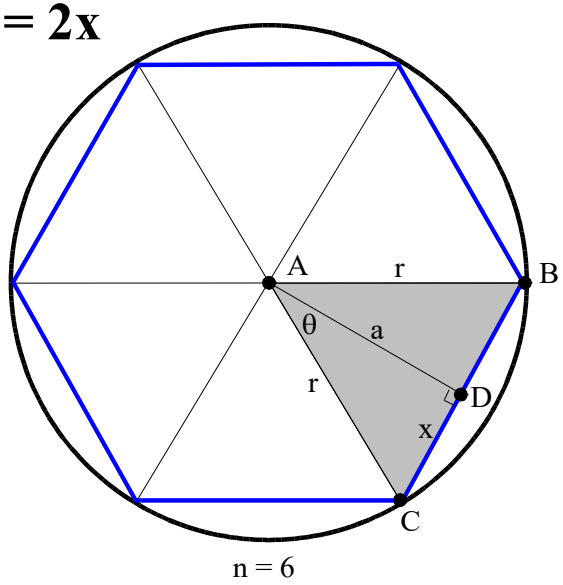
The length of segment CB is 2 times the length of segment CD.
The length of segment CB = 2x

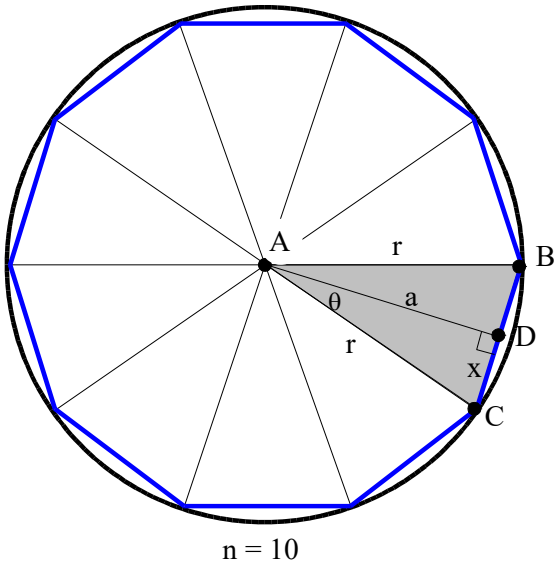
The **perimeter** of each regular polygon is **n times** the length of segment CB.

The **perimeter** of each regular polygon is **2nx** = **2n**









The Value of π

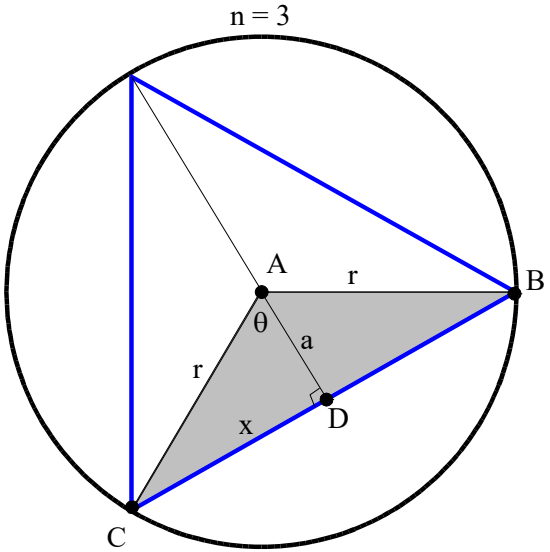
x = rSin(180º/n)
a = rCos(180º/n)

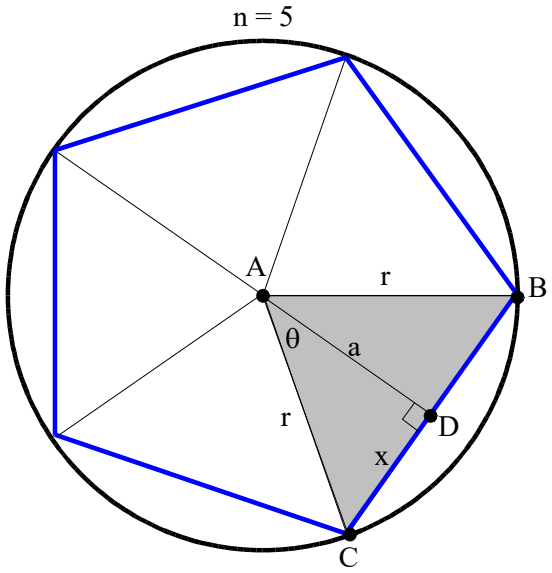
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

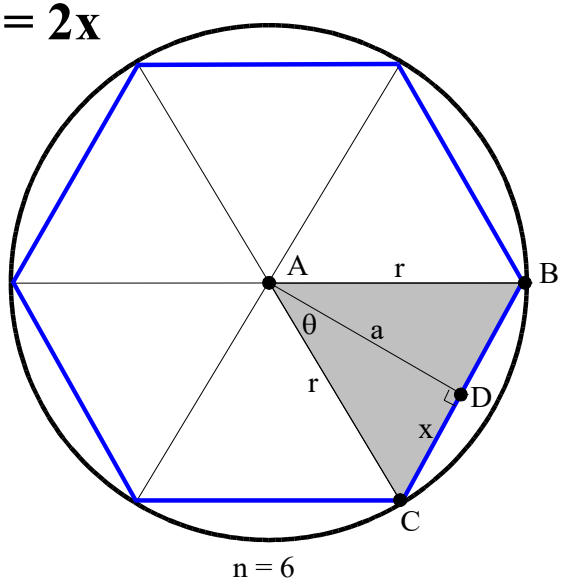
The length of segment CB is 2 times the length of segment CD.
The length of segment CB = 2x

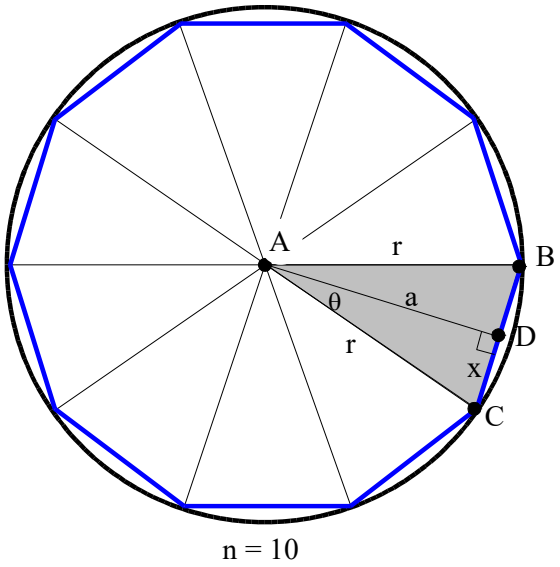
The **perimeter** of each regular polygon is **n times** the length of segment CB.

The **perimeter** of each regular polygon is **2nx** = **2nrSin(180º/n)**







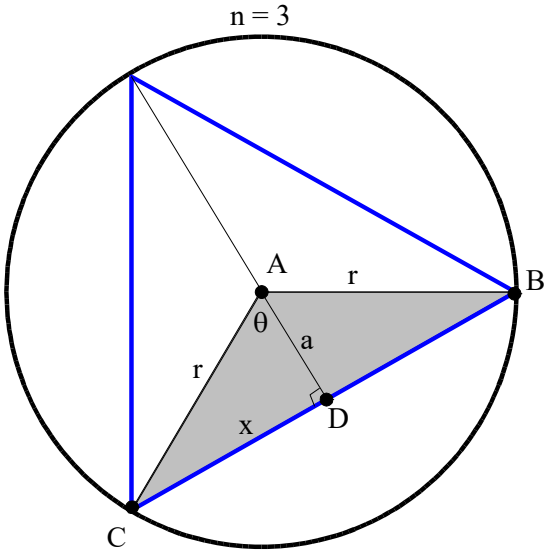


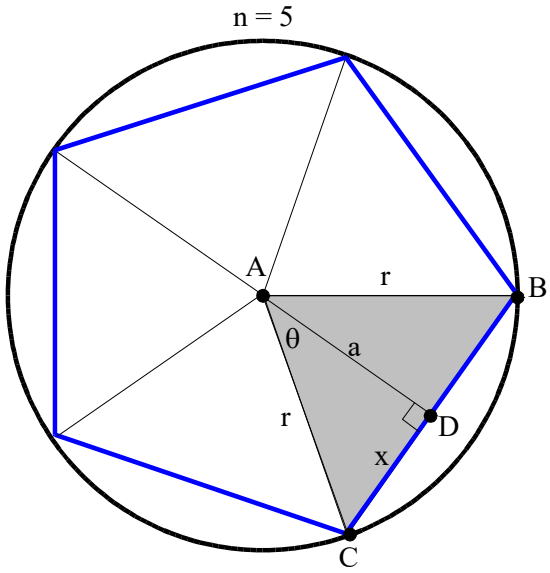
The Value of π

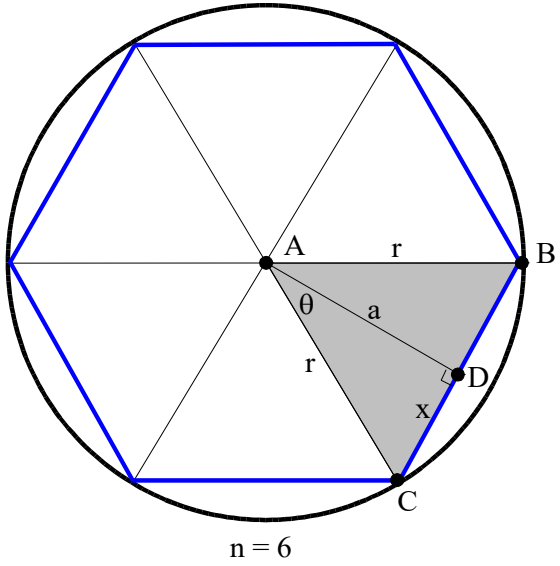
x = rSin(180º/n)
a = rCos(180º/n)

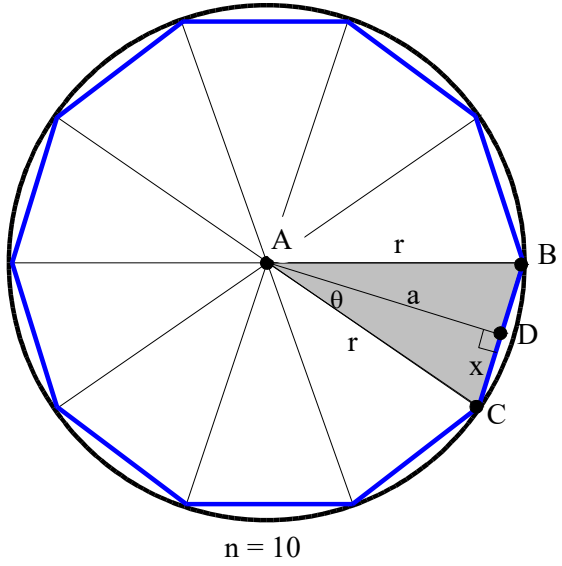
Regular Polygon Area
$nr^2Sin(180º/n)Cos(180º/n)$

Regular Polygon Perimeter
2nrSin(180º/n)





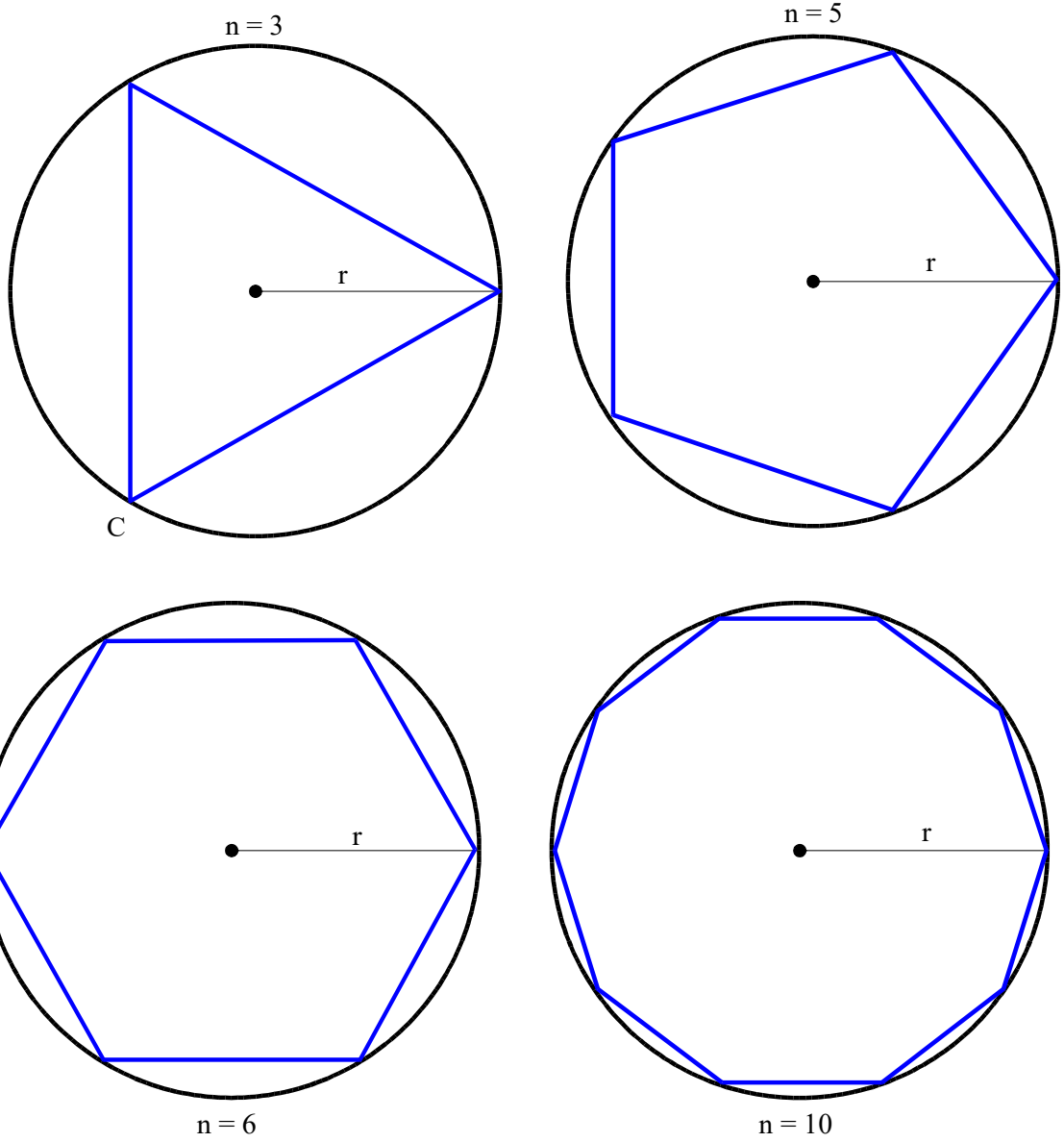




The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

Regular Polygon Perimeter
$2nrSin(180^o/n)$

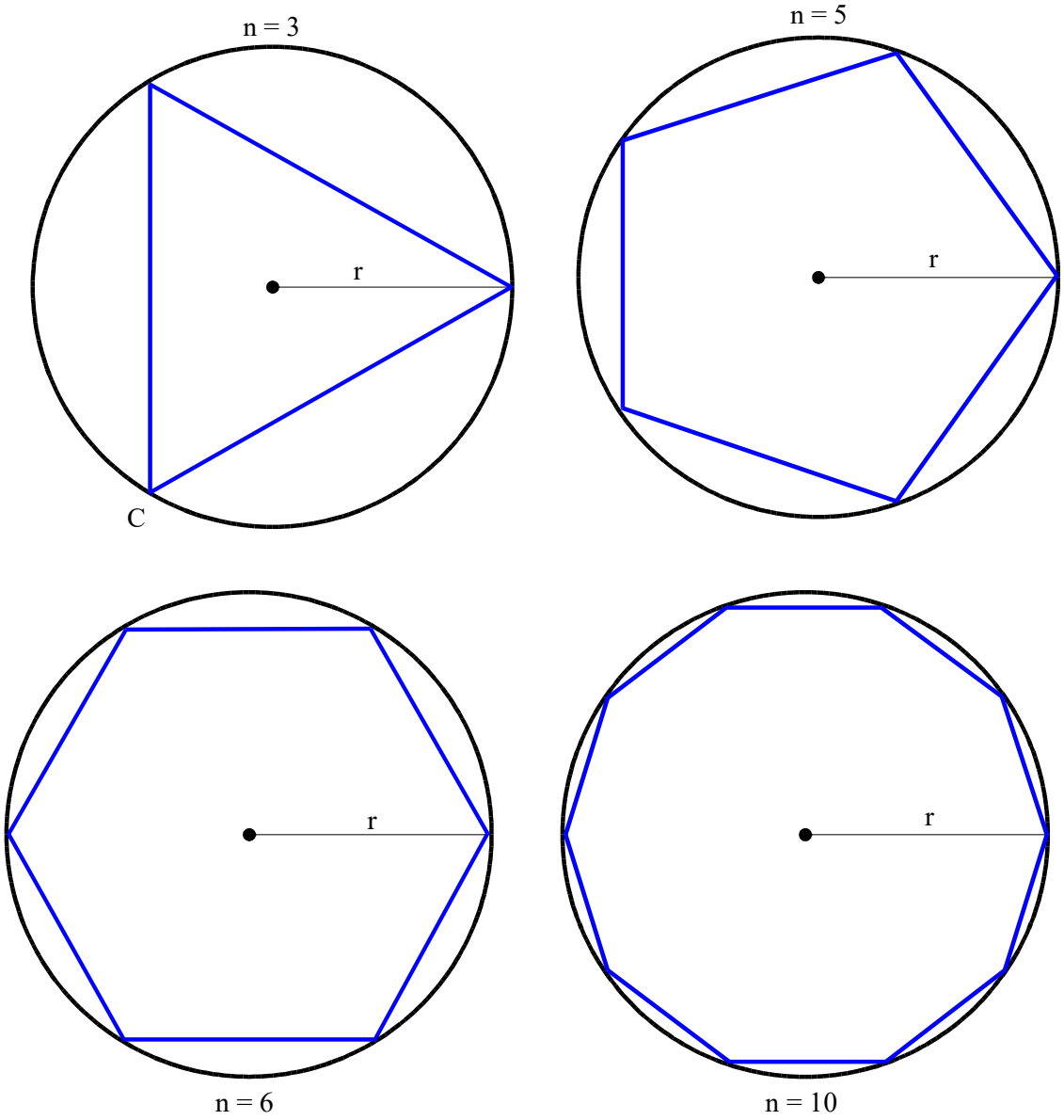


The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

Regular Polygon Perimeter
$2nrSin(180^o/n)$

Clearly, as the value of n increases,

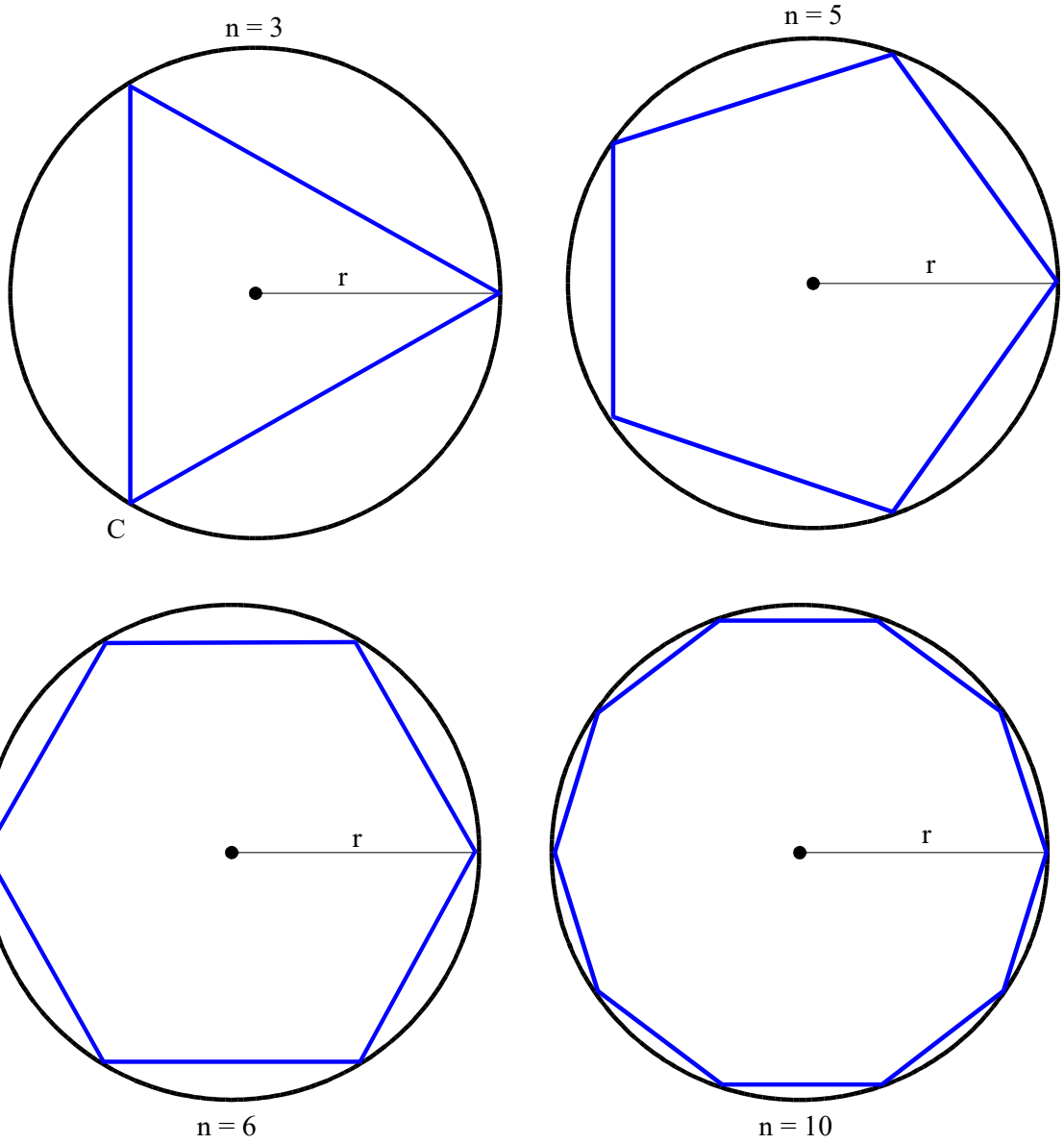


The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

Regular Polygon Perimeter
$2nrSin(180^o/n)$

Clearly, as the value of n increases, the area of the polygon increases

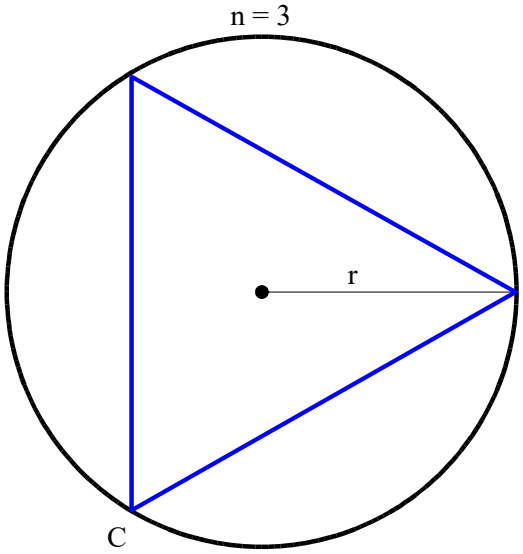


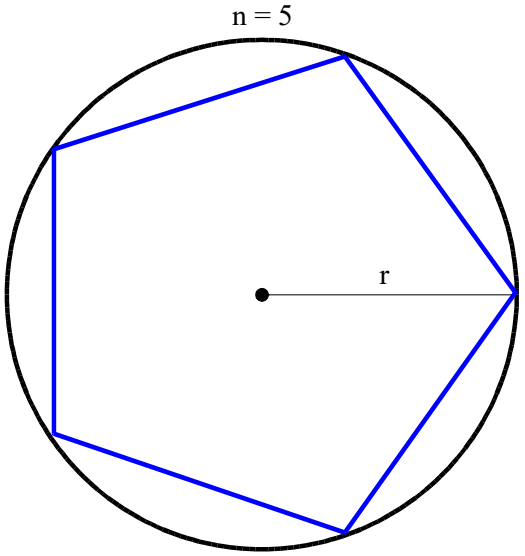
The Value of π

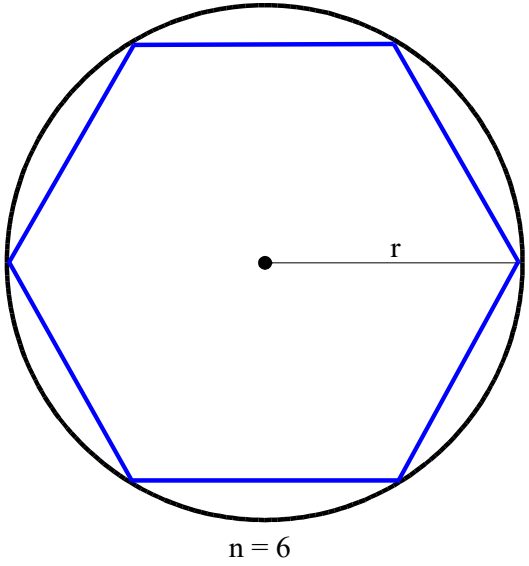
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

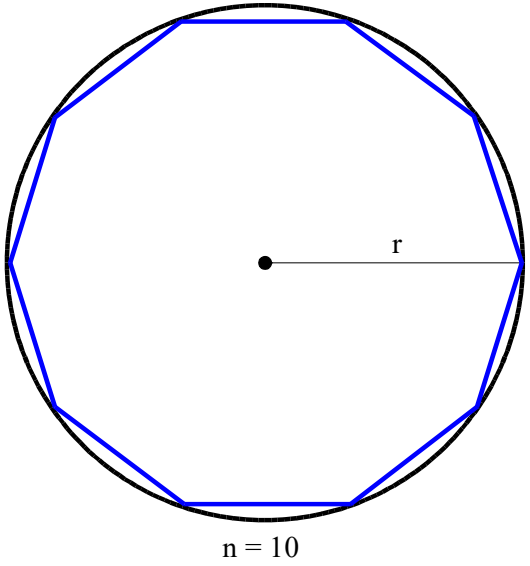
Regular Polygon Perimeter
$2nrSin(180^o/n)$

Clearly, as the value of n increases, the area of the polygon increases and gets closer to the area of the circle.









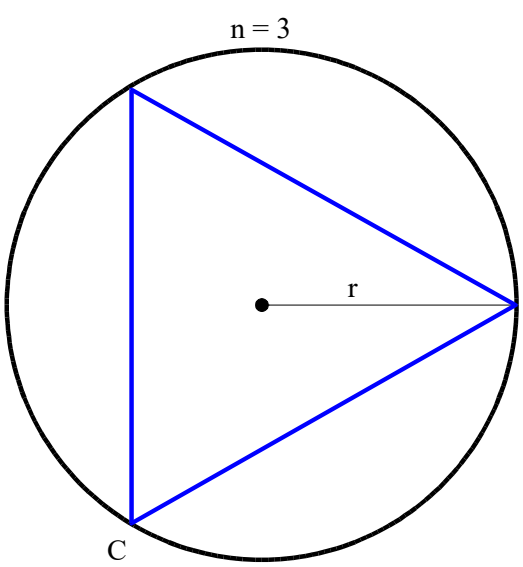
The Value of π

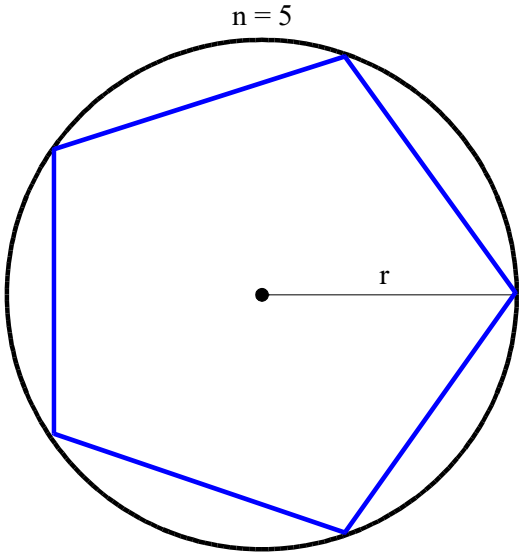
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

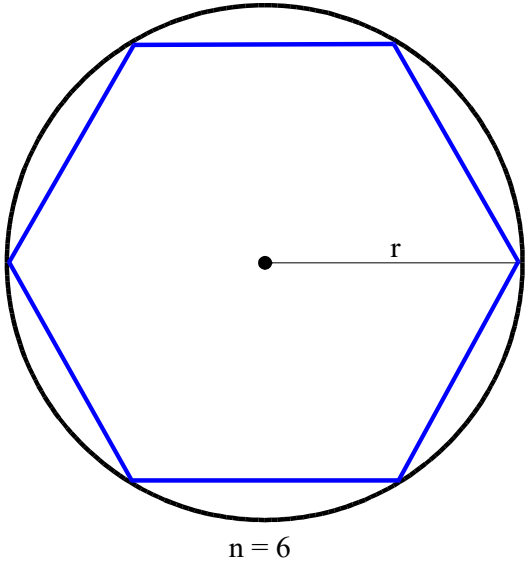
Regular Polygon Perimeter
$2nrSin(180^o/n)$

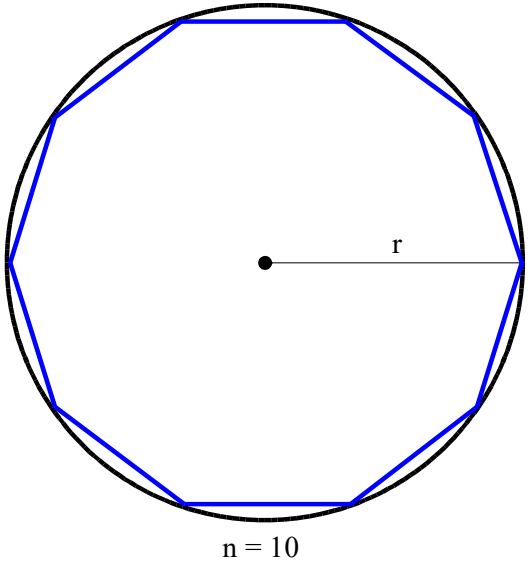
Clearly, as the value of n increases, the area of the polygon increases and gets closer to the area of the circle.

Also, as the value of n increases,









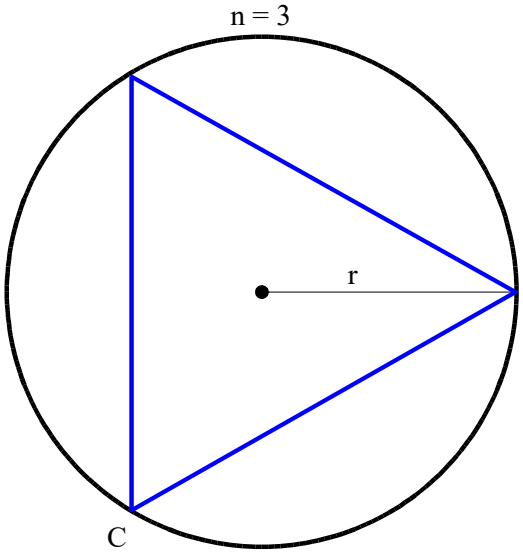
The Value of π

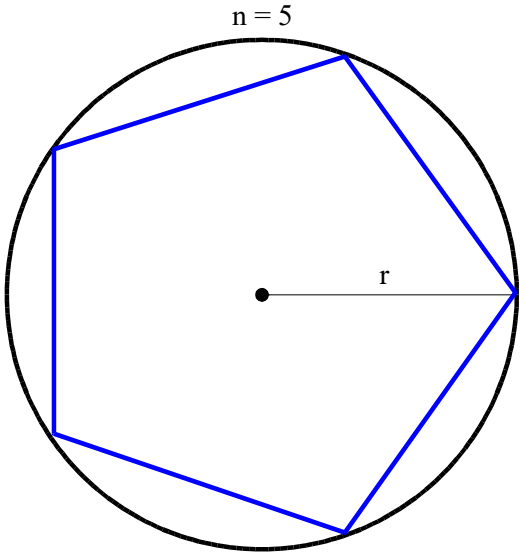
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

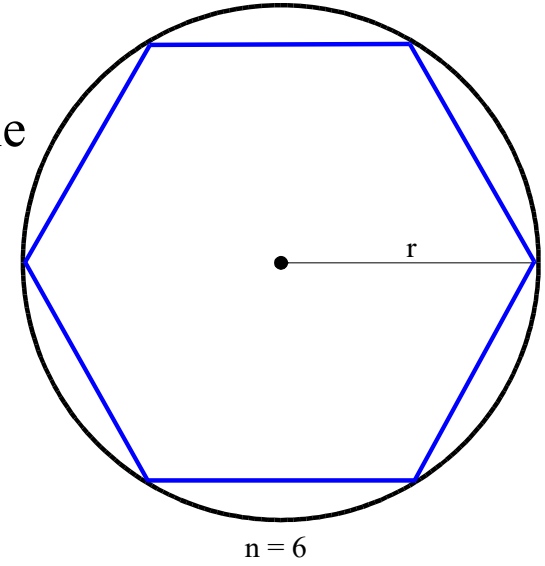
Regular Polygon Perimeter
$2nrSin(180^o/n)$

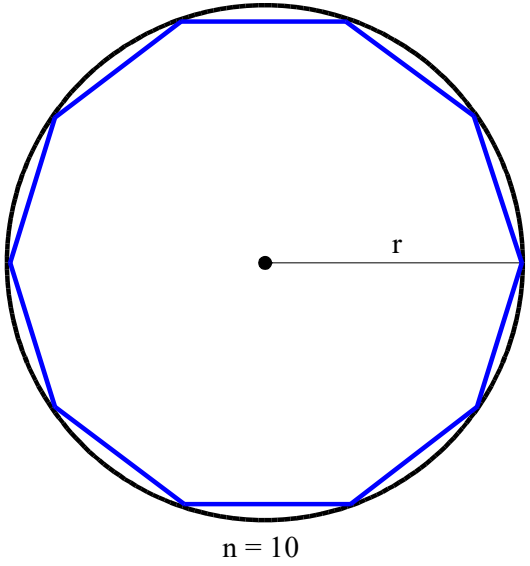
Clearly, as the value of n increases, the area of the polygon increases and gets closer to the area of the circle.

Also, as the value of n increases, the perimeter of the polygon increases









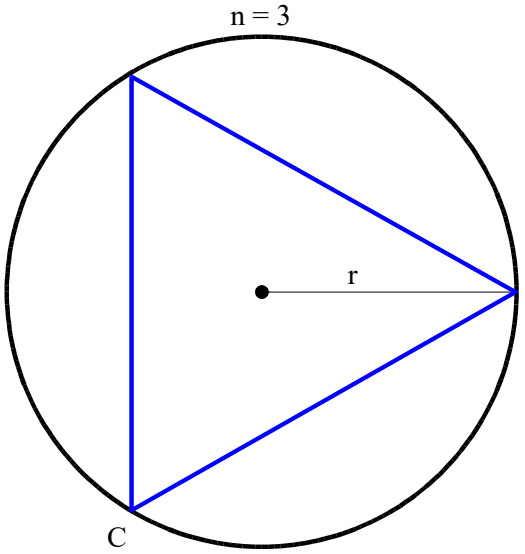
The Value of π

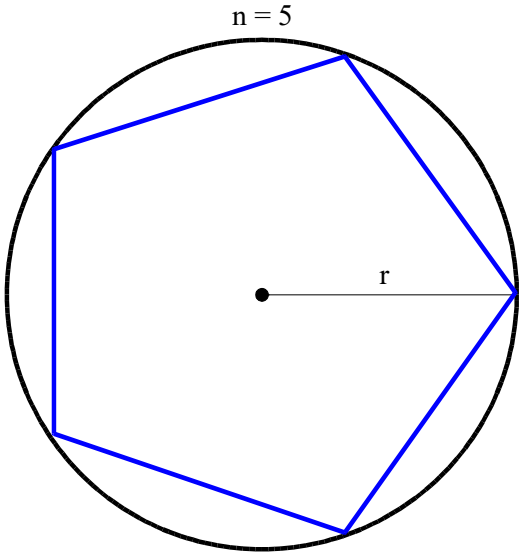
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

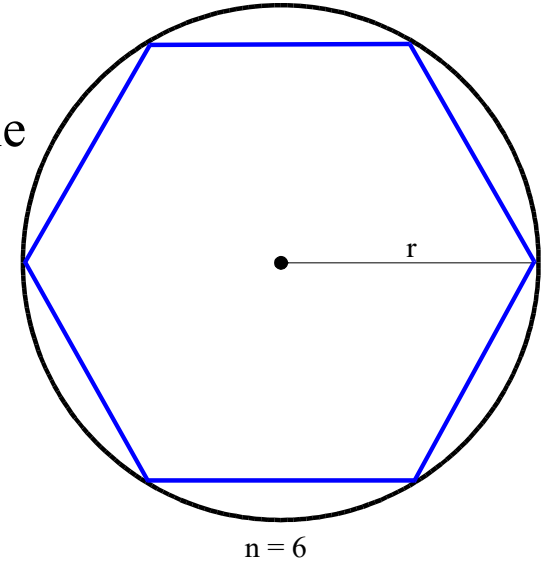
Regular Polygon Perimeter
$2nrSin(180^o/n)$

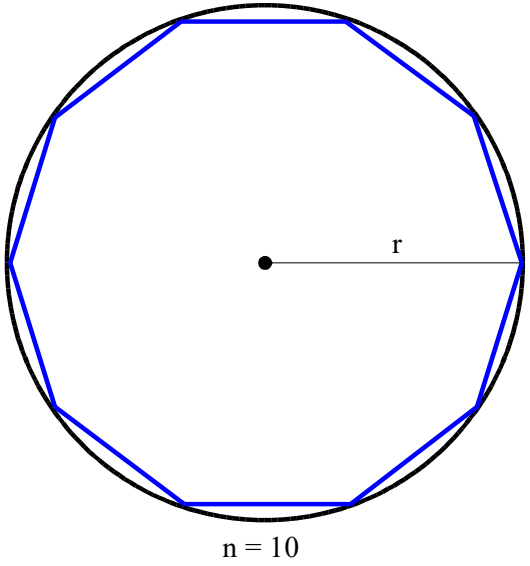
Clearly, as the value of n increases, the area of the polygon increases and gets closer to the area of the circle.

Also, as the value of n increases, the perimeter of the polygon increases and gets closer to the circumference of the circle.









The Value of π

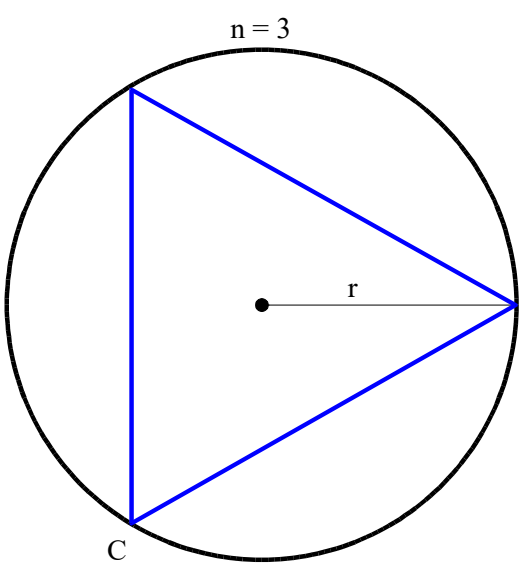
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

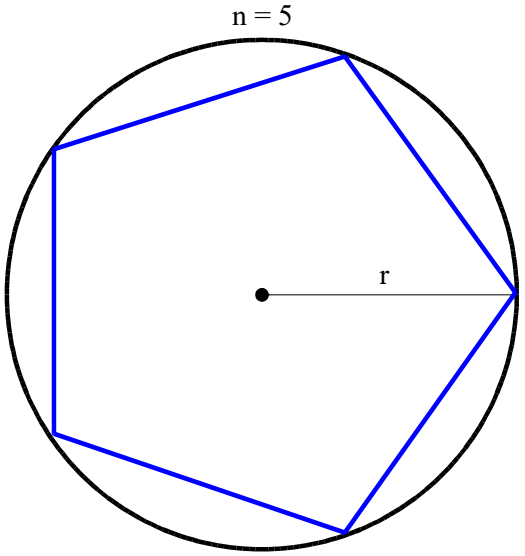
Regular Polygon Perimeter
$2nrSin(180^o/n)$

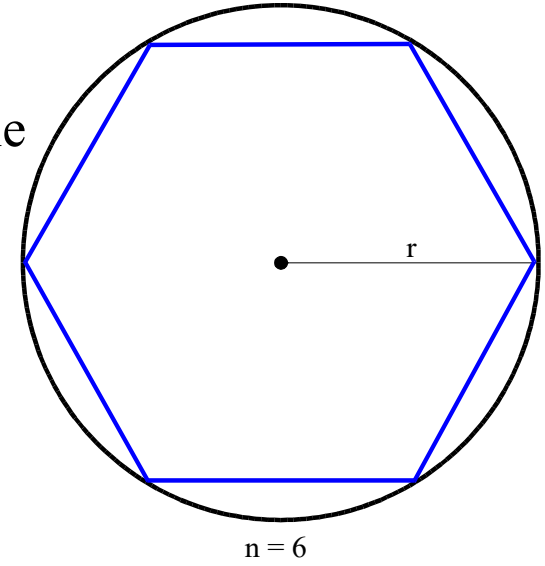
Clearly, as the value of n increases, the area of the polygon increases and gets closer to the area of the circle.

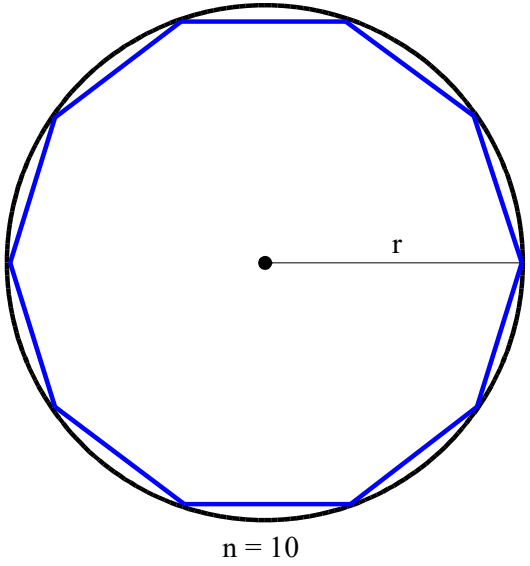
Also, as the value of n increases, the perimeter of the polygon increases and gets closer to the circumference of the circle.

These can each be used to approximate the value of π.









The Value of π

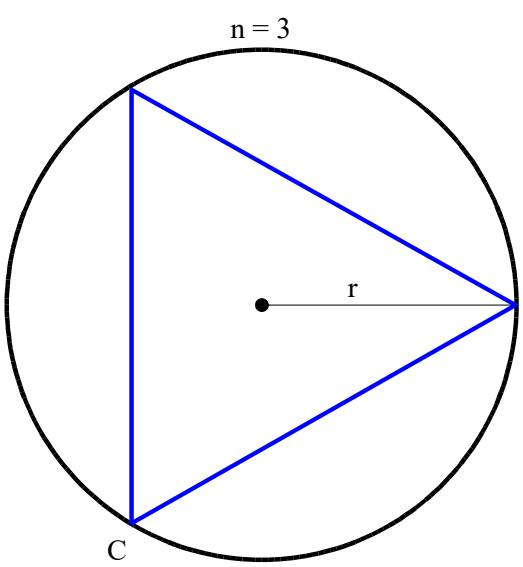
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

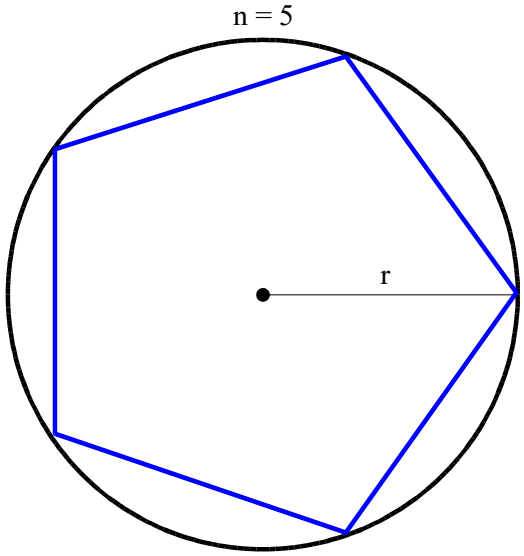
Regular Polygon Perimeter
$2nrSin(180^o/n)$

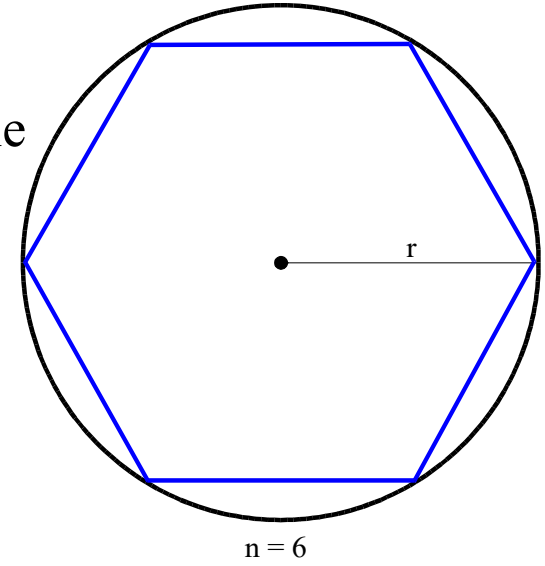
Clearly, as the value of n increases, the area of the polygon increases and gets closer to the area of the circle.

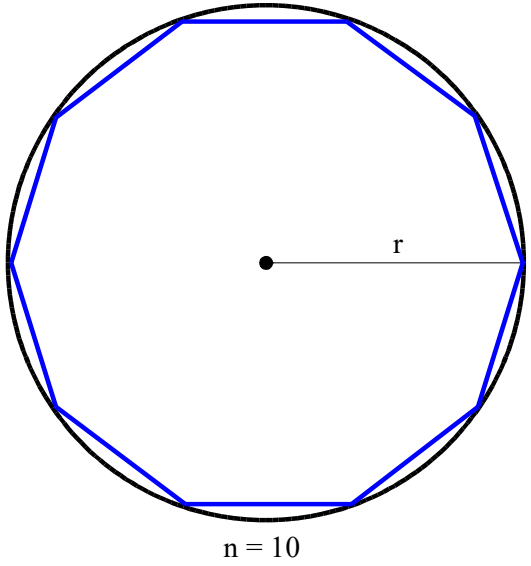
Also, as the value of n increases, the perimeter of the polygon increases and gets closer to the circumference of the circle.

These can each be used to approximate the value of π. We will consider area first.





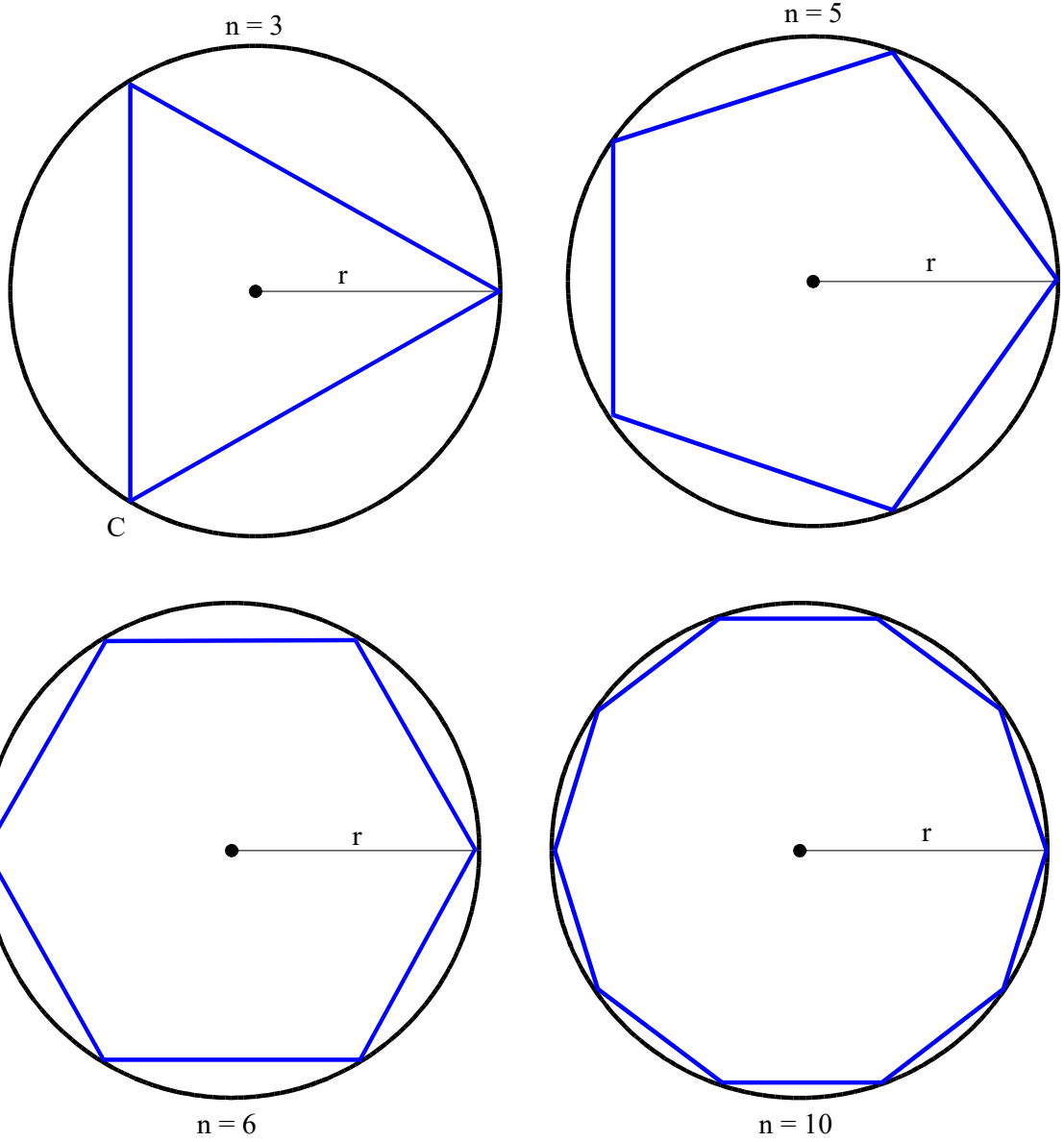




The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

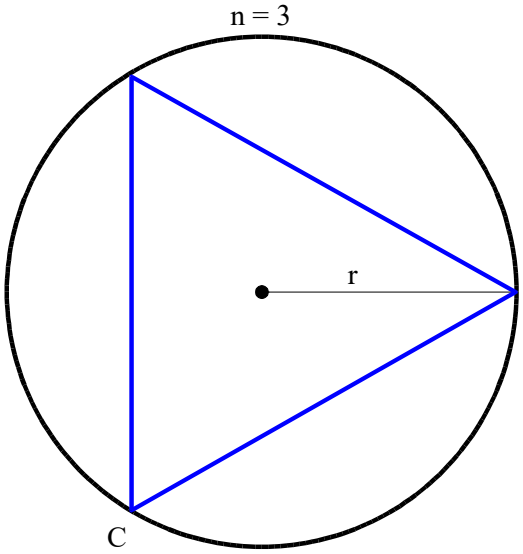
Regular Polygon Perimeter
$2nrSin(180^o/n)$

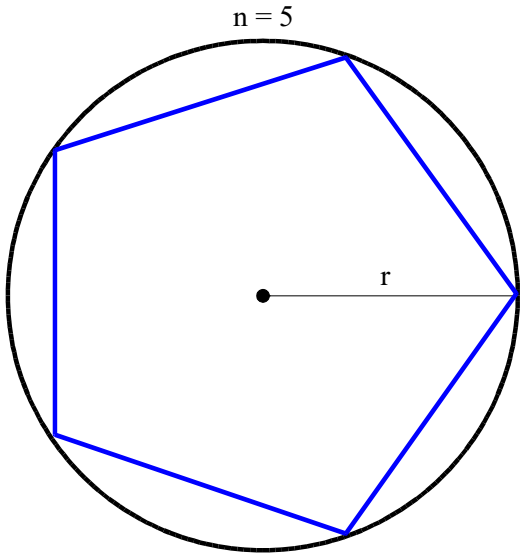


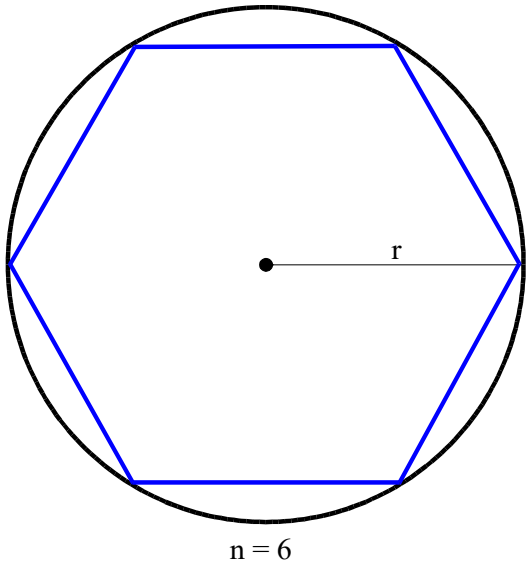
The Value of π

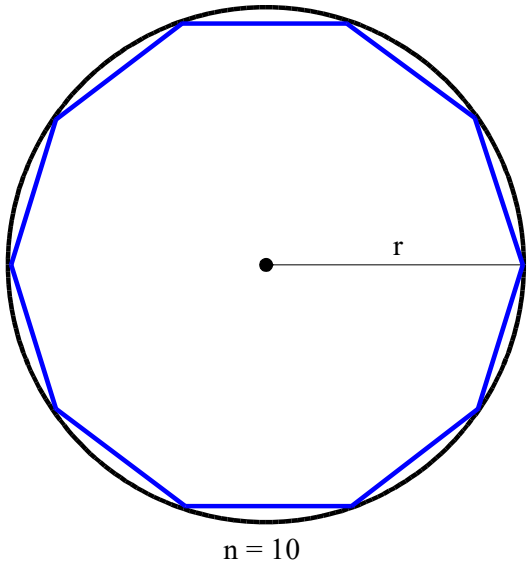
Regular Polygon Area

$nr^2Sin(180^o/n)Cos(180^o/n)$





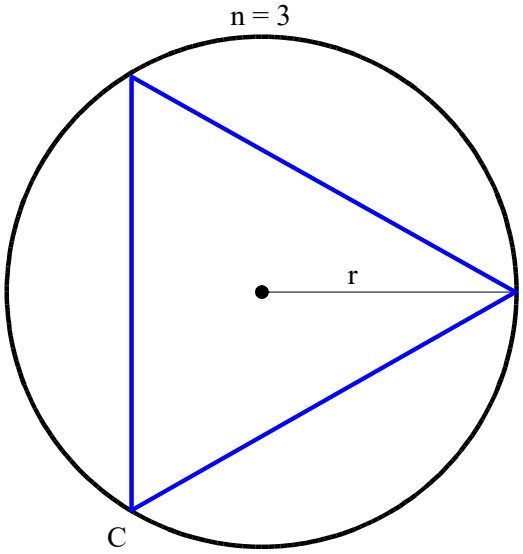


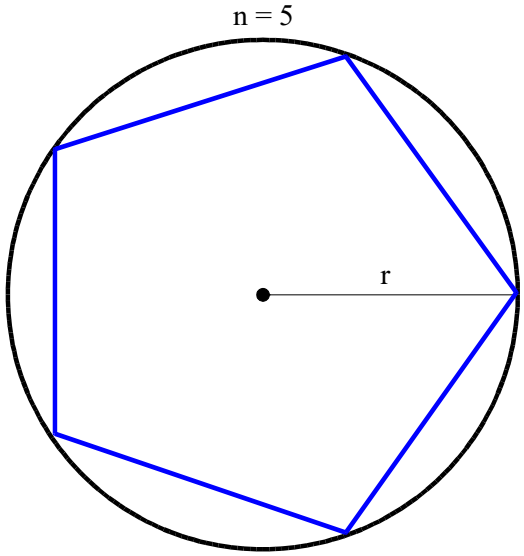


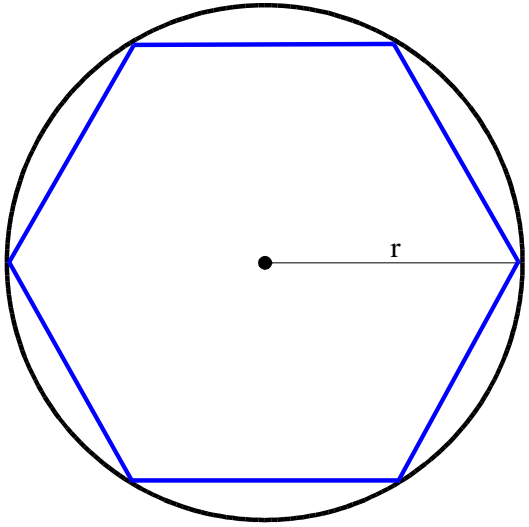
The Value of π

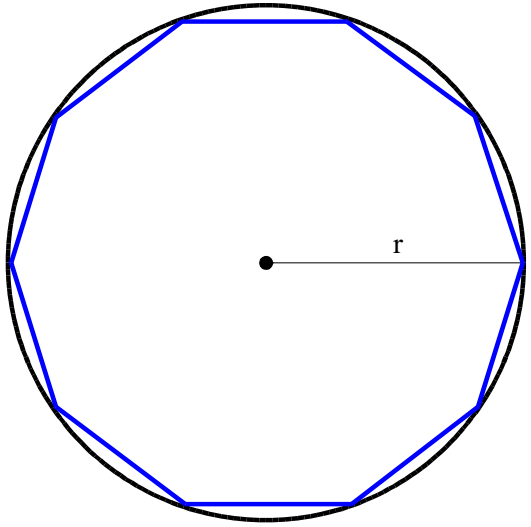
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle.





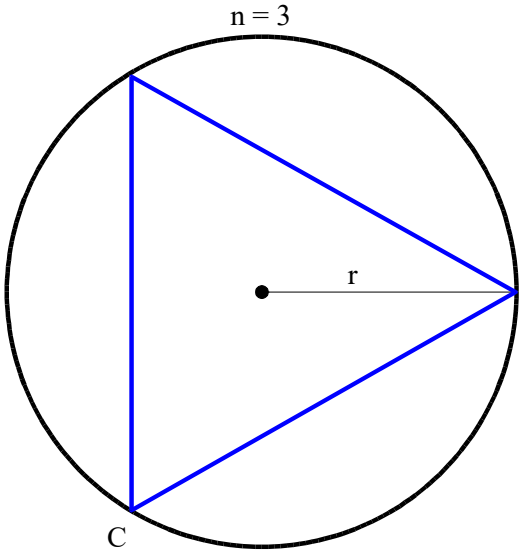


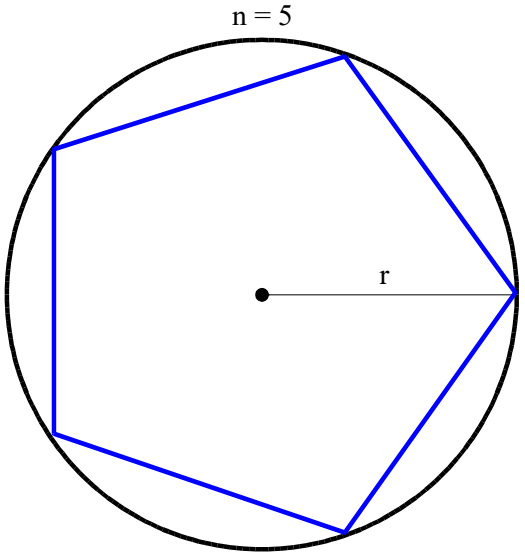


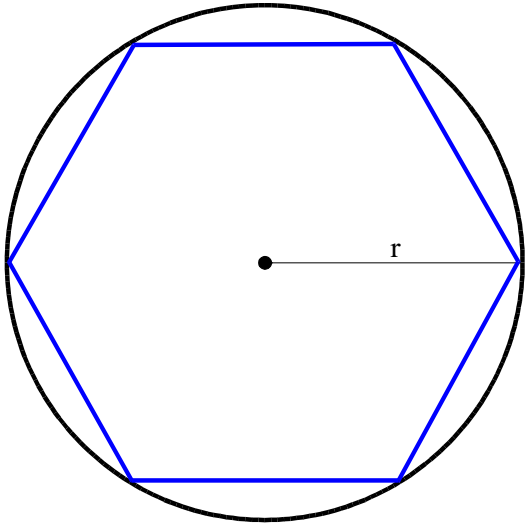
The Value of π

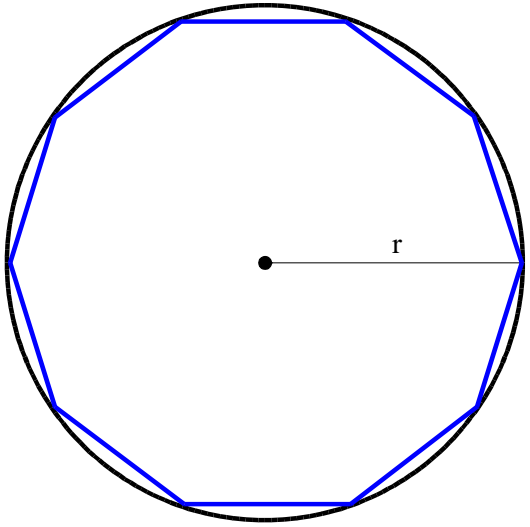
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A =$





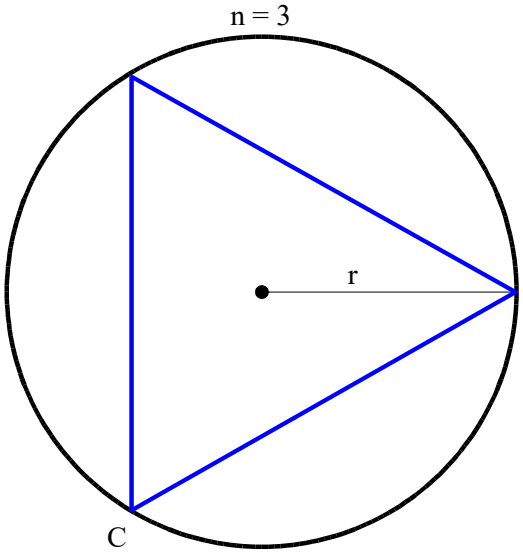


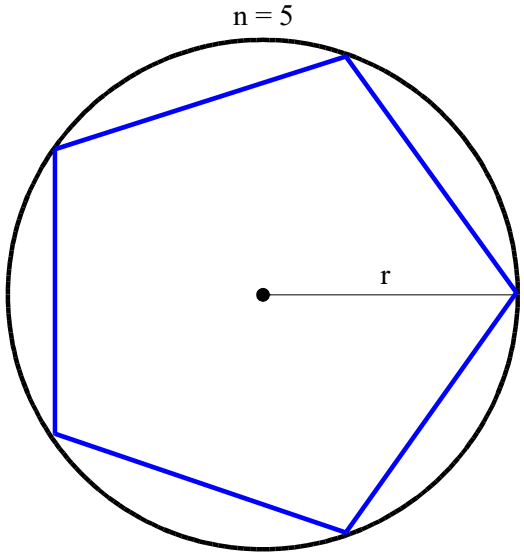


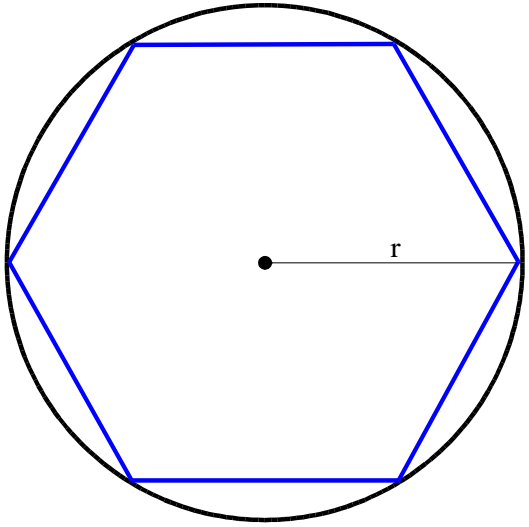
The Value of π

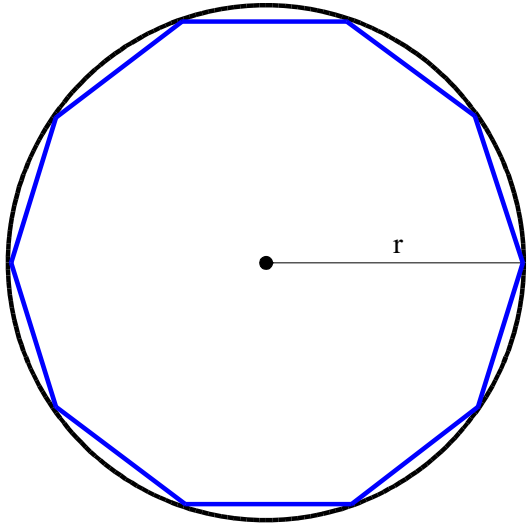
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A = \pi r^2$







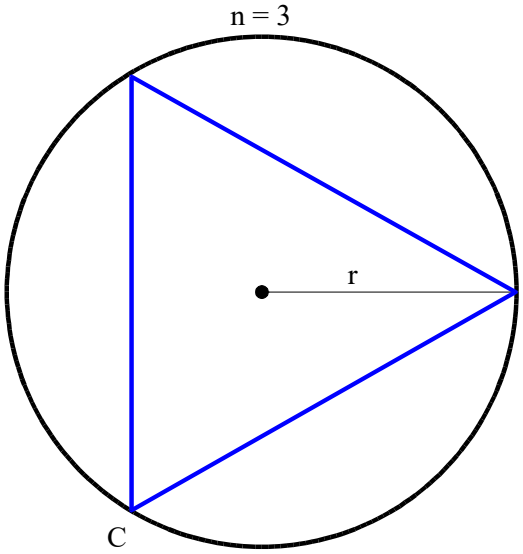


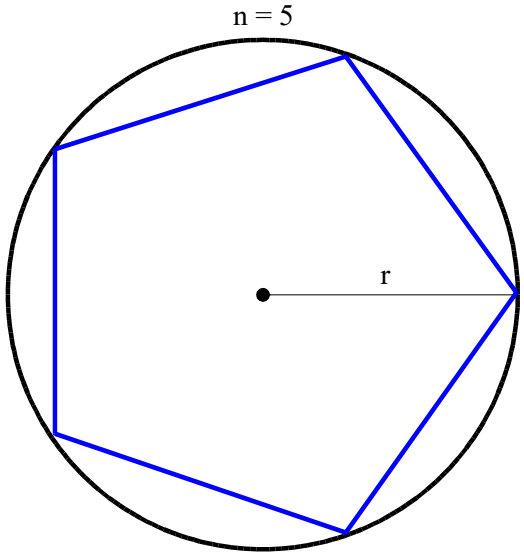
The Value of π

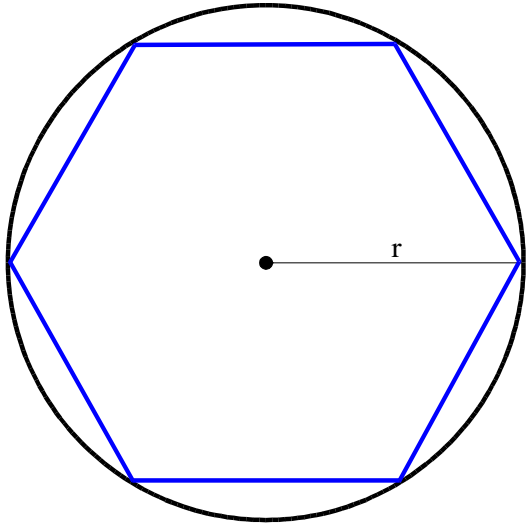
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

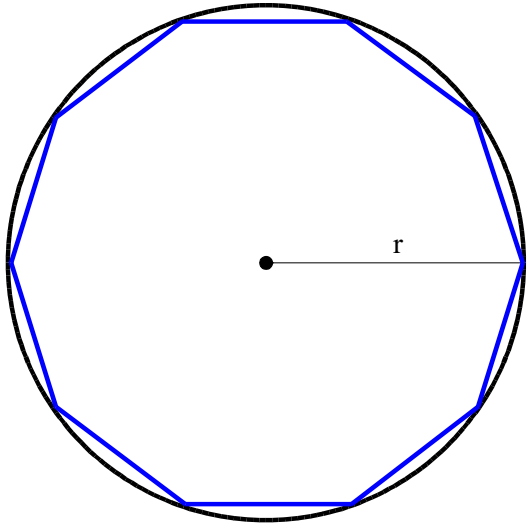
There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1**,







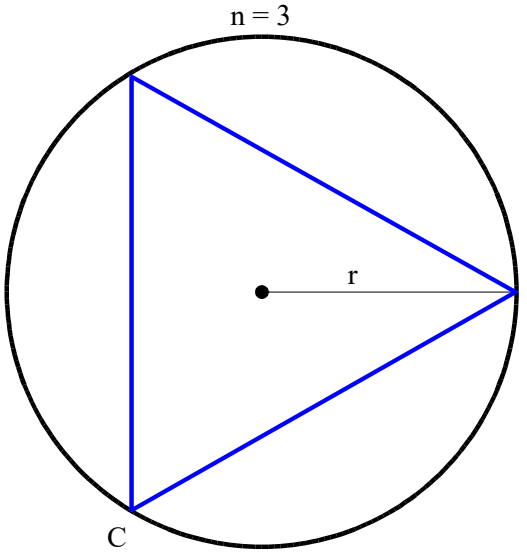


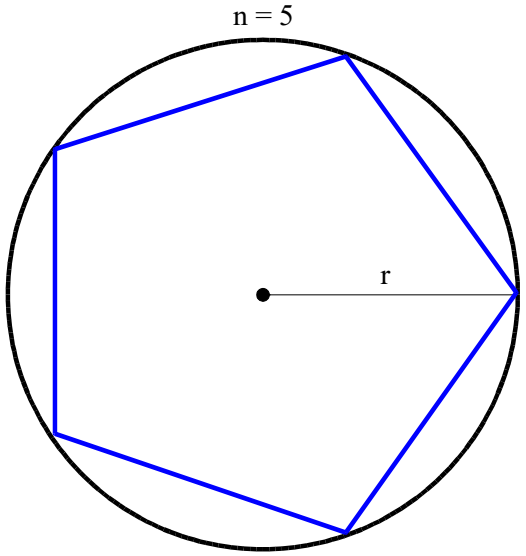
The Value of π

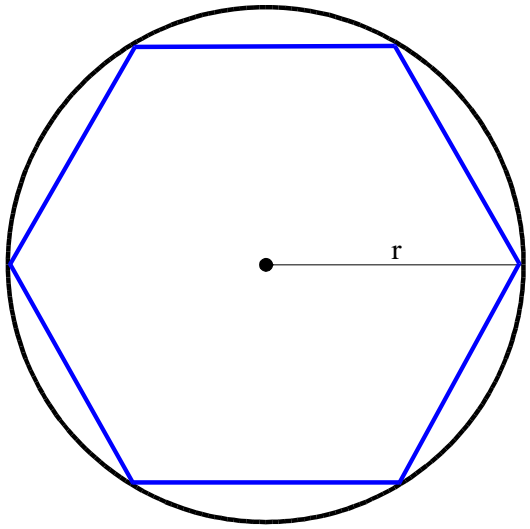
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

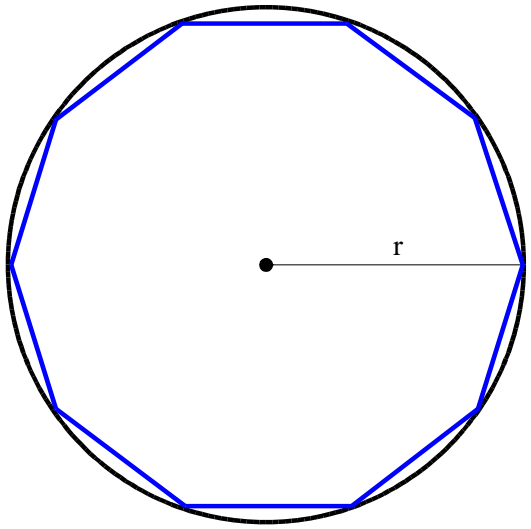
There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1 unit**,









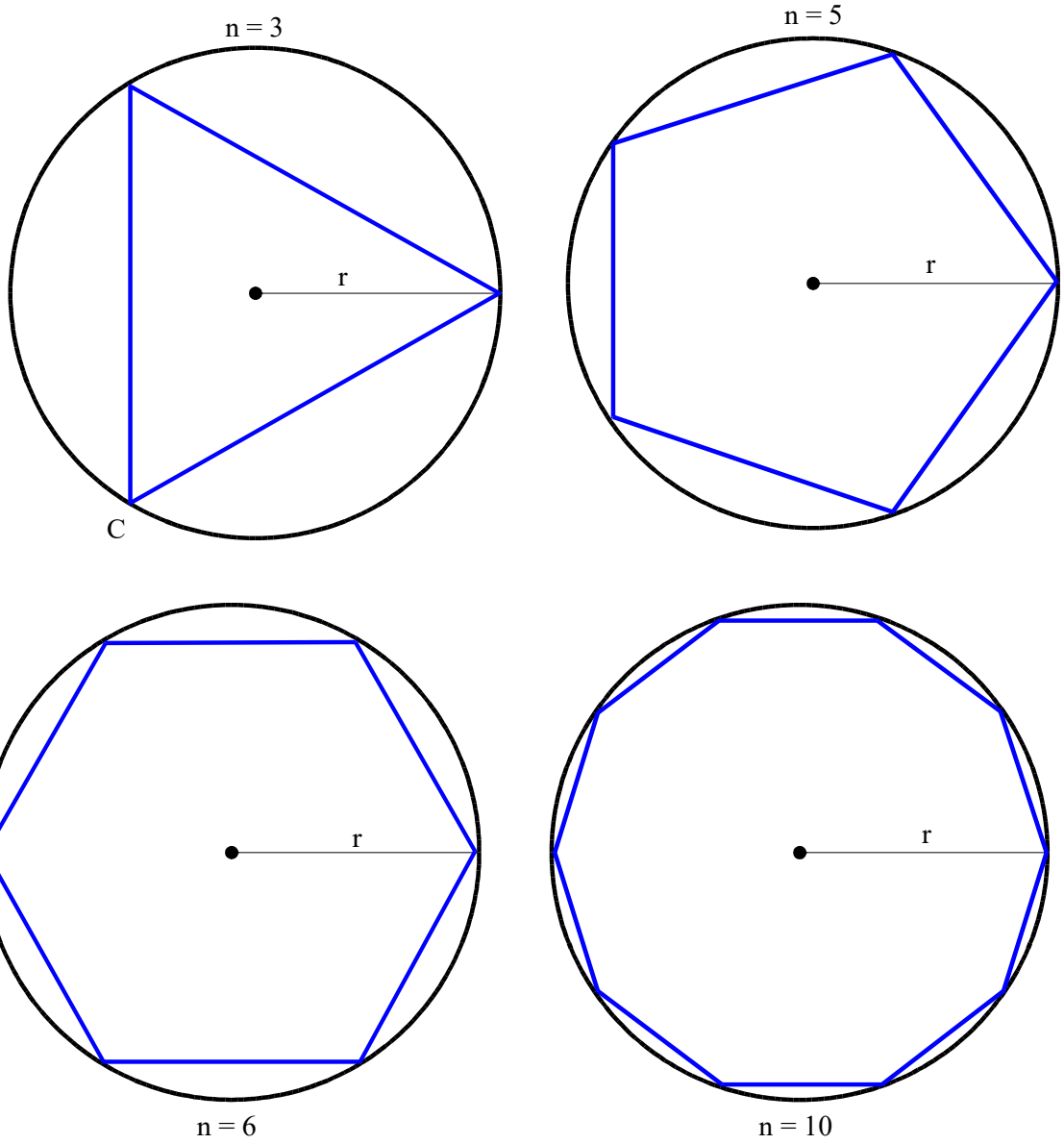
The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1 unit**,

The unit of length does not matter.



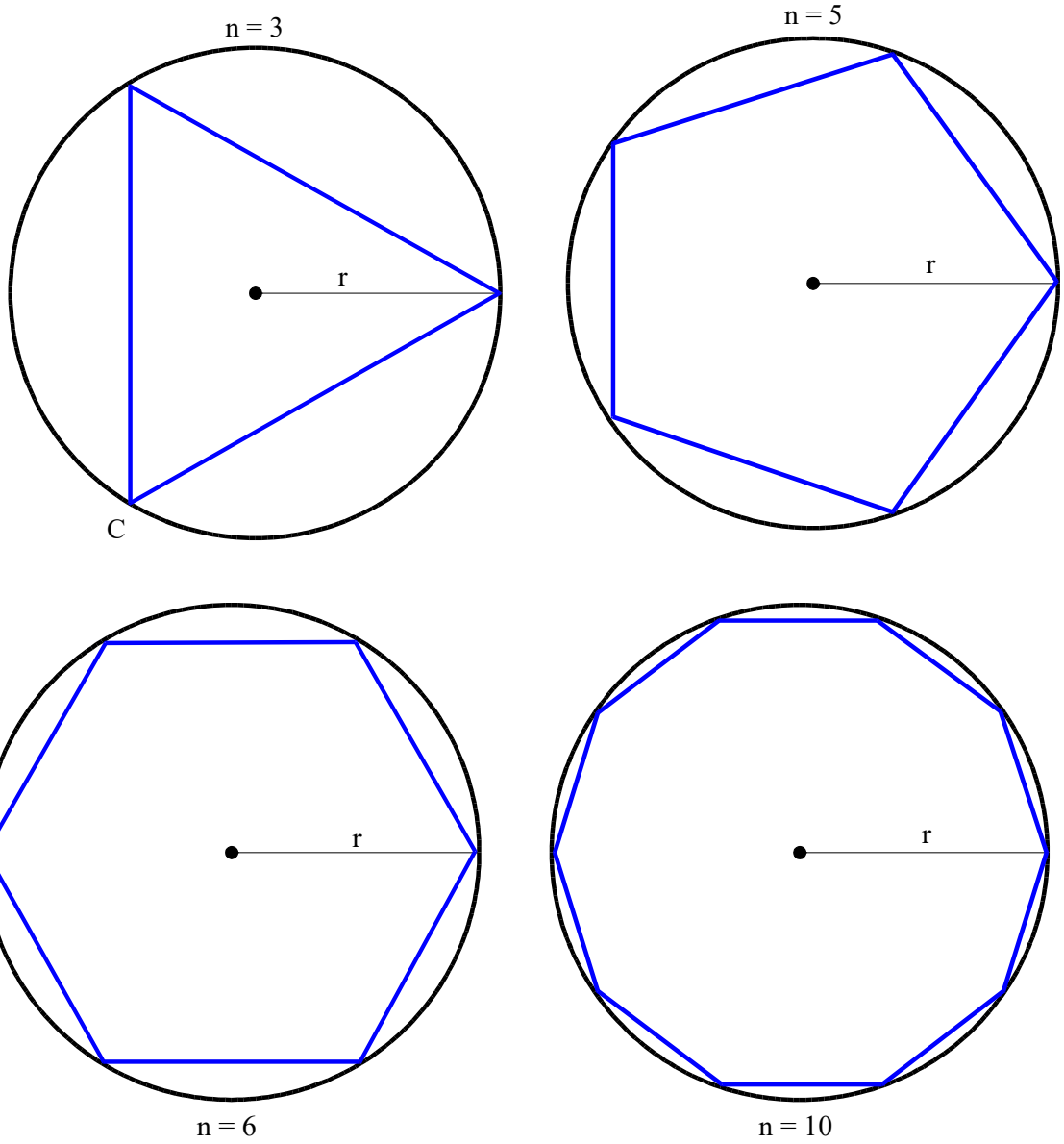
The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1 unit**,

The unit of length does not matter. r could be 1 **inch**,



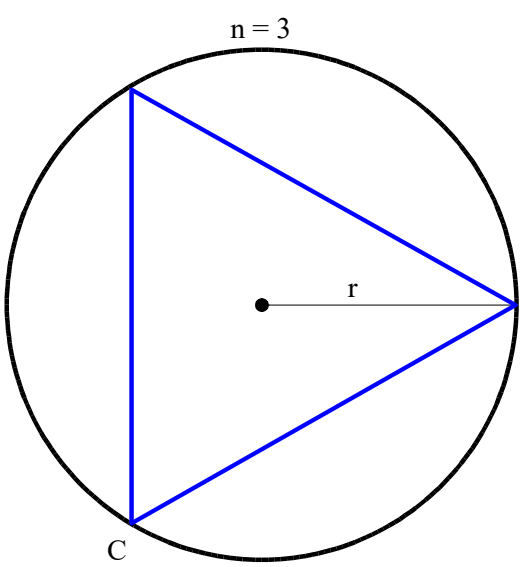
The Value of π

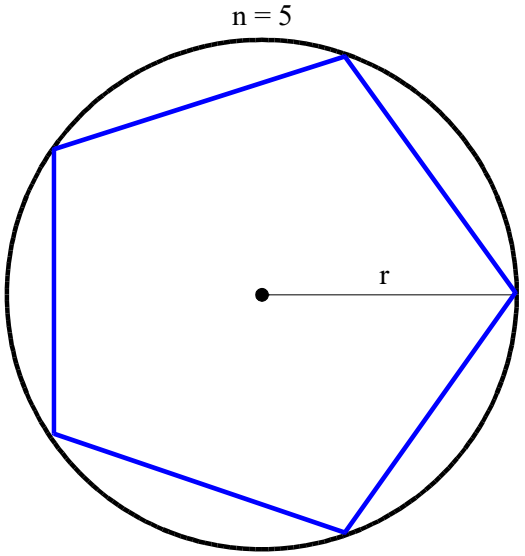
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

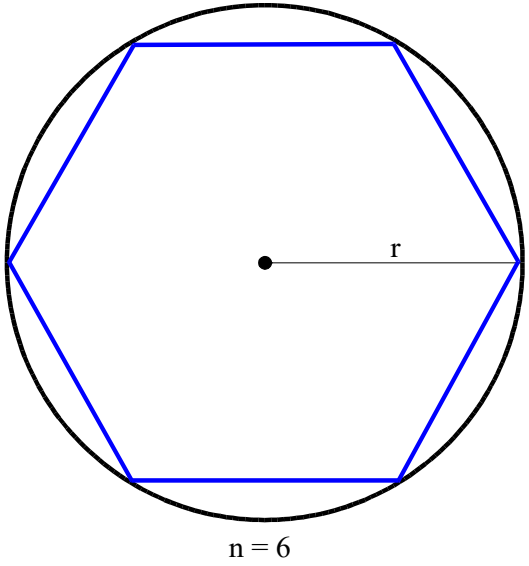
There is a well known formula for the area of a circle. $A = \pi r^2$

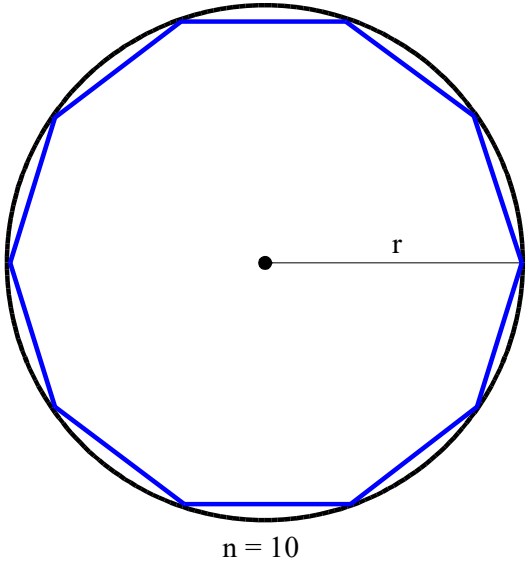
If **r = 1 unit**,

The unit of length does not matter. r could be 1 **inch**, 1 **centimeter**,









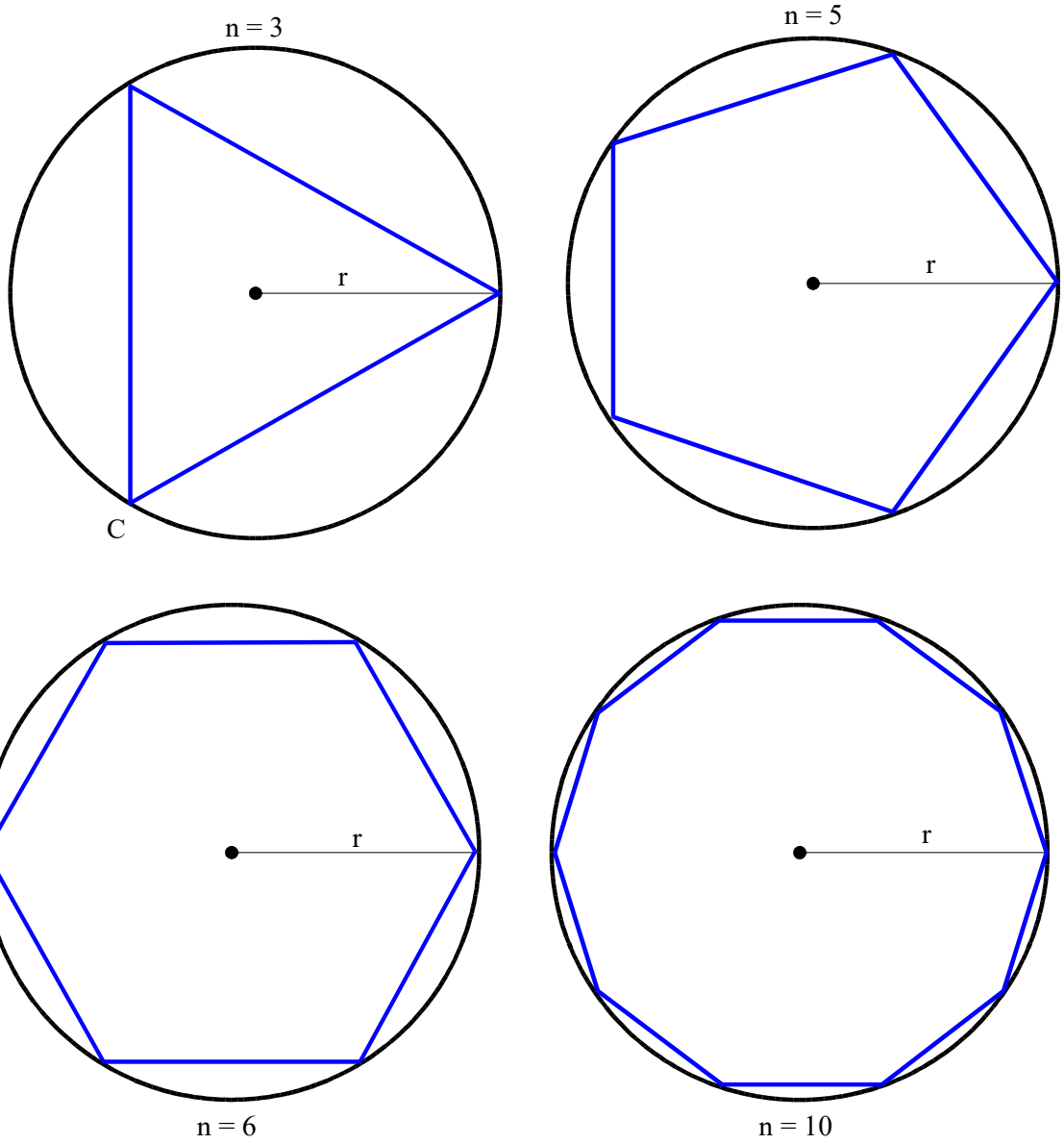
The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1 unit**,

The unit of length does not matter. r could be 1 **inch**, 1 **centimeter**, 1 **foot**,



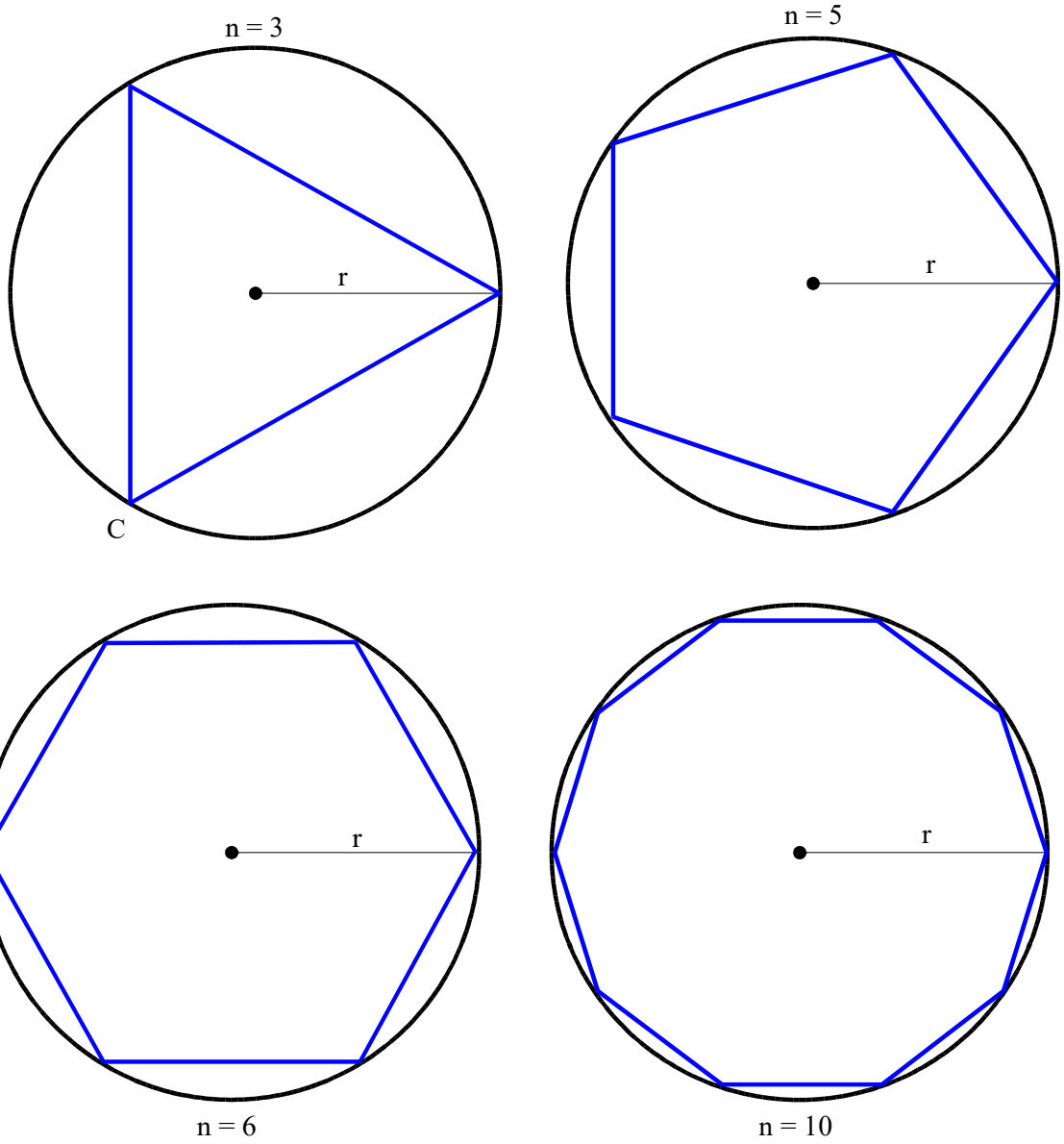
The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1 unit**,

The unit of length does not matter. r could be 1 **inch**, 1 **centimeter**, 1 **foot**, … any unit of length.

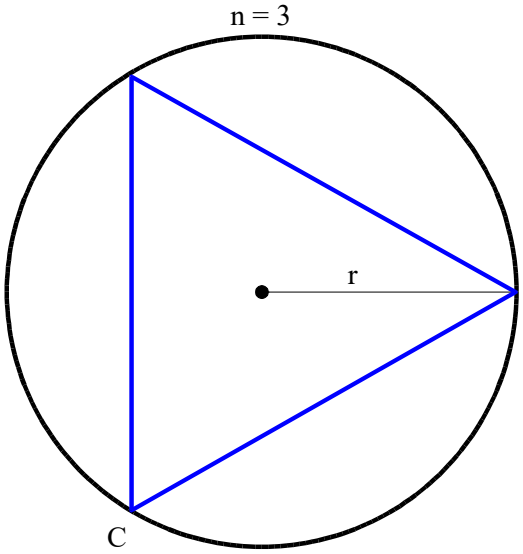


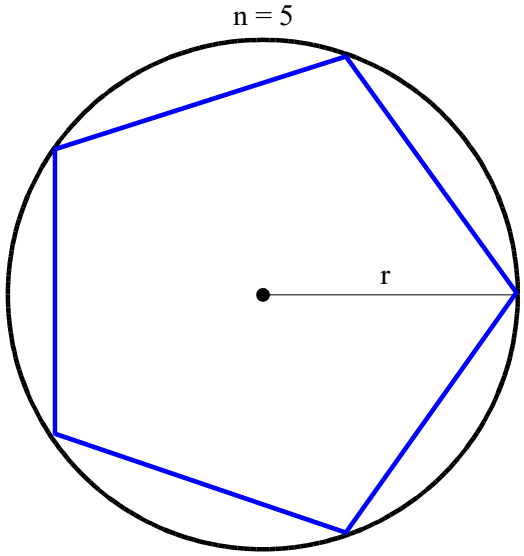
The Value of π

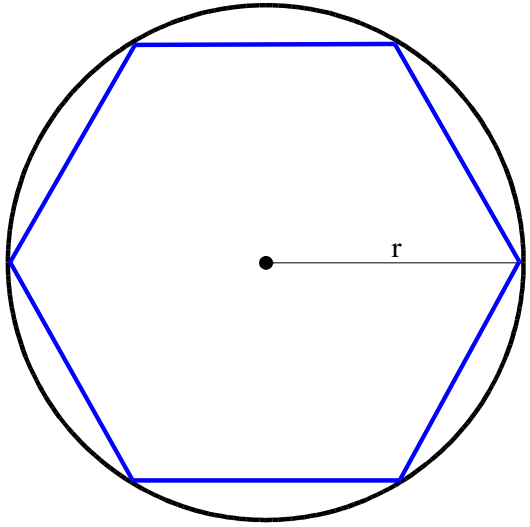
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

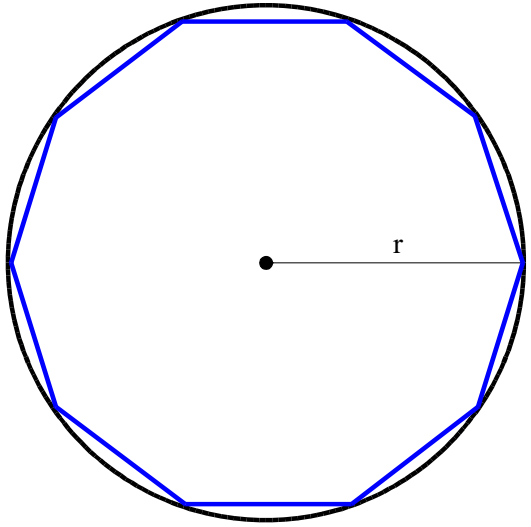
There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1**,







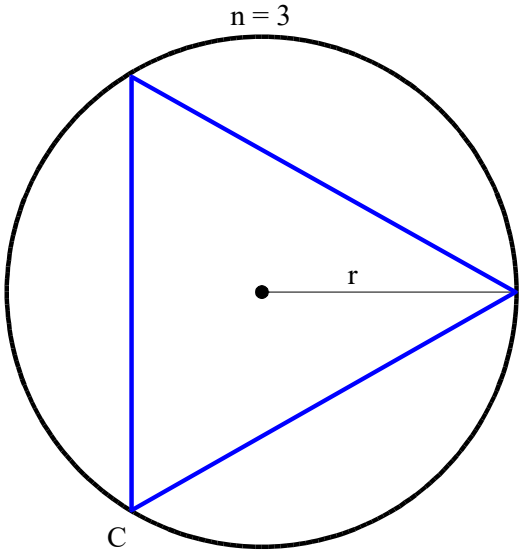


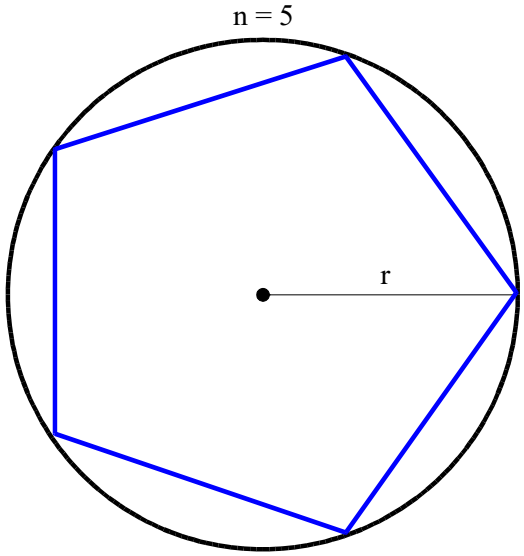
The Value of π

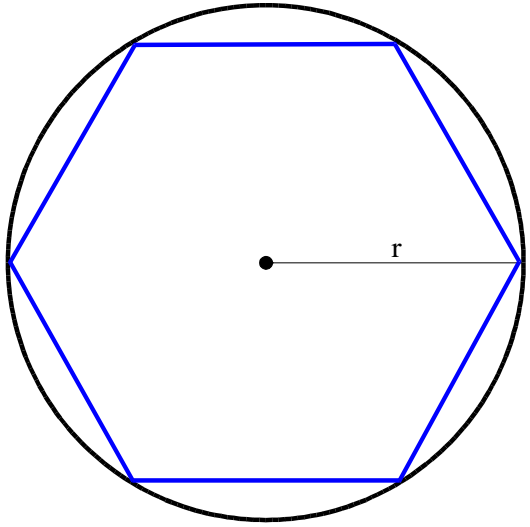
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

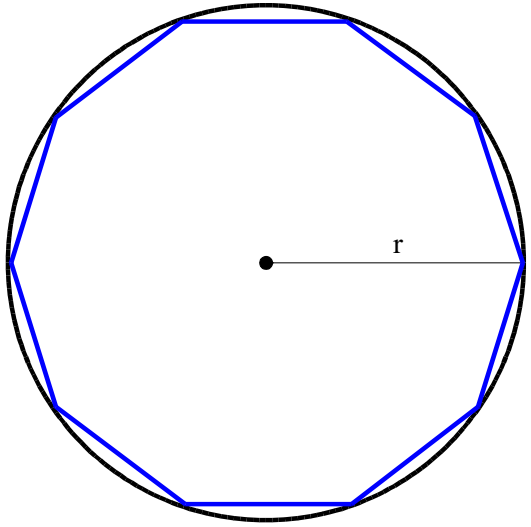
There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1**, then **A =**







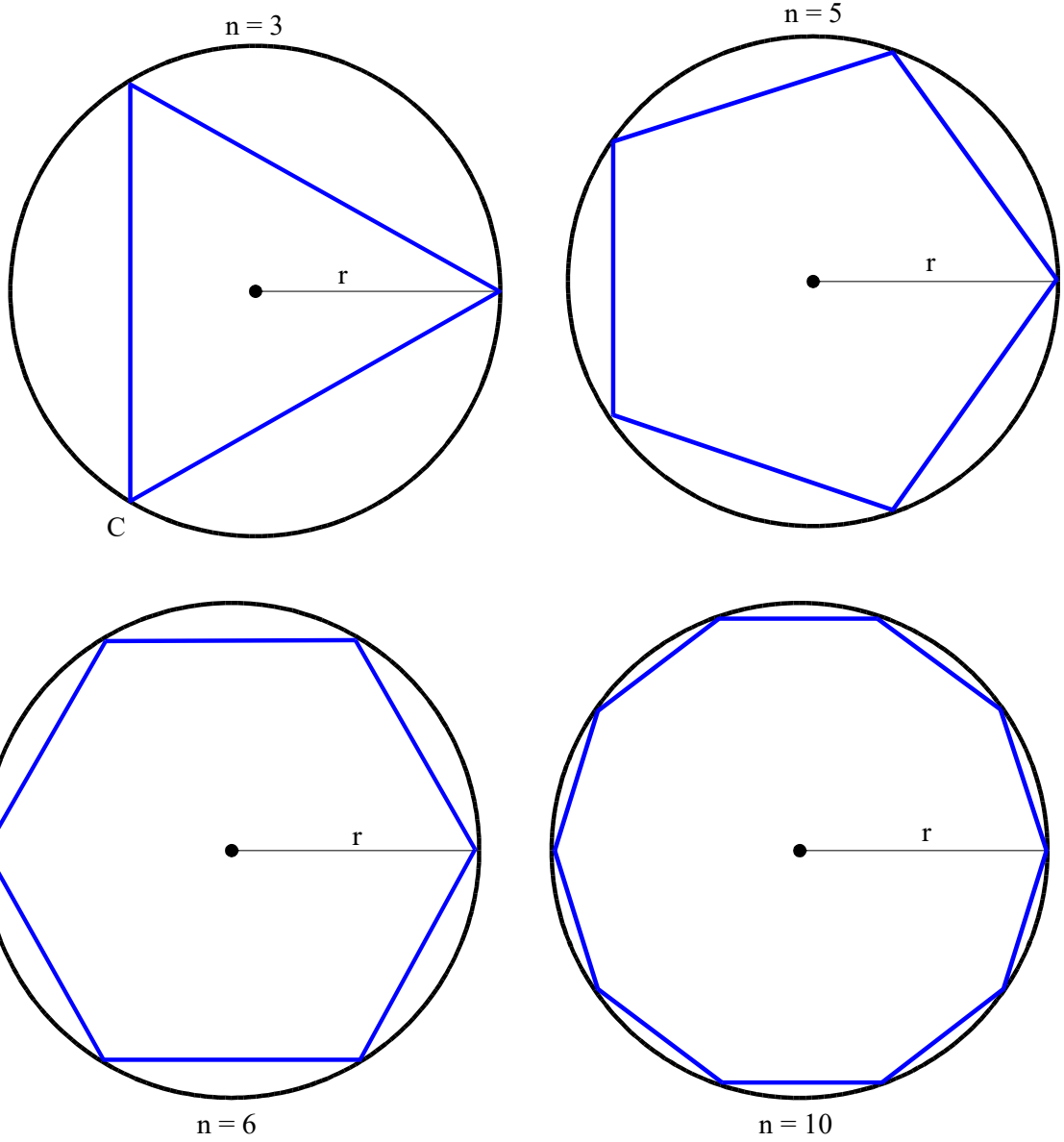


The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1**, then **A = π.**

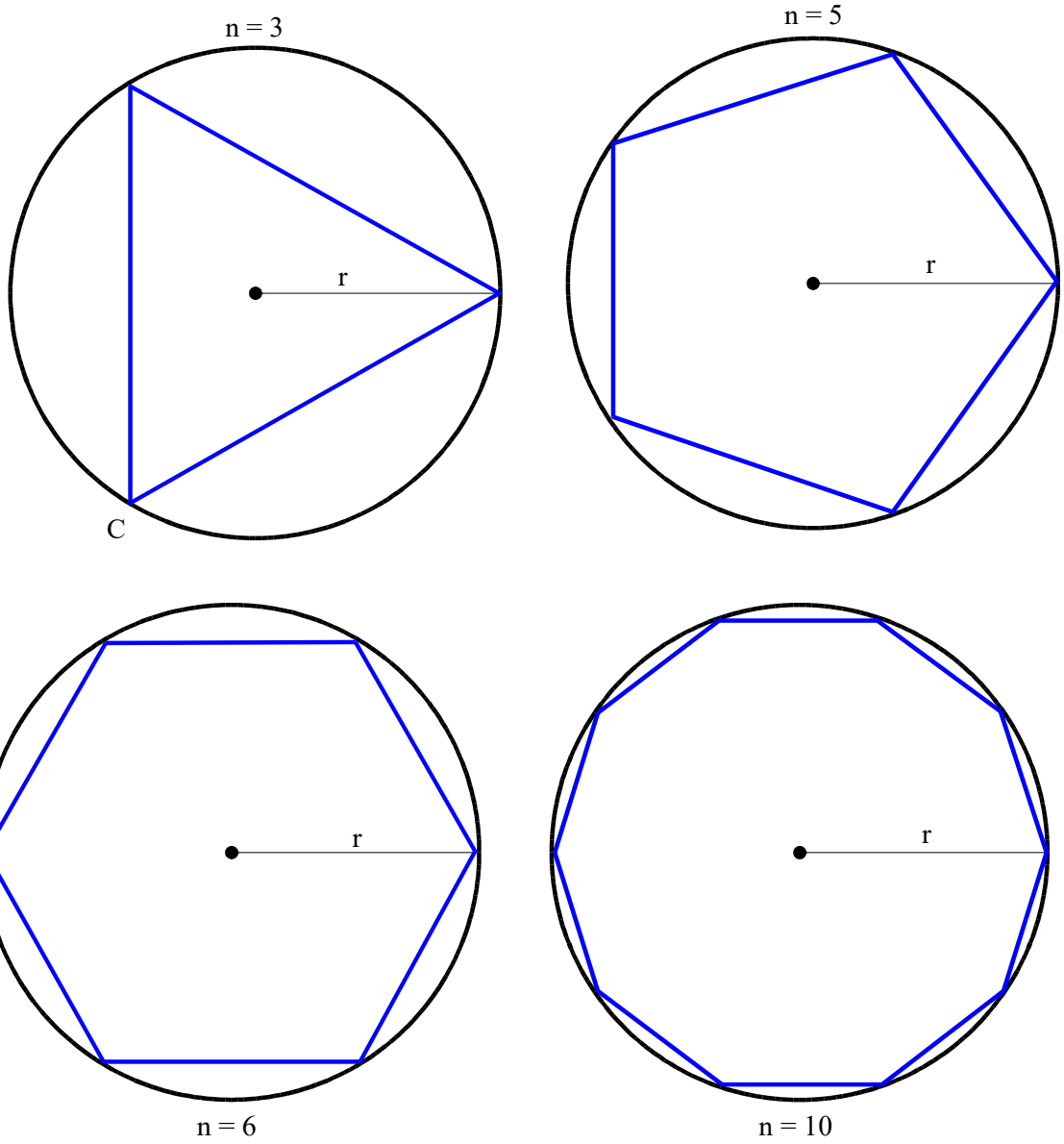


The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1**, then **A = π.**
square units



The Value of π

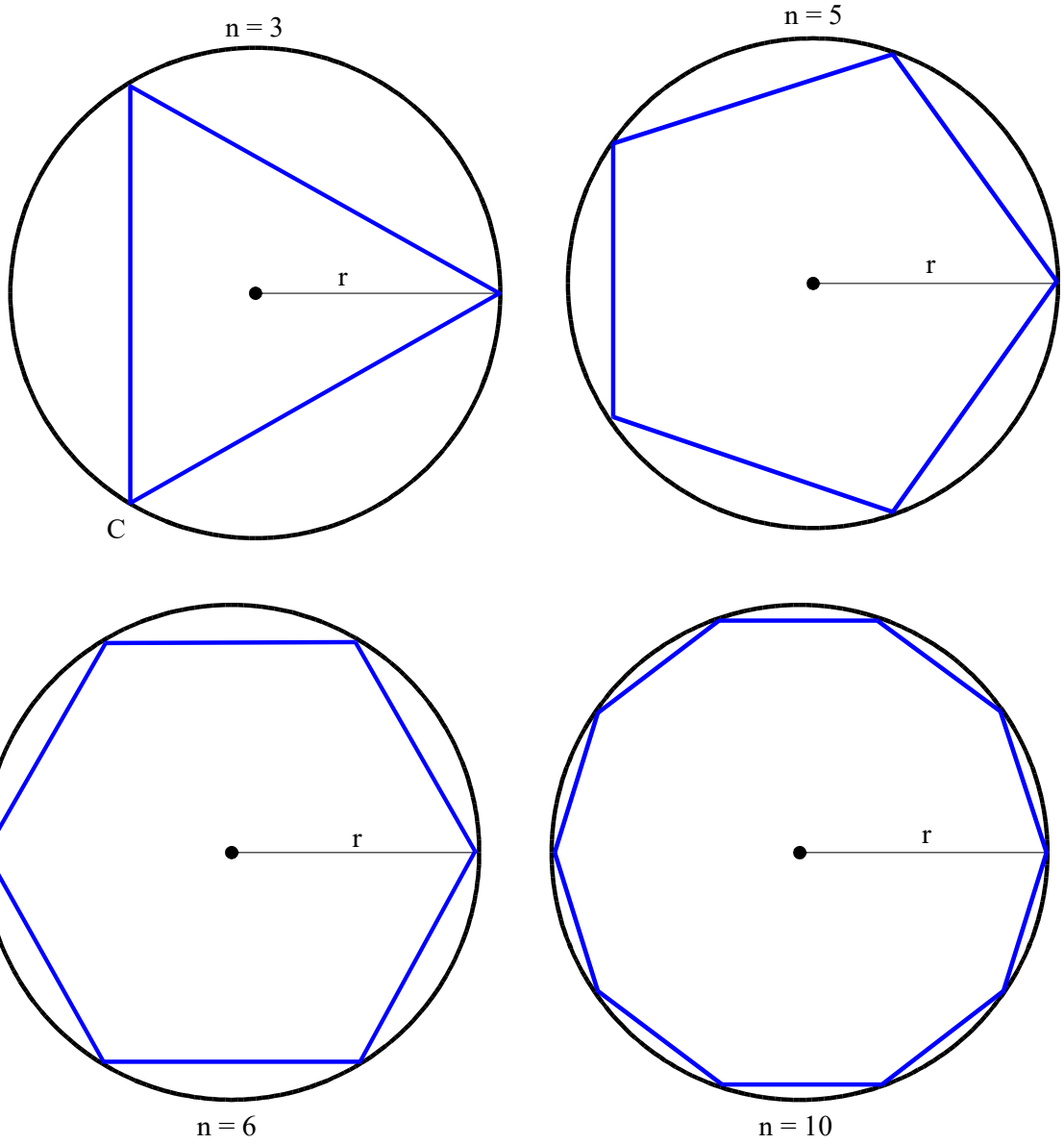
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1**, then **A = π.**

square units

If r is given in **inches**,



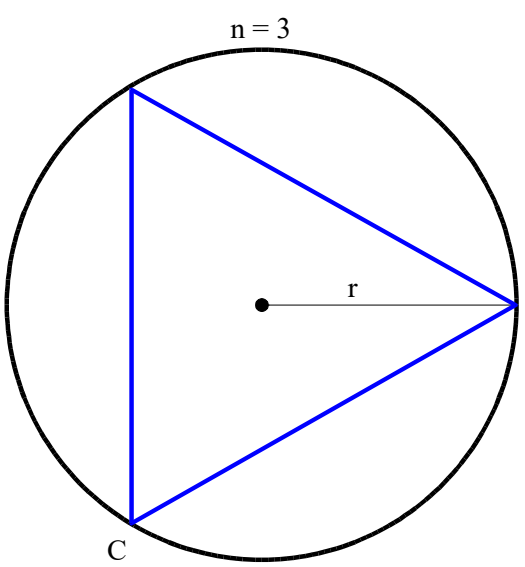
The Value of π

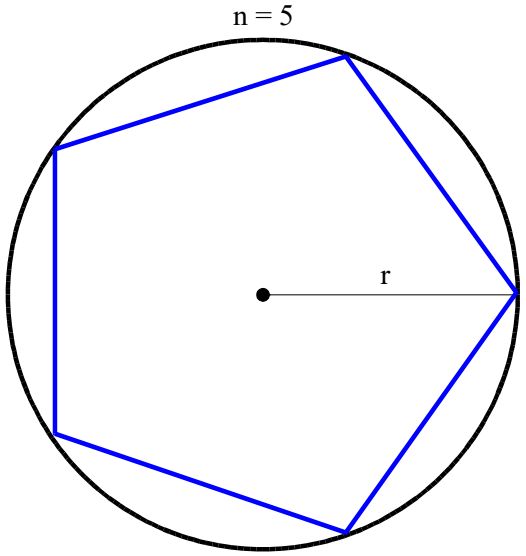
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

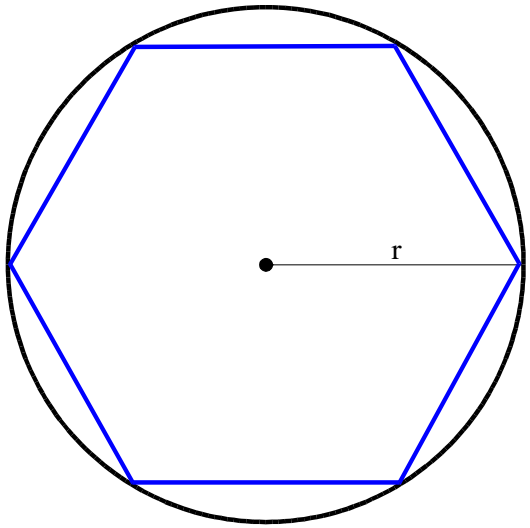
There is a well known formula for the area of a circle. $A = \pi r^2$

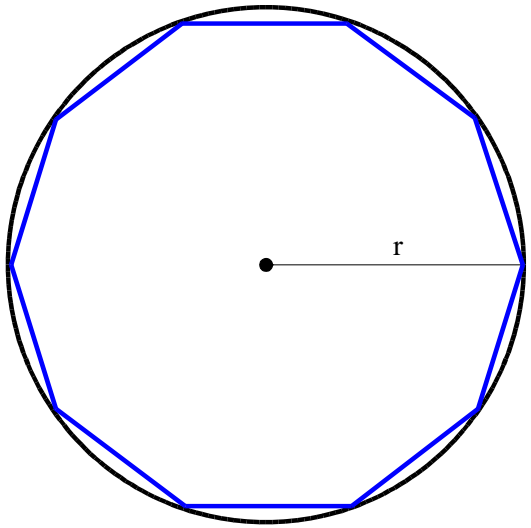
If **r = 1**, then **A = π.**
square units

If r is given in **inches**, then the area would be in **square inches**.







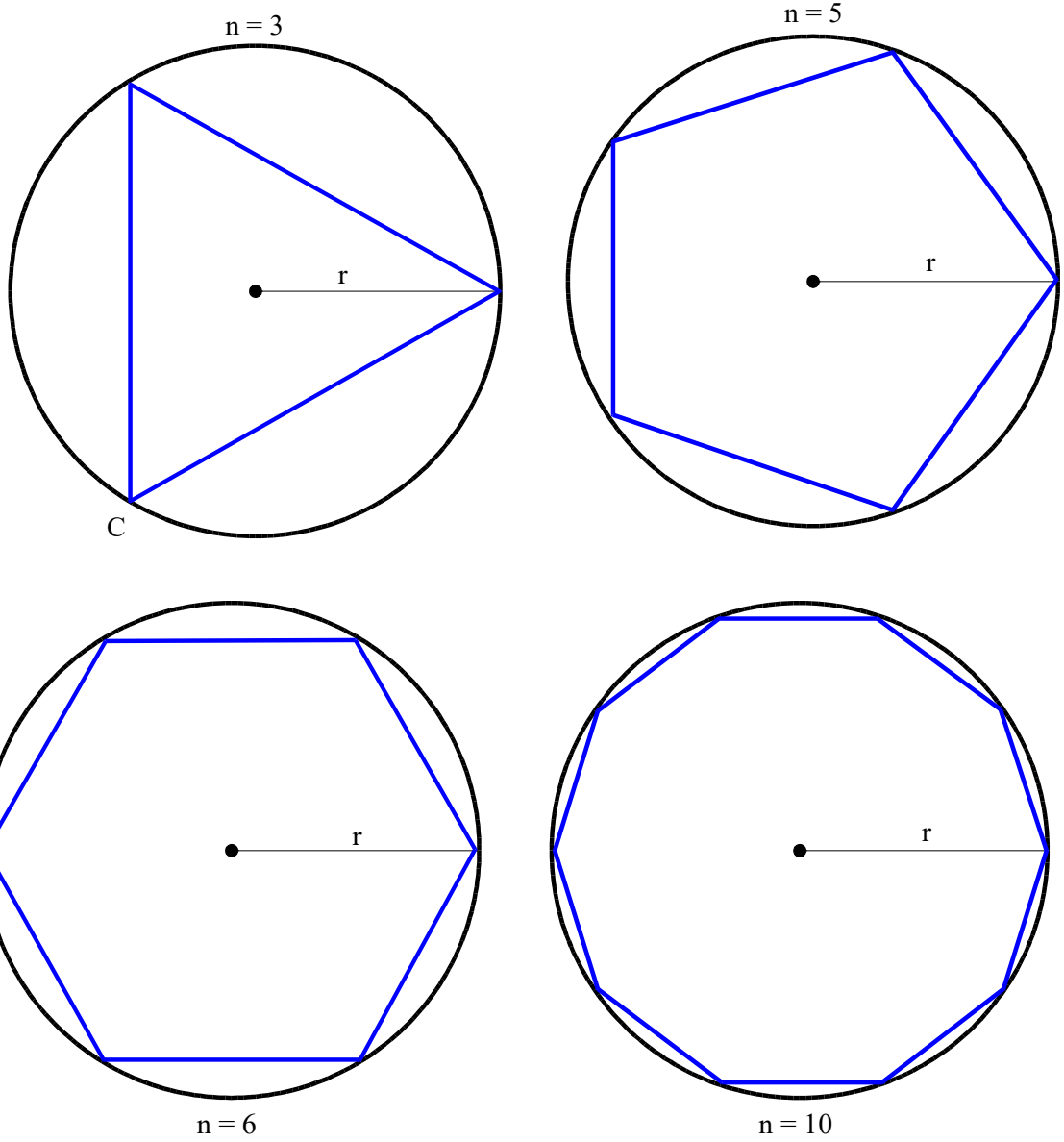


The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

There is a well known formula for the area of a circle. $A = \pi r^2$

If **r = 1**, then **A = π.**

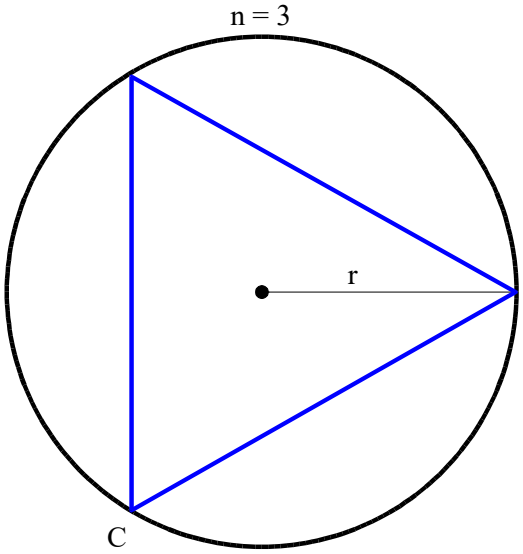


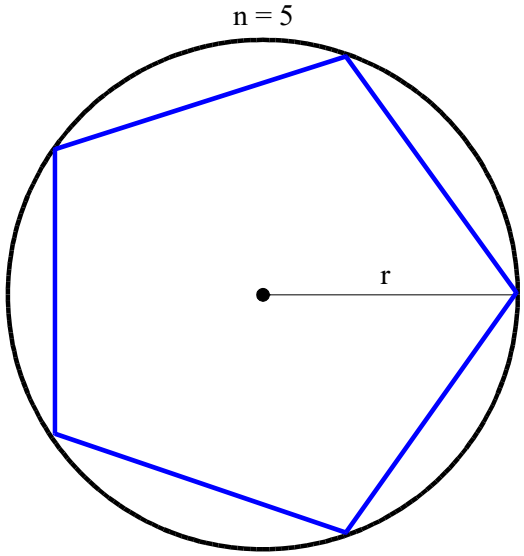
The Value of π

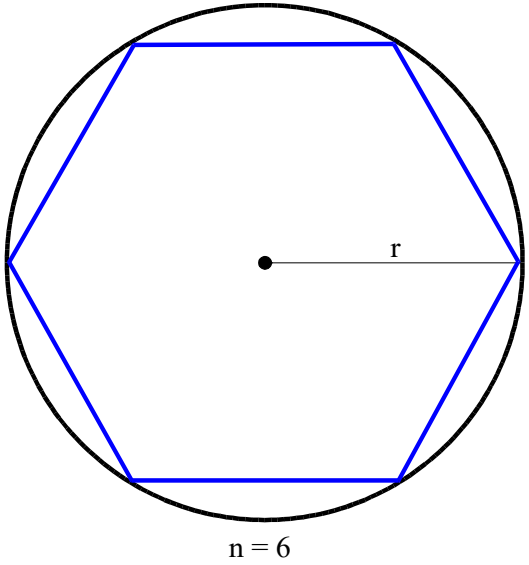
Regular Polygon Area

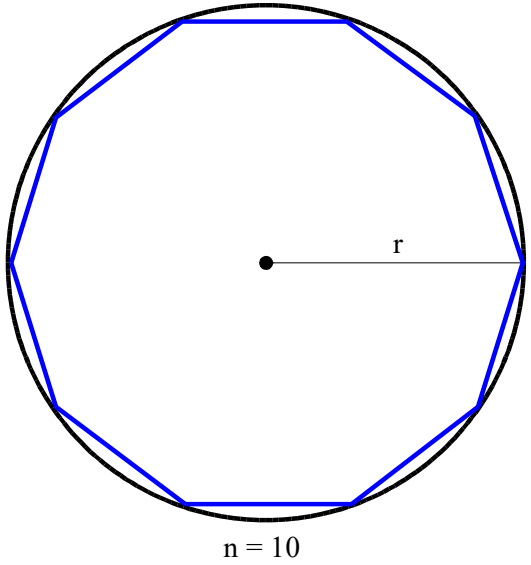
$nr^2Sin(180^o/n)Cos(180^o/n)$

If r = 1, then the area of the circle is π.







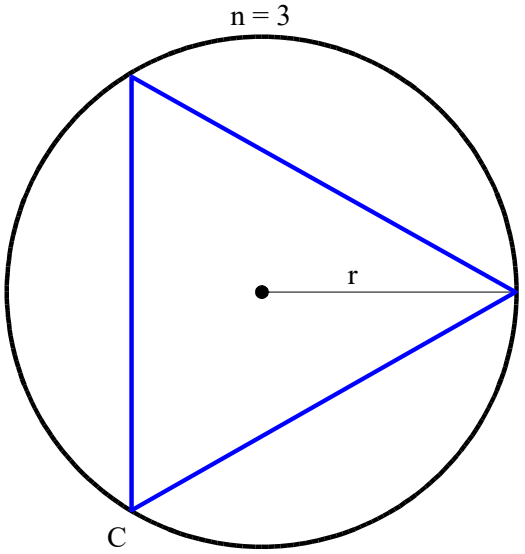


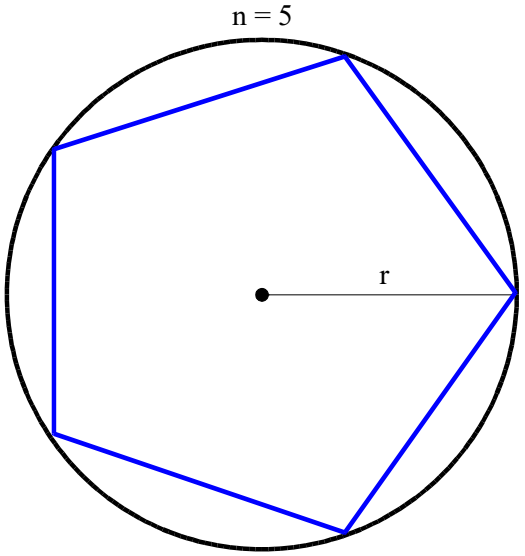
The Value of π

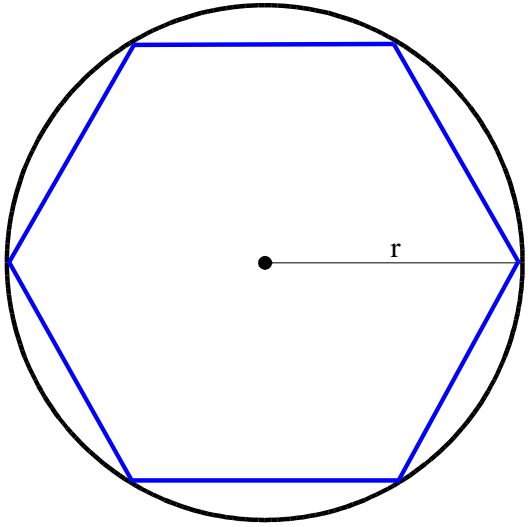
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

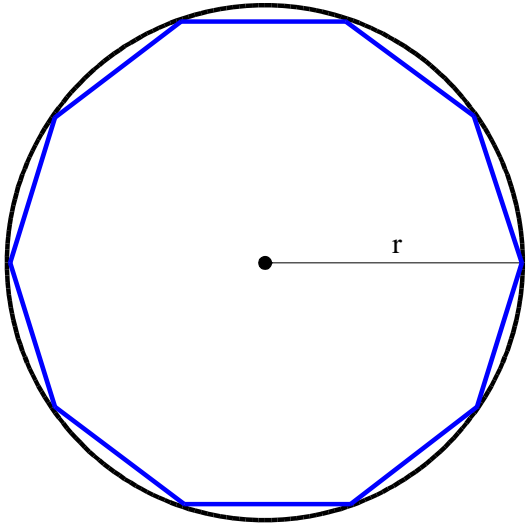
If r = 1, then the area of the circle is π.

Now consider the area of the regular polygons if r = 1.









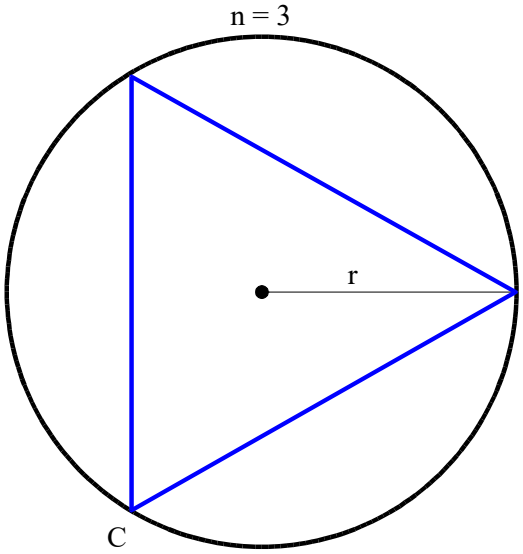
The Value of π

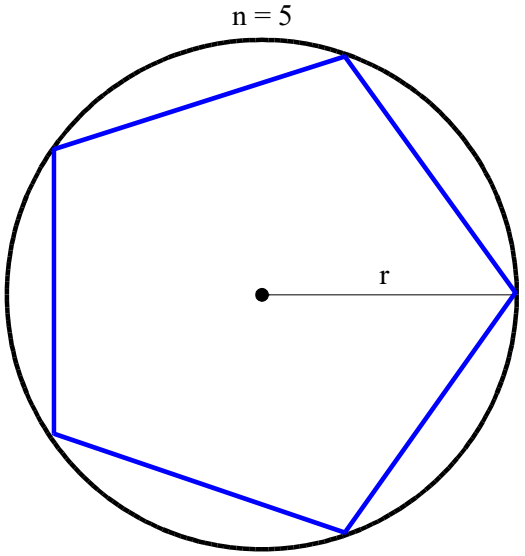
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

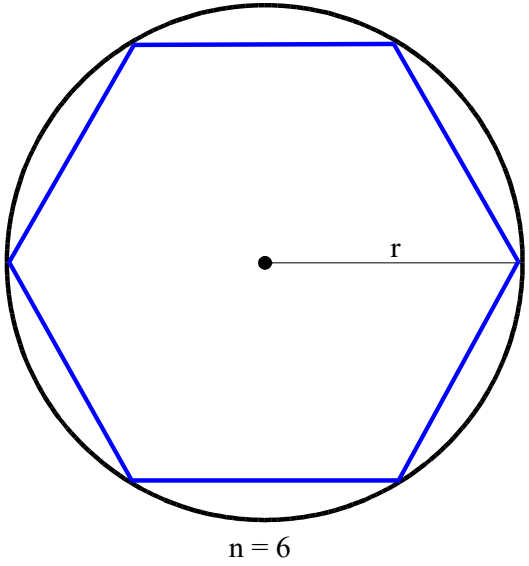
If r = 1, then the area of the circle is π.

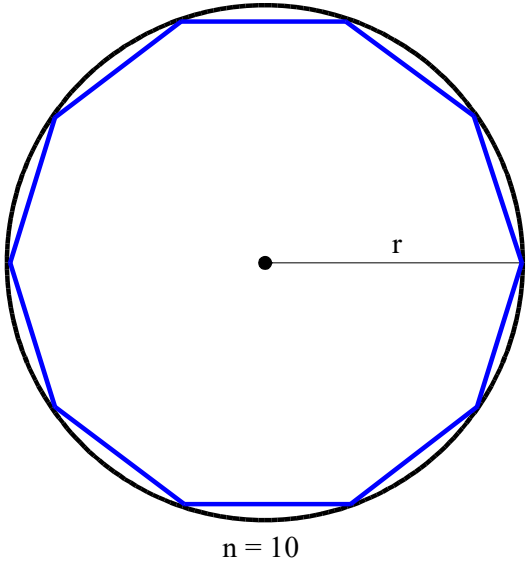
Now consider the area of the regular polygons if r = 1.

The regular polygon area is
$nr^2Sin(180^o/n)Cos(180^o/n)$









The Value of π

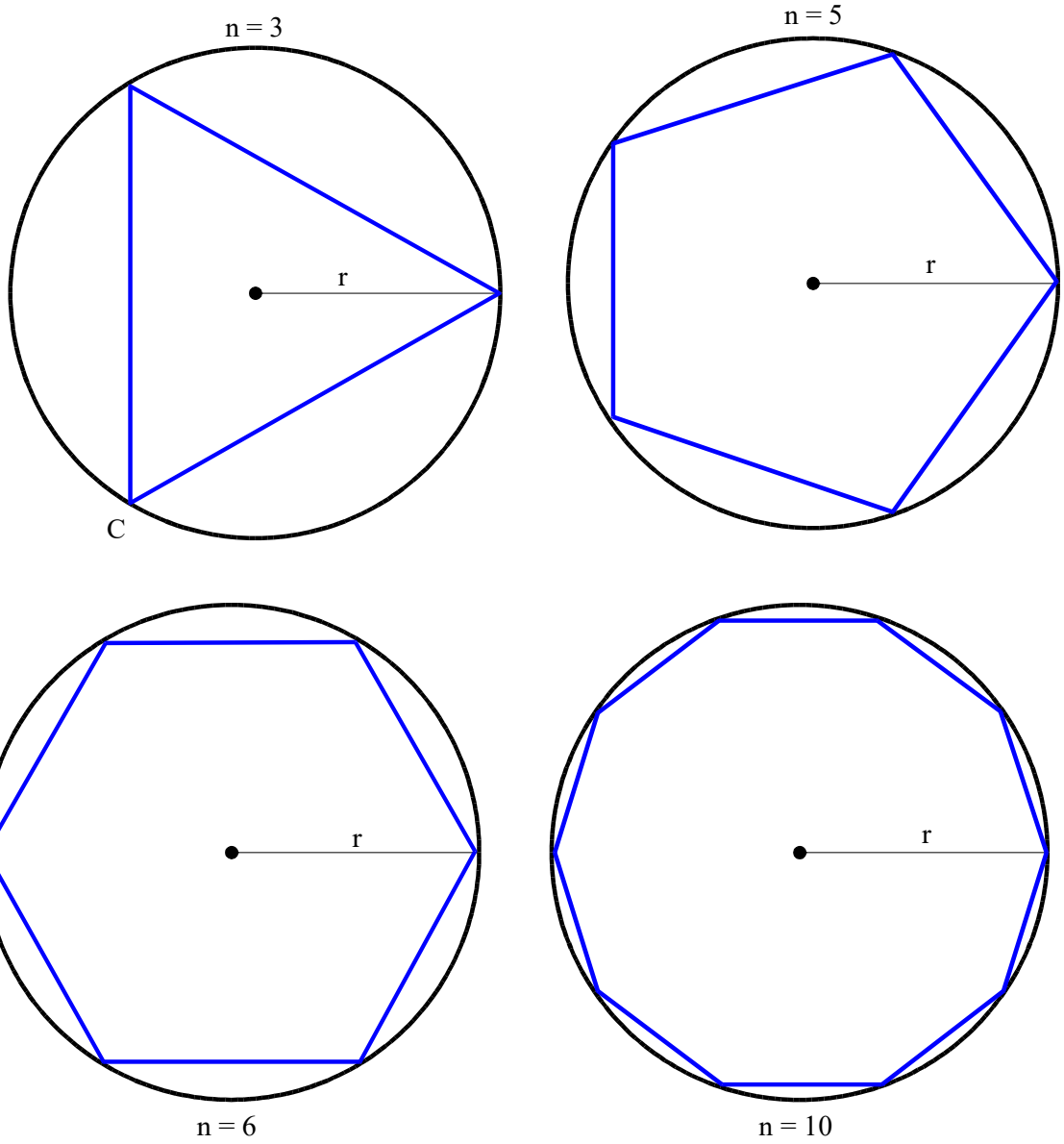
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

If r = 1, then the area of the circle is π.

Now consider the area of the regular polygons if r = 1.

The regular polygon area is
$nr^2Sin(180^o/n)Cos(180^o/n)$

1



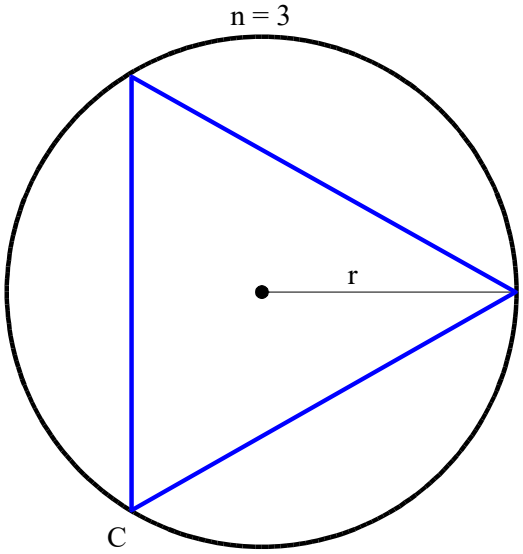
The Value of π

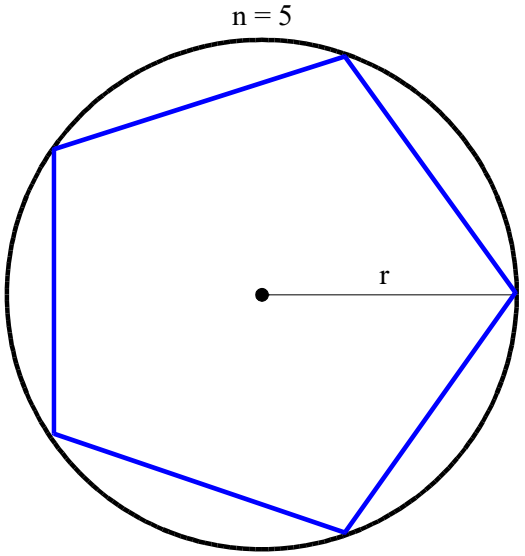
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

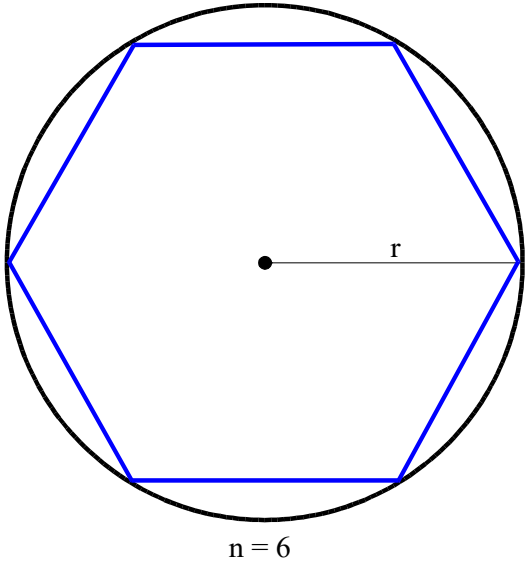
If r = 1, then the area of the circle is π.

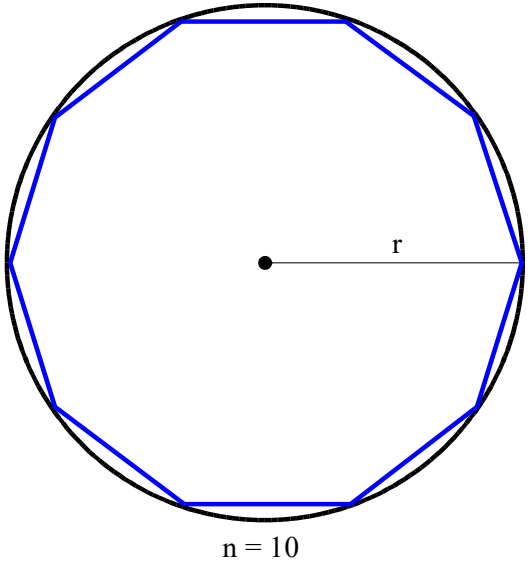
Now consider the area of the regular polygons if r = 1.

The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.









The Value of π

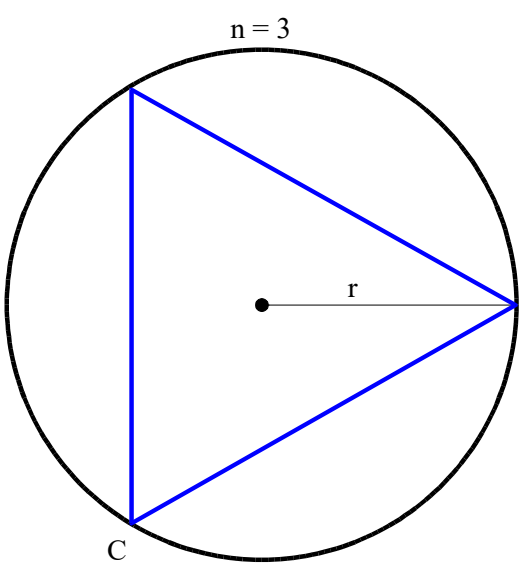
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

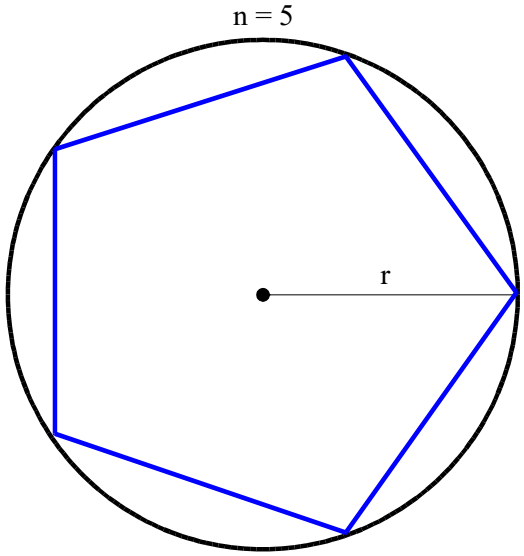
If r = 1, then the area of the circle is π.

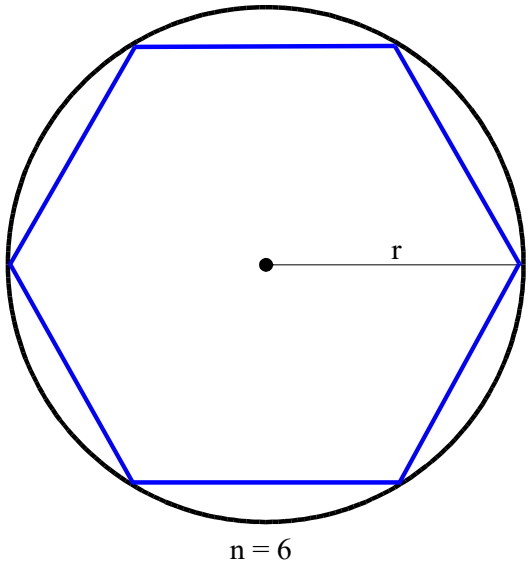
Now consider the area of the regular polygons if r = 1.

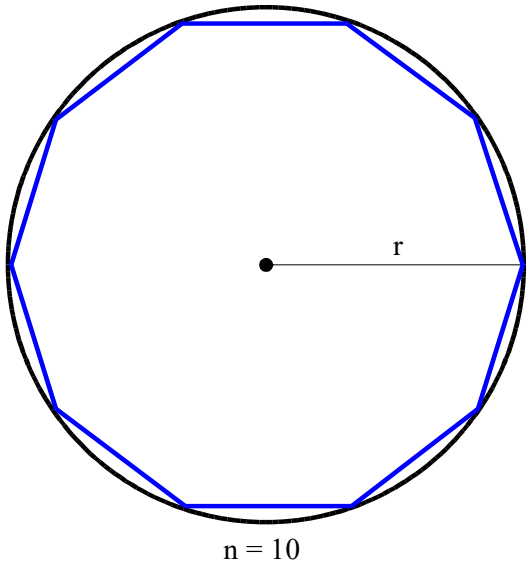
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

As n increases,









The Value of π

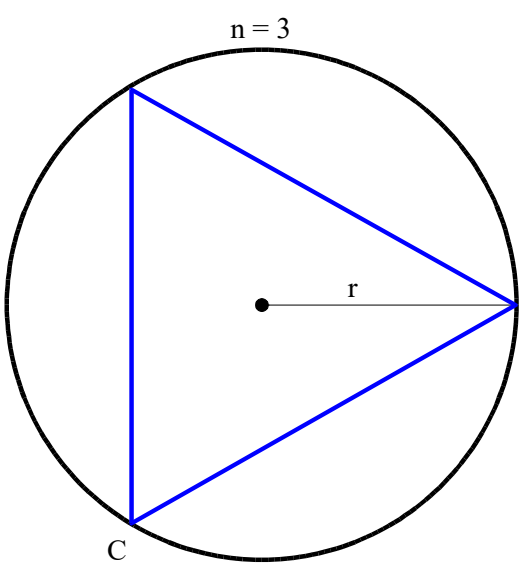
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

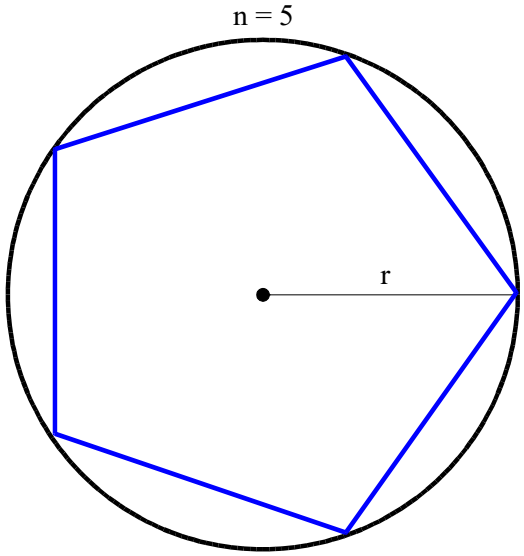
If r = 1, then the area of the circle is π.

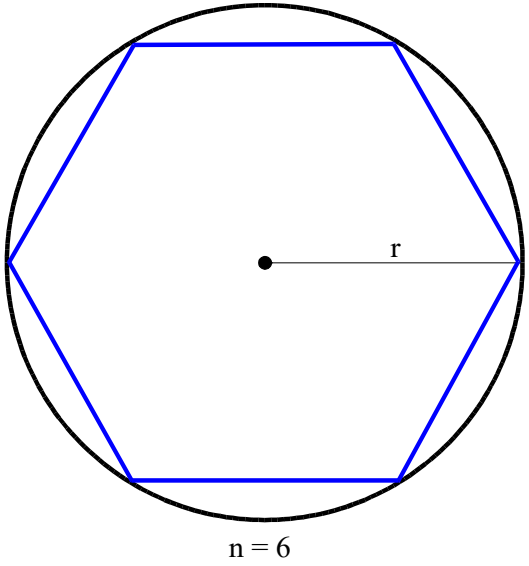
Now consider the area of the regular polygons if r = 1.

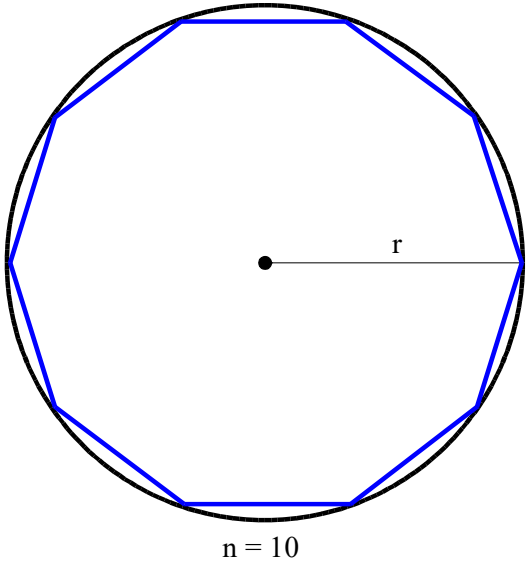
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

As n increases, the value of this expression will increase.









The Value of π

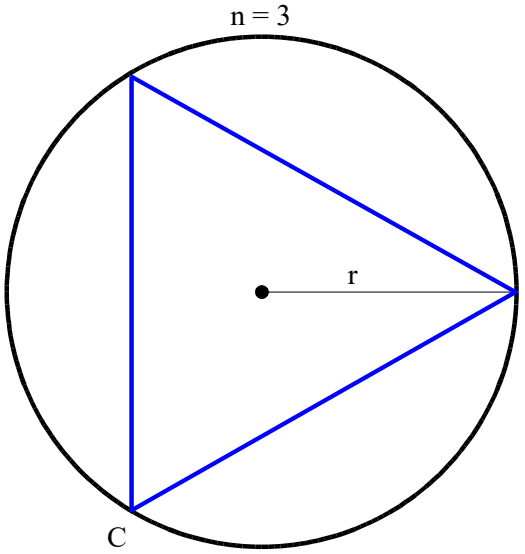
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

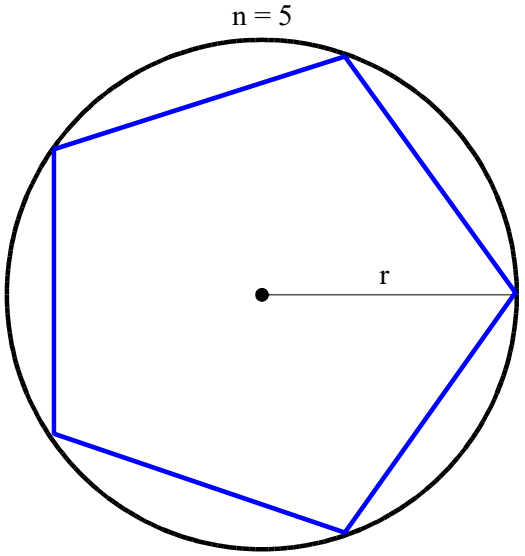
If r = 1, then the area of the circle is π.

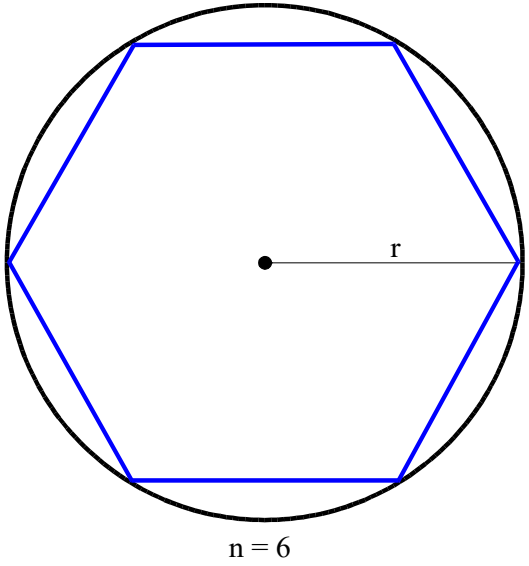
Now consider the area of the regular polygons if r = 1.

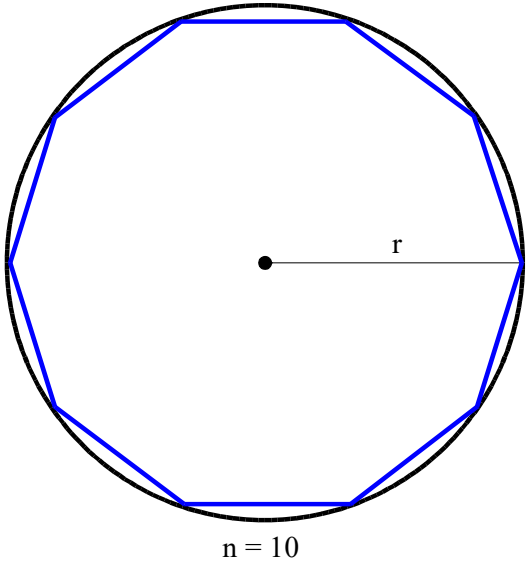
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

As n increases, the value of this expression will increase and get closer to π.









The Value of π

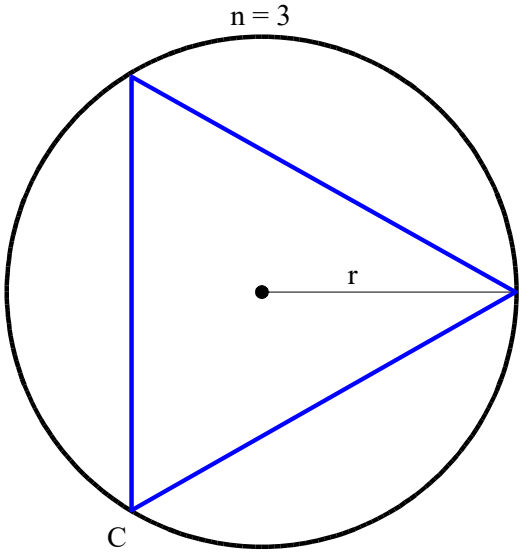
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

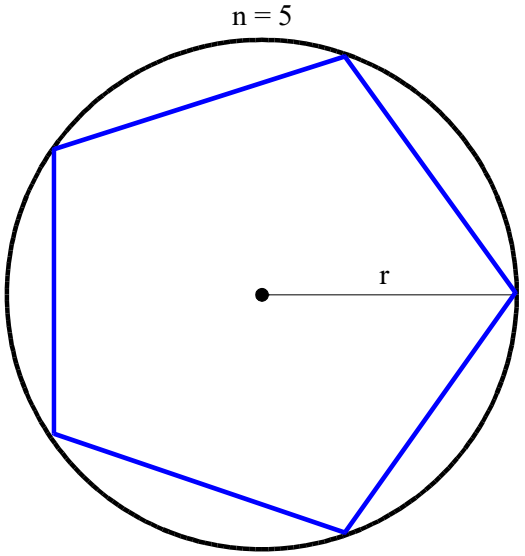
If r = 1, then the area of the circle is π.

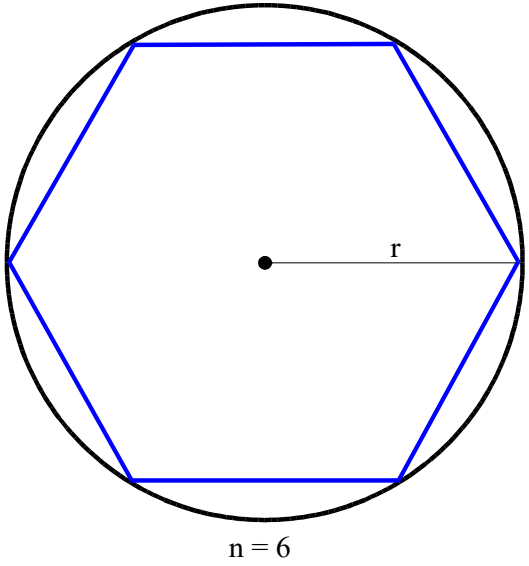
Now consider the area of the regular polygons if r = 1.

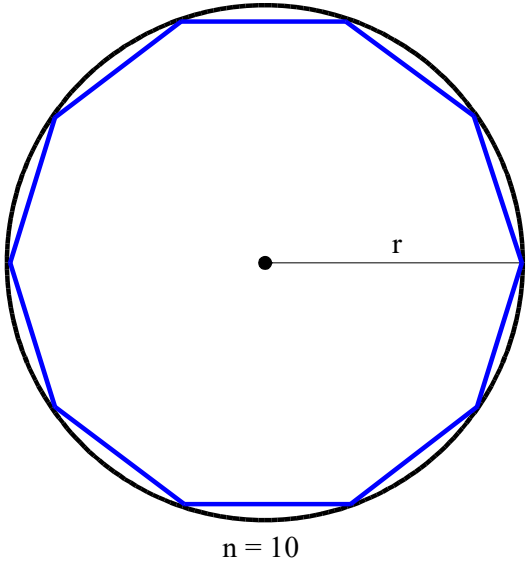
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

As n increases, the value of this expression will increase and get closer to π, the area of the circle.









The Value of π

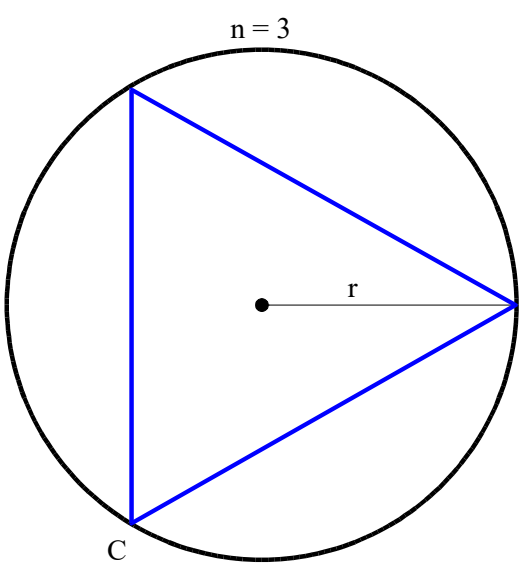
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

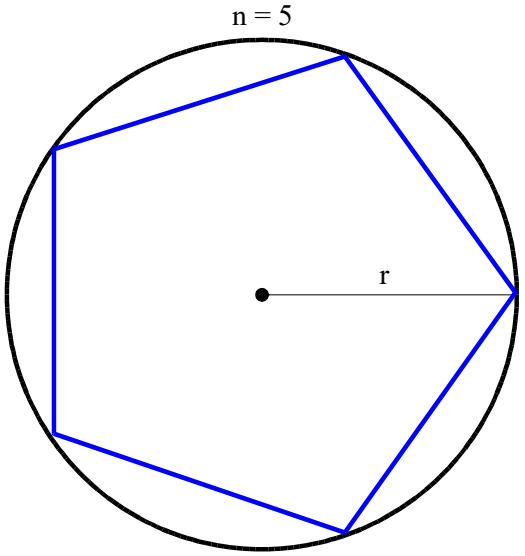
If r = 1, then the area of the circle is π.

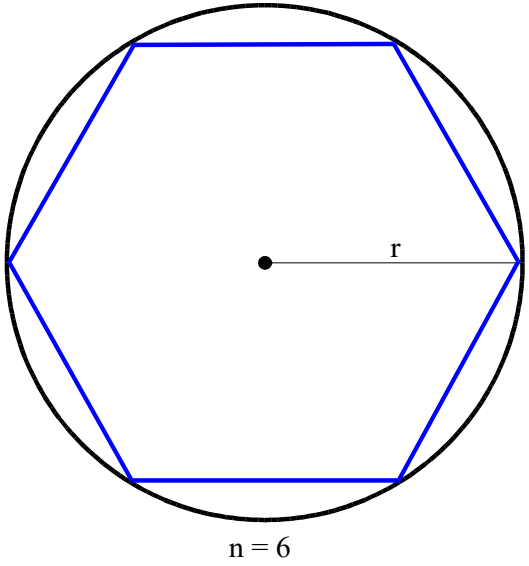
Now consider the area of the regular polygons if r = 1.

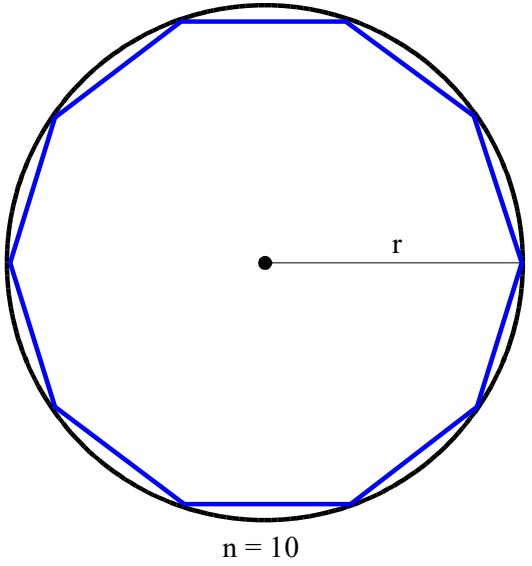
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

As n increases, the value of this expression will increase and get closer to π, the area of the circle.
Let's create a table.









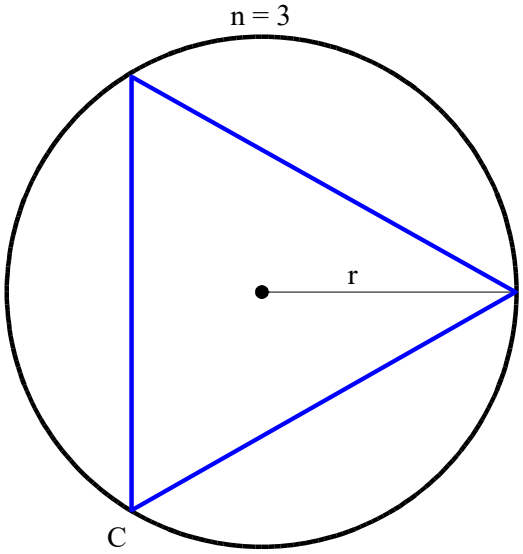
The Value of π

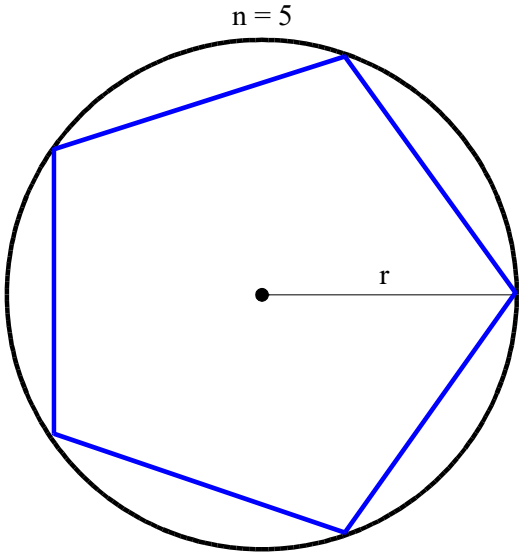
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

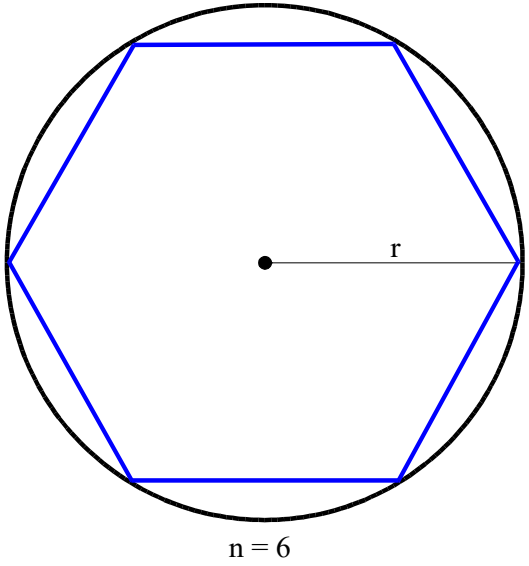
If r = 1, then the area of the circle is π.

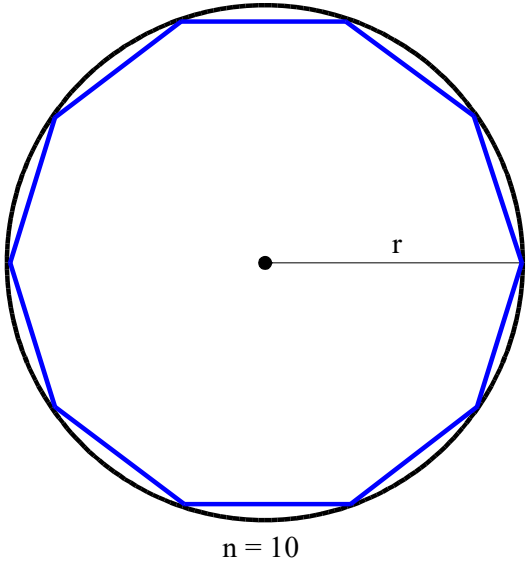
Now consider the area of the regular polygons if r = 1.

The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.









The Value of π

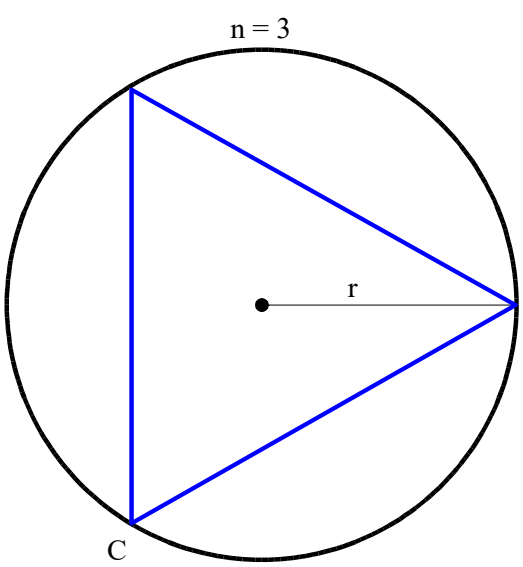
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

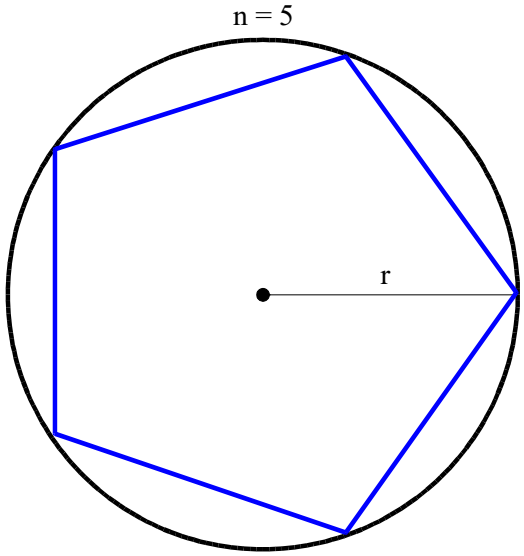
If r = 1, then the area of the circle is π.

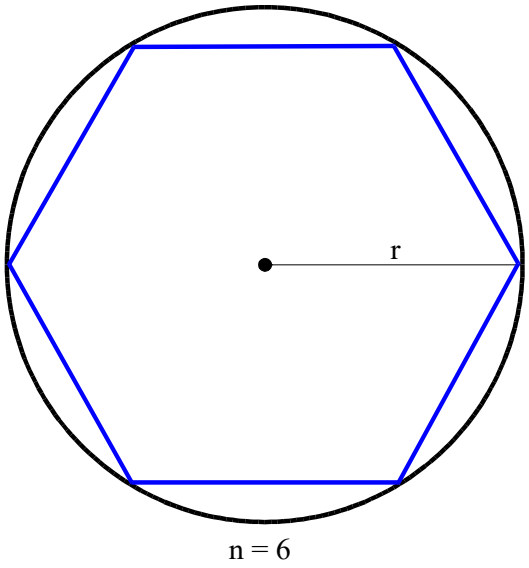
Now consider the area of the regular polygons if r = 1.

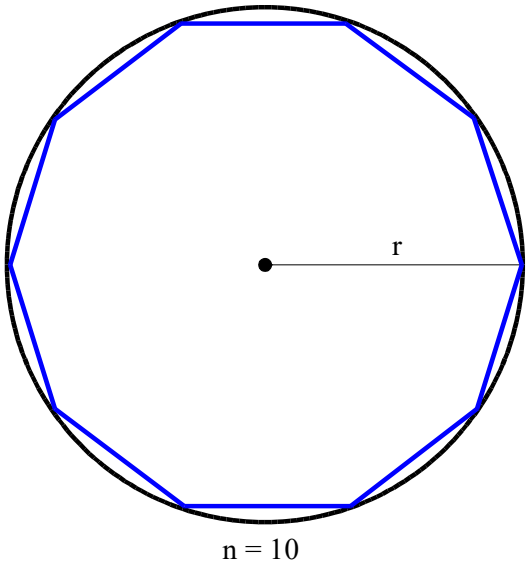
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area









The Value of π

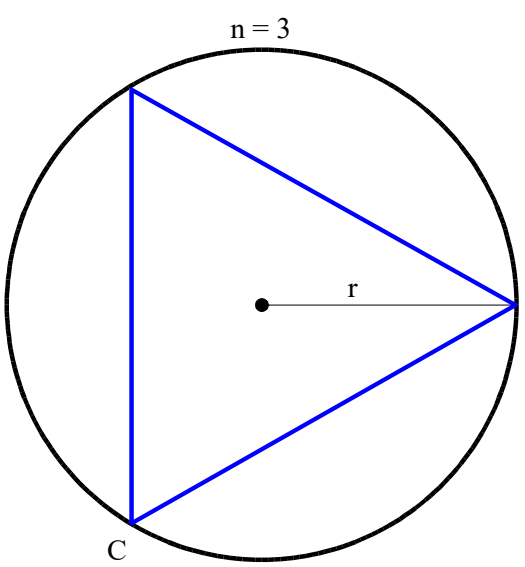
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

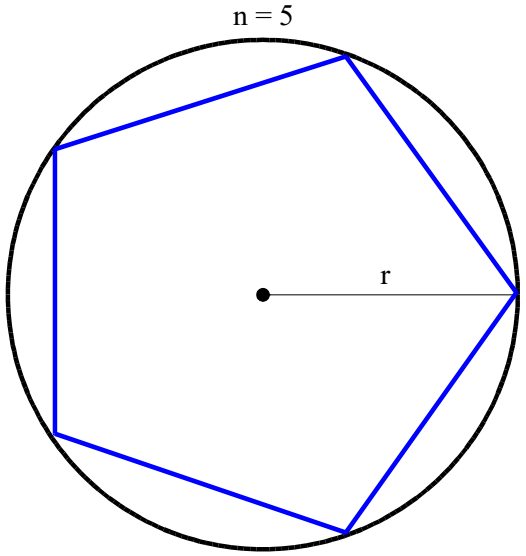
If r = 1, then the area of the circle is π.

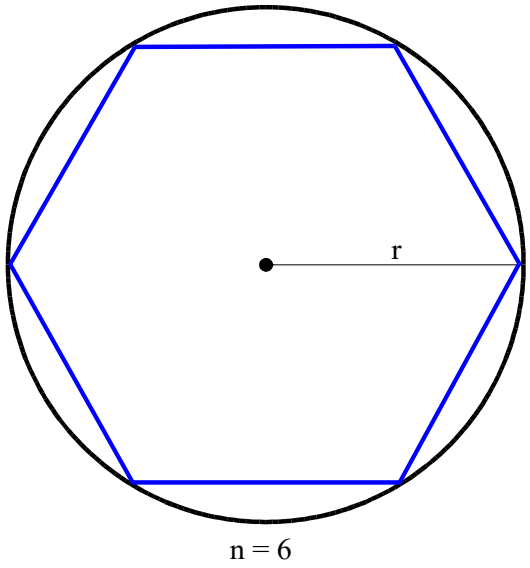
Now consider the area of the regular polygons if r = 1.

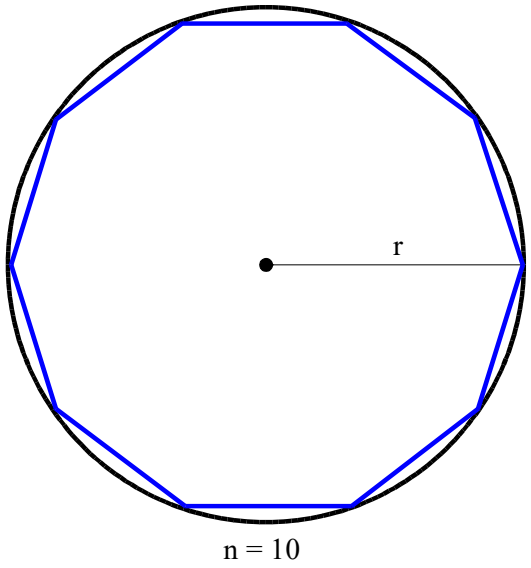
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area









The Value of π

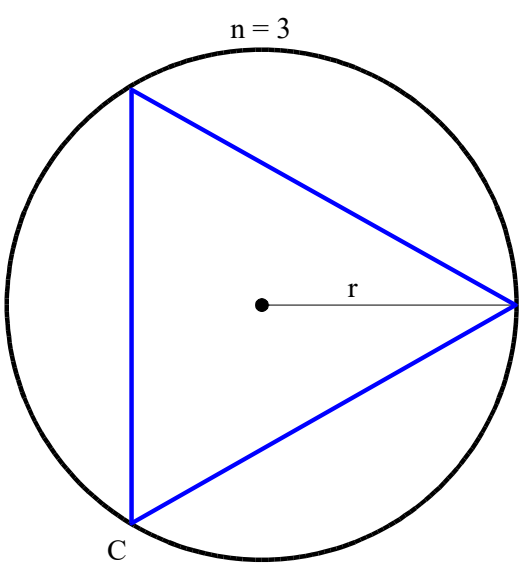
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

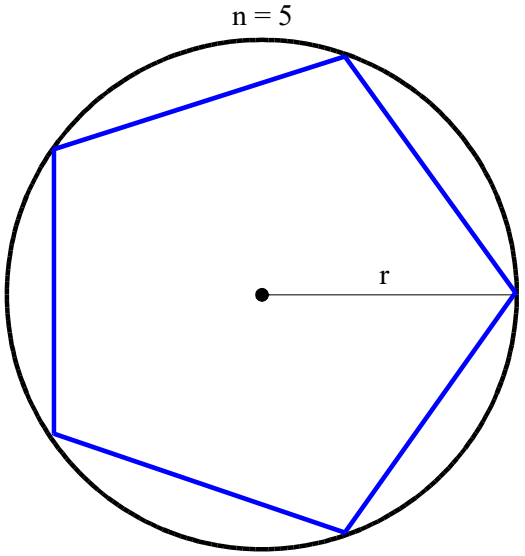
If r = 1, then the area of the circle is π.

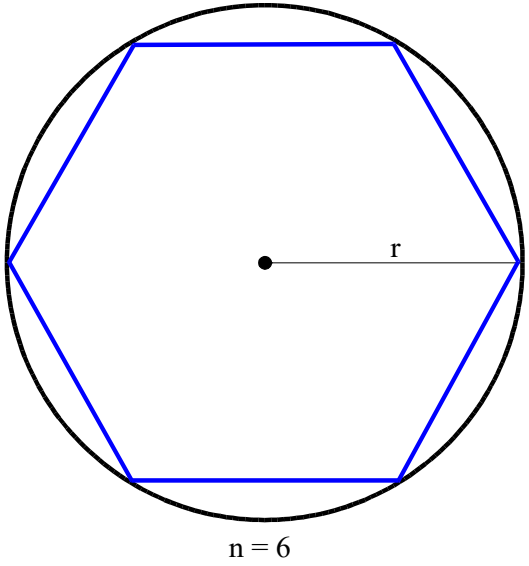
Now consider the area of the regular polygons if r = 1.

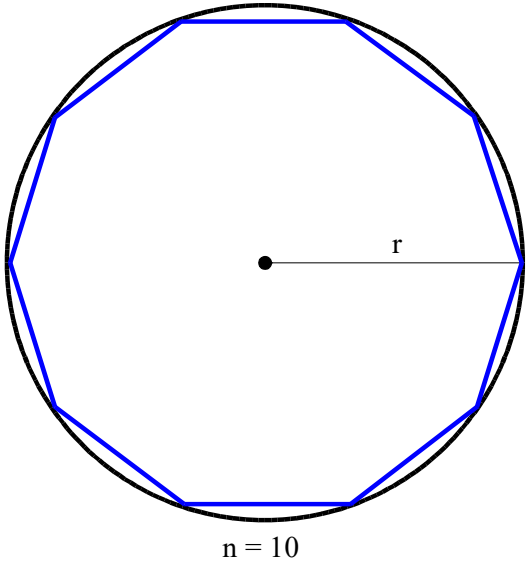
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	









The Value of π

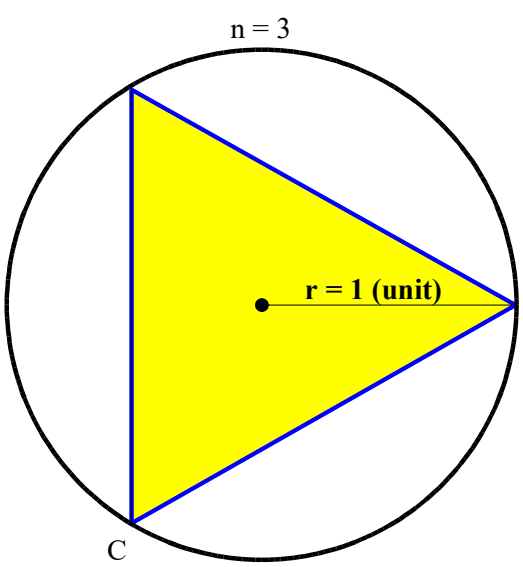
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

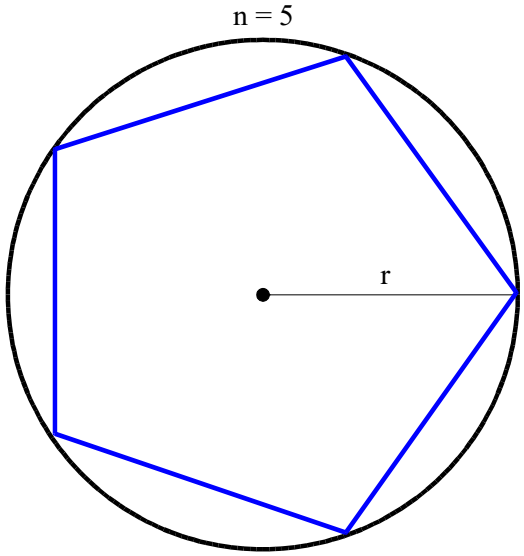
If r = 1, then the area of the circle is π.

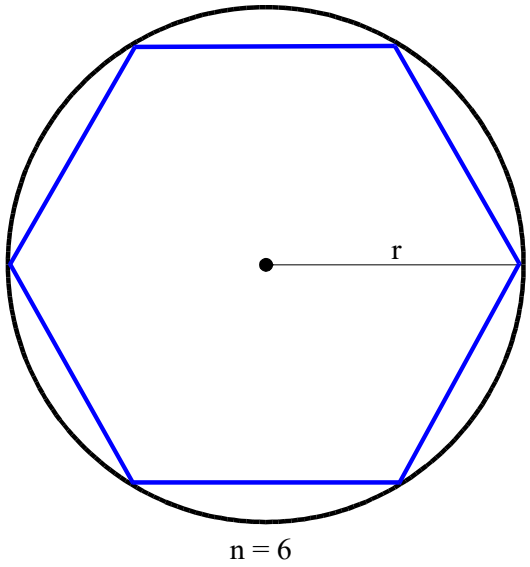
Now consider the area of the regular polygons if r = 1.

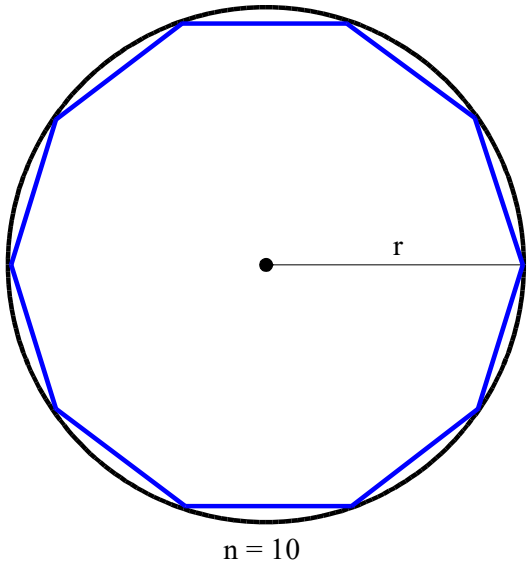
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	









The Value of π

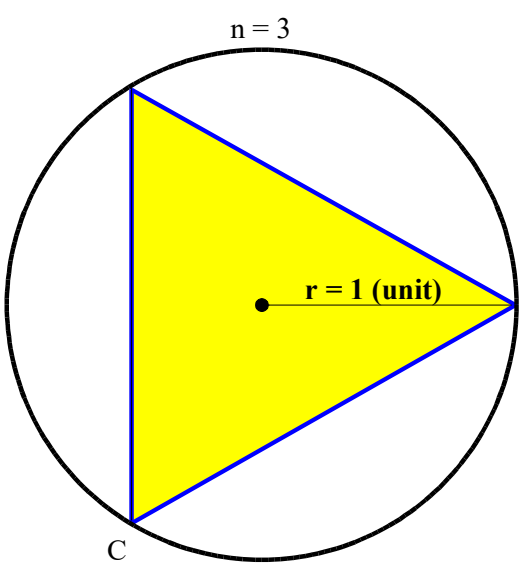
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

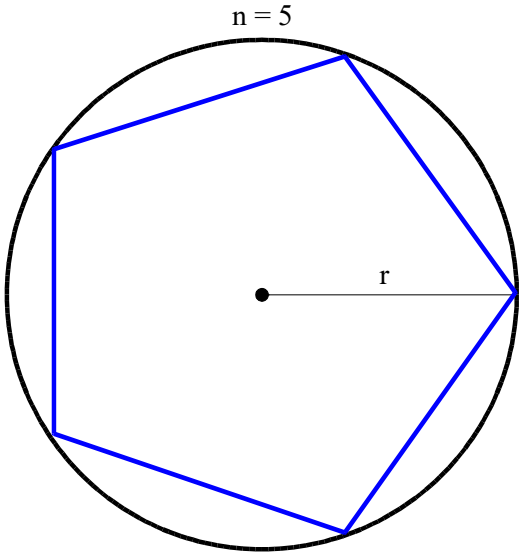
If r = 1, then the area of the circle is π.

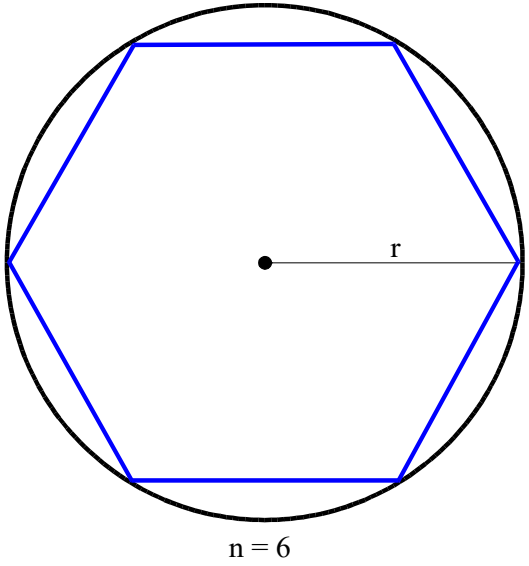
Now consider the area of the regular polygons if r = 1.

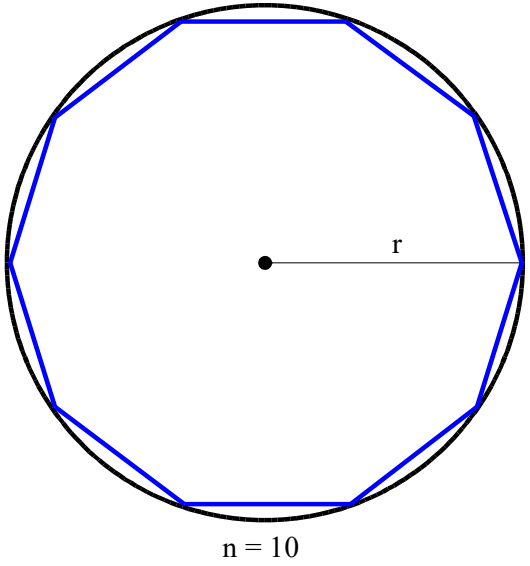
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299









The Value of π

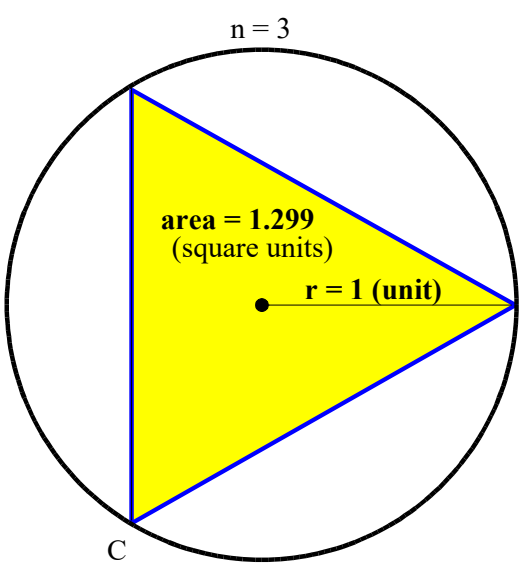
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

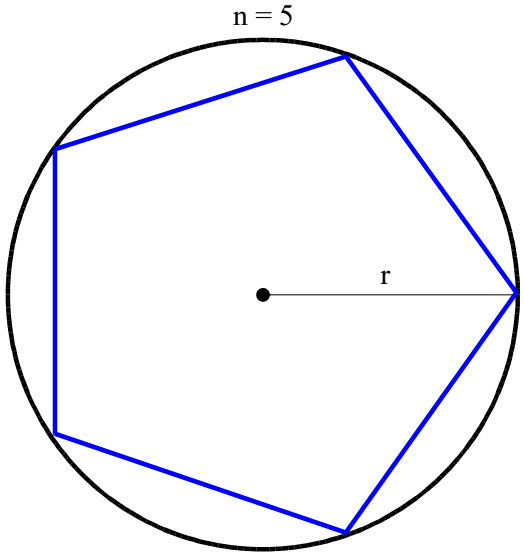
If r = 1, then the area of the circle is π.

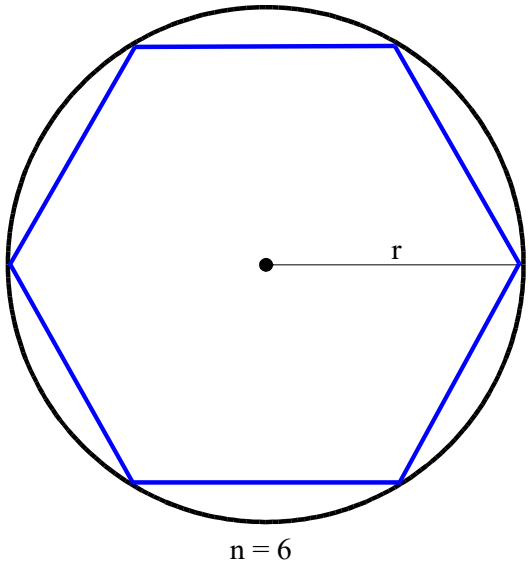
Now consider the area of the regular polygons if r = 1.

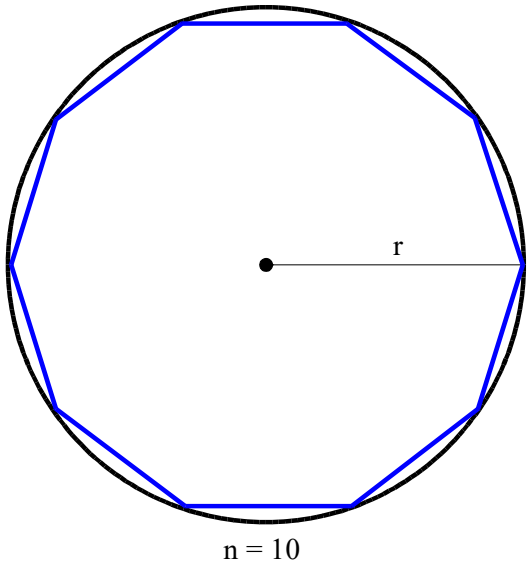
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299









The Value of π

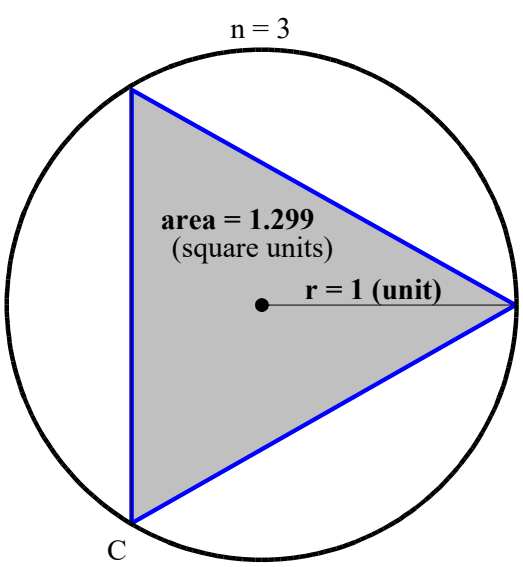
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

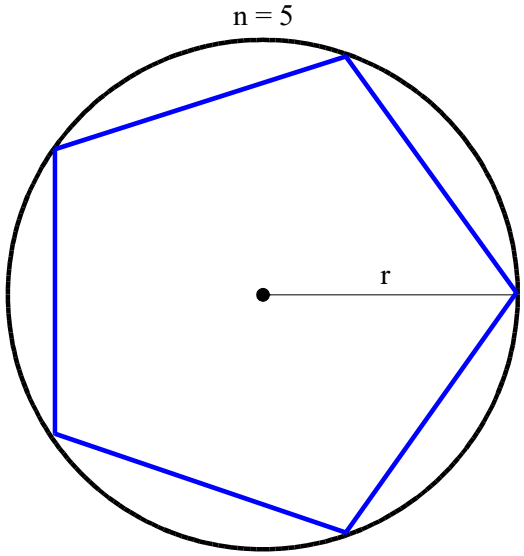
If r = 1, then the area of the circle is π.

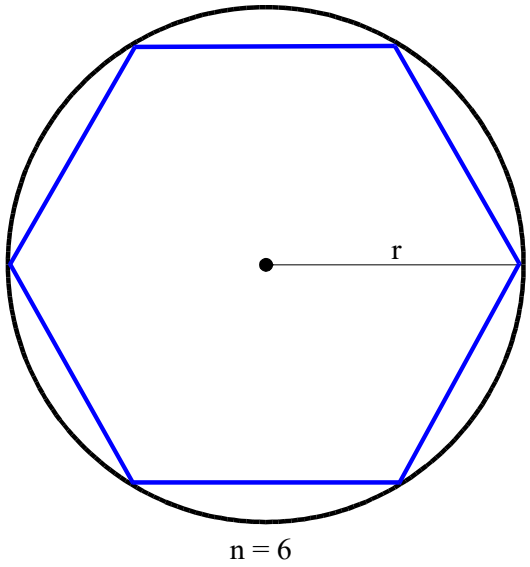
Now consider the area of the regular polygons if r = 1.

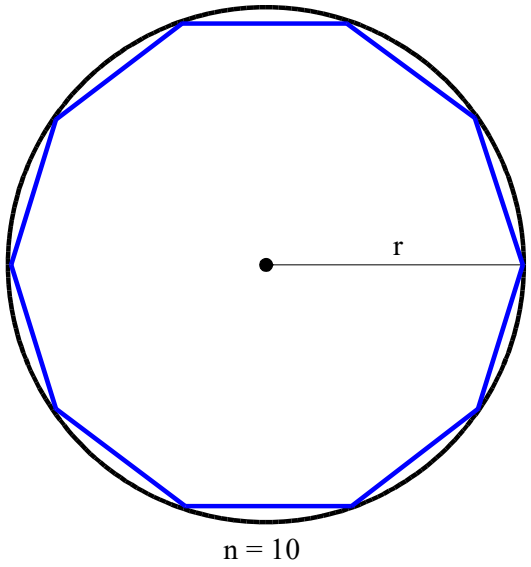
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299









The Value of π

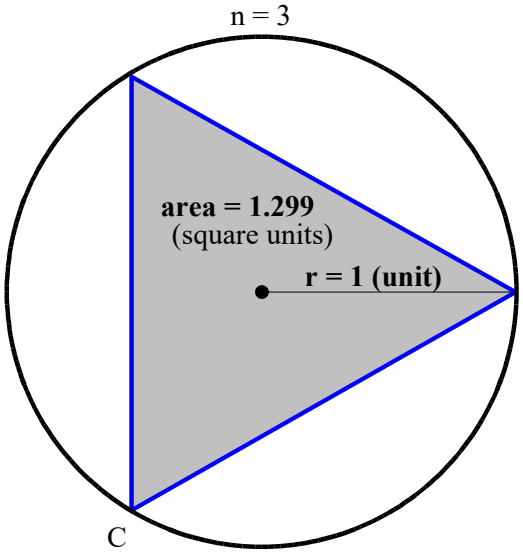
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

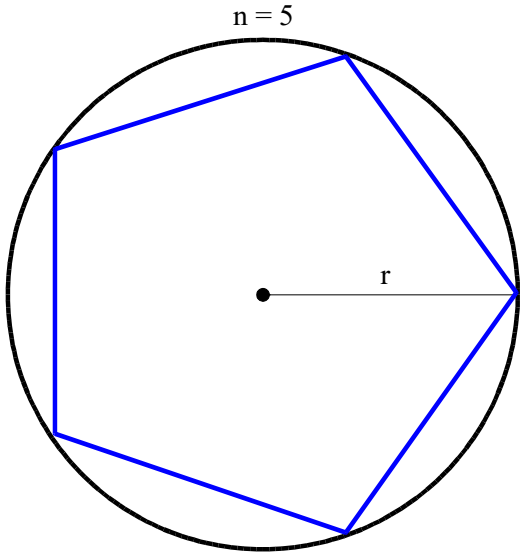
If r = 1, then the area of the circle is π.

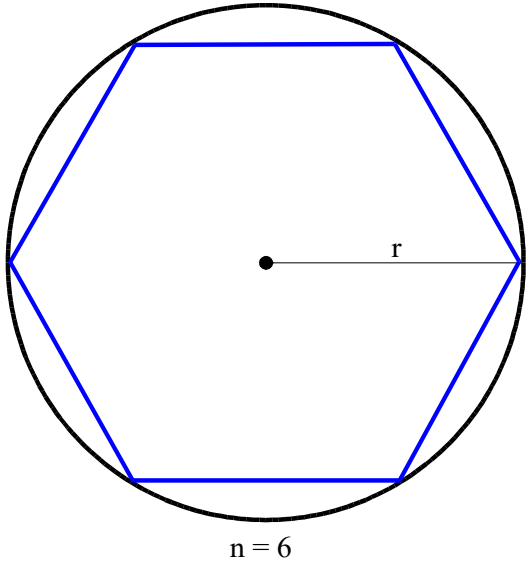
Now consider the area of the regular polygons if r = 1.

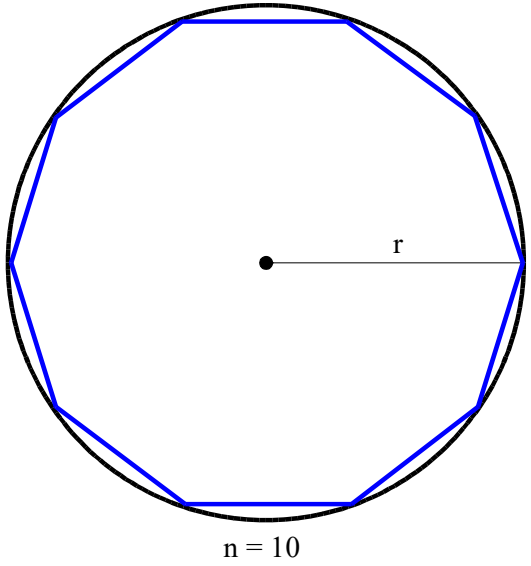
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	









The Value of π

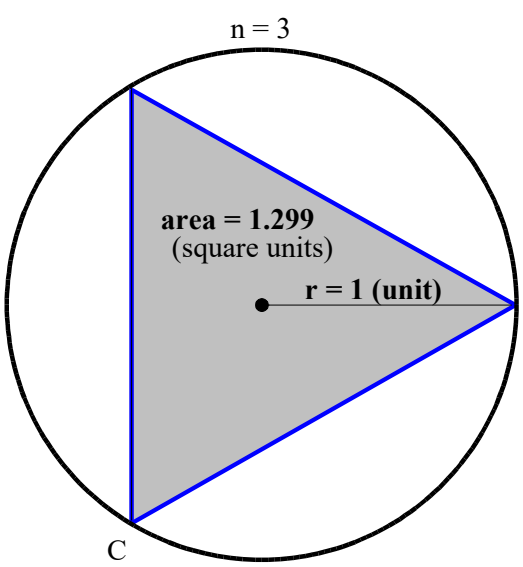
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

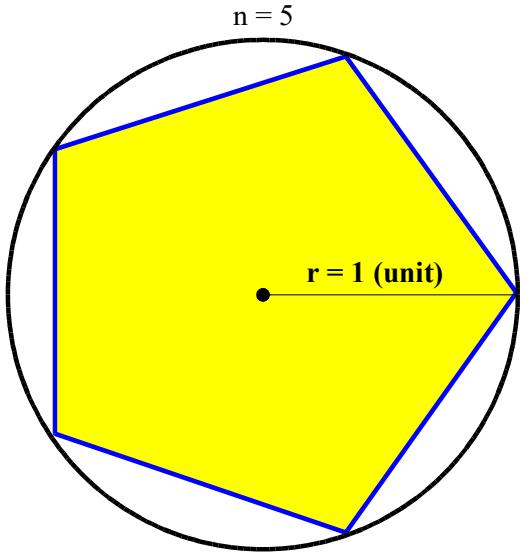
If r = 1, then the area of the circle is π.

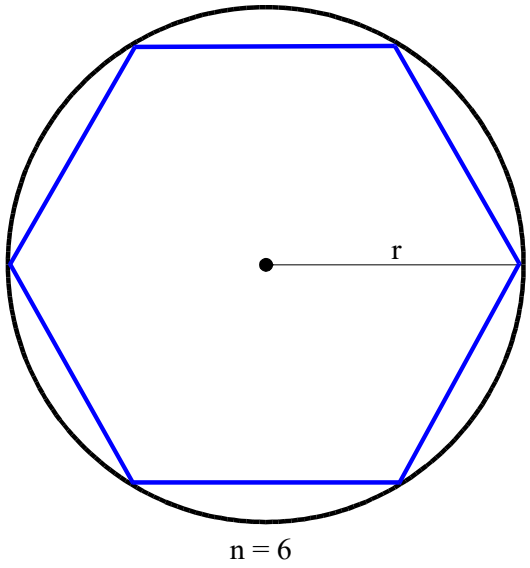
Now consider the area of the regular polygons if r = 1.

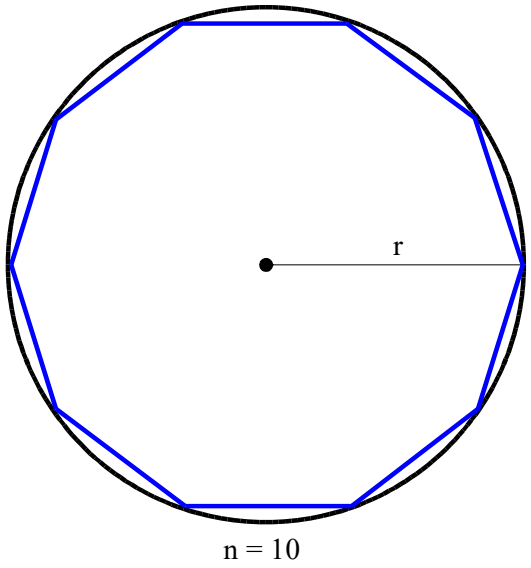
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	









The Value of π

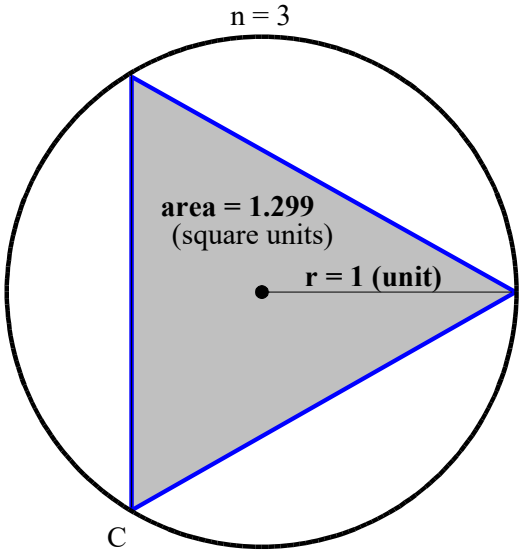
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

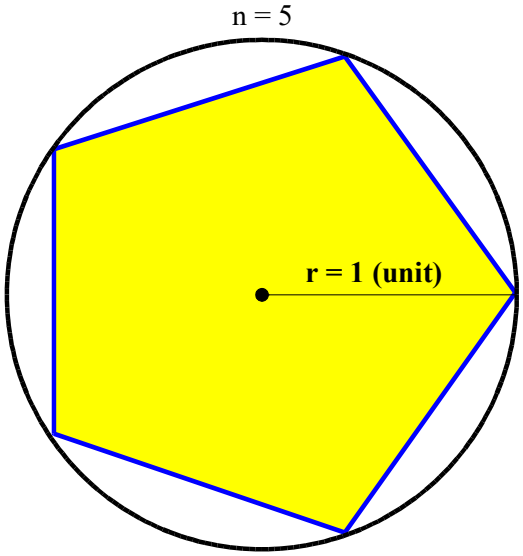
If r = 1, then the area of the circle is π.

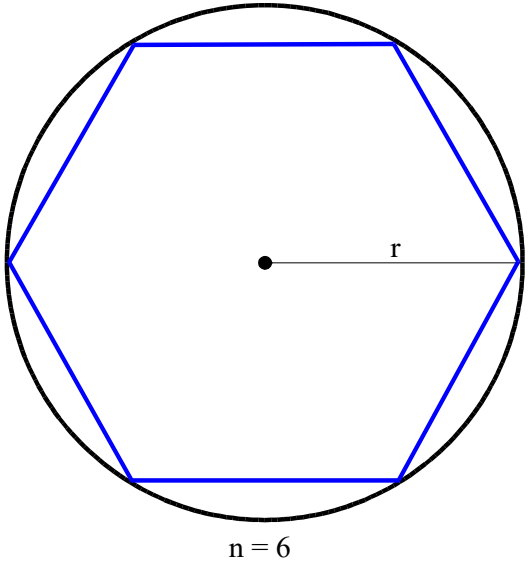
Now consider the area of the regular polygons if r = 1.

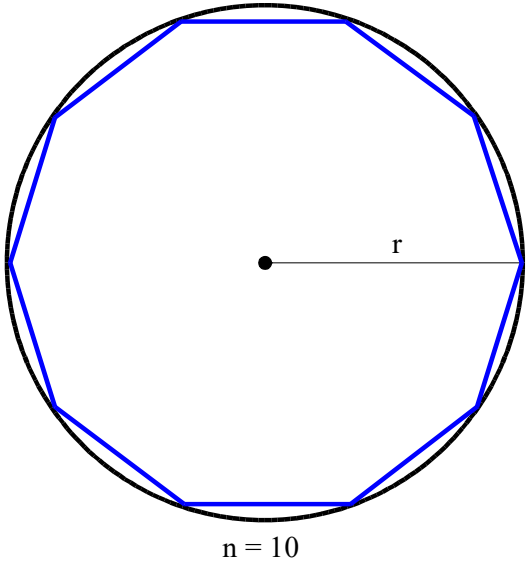
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378









The Value of π

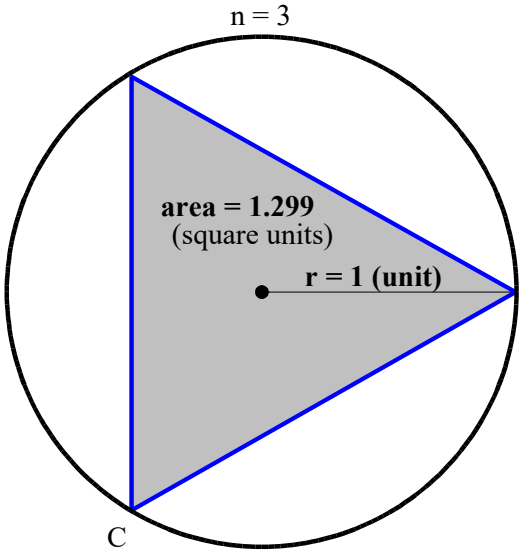
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

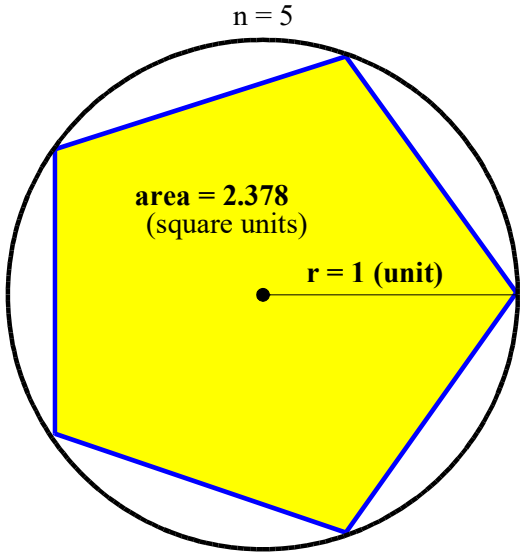
If r = 1, then the area of the circle is π.

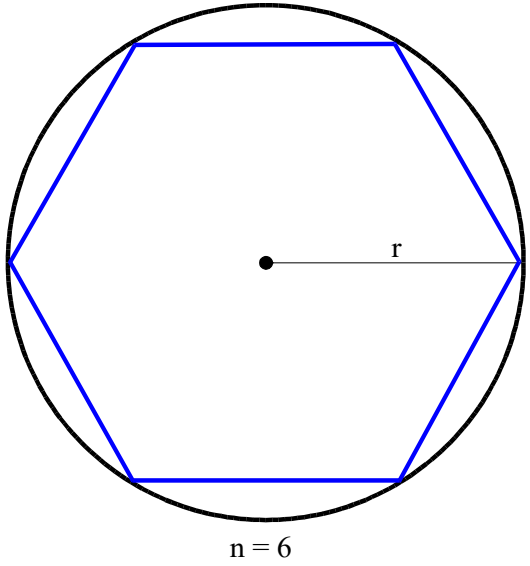
Now consider the area of the regular polygons if r = 1.

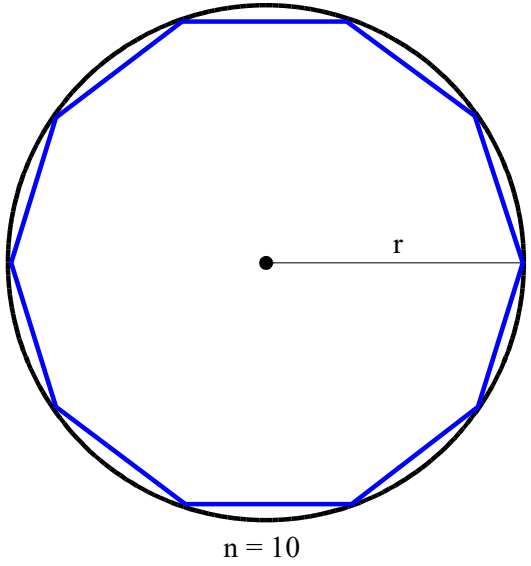
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378









The Value of π

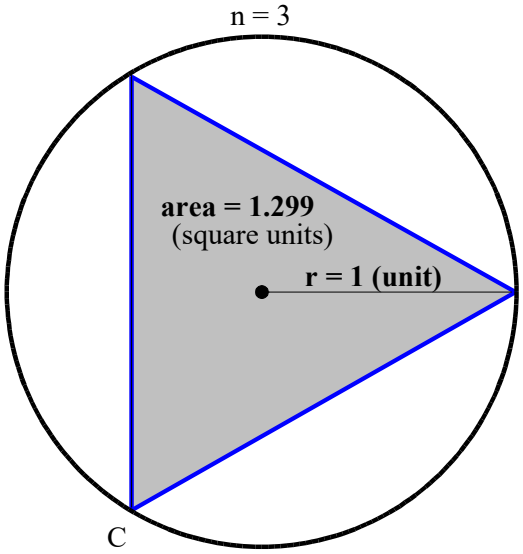
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

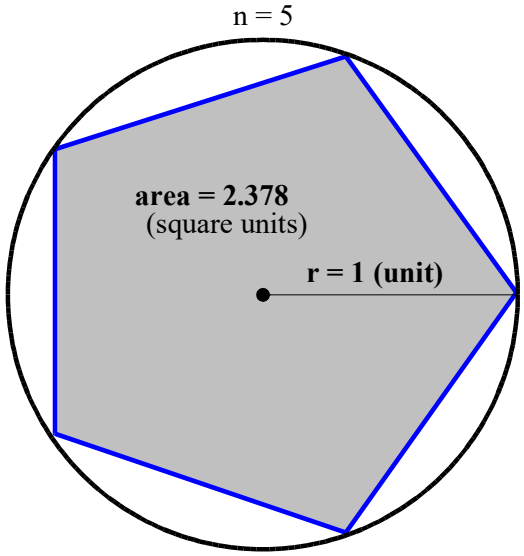
If r = 1, then the area of the circle is π.

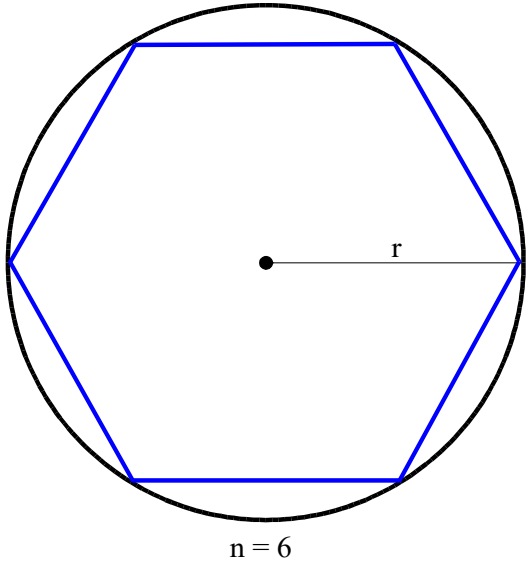
Now consider the area of the regular polygons if r = 1.

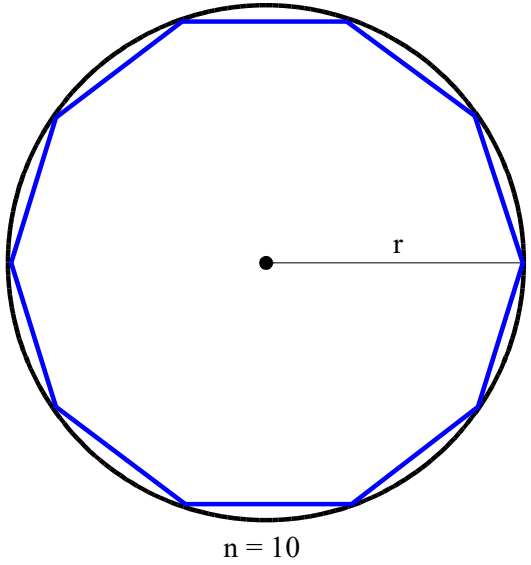
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378









The Value of π

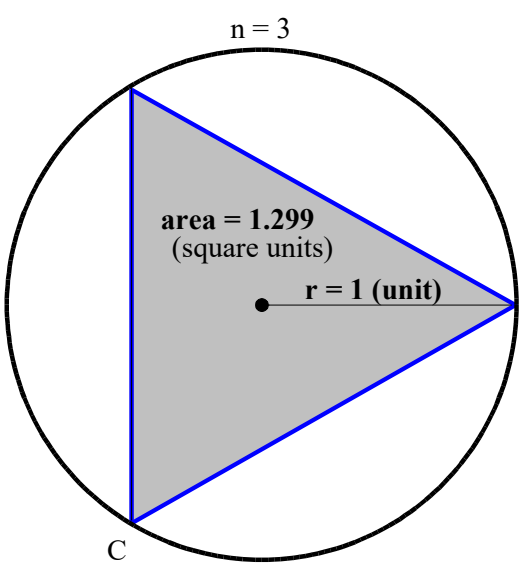
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

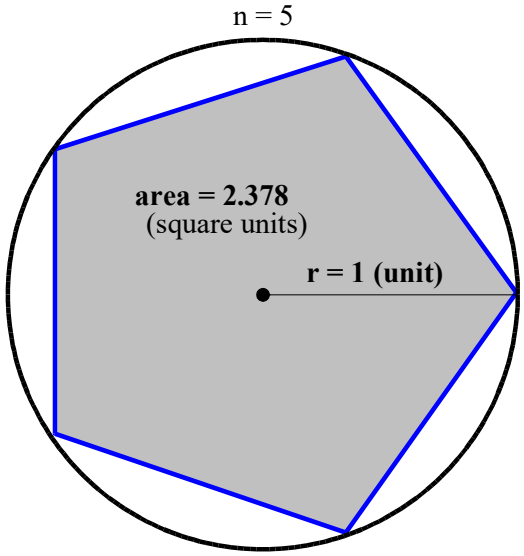
If r = 1, then the area of the circle is π.

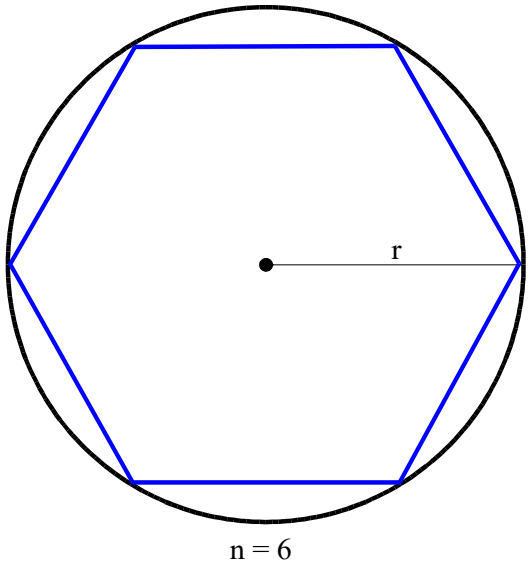
Now consider the area of the regular polygons if r = 1.

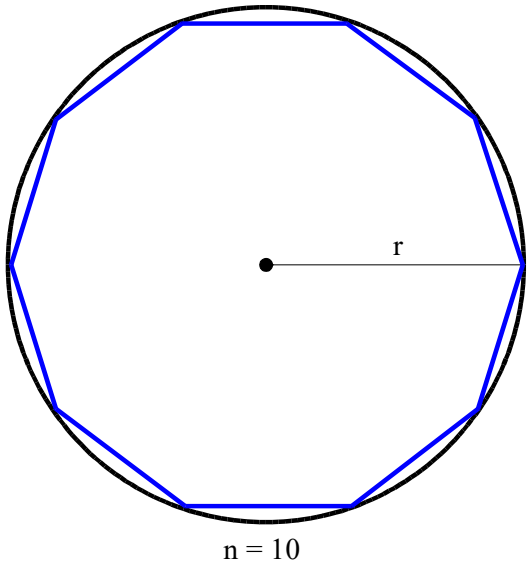
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	









The Value of π

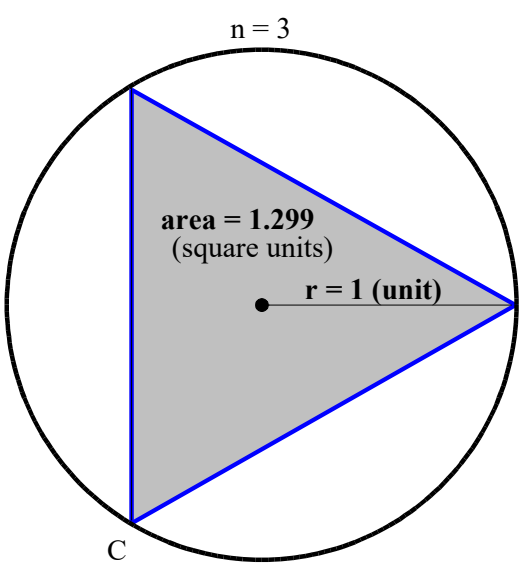
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

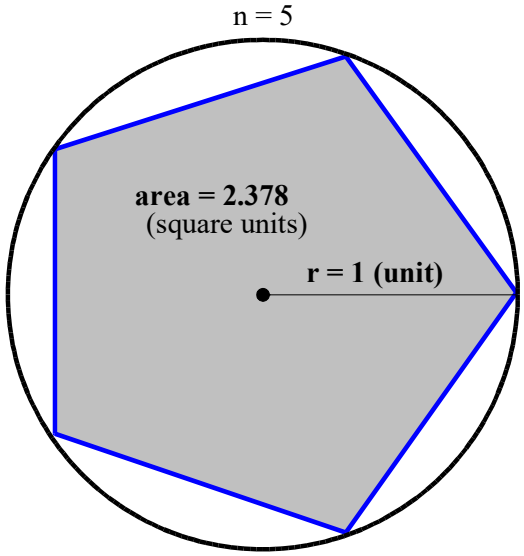
If r = 1, then the area of the circle is π.

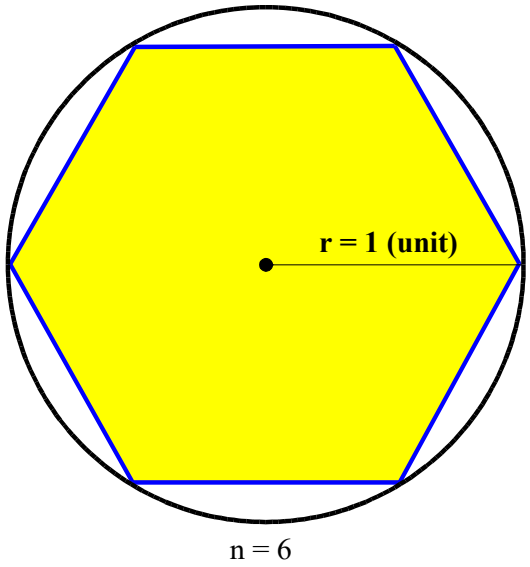
Now consider the area of the regular polygons if r = 1.

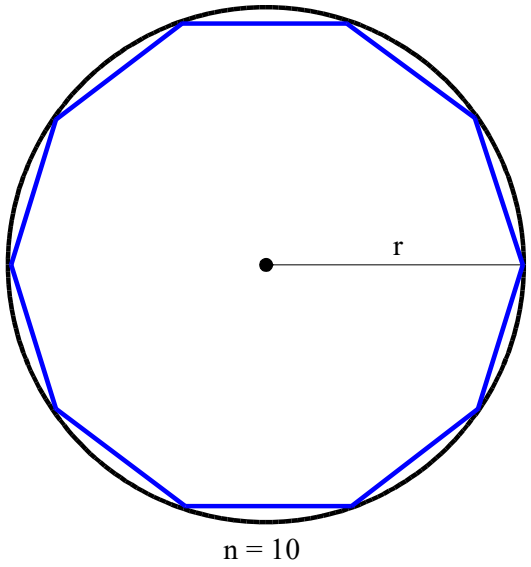
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	









The Value of π

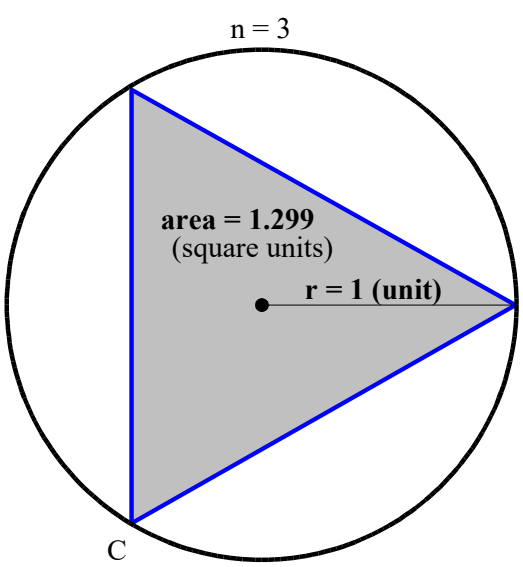
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

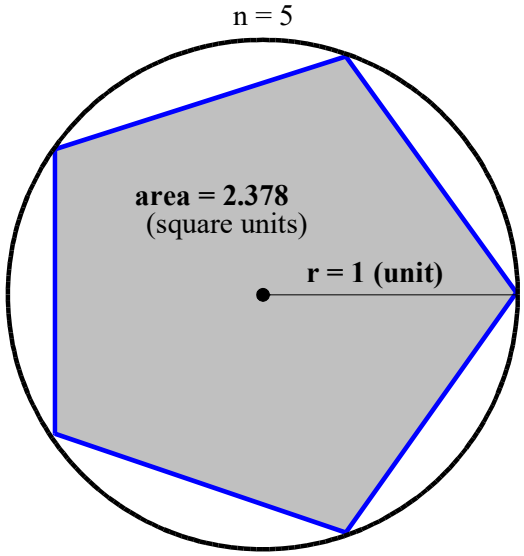
If r = 1, then the area of the circle is π.

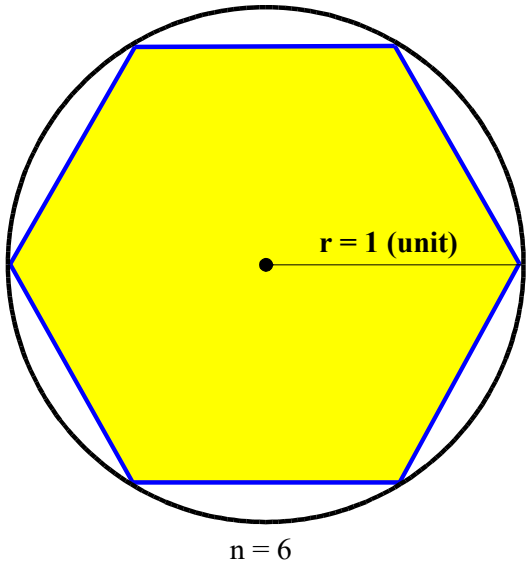
Now consider the area of the regular polygons if r = 1.

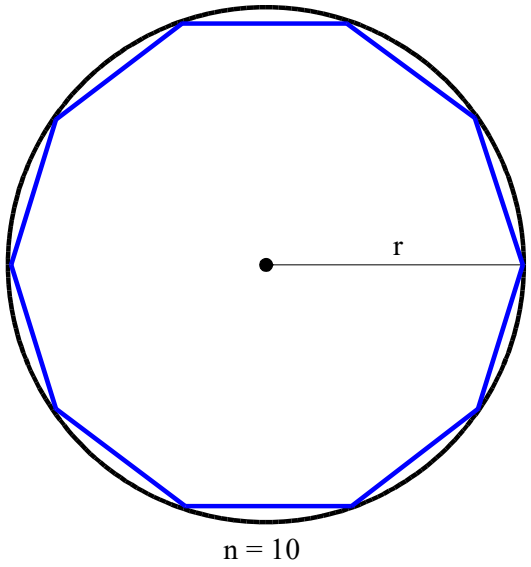
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	2.598









The Value of π

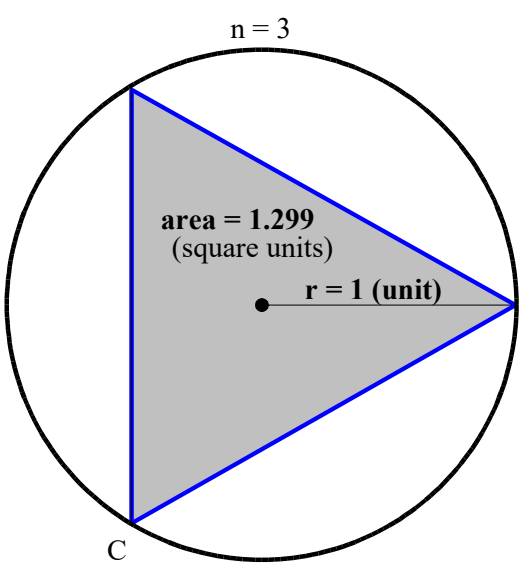
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

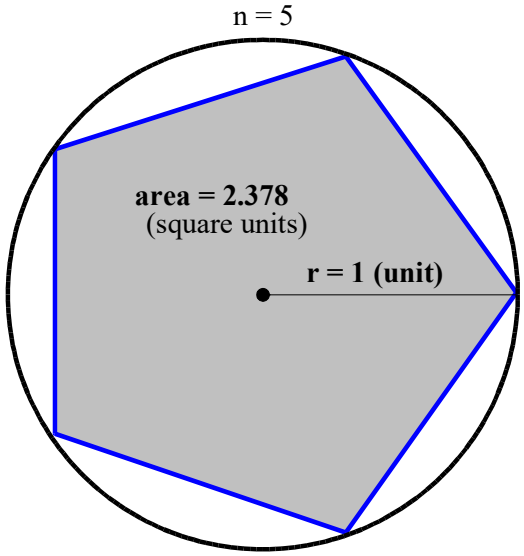
If r = 1, then the area of the circle is π.

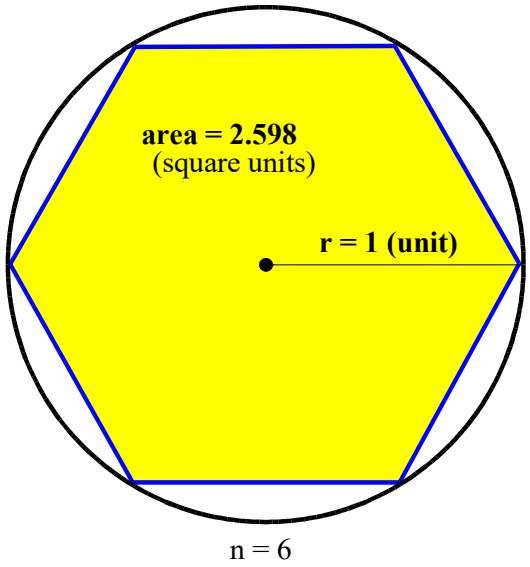
Now consider the area of the regular polygons if r = 1.

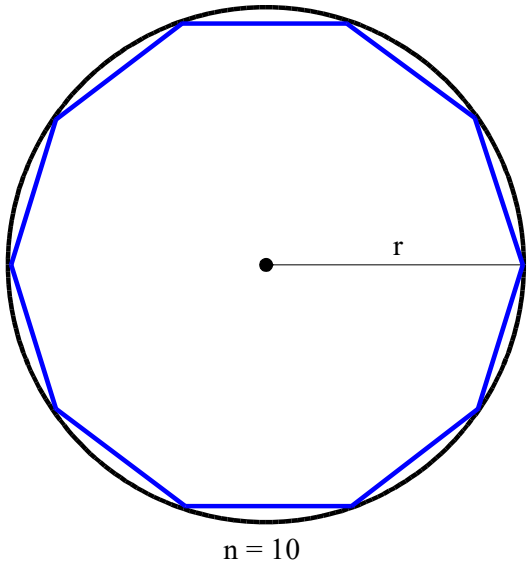
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	2.598









The Value of π

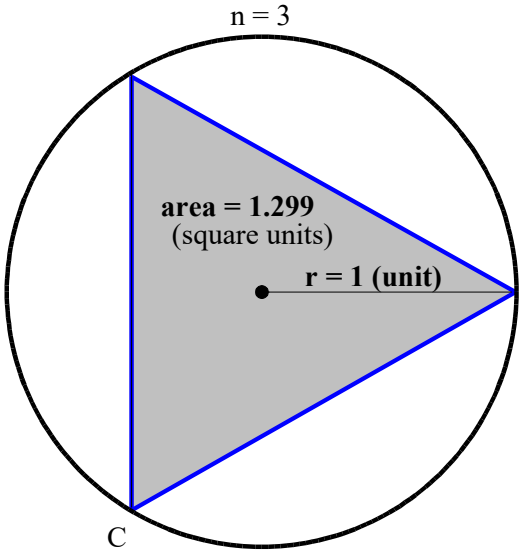
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

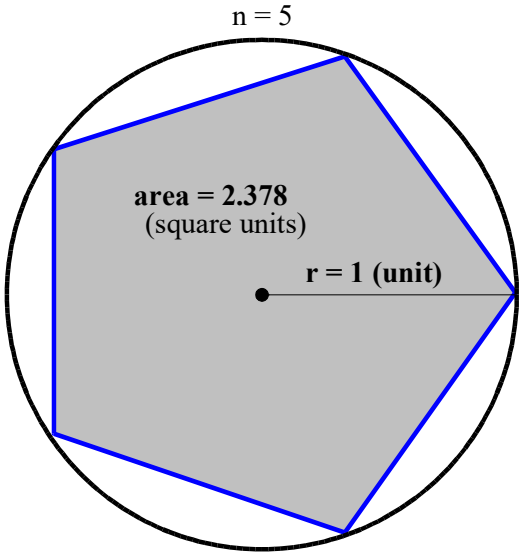
If r = 1, then the area of the circle is π.

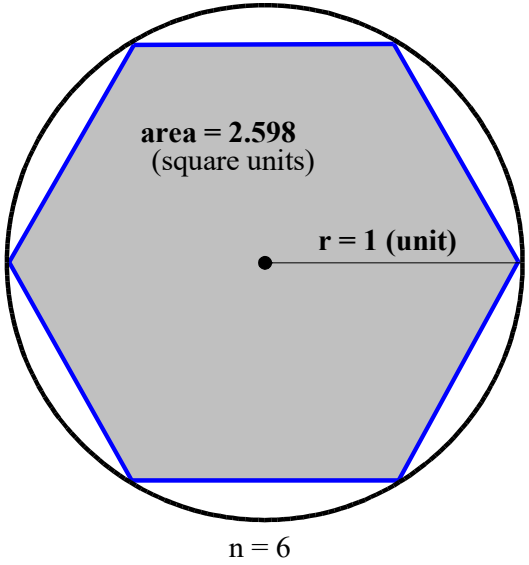
Now consider the area of the regular polygons if r = 1.

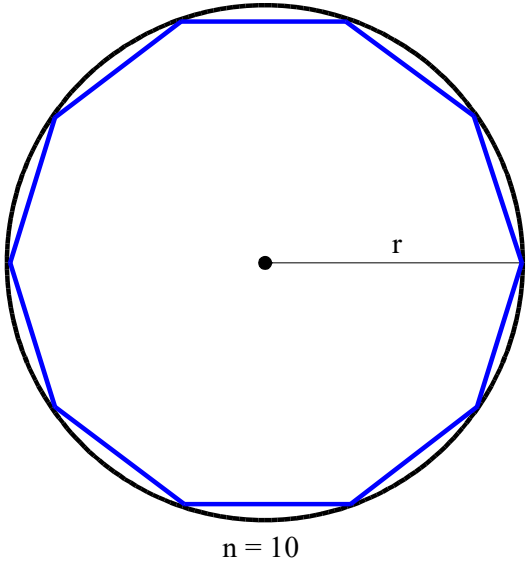
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	2.598









The Value of π

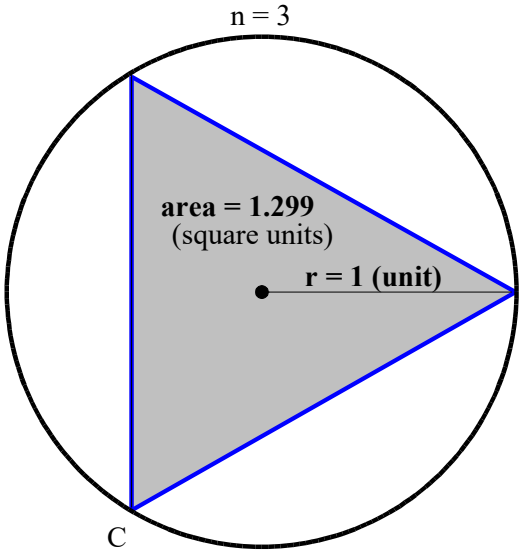
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

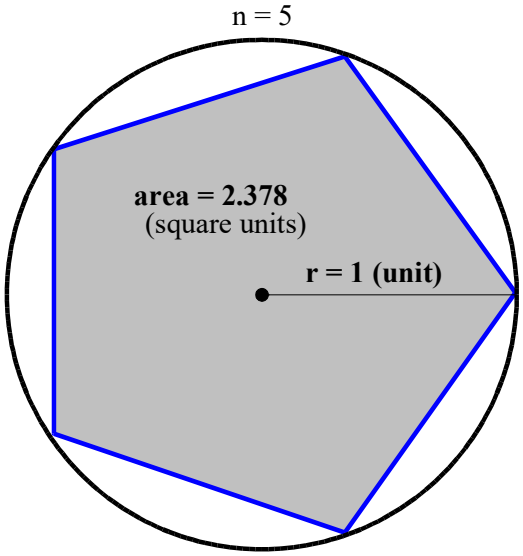
If r = 1, then the area of the circle is π.

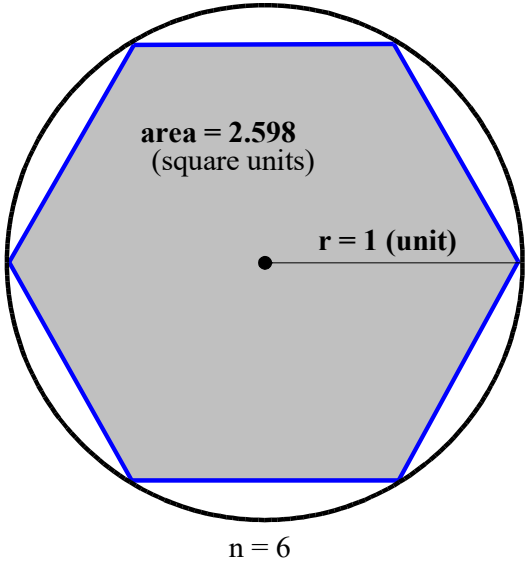
Now consider the area of the regular polygons if r = 1.

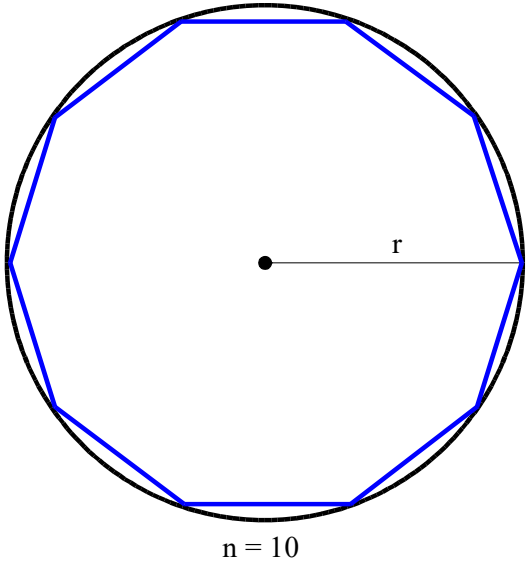
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	2.598
10	









The Value of π

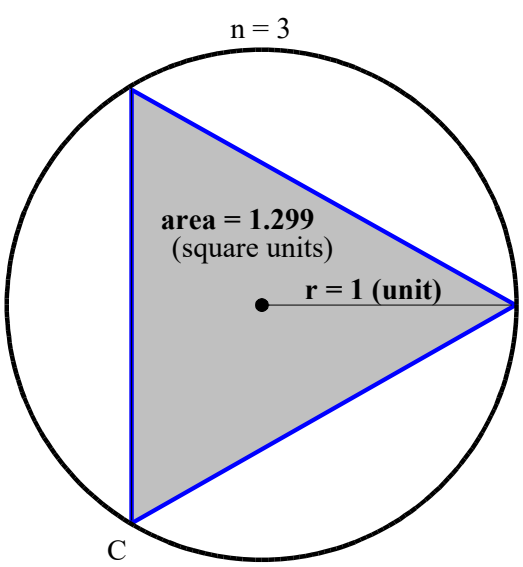
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

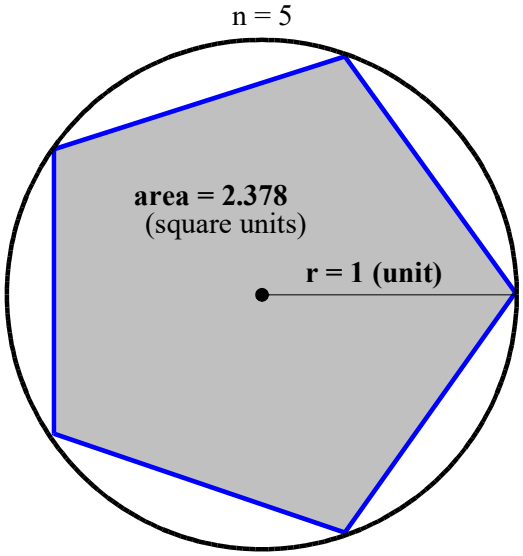
If r = 1, then the area of the circle is π.

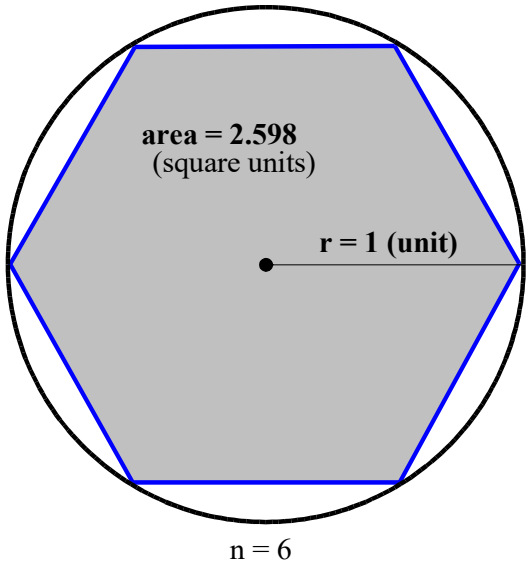
Now consider the area of the regular polygons if r = 1.

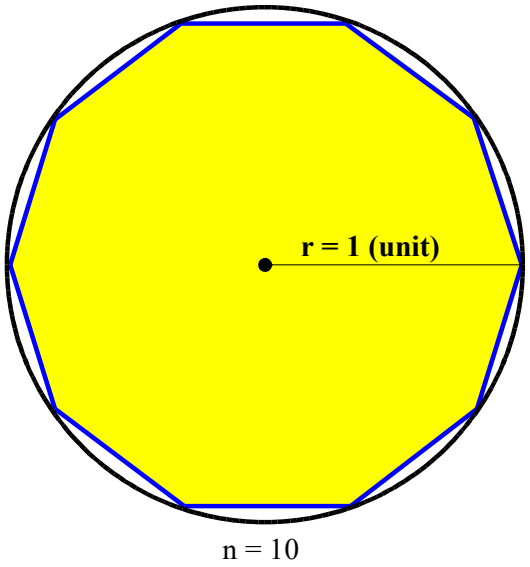
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	2.598
10	









The Value of π

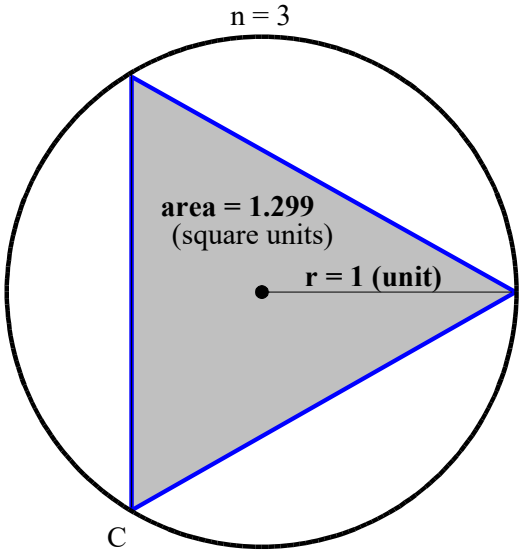
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

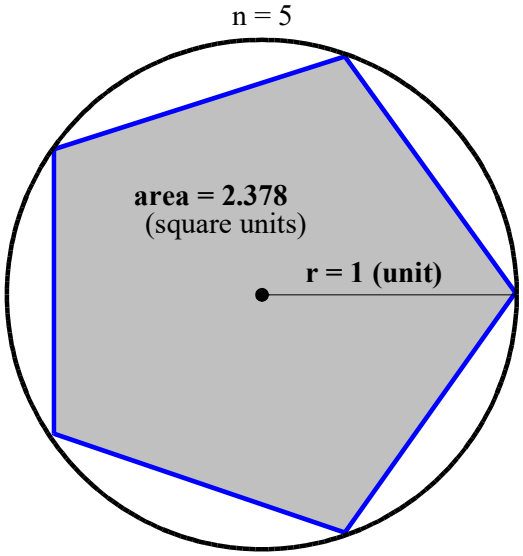
If r = 1, then the area of the circle is π.

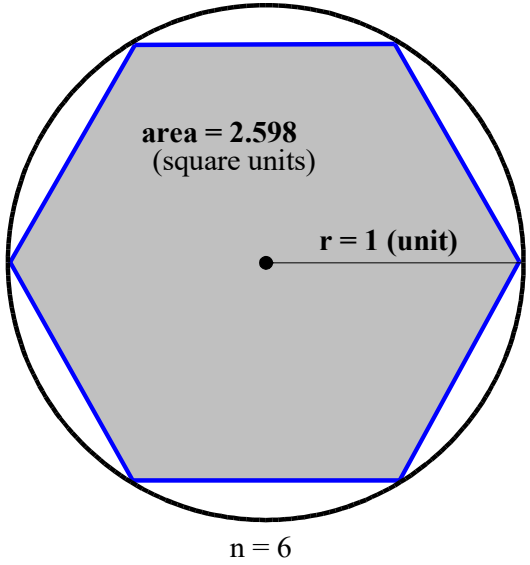
Now consider the area of the regular polygons if r = 1.

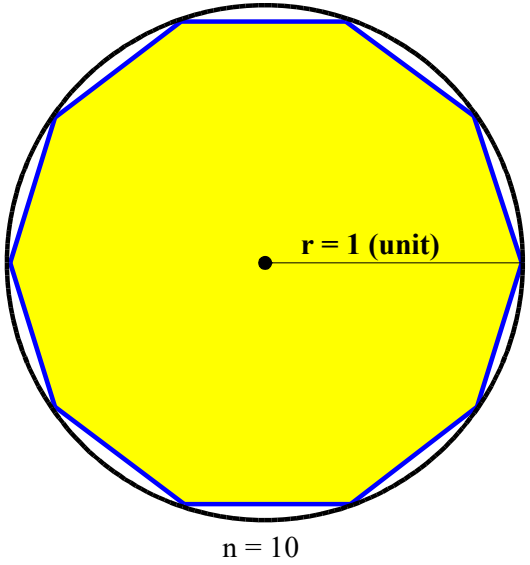
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	2.598
10	2.939









The Value of π

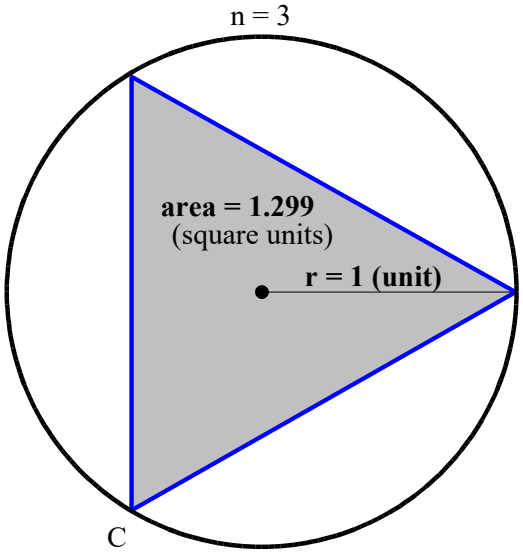
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

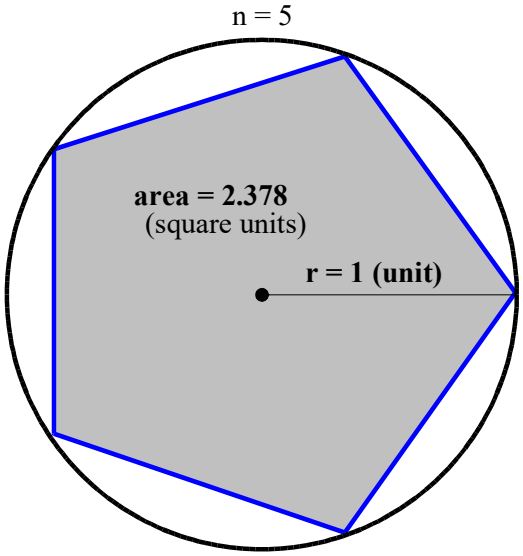
If r = 1, then the area of the circle is π.

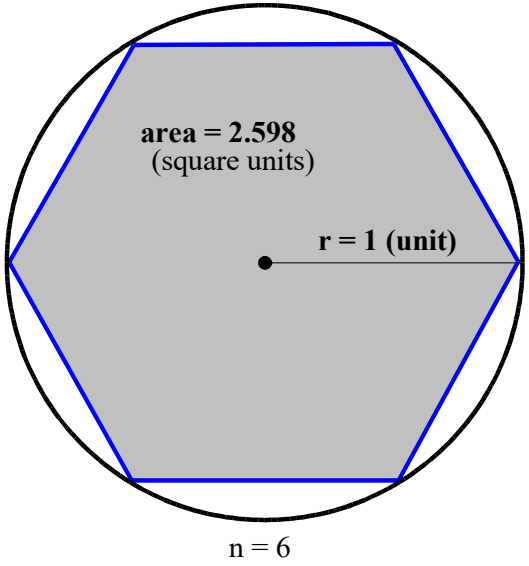
Now consider the area of the regular polygons if r = 1.

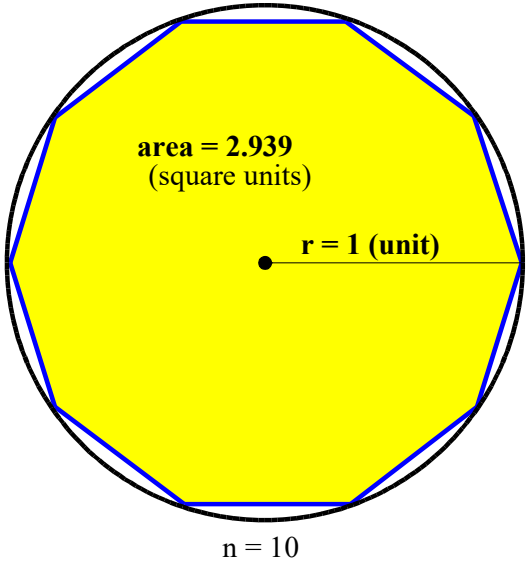
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	2.598
10	2.939









The Value of π

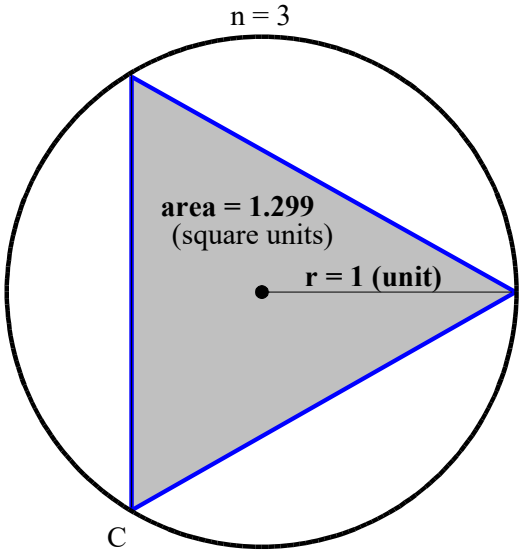
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

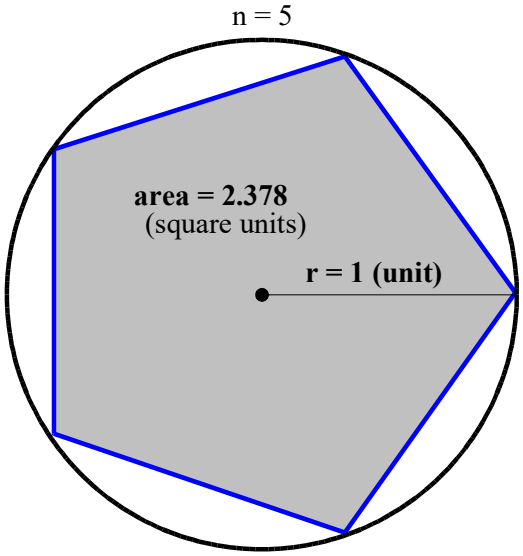
If r = 1, then the area of the circle is π.

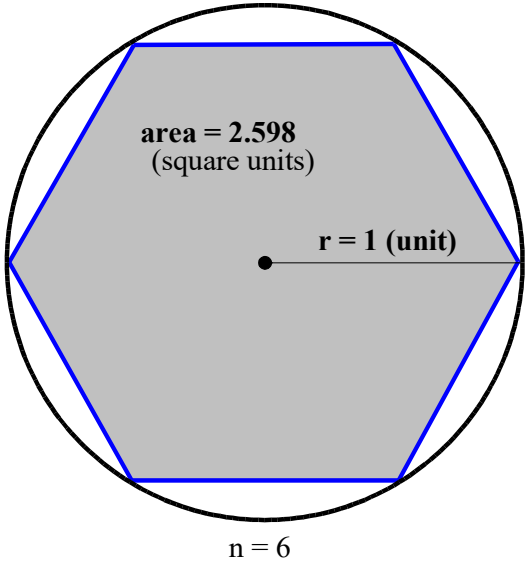
Now consider the area of the regular polygons if r = 1.

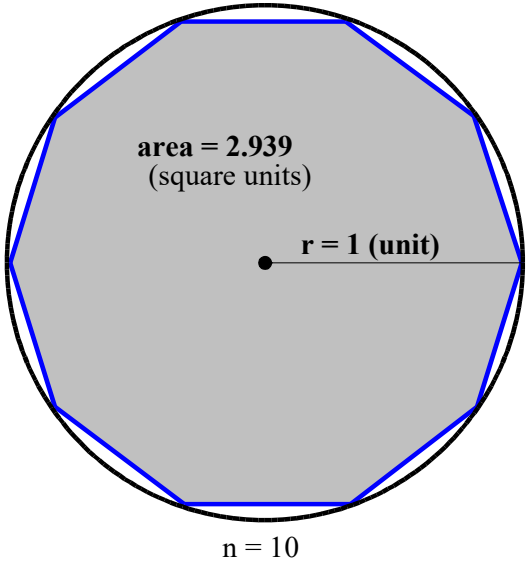
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	2.598
10	2.939









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

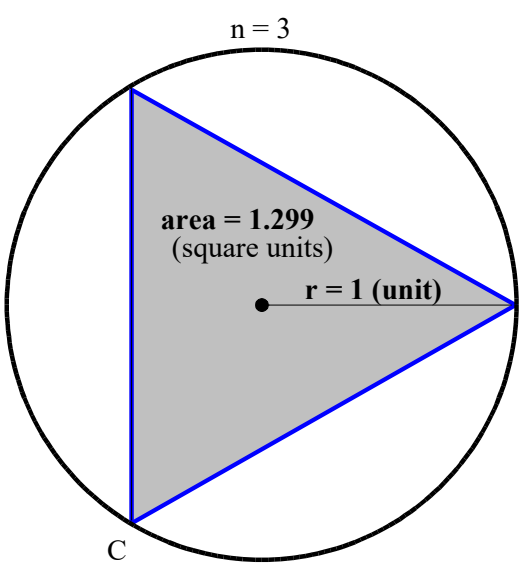
If r = 1, then the area of the circle is π.

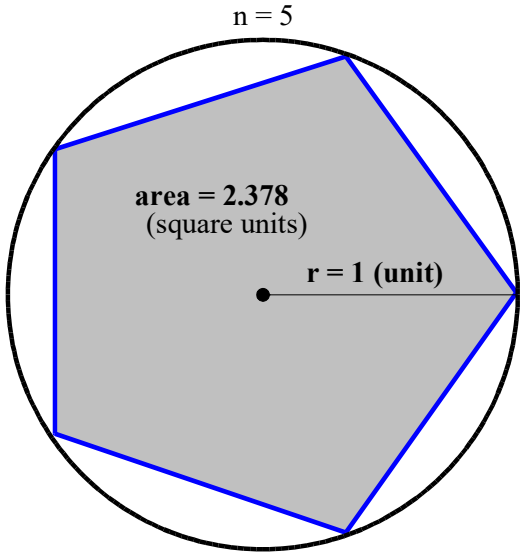
Now consider the area of the regular polygons if r = 1.

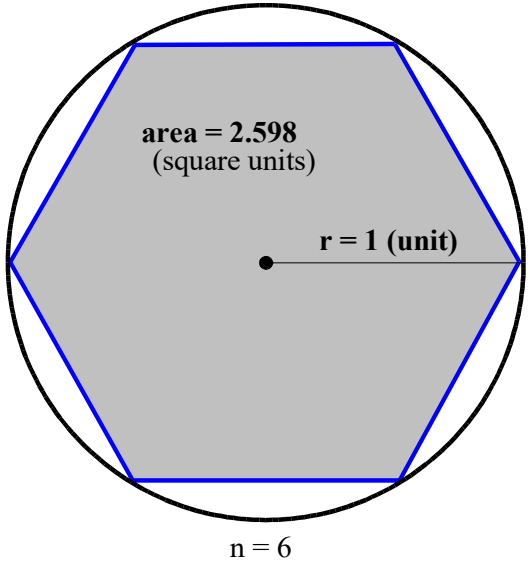
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

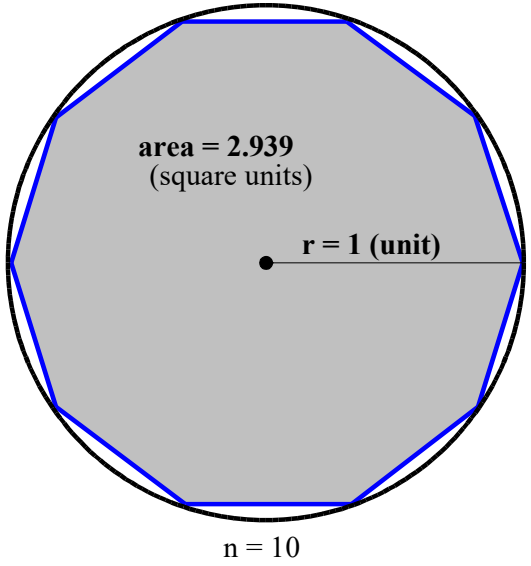
n	area
3	1.299
5	2.378
6	2.598
10	2.939

increasing









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

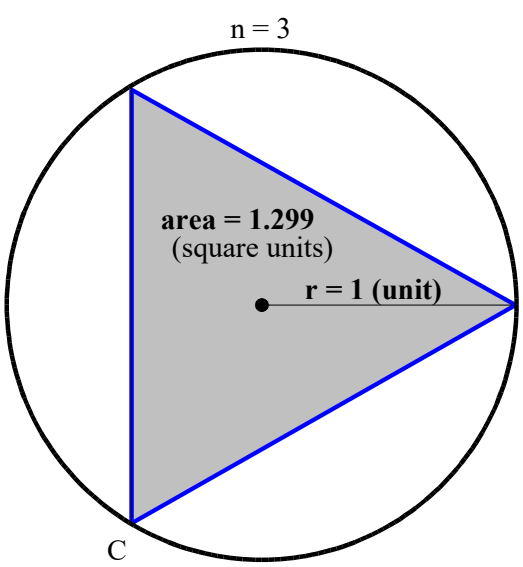
If r = 1, then the area of the circle is π.

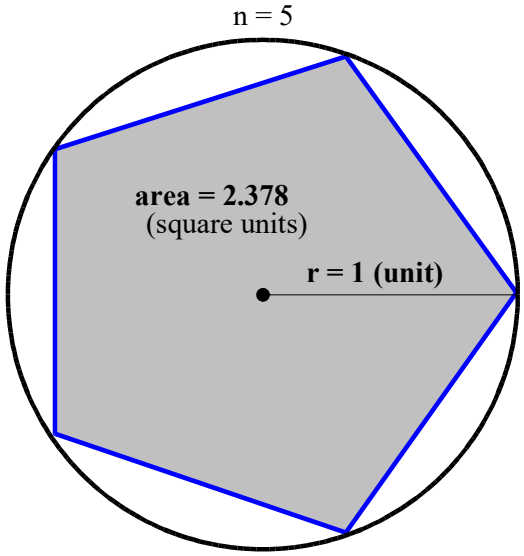
Now consider the area of the regular polygons if r = 1.

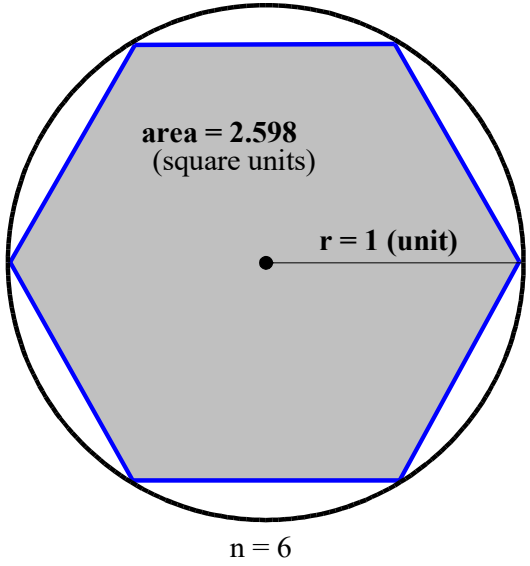
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

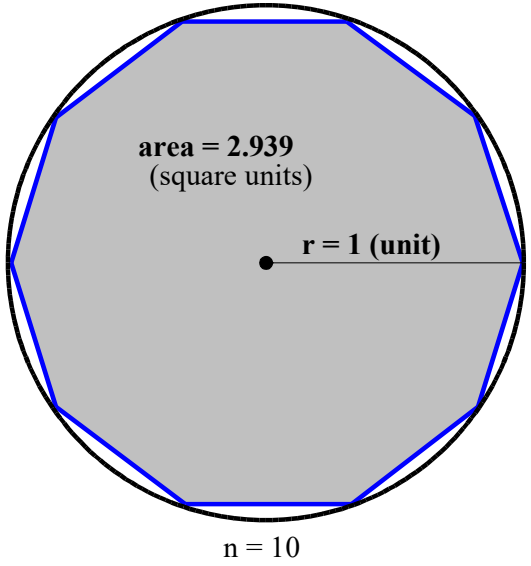
n	area
3	1.299
5	2.378
6	2.598
10	2.939

increasing (as expected)









The Value of π

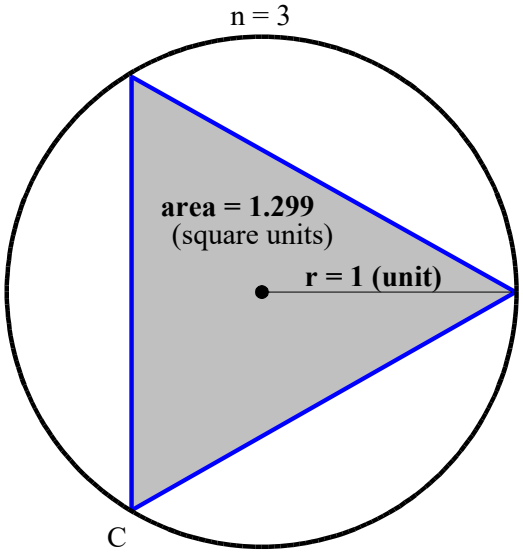
Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

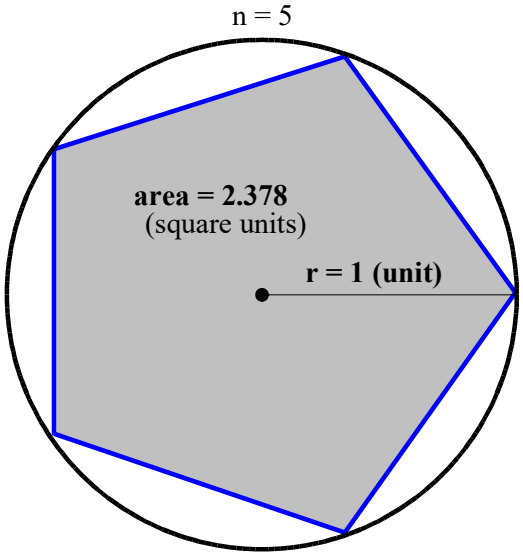
If r = 1, then the area of the circle is π.

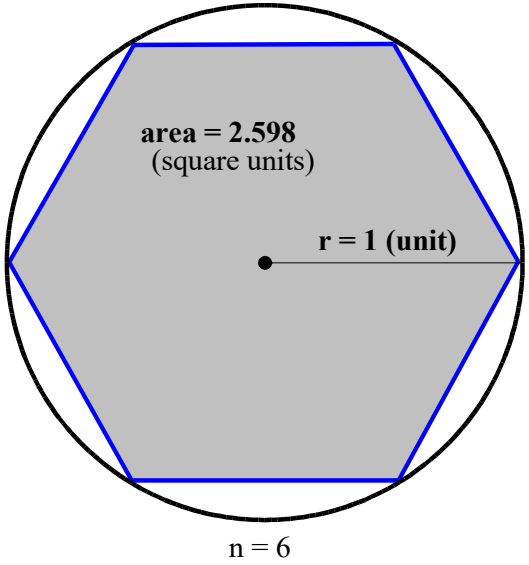
Now consider the area of the regular polygons if r = 1.

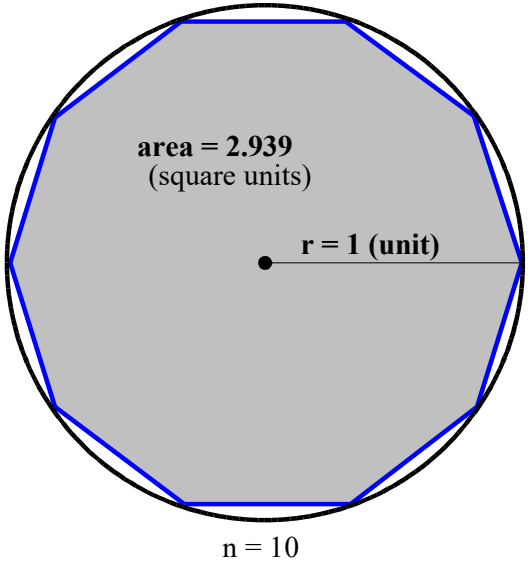
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

n	area
3	1.299
5	2.378
6	2.598
10	2.939









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

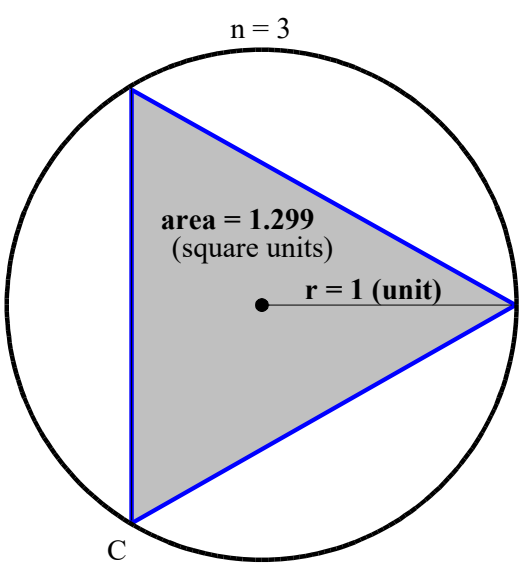
If r = 1, then the area of the circle is π.

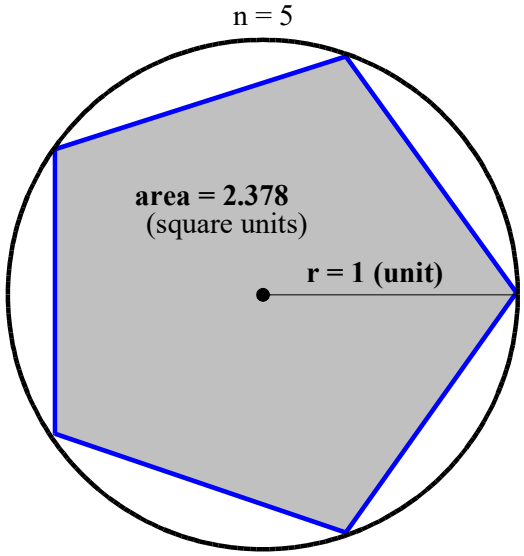
Now consider the area of the regular polygons if r = 1.

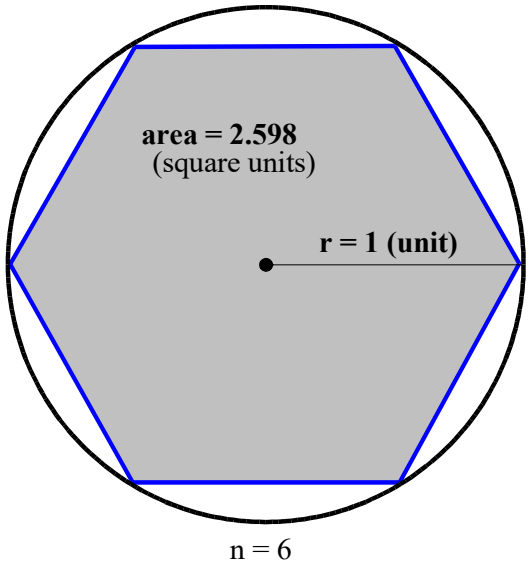
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

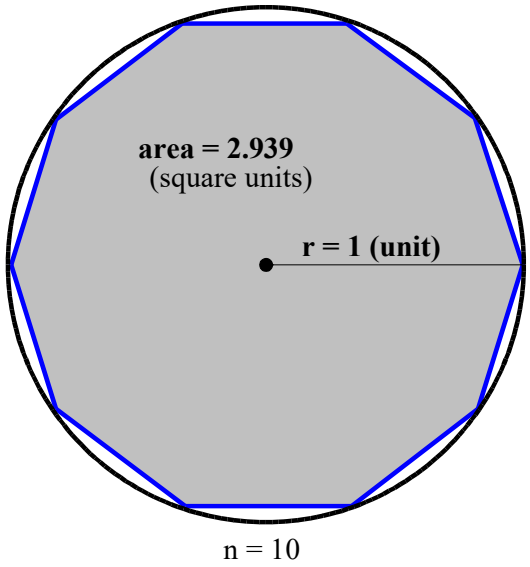
n	area
3	1.299
5	2.378
6	2.598
10	2.939

n	area









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

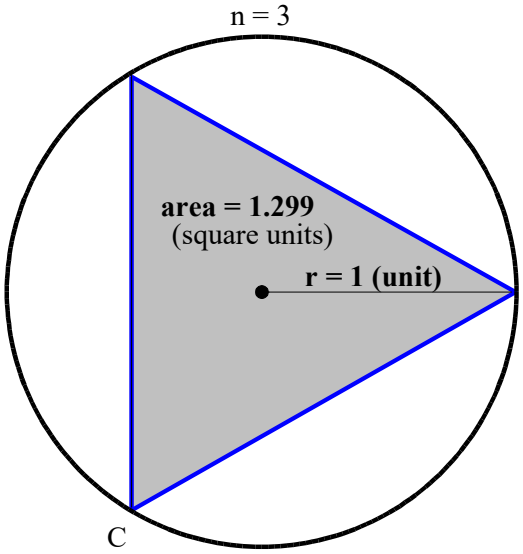
If r = 1, then the area of the circle is π.

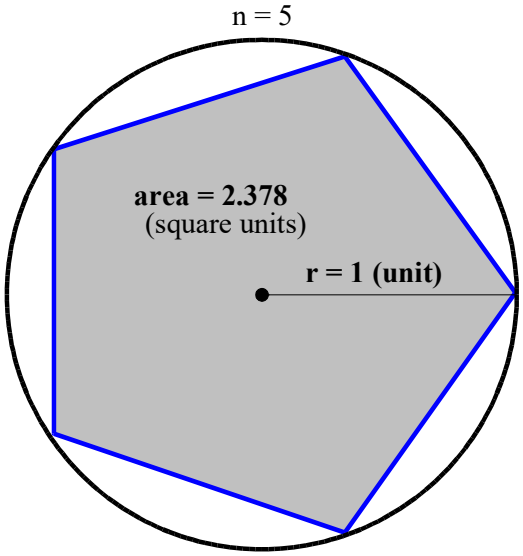
Now consider the area of the regular polygons if r = 1.

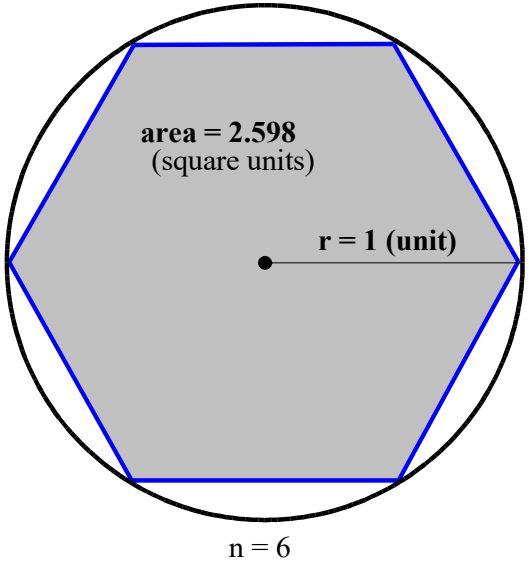
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

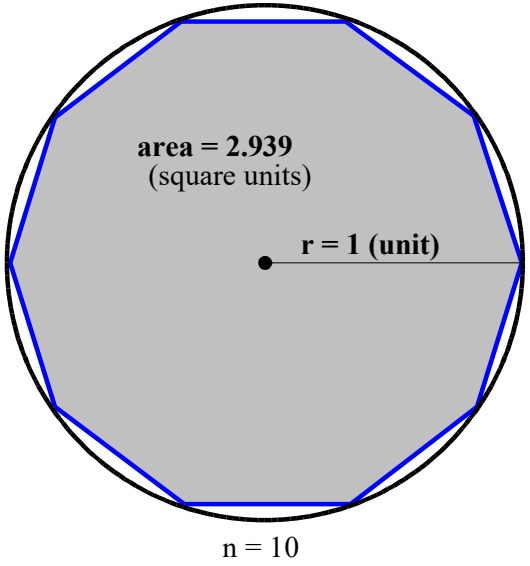
n	area
3	1.299
5	2.378
6	2.598
10	2.939

n	area
20	









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

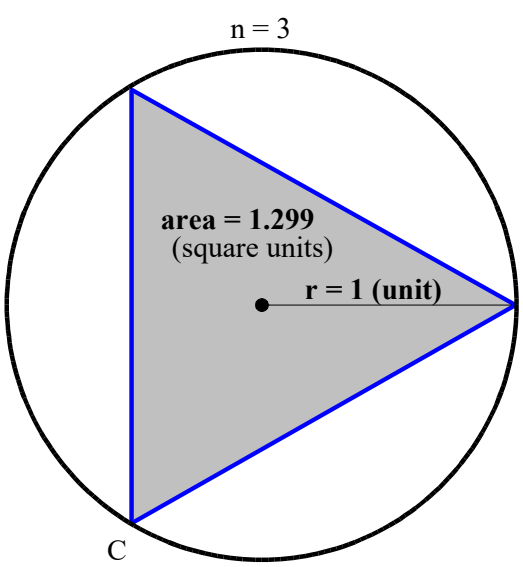
If r = 1, then the area of the circle is π.

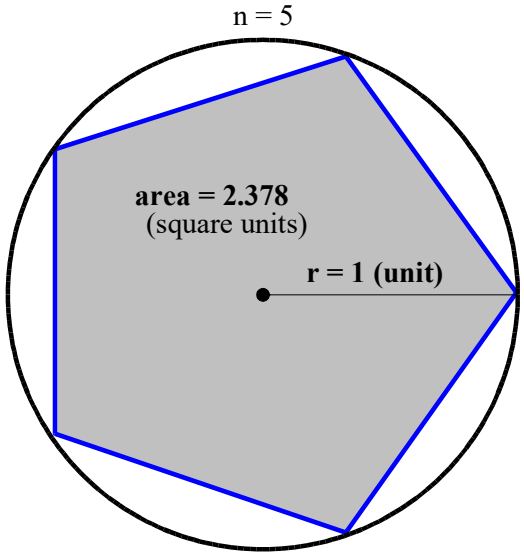
Now consider the area of the regular polygons if r = 1.

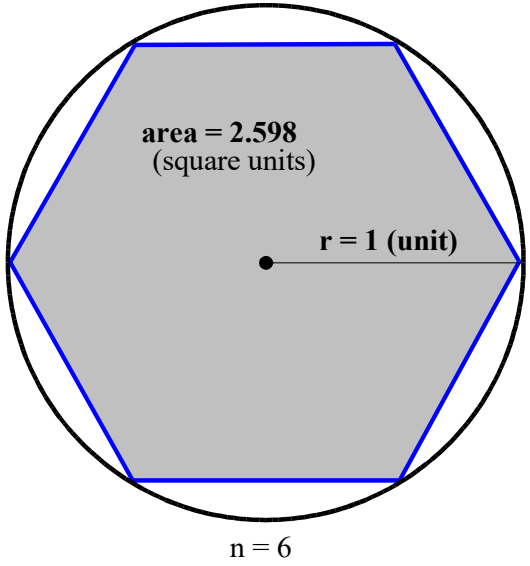
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

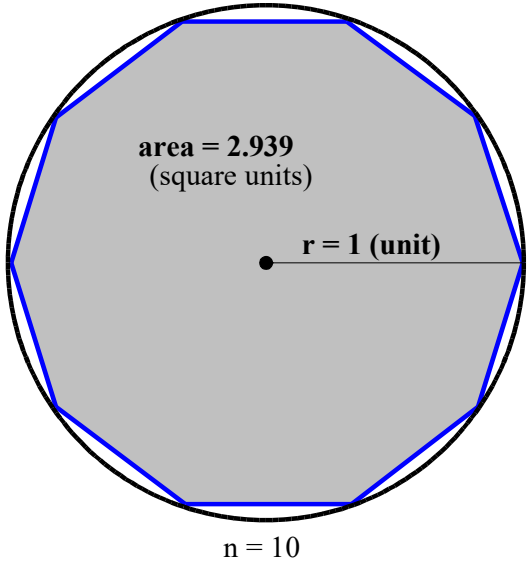
n	area
3	1.299
5	2.378
6	2.598
10	2.939

n	area
20	3.0902









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

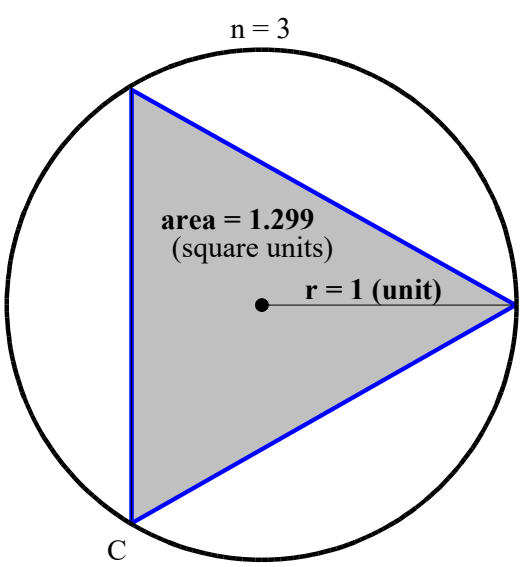
If r = 1, then the area of the circle is π.

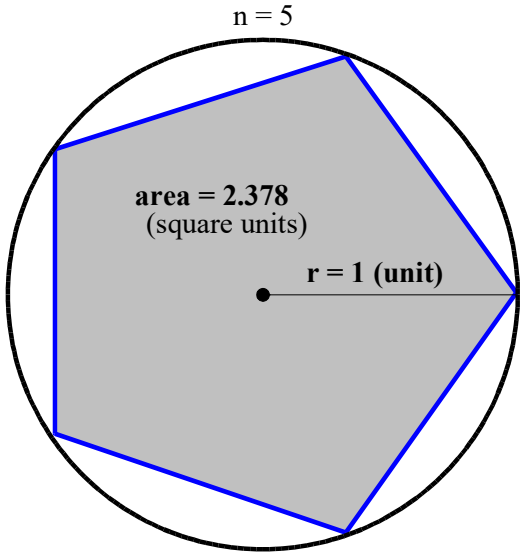
Now consider the area of the regular polygons if r = 1.

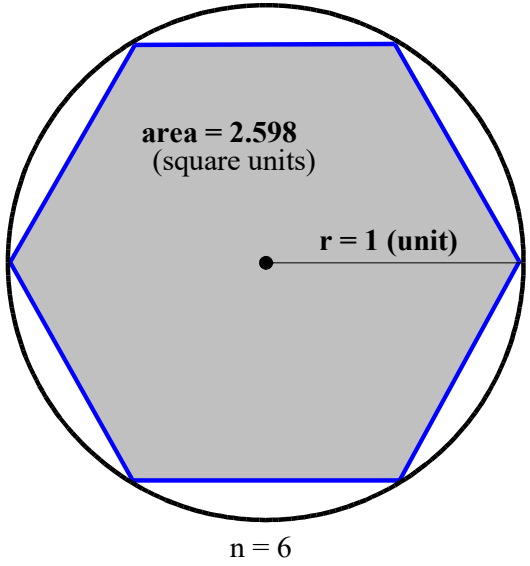
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

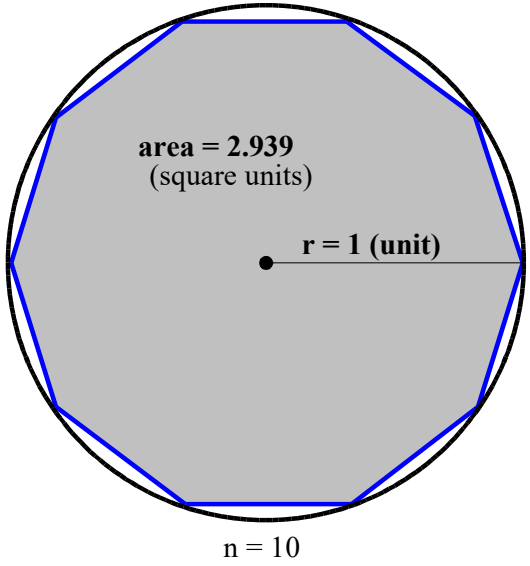
n	area
3	1.299
5	2.378
6	2.598
10	2.939

n	area
20	3.0902
50	









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

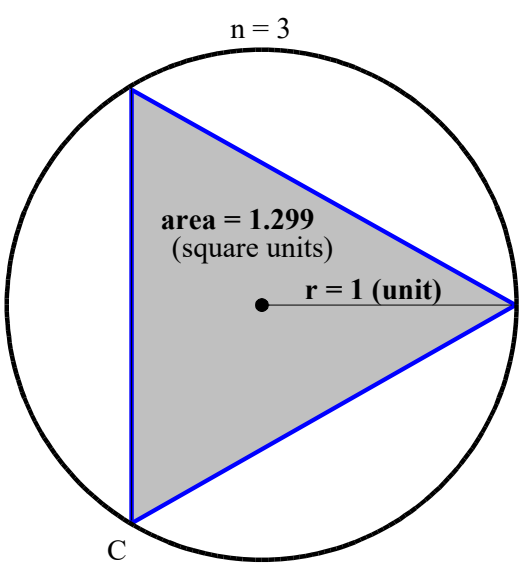
If r = 1, then the area of the circle is π.

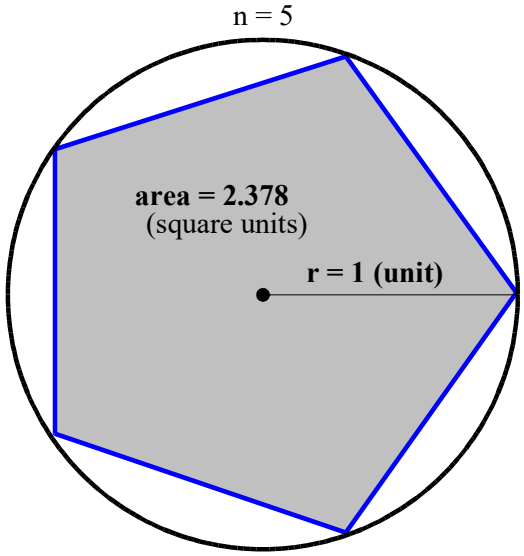
Now consider the area of the regular polygons if r = 1.

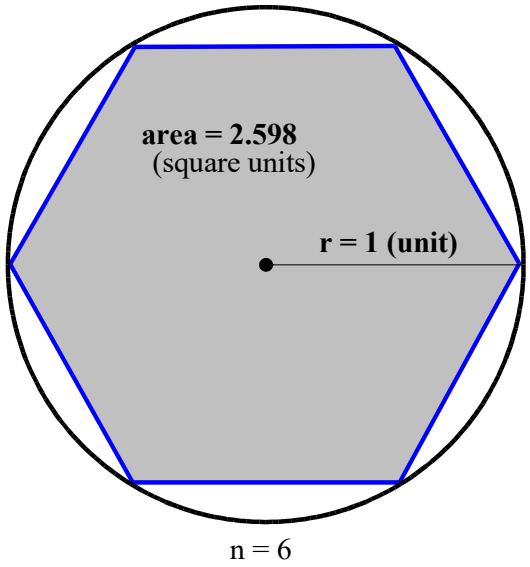
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

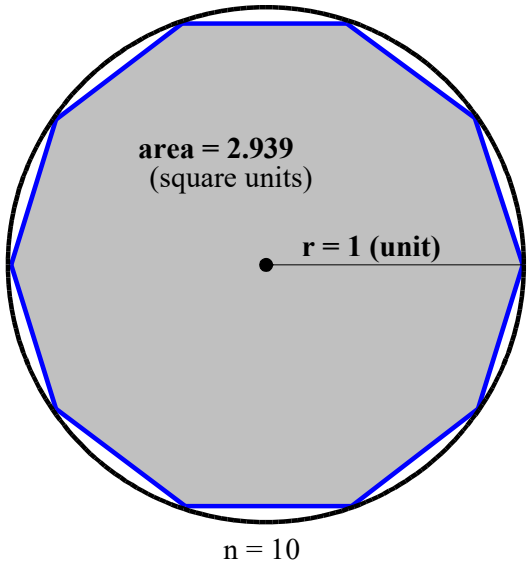
n	area
3	1.299
5	2.378
6	2.598
10	2.939

n	area
20	3.0902
50	3.1333









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

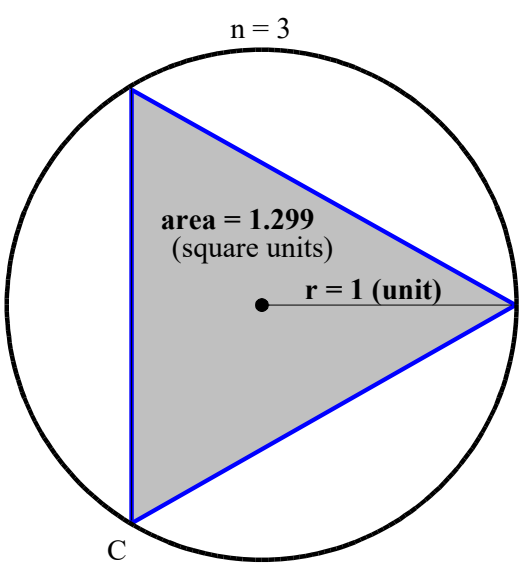
If r = 1, then the area of the circle is π.

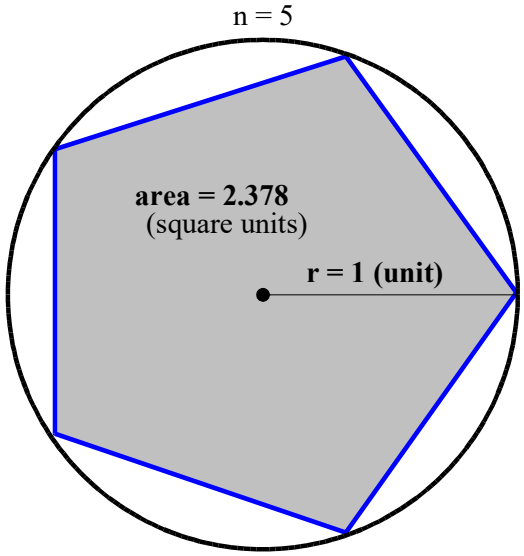
Now consider the area of the regular polygons if r = 1.

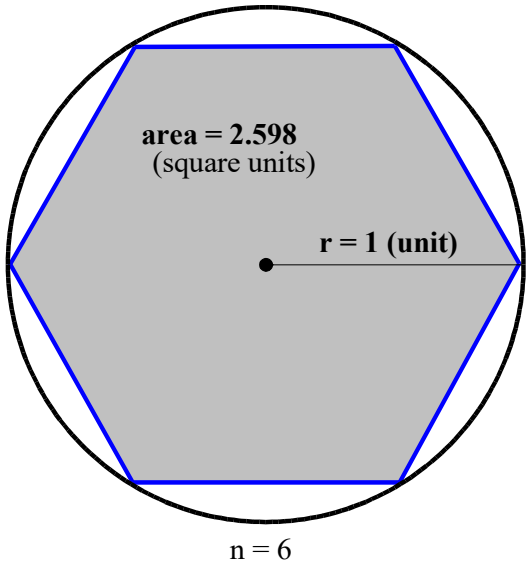
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

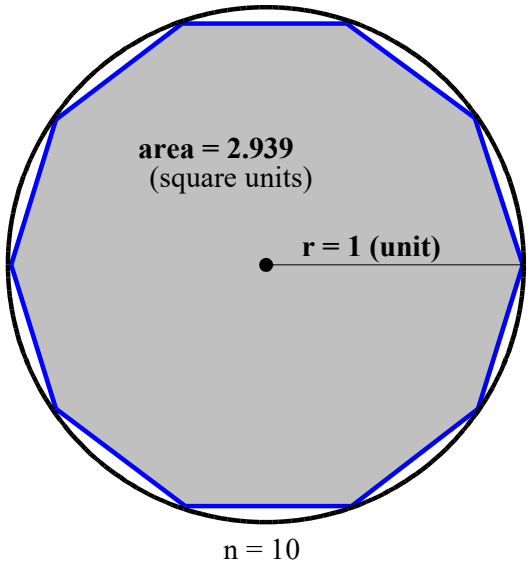
n	area
3	1.299
5	2.378
6	2.598
10	2.939

n	area
20	3.0902
50	3.1333
100	









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

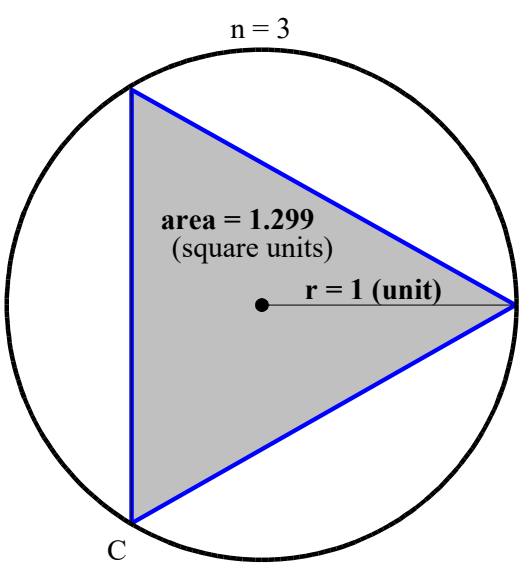
If r = 1, then the area of the circle is π.

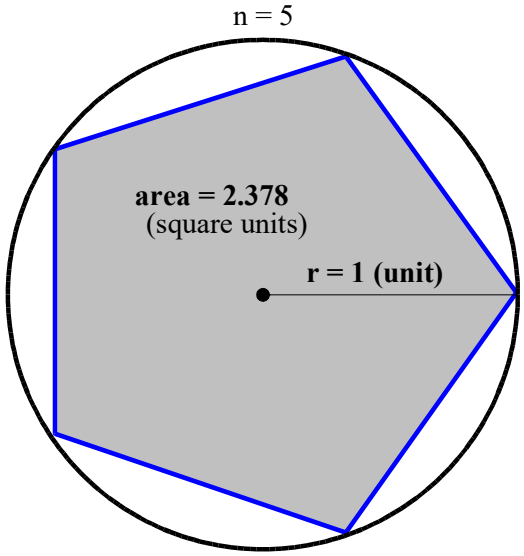
Now consider the area of the regular polygons if r = 1.

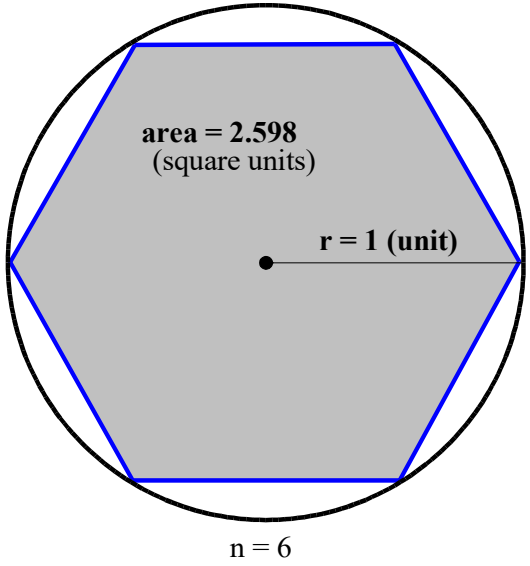
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

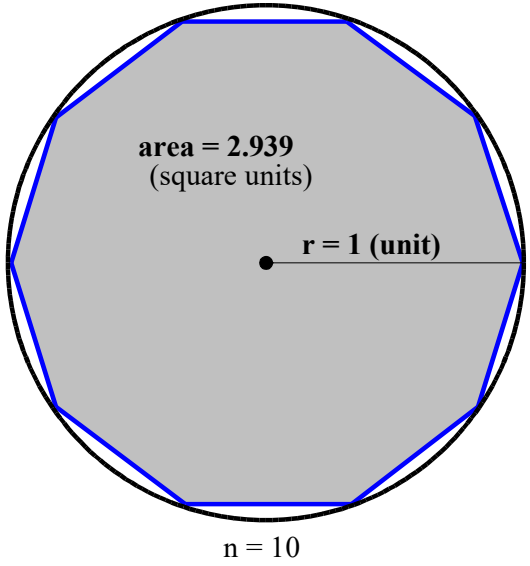
n	area
3	1.299
5	2.378
6	2.598
10	2.939

n	area
20	3.0902
50	3.1333
100	3.1395









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

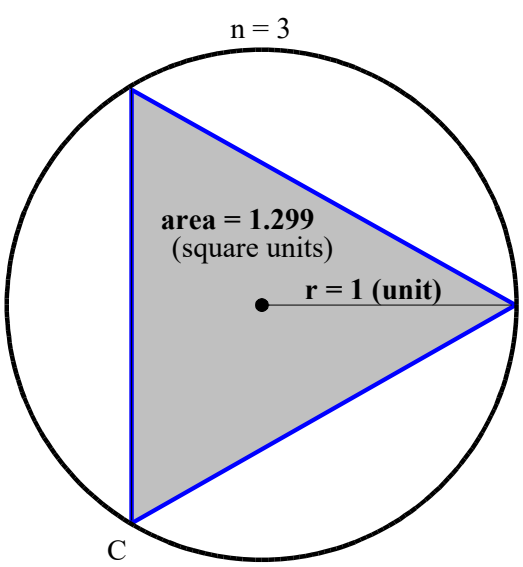
If r = 1, then the area of the circle is π.

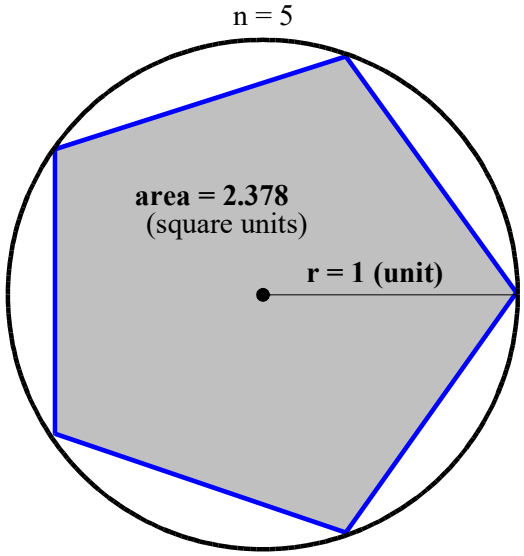
Now consider the area of the regular polygons if r = 1.

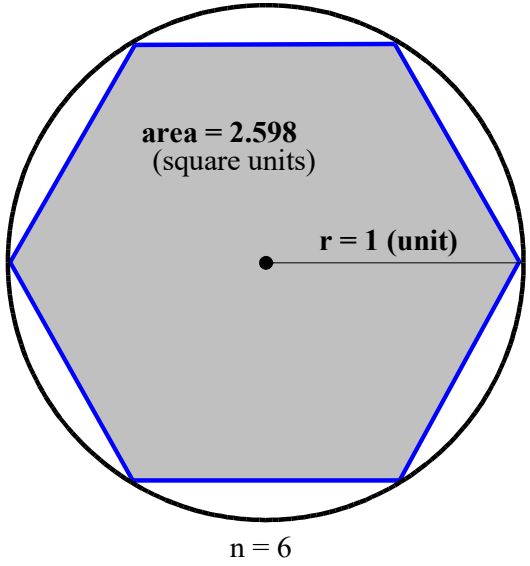
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

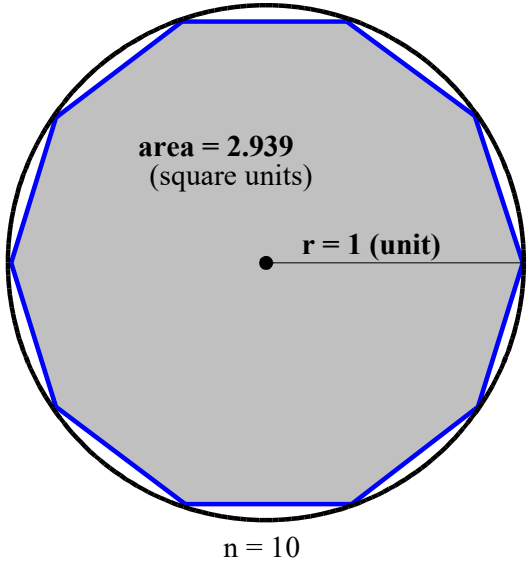
n	area
3	1.299
5	2.378
6	2.598
10	2.939

n	area
20	3.0902
50	3.1333
100	3.1395
1000	









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

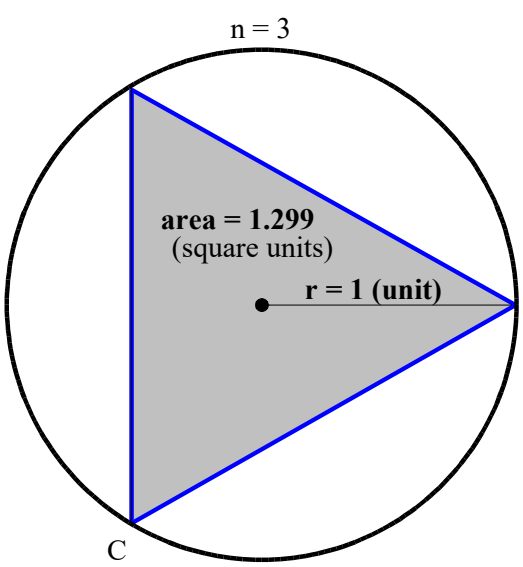
If r = 1, then the area of the circle is π.

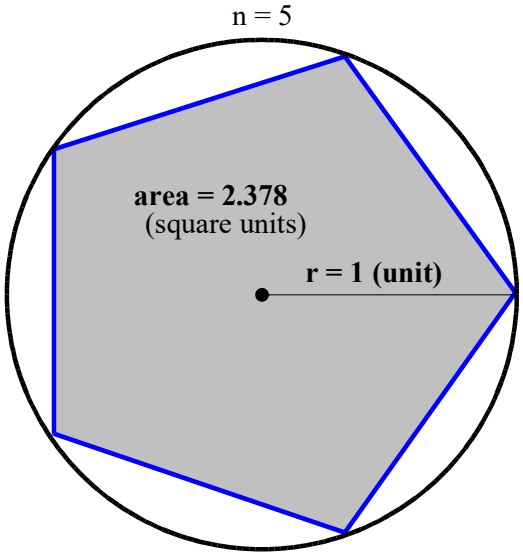
Now consider the area of the regular polygons if r = 1.

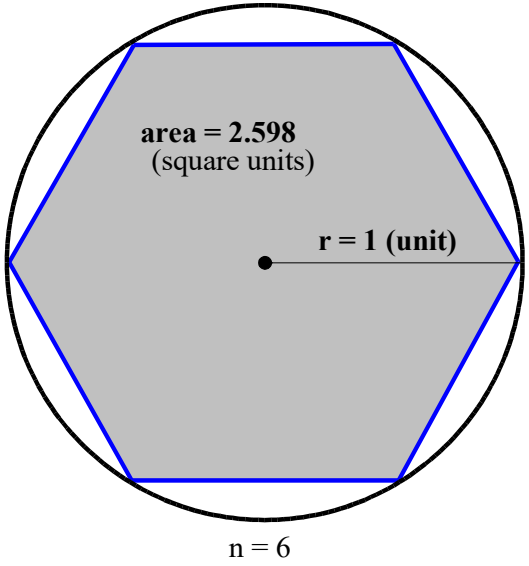
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

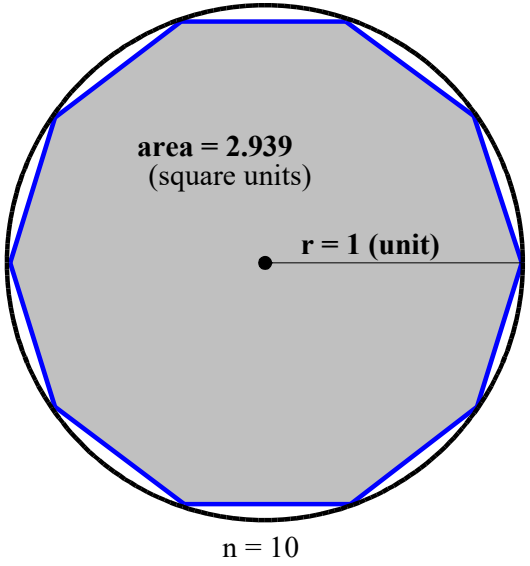
n	area
3	1.299
5	2.378
6	2.598
10	2.939

n	area
20	3.0902
50	3.1333
100	3.1395
1000	3.1416









The Value of π

Regular Polygon Area
$nr^2Sin(180^o/n)Cos(180^o/n)$

If r = 1, then the area of the circle is π.

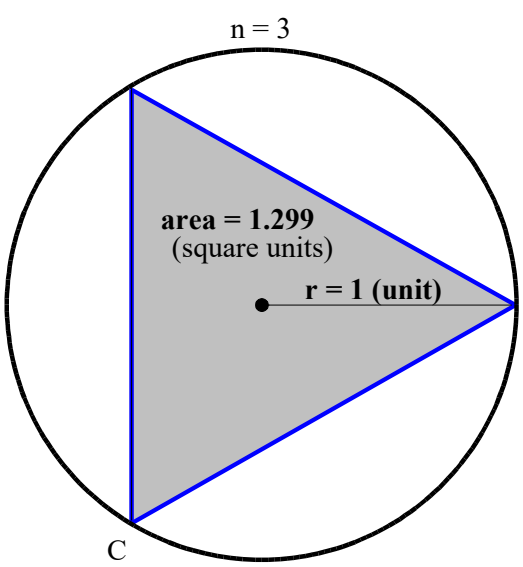
Now consider the area of the regular polygons if r = 1.

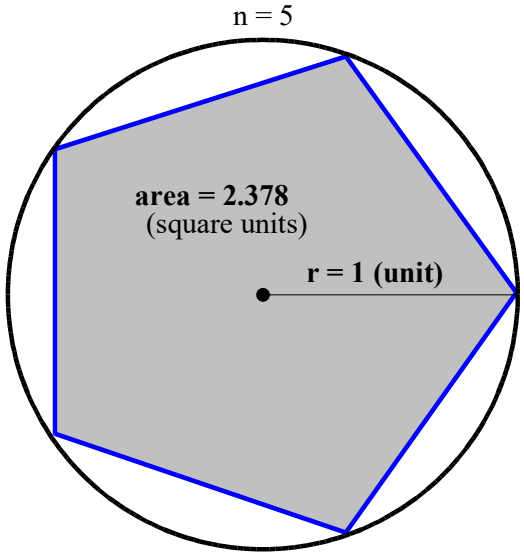
The regular polygon area is **$nSin(180^o/n)Cos(180^o/n)$**.

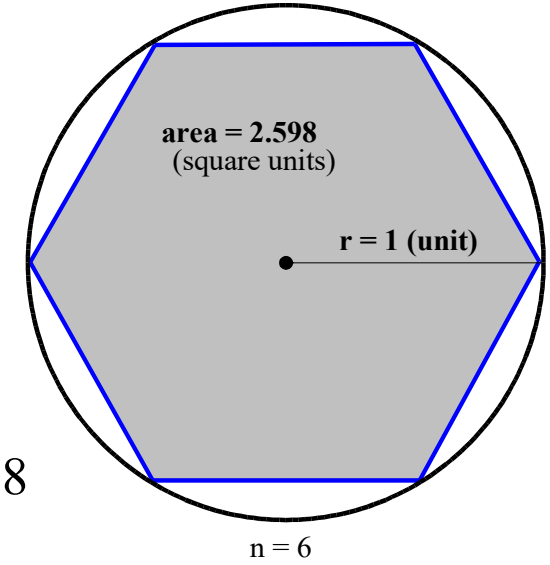
n	area
3	1.299
5	2.378
6	2.598
10	2.939

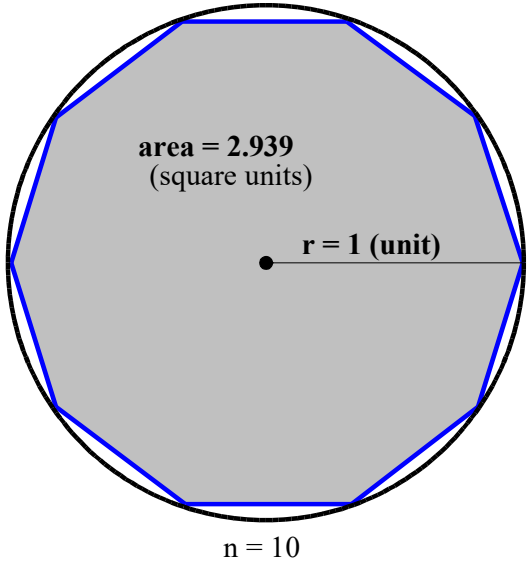
n	area
20	3.0902
50	3.1333
100	3.1395
1000	3.1416

3.14157198









The Value of π

Regular Polygon Area
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If r = 1, then the area of the circle is π.

Now consider the area of the regular polygons if r = 1.

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Can you imagine a regular polygon with 1000 sides inscribed in a circle!

The Value of π

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The Value of π

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Can you imagine a regular polygon with 1000 sides inscribed in a circle! That explains why its area is so close to π, the area of the circle.
According to my calculator, π is approximately 3.14159265.

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Notice that we are still a little less than π.

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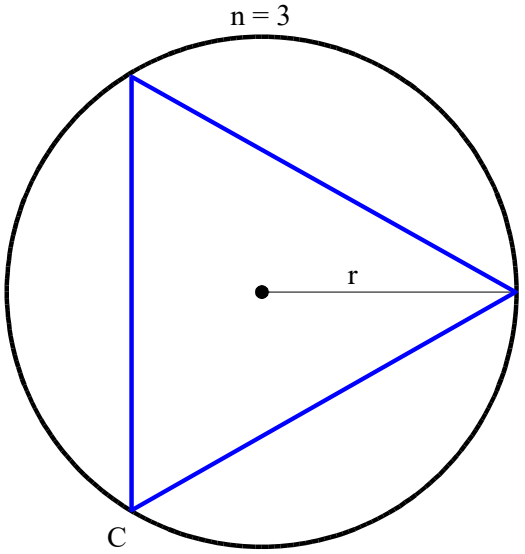
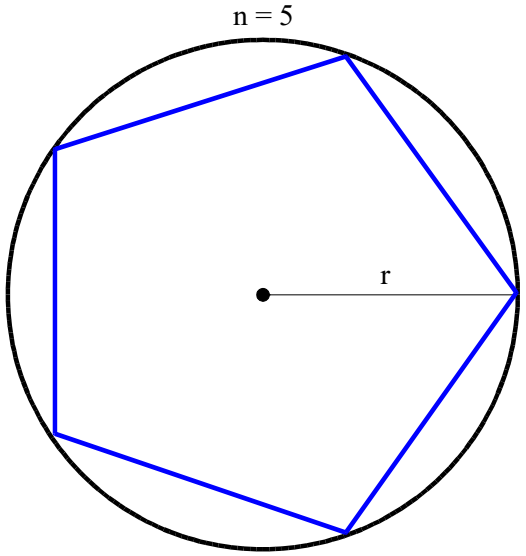
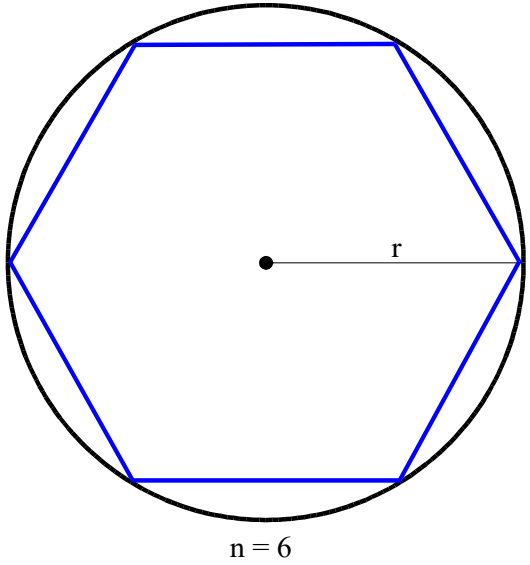
According to my calculator, π is approximately 3.14159265.
Notice that we are still a little less than π. When I put 100,000 into the formula for the regular polygon's area, I get 3.14159265 as well.
Now let's look at perimeter.

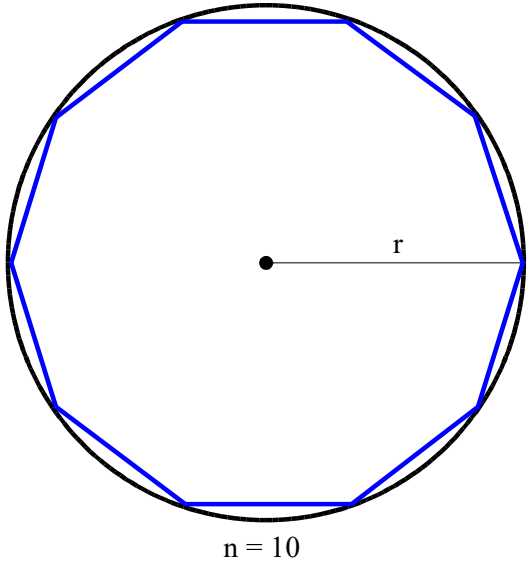
The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)





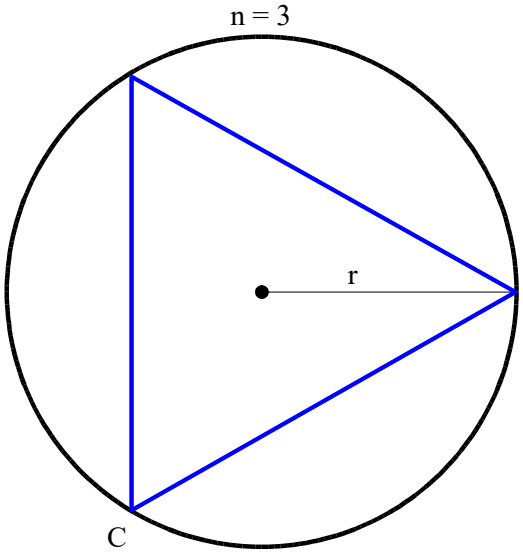


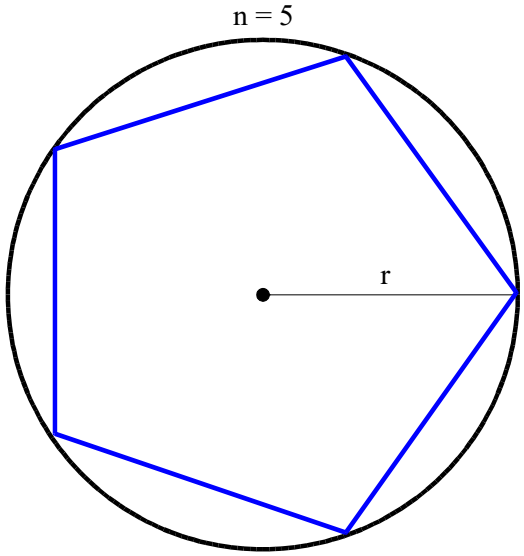


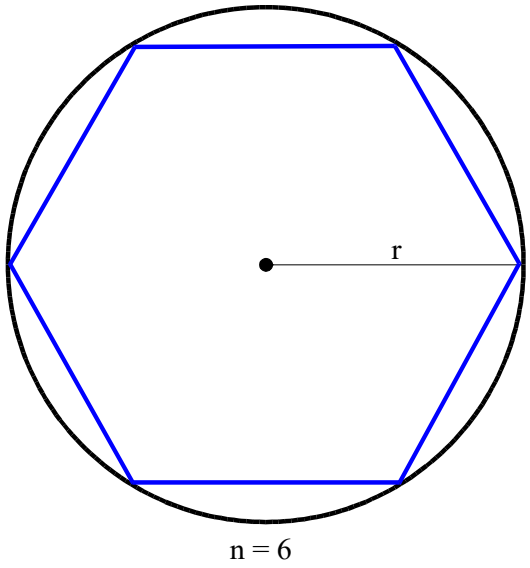
The Value of π

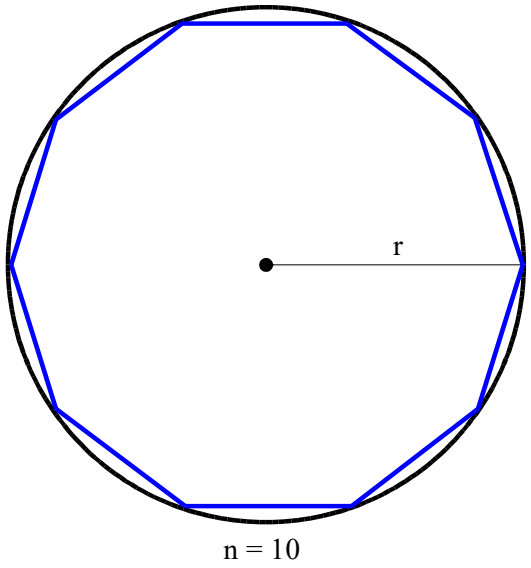
Regular Polygon Perimeter
$2nrSin(180^o/n)$

There is a well known formula for the circumference of a circle.





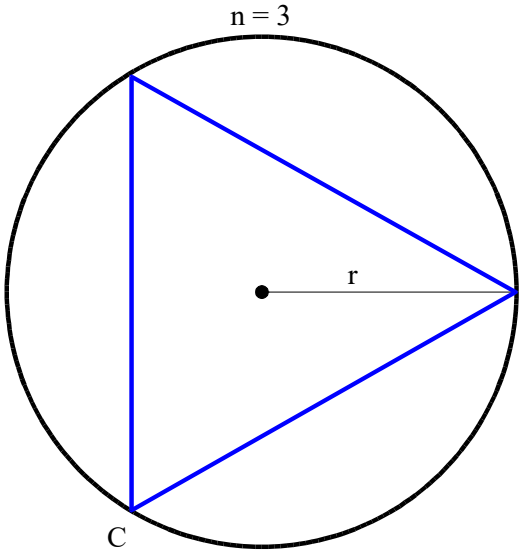


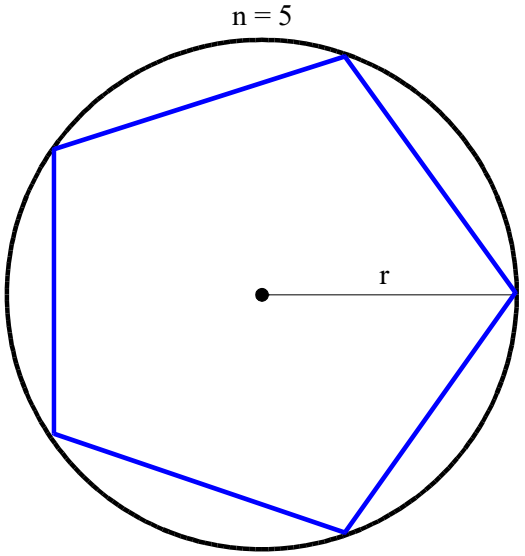


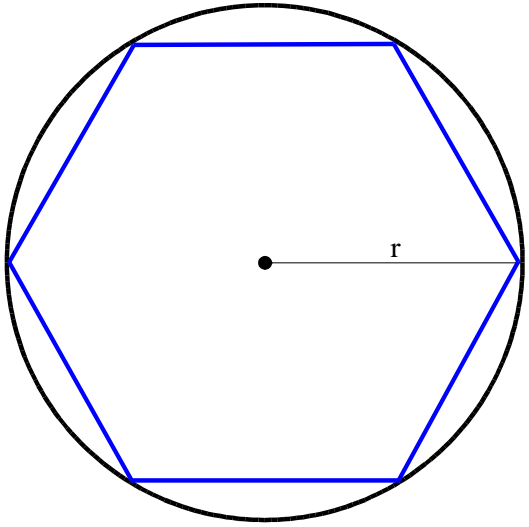
The Value of π

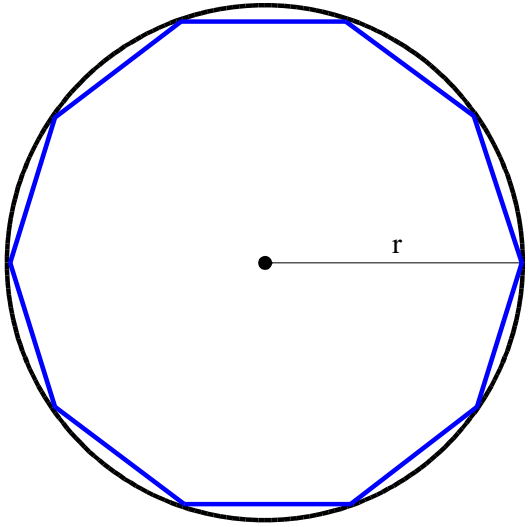
Regular Polygon Perimeter
2nrSin(180°/n)

There is a well known formula for the circumference of a circle. **C =**





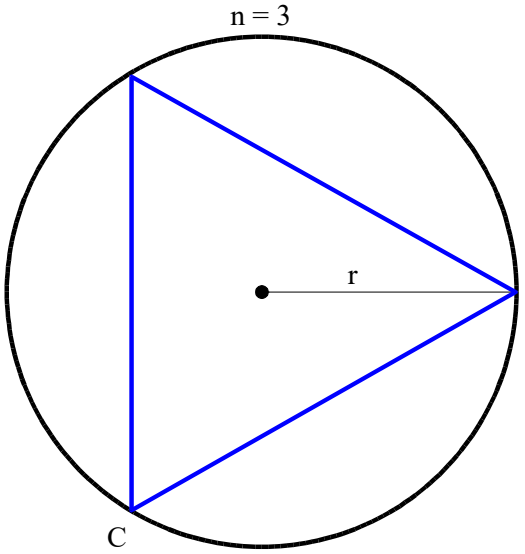


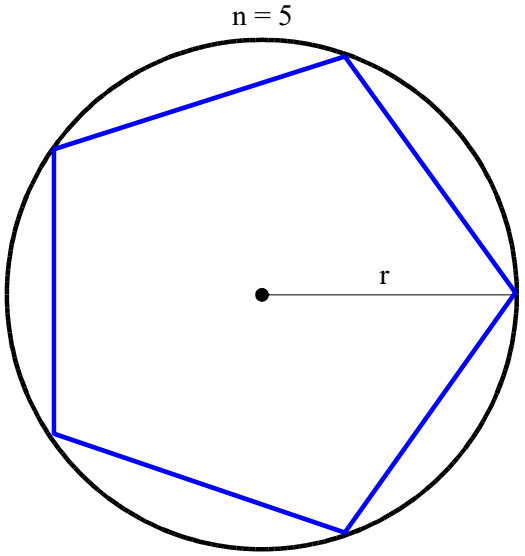


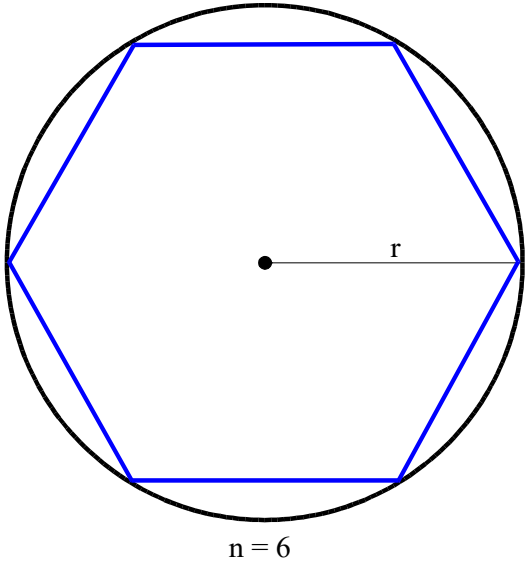
The Value of π

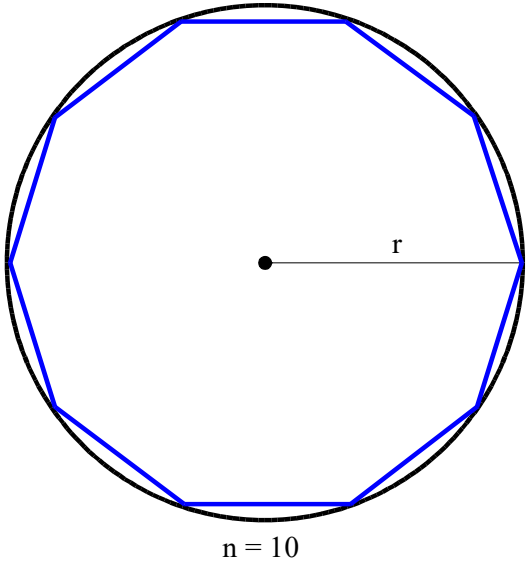
Regular Polygon Perimeter
2nrSin(180°/n)

There is a well known formula for the circumference of a circle. **C = 2πr**







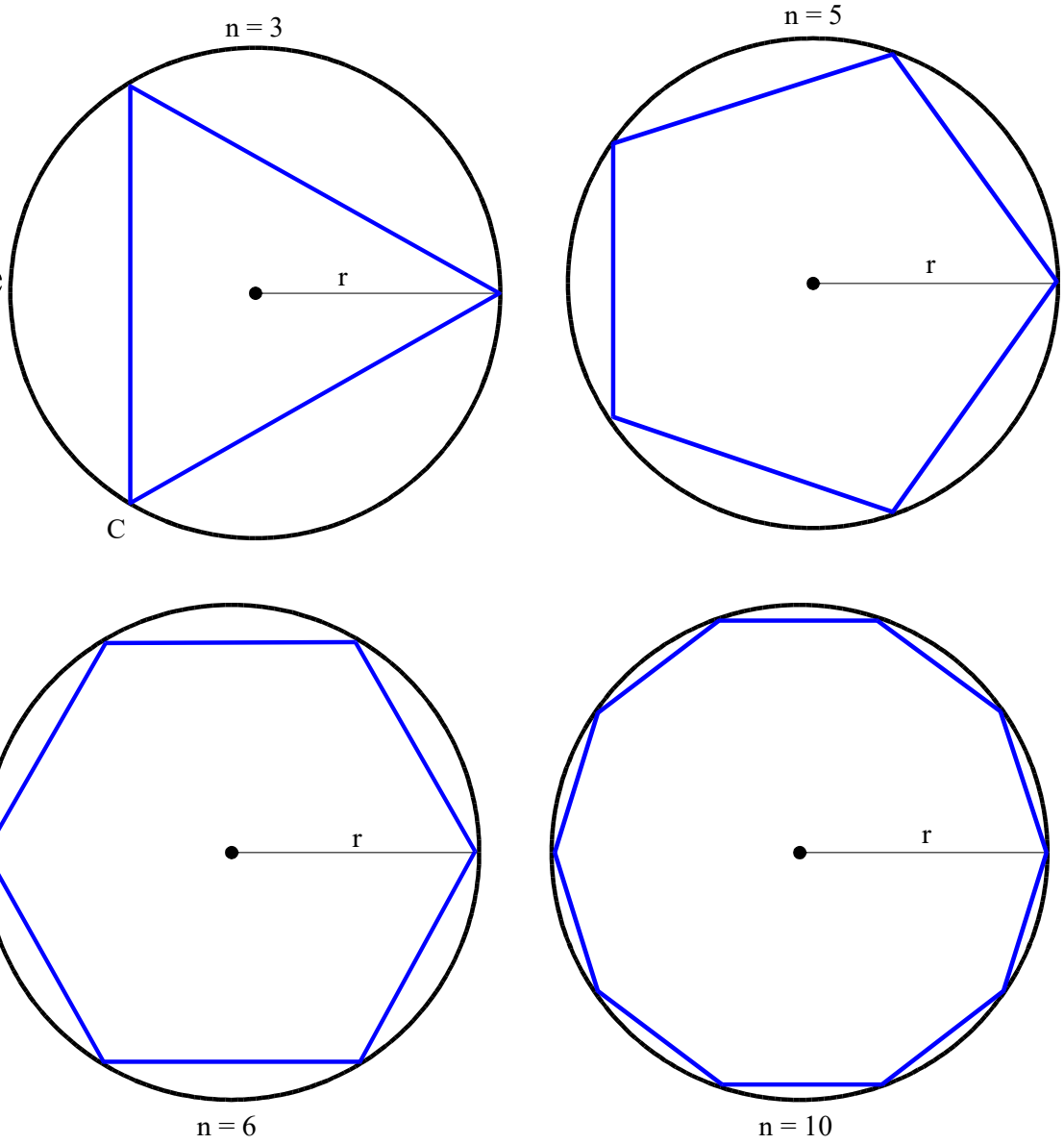


The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

There is a well known formula for the circumference of a circle. **C = 2πr**

If **r = 0.5**



The Value of π

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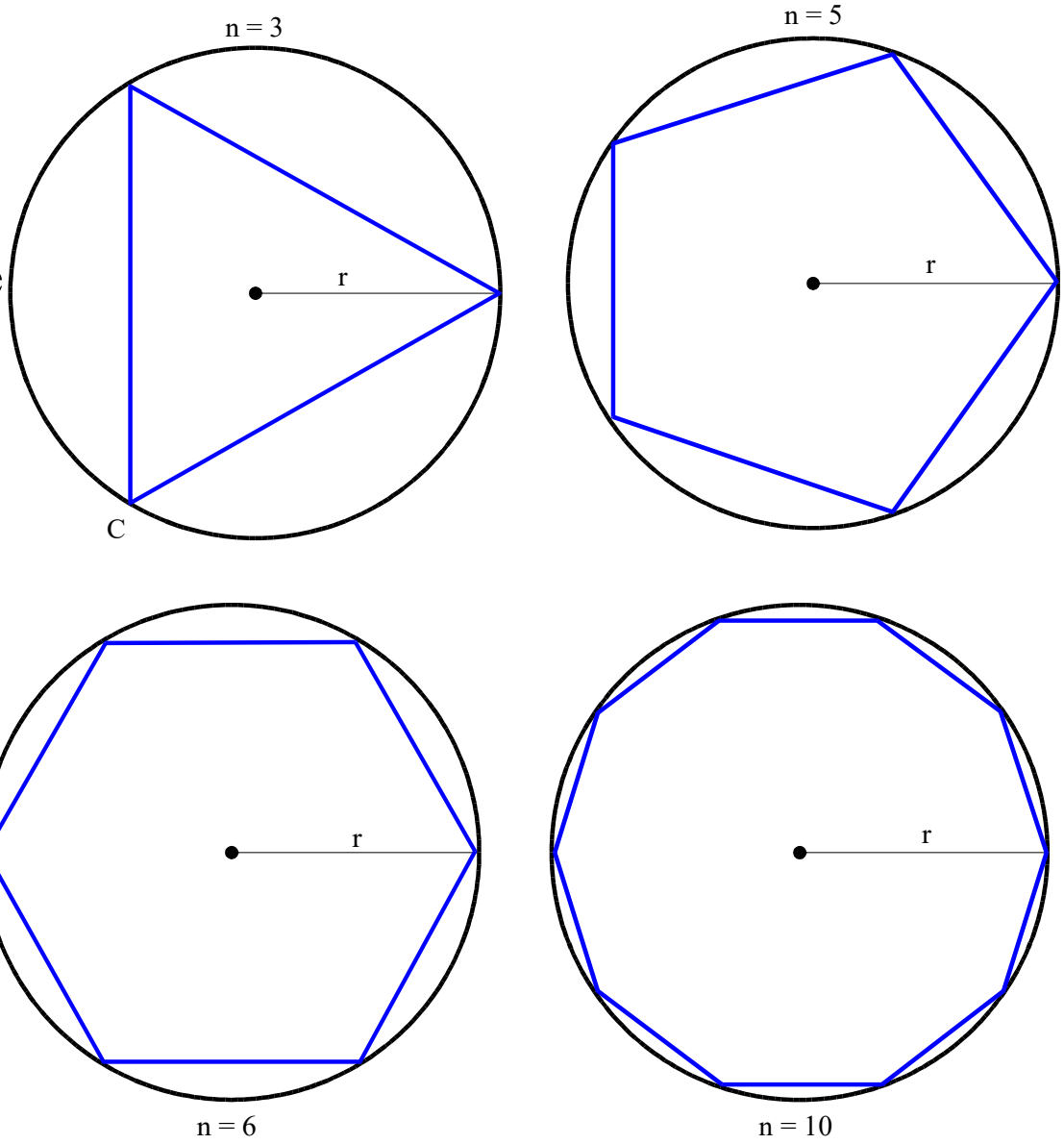

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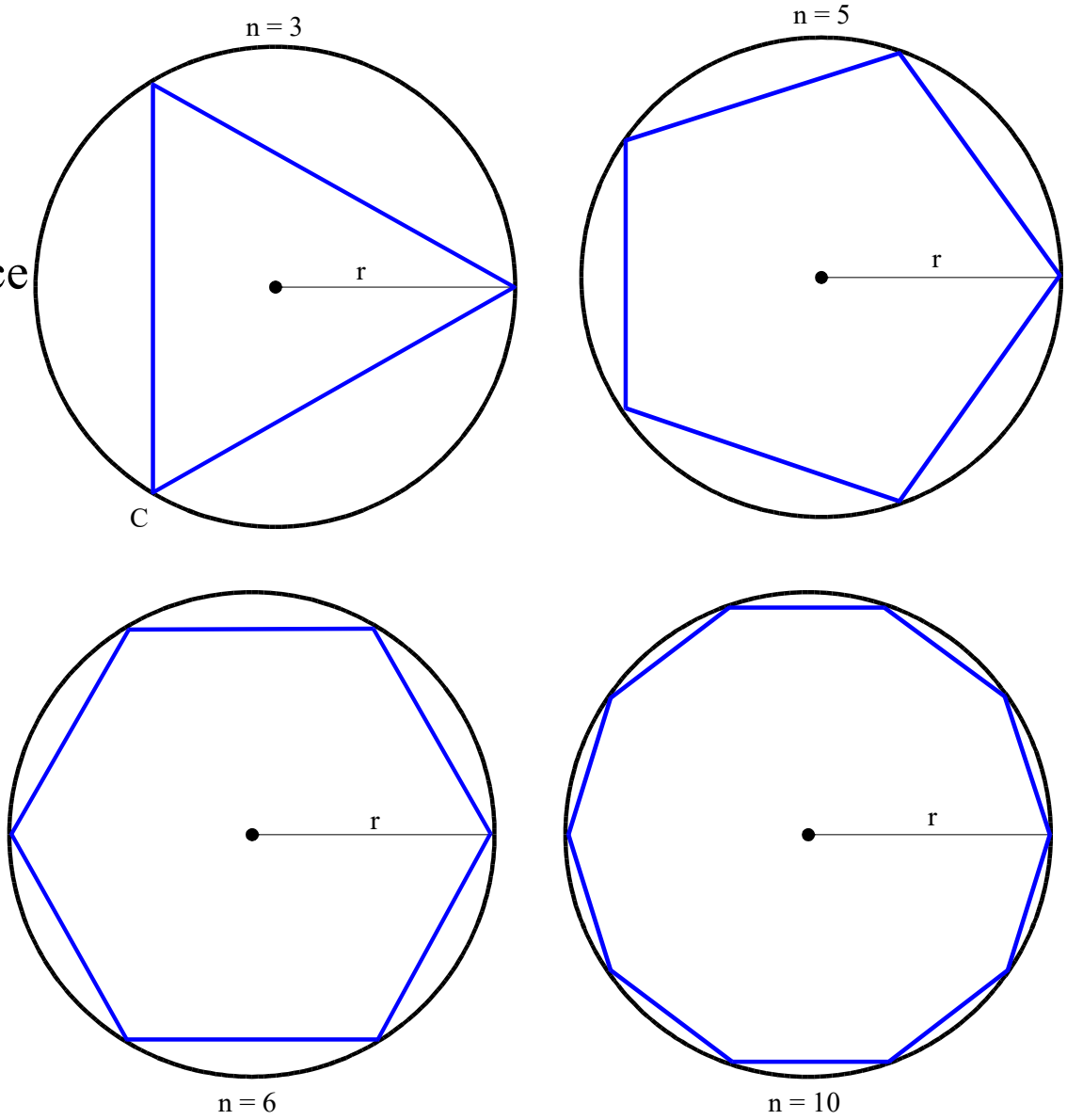
Once again, the unit of length does not matter.



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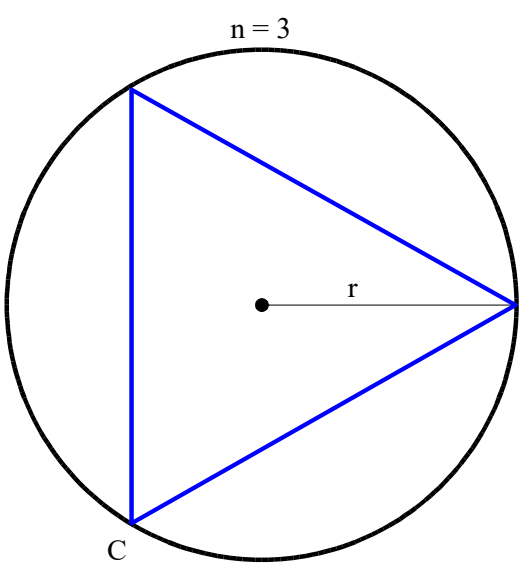

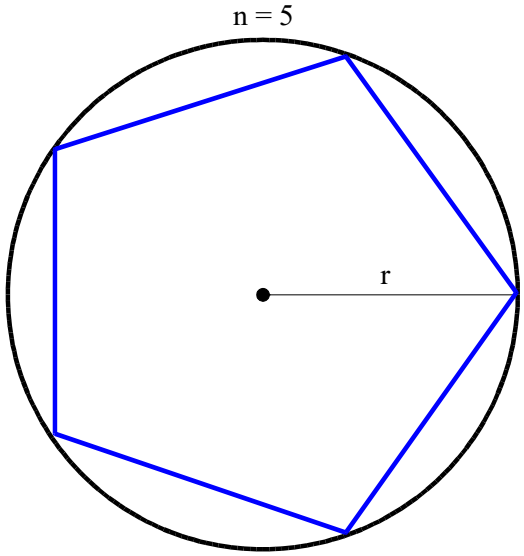

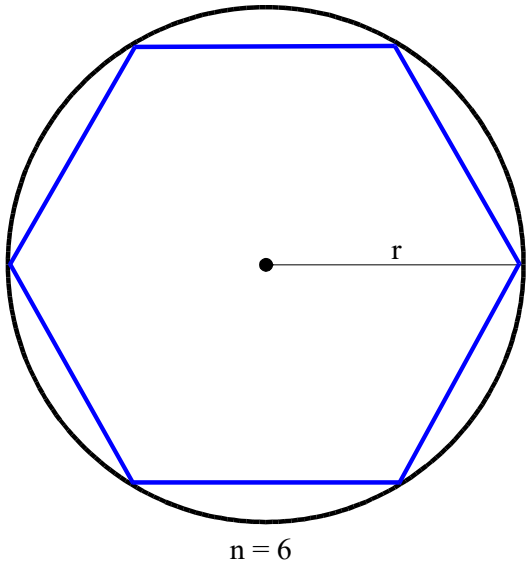

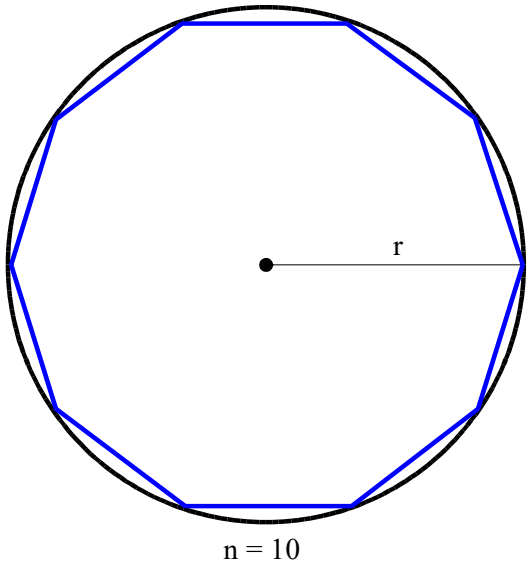

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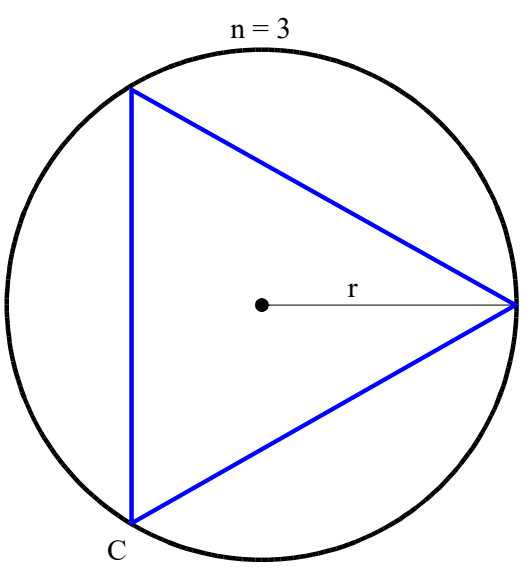

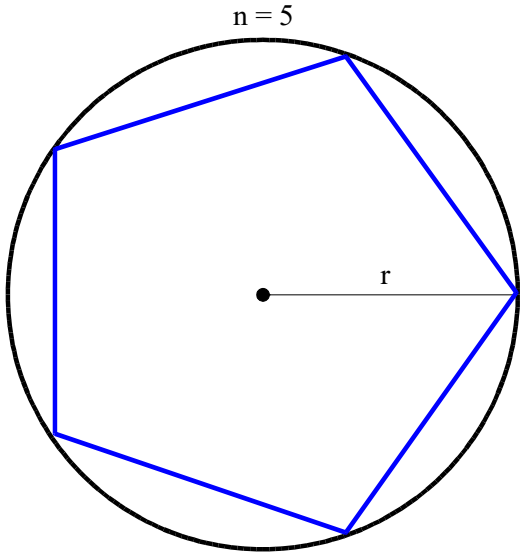

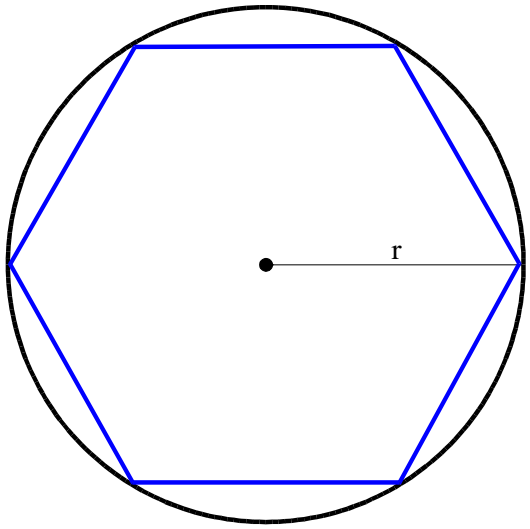

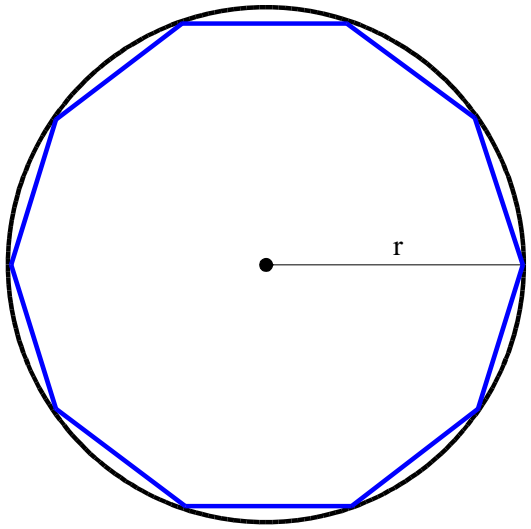

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2nrSin(180°/n)

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If **r = 0.5** units

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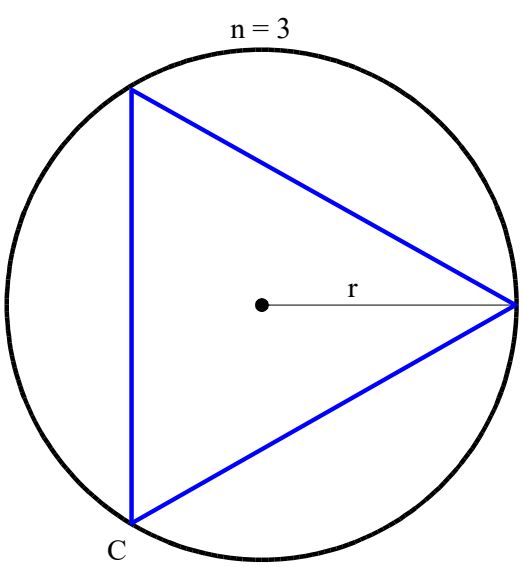

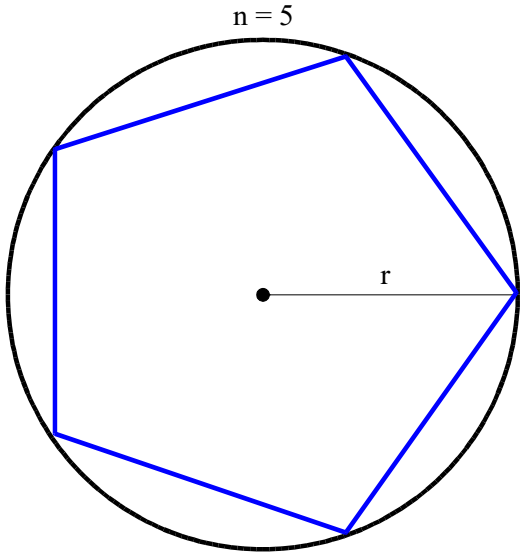

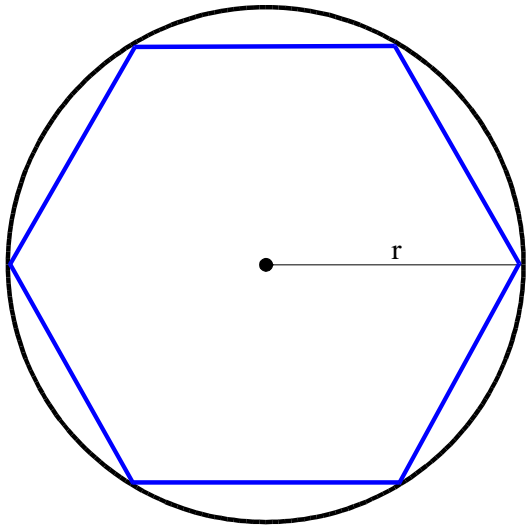

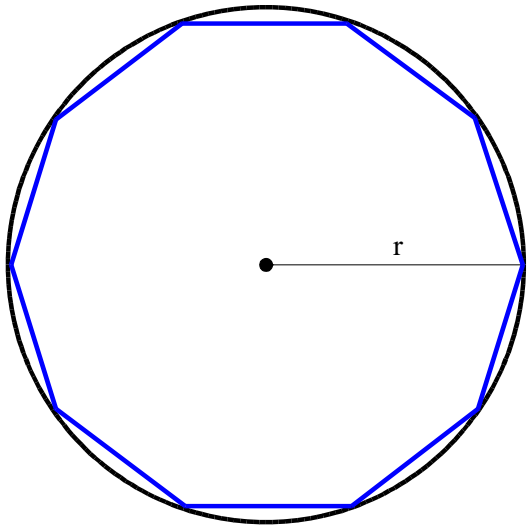

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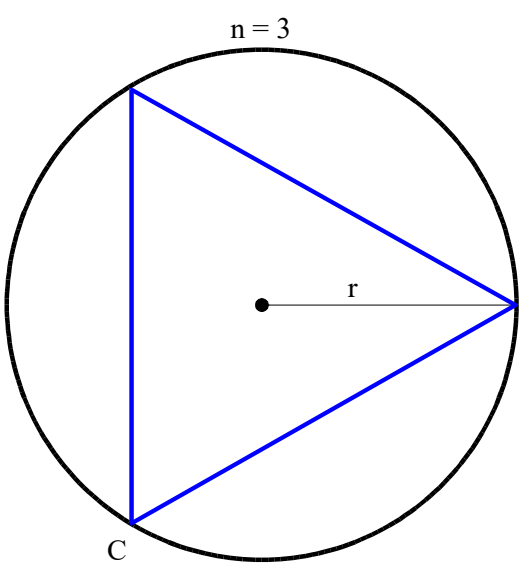
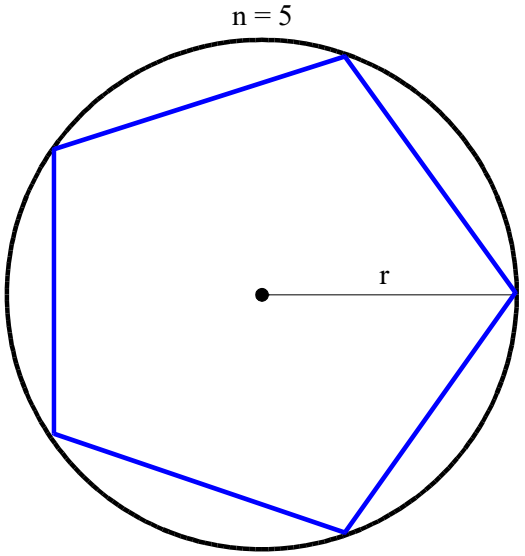
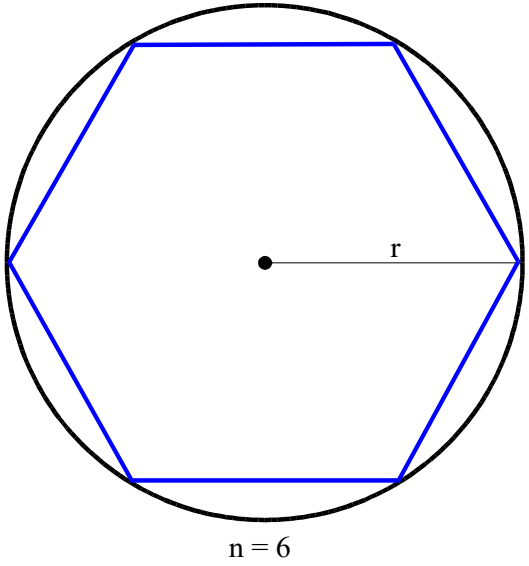
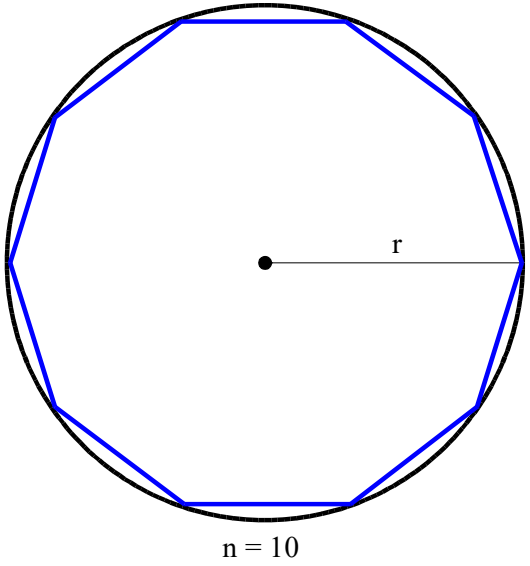
If **r = 0.5** units

Once again, the unit of length does not matter.
r could be 0.5 **inches**, 0.5 **centimeters**, 0.5 **feet**, … any unit of length.







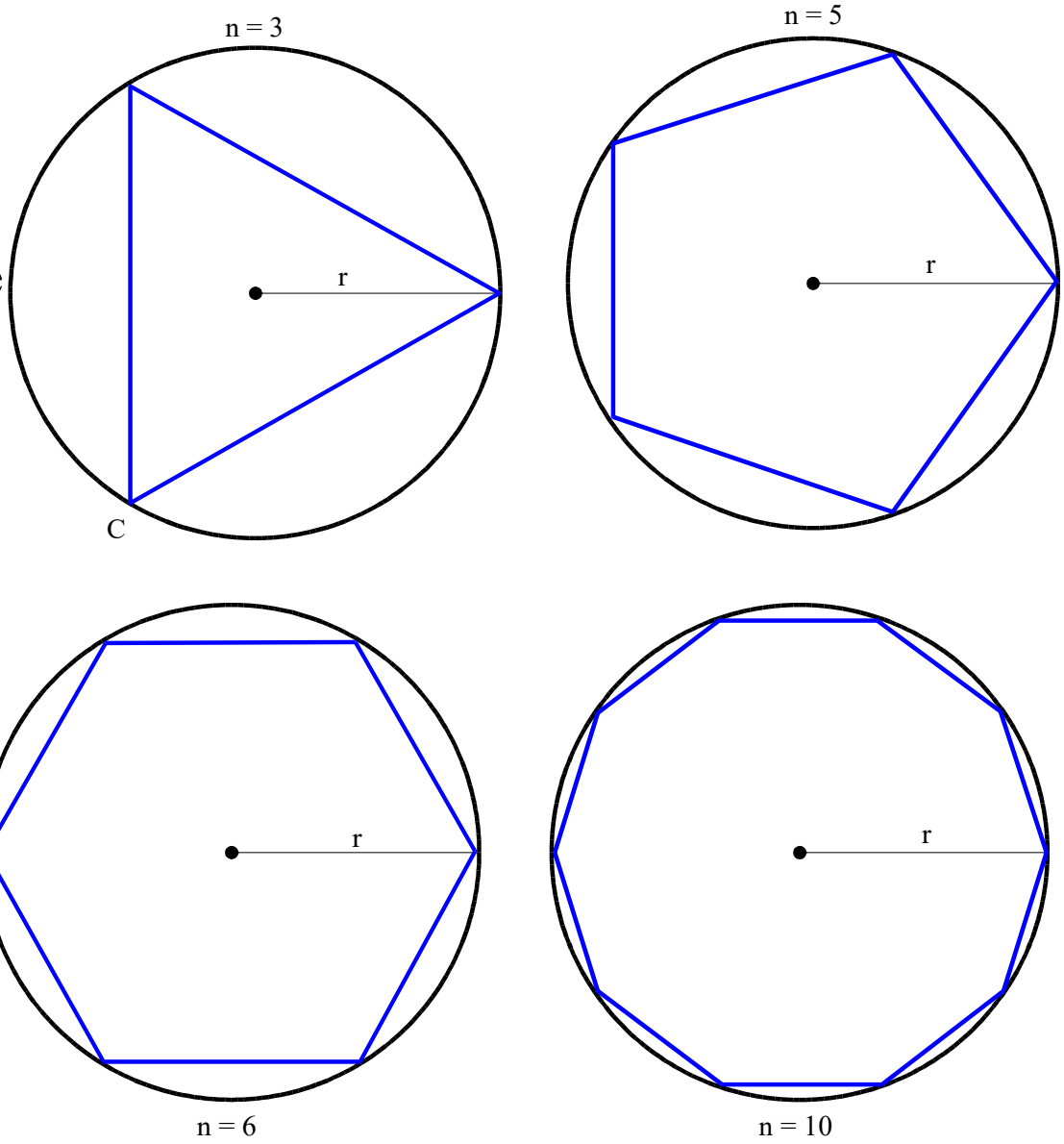


The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

There is a well known formula for the circumference of a circle. **C = 2πr**

If **r = 0.5**



The Value of π

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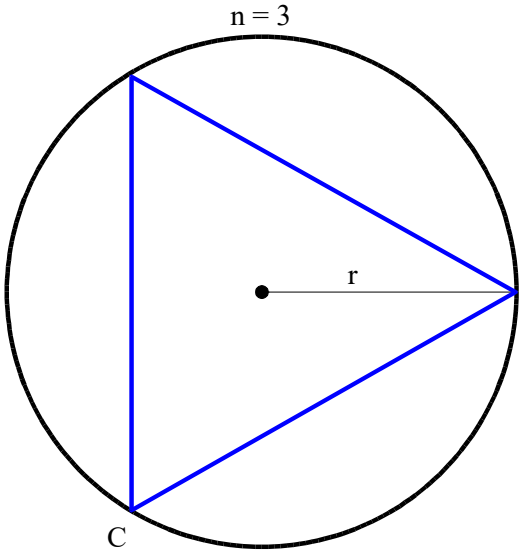

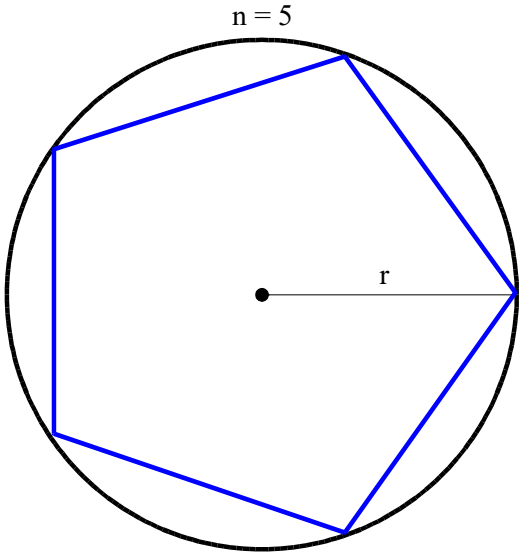

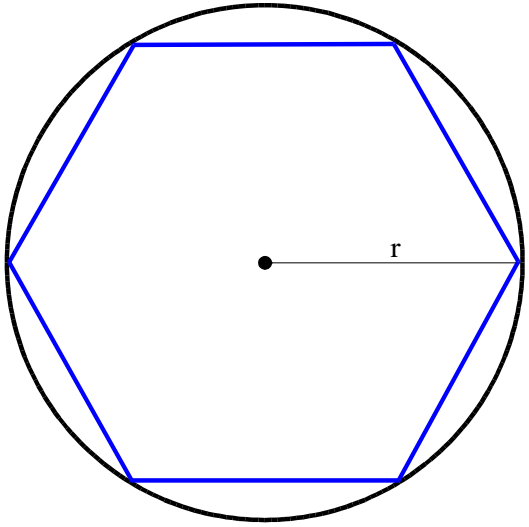

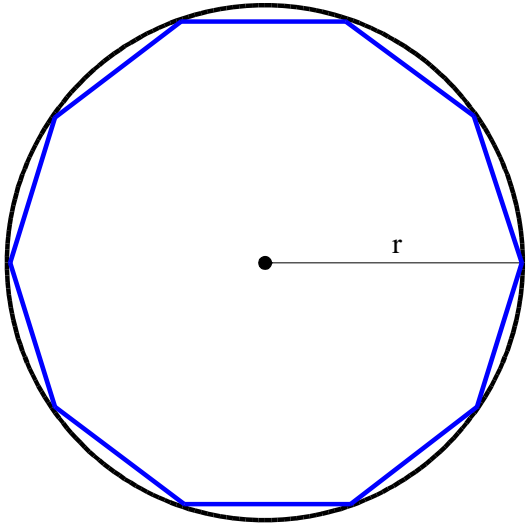

The Value of π

Regular Polygon Perimeter
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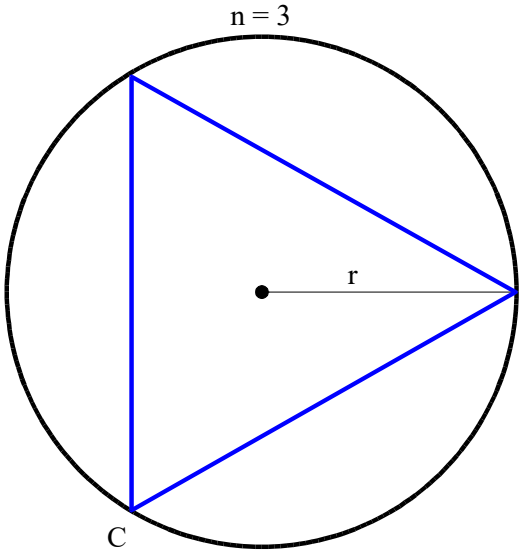

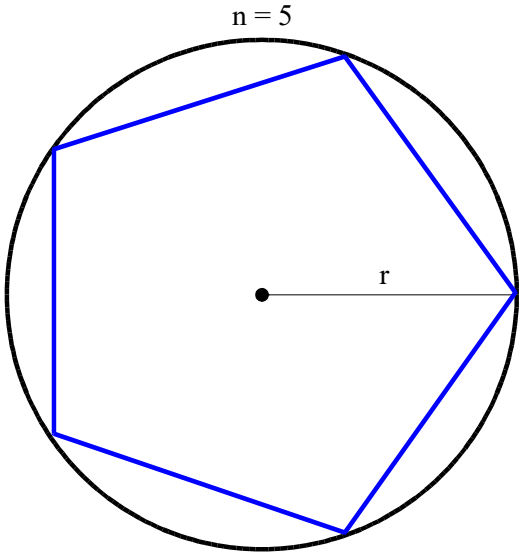

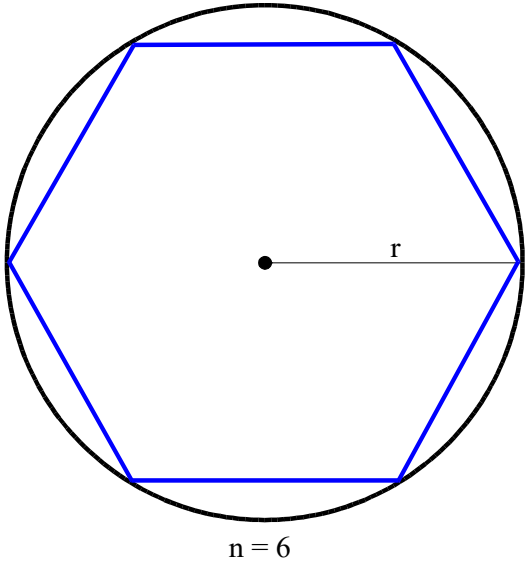

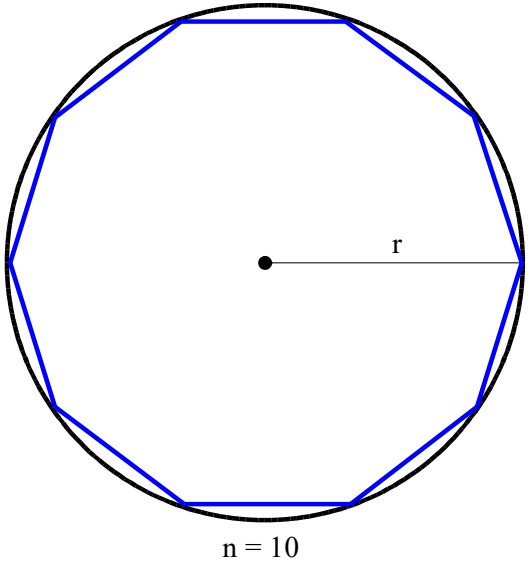

The Value of π

Regular Polygon Perimeter
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There is a well known formula for the circumference of a circle. **C = 2πr**

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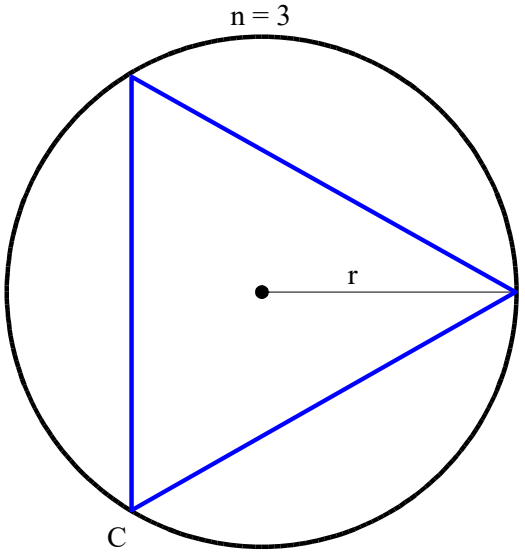
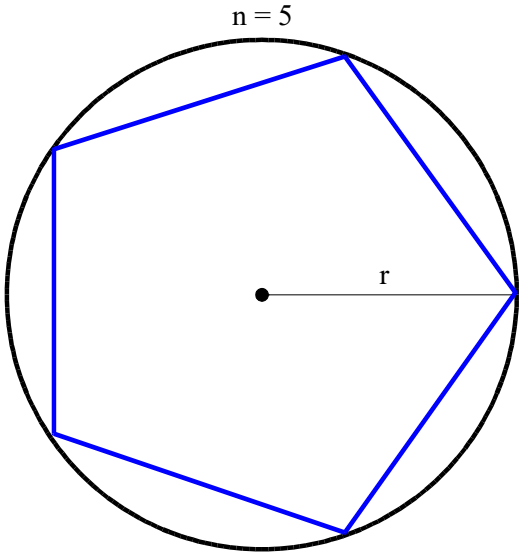
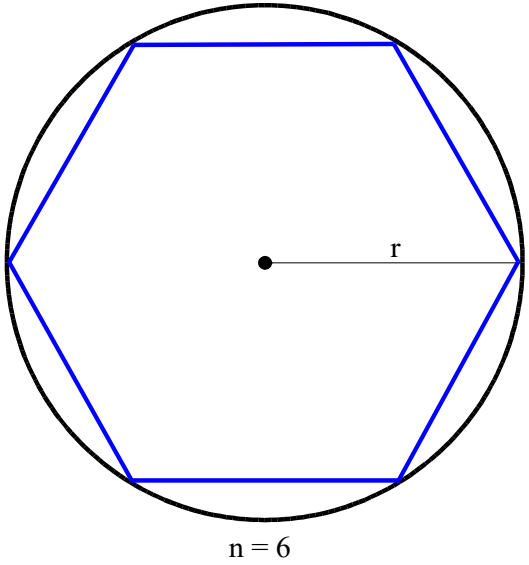
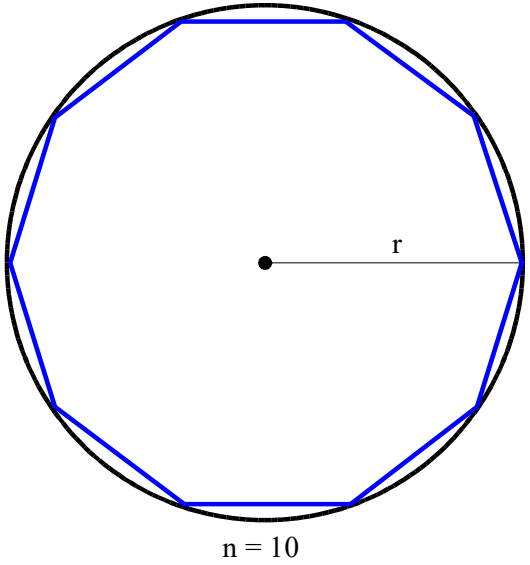








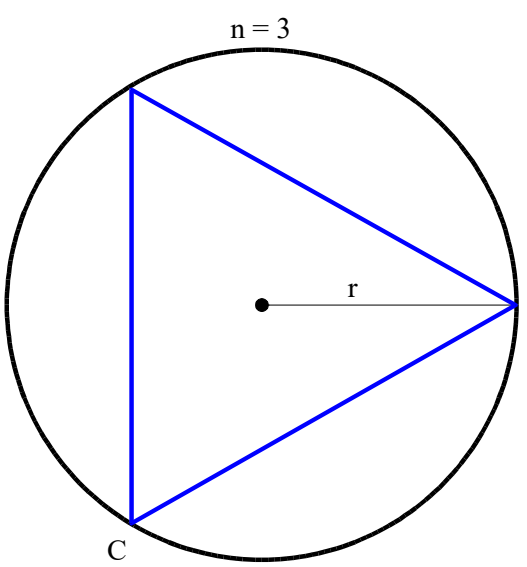
The Value of π

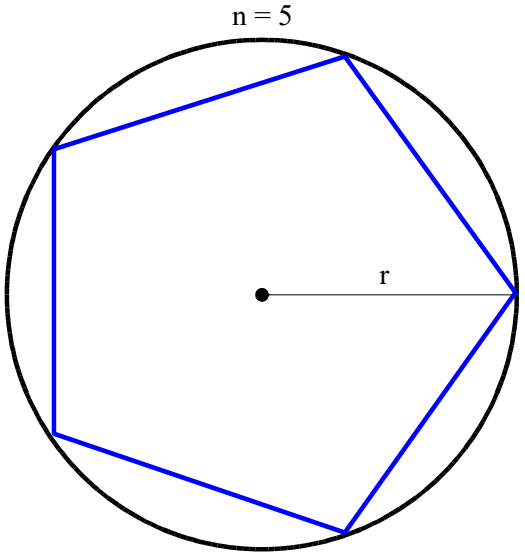
Regular Polygon Perimeter
2nrSin(180°/n)

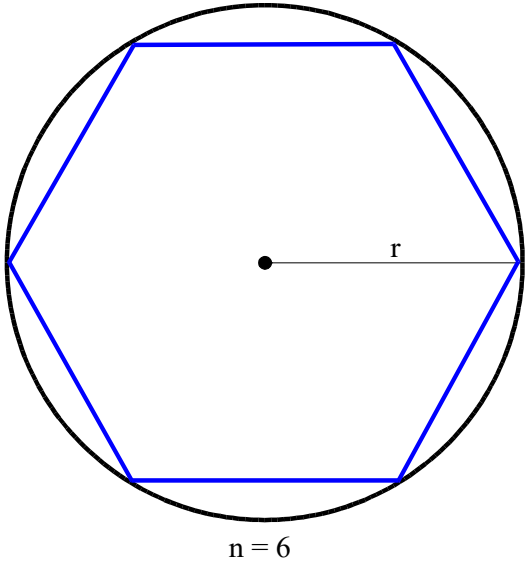
There is a well known formula for the circumference of a circle. **C = 2πr**

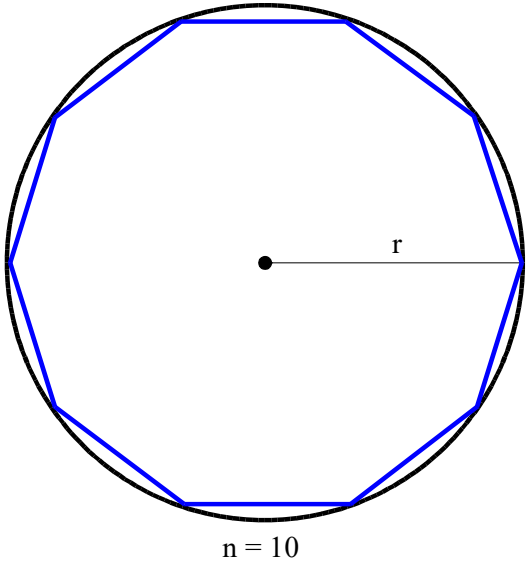
If **r = 0.5**, **C = π** units.

If the radius was given in **inches**,









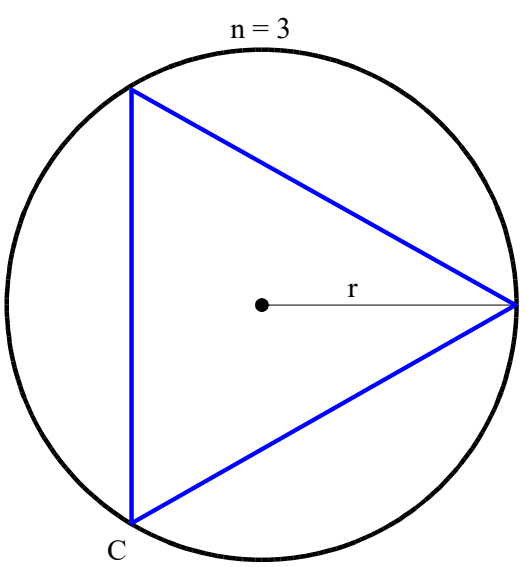
The Value of π

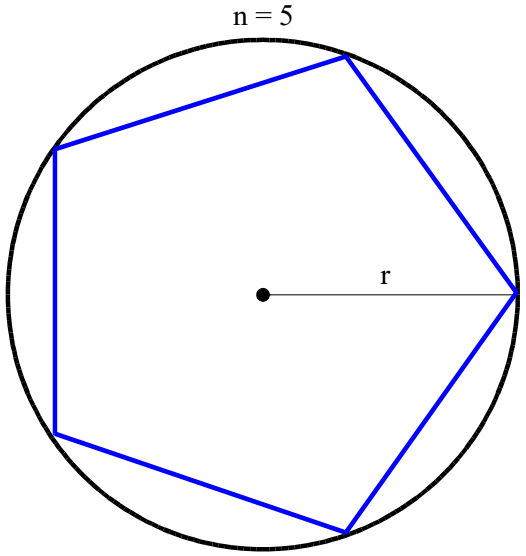
Regular Polygon Perimeter
2nrSin(180°/n)

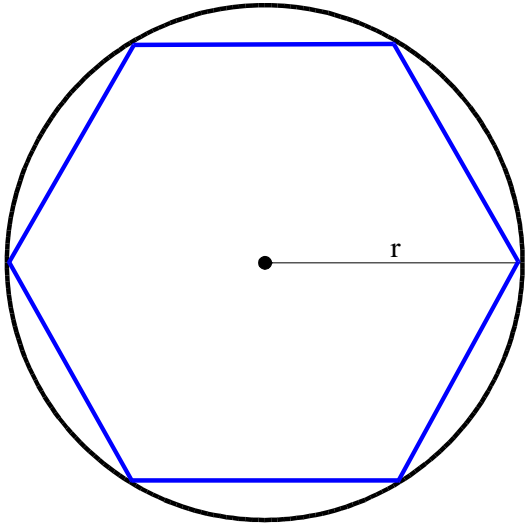
There is a well known formula for the circumference of a circle. **C = 2πr**

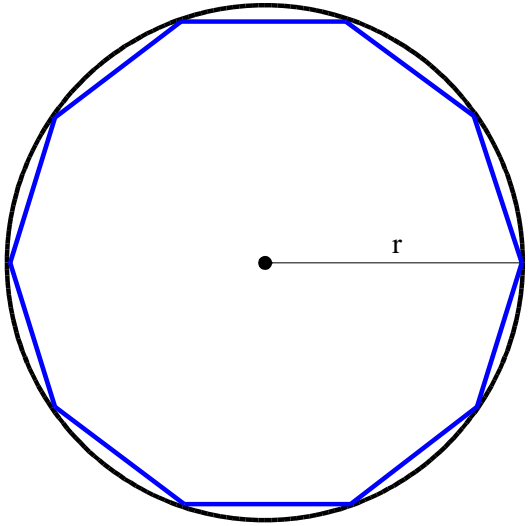
If **r = 0.5**, **C = π** units.

If the radius was given in **inches**, then the circumference would also be in **inches**.







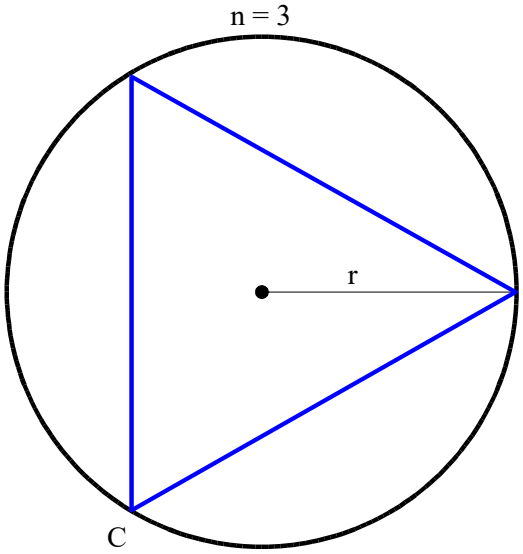


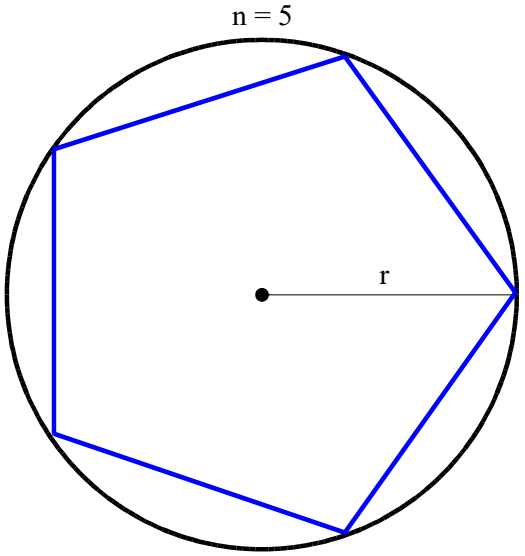
The Value of π

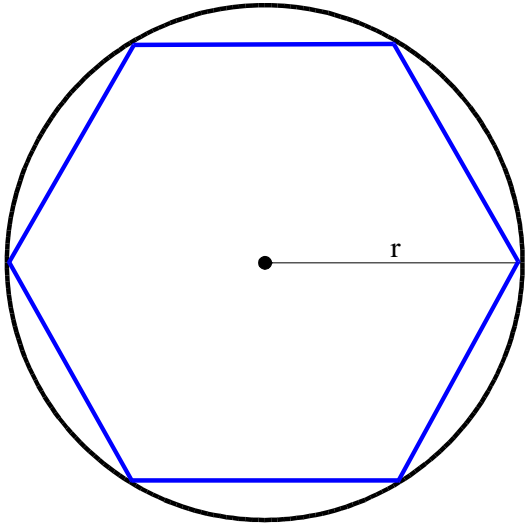
Regular Polygon Perimeter
$2nrSin(180^o/n)$

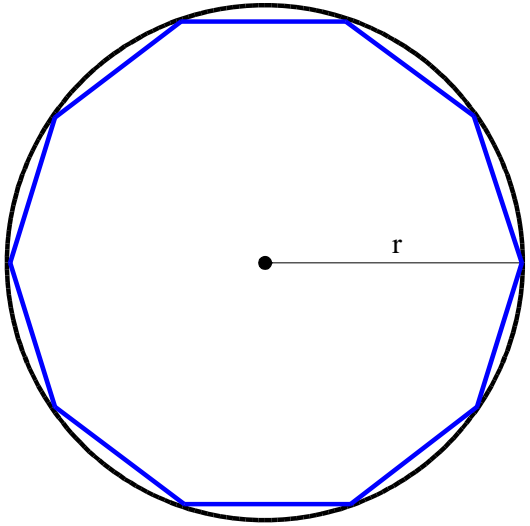
There is a well known formula for the circumference of a circle. **$C = 2\pi r$**

If **$r = 0.5$**, **$C = \pi$**.





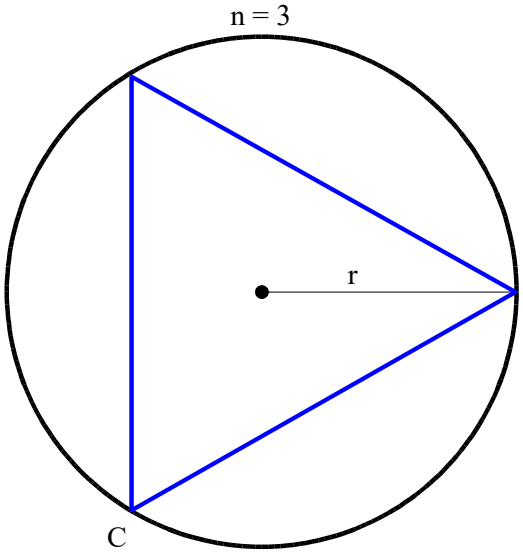


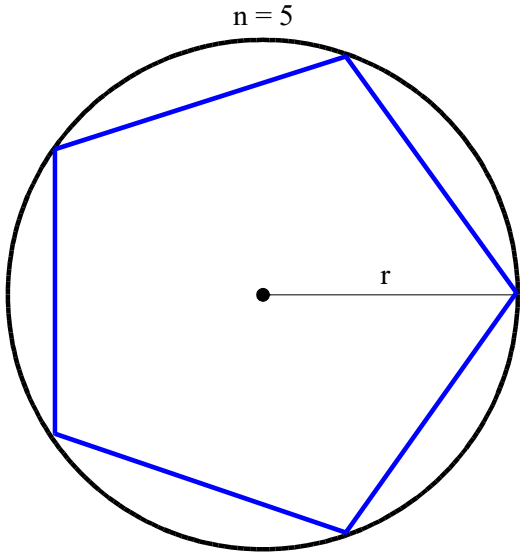


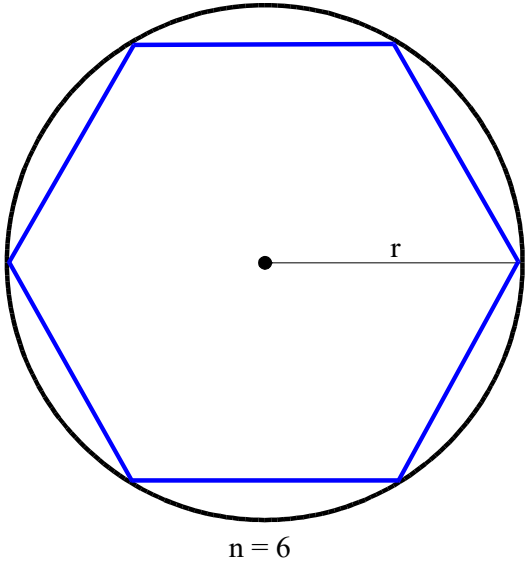
The Value of π

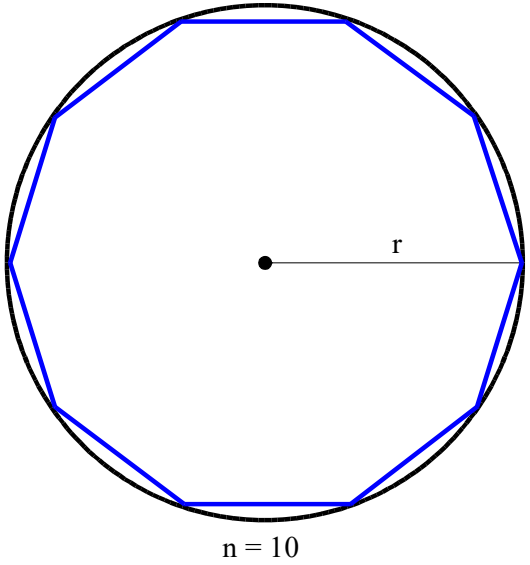
Regular Polygon Perimeter
2nrSin(180°/n)

If r = 0.5, then the circumference of the circle is π.







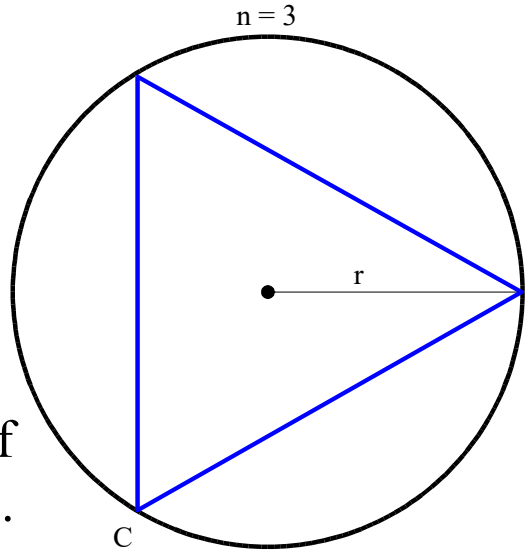


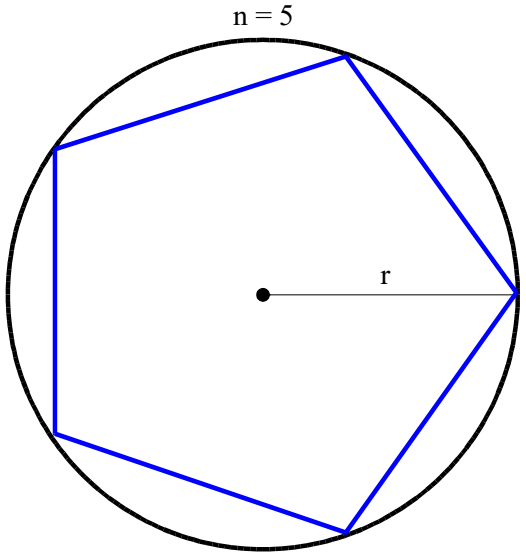
The Value of π

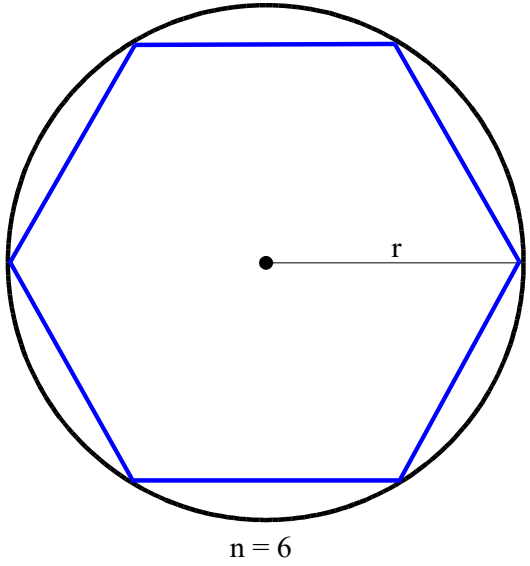
Regular Polygon Perimeter
2nrSin(180°/n)

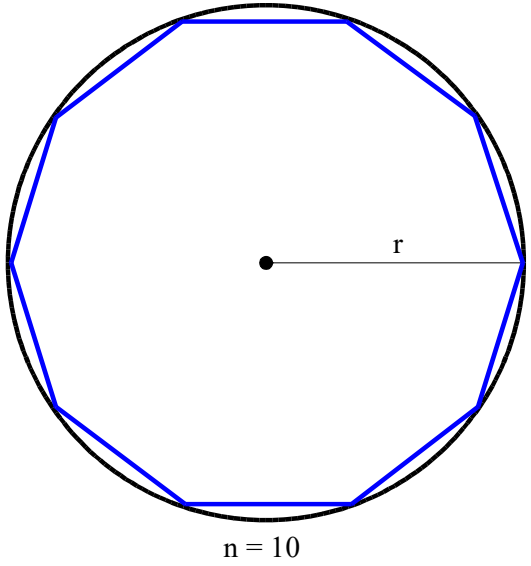
If r = 0.5, then the circumference of the circle is π.

Now consider the perimeter of the regular polygons if r = 0.5.









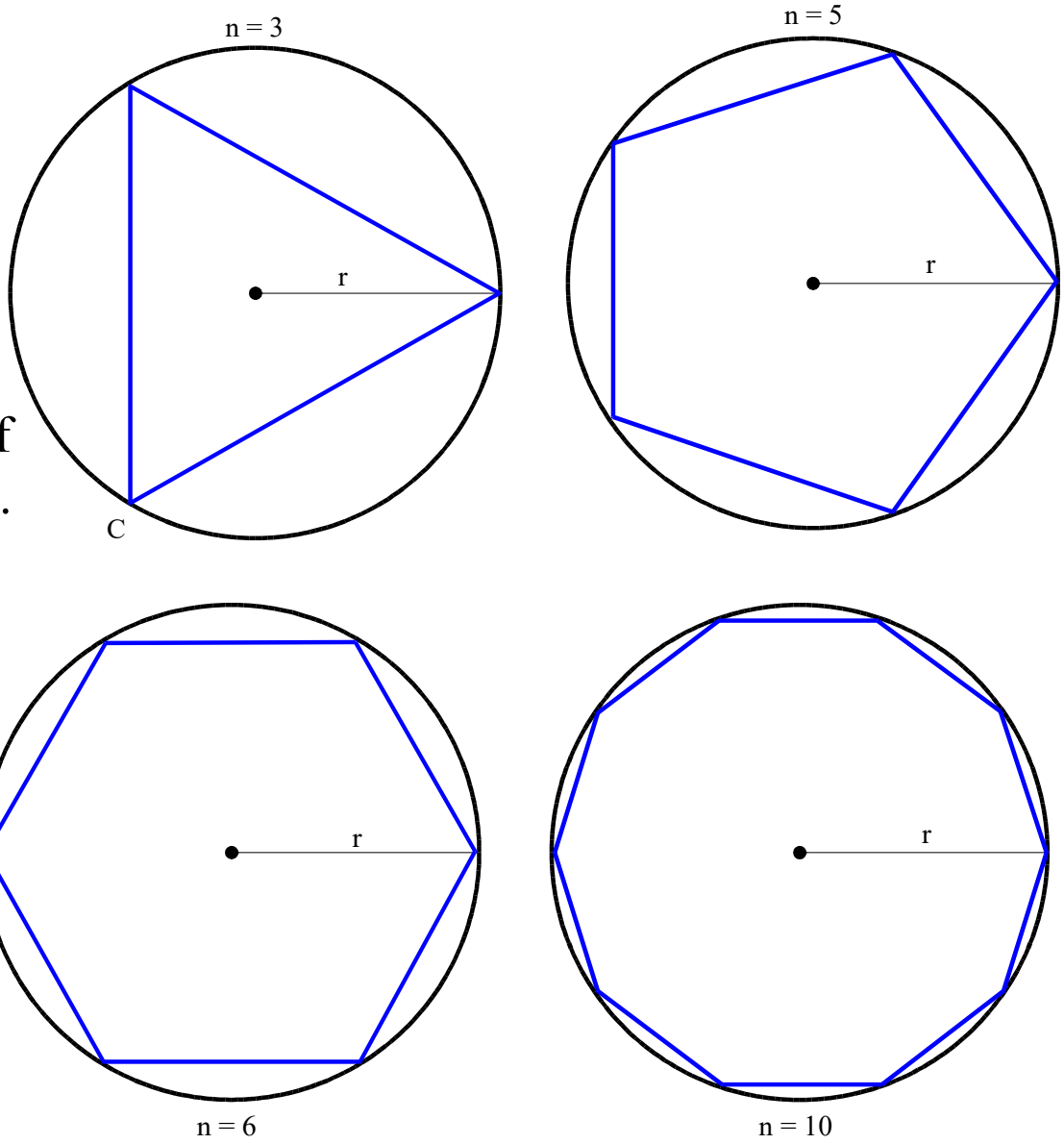
The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

If r = 0.5, then the circumference of the circle is π.

Now consider the perimeter of the regular polygons if r = 0.5.

2nrSin(180°/n)



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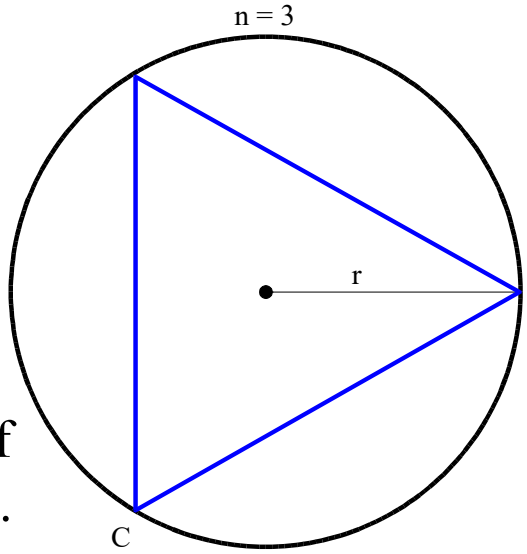
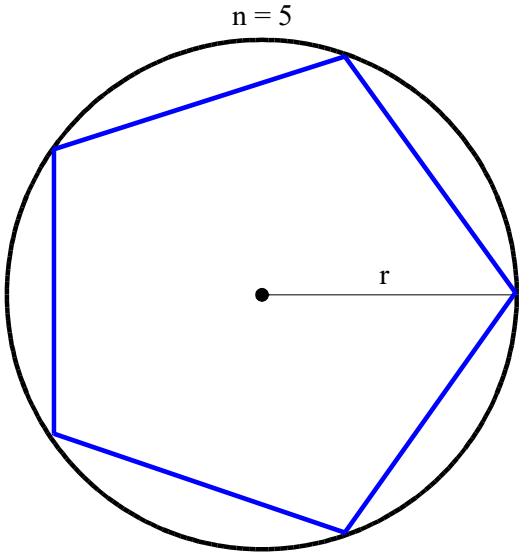
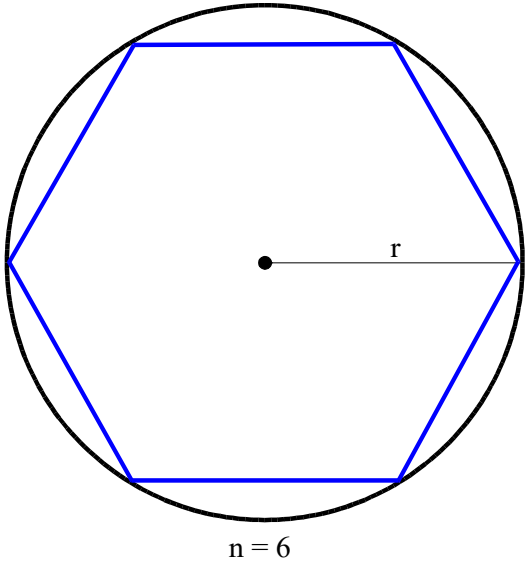
2nrSin(180°/n)

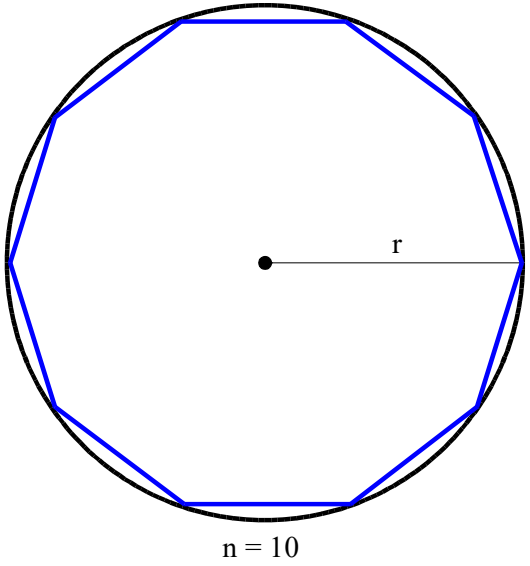
↑

0.5









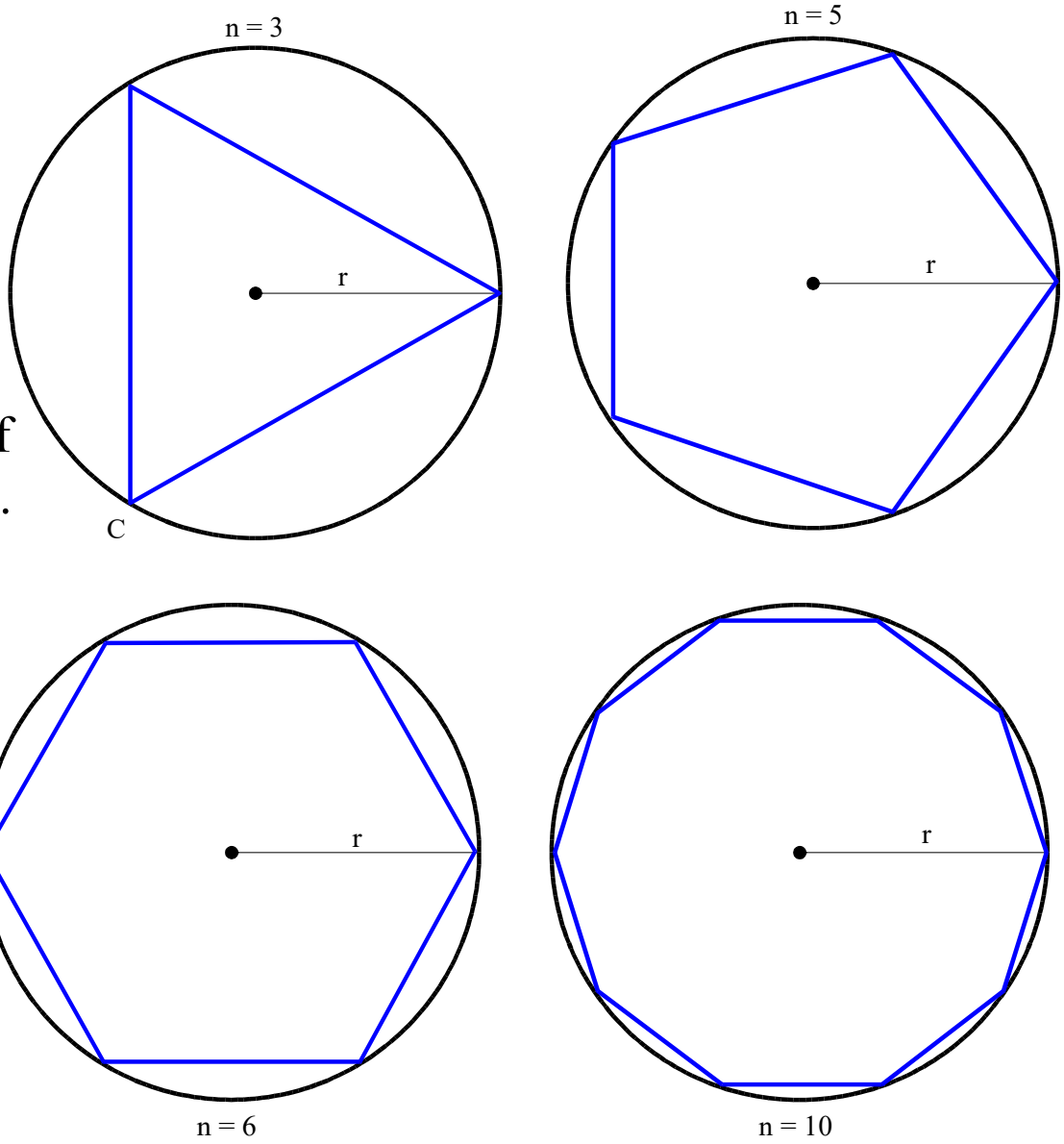
The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

If r = 0.5, then the circumference of the circle is π.

Now consider the perimeter of the regular polygons if r = 0.5.

nSin(180°/n)



The Value of π

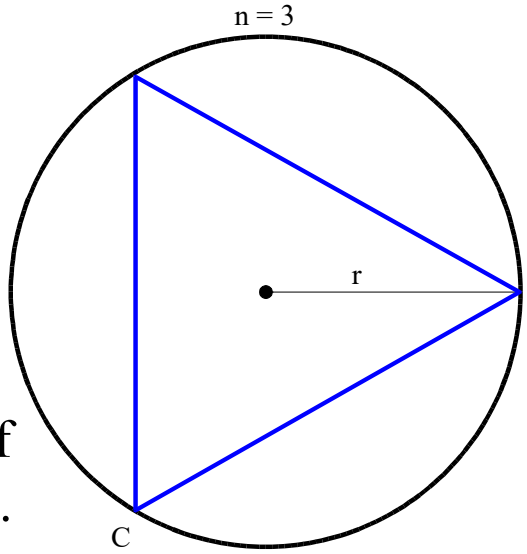
Regular Polygon Perimeter
2nrSin(180°/n)

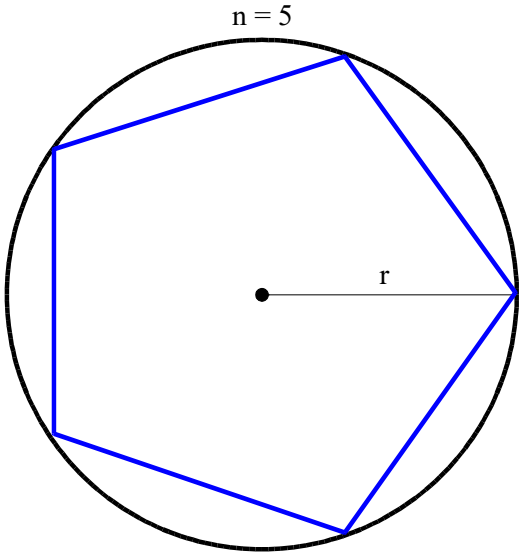
If r = 0.5, then the circumference of the circle is π.

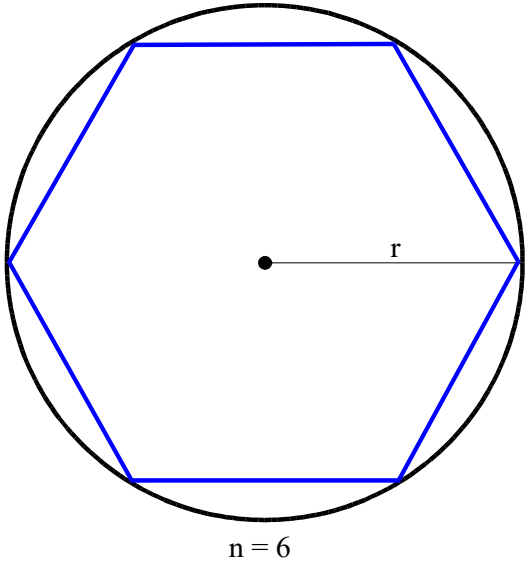
Now consider the perimeter of the regular polygons if r = 0.5.

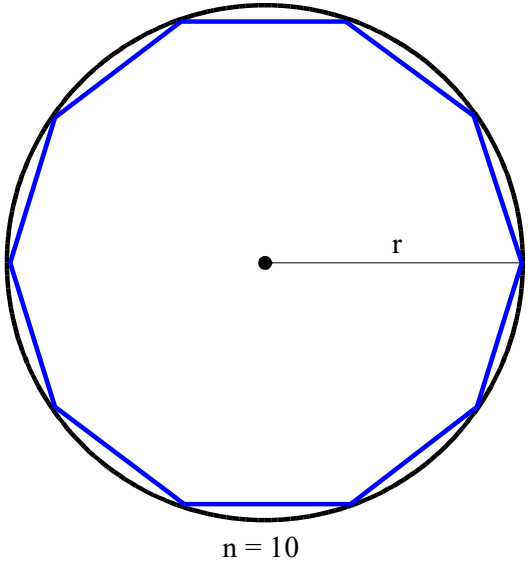
nSin(180°/n)

As n increases,









The Value of π

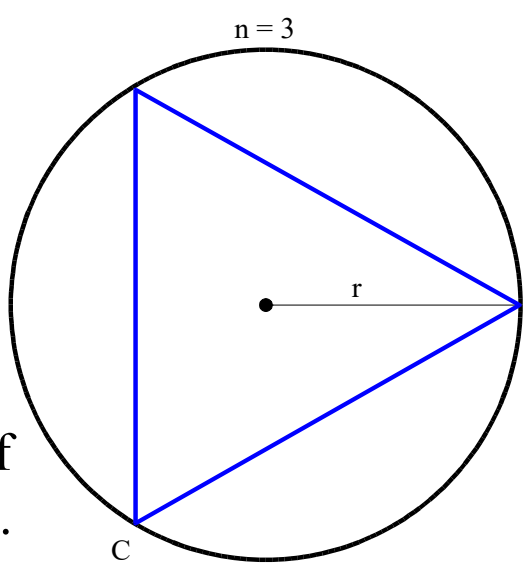
Regular Polygon Perimeter
2nrSin(180°/n)

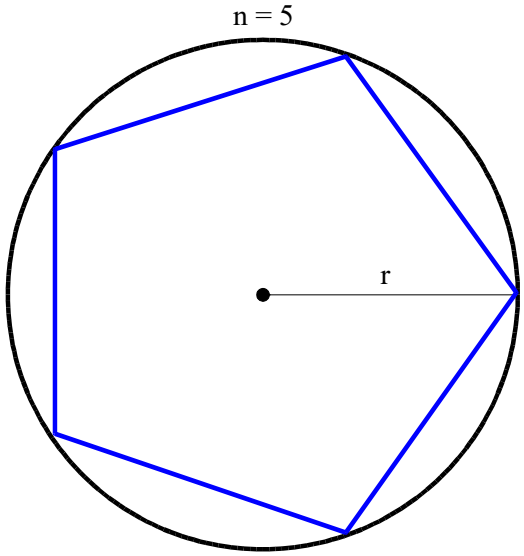
If r = 0.5, then the circumference of the circle is π.

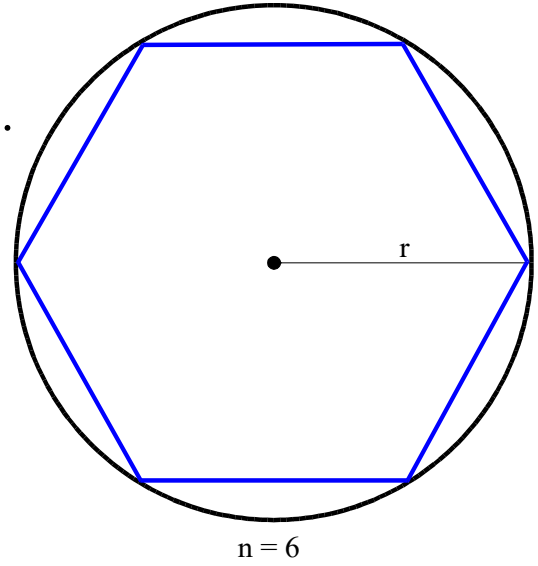
Now consider the perimeter of the regular polygons if r = 0.5.

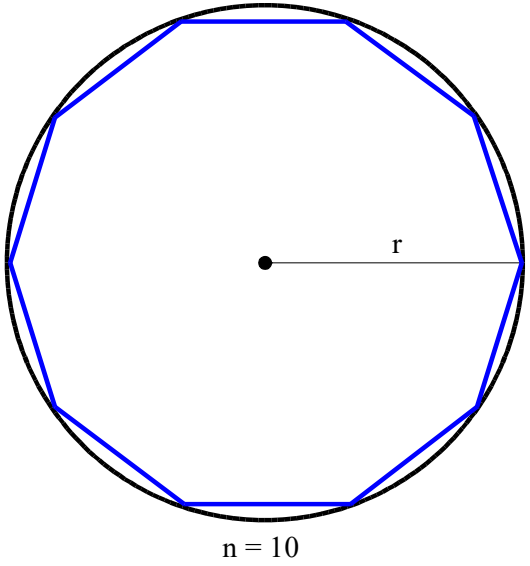
nSin(180°/n)

As n increases, the value of this expression will increase.









The Value of π

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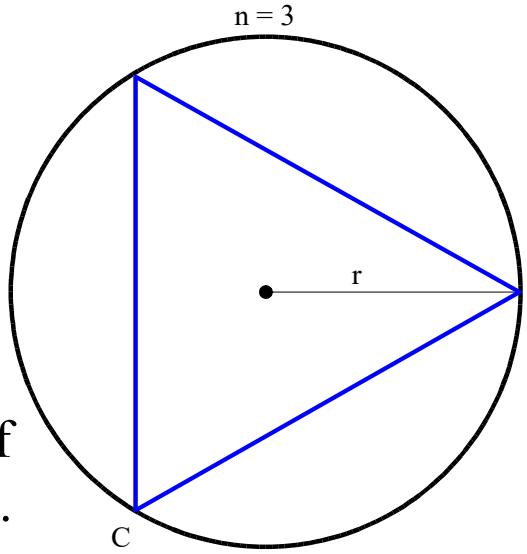
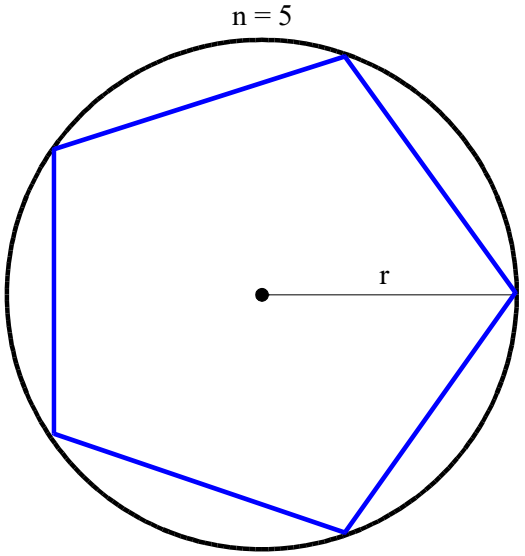
If r = 0.5, then the circumference of the circle is π.

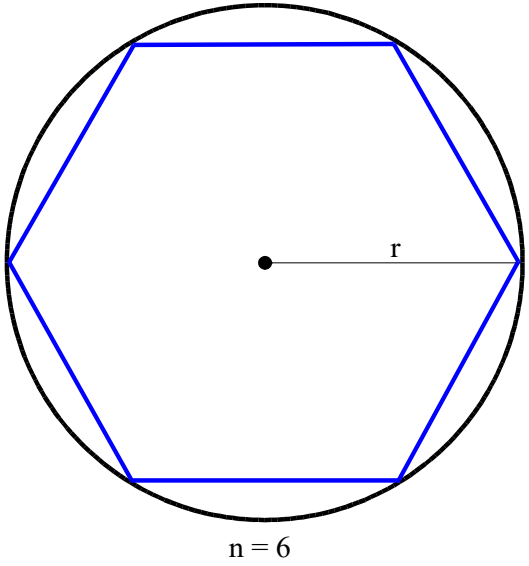
Now consider the perimeter of the regular polygons if r = 0.5.

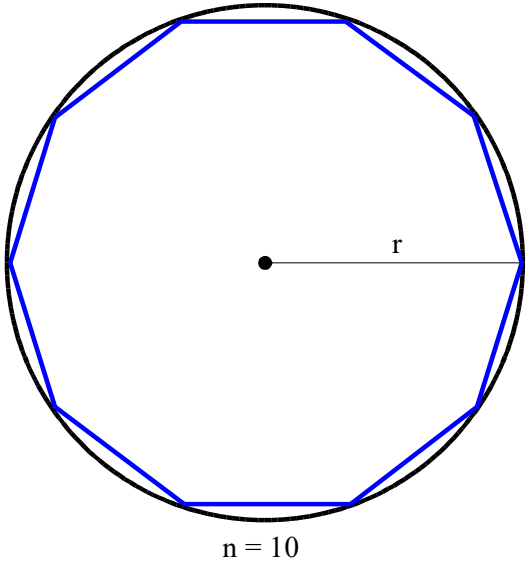
nSin(180°/n)

As n increases, the value of this expression will increase and get closer to π.









The Value of π

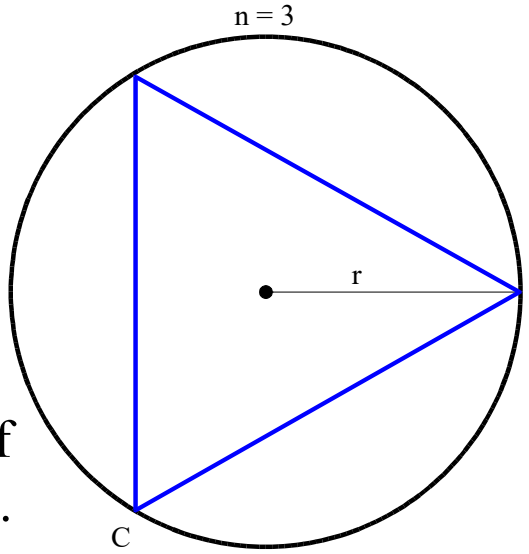
Regular Polygon Perimeter
2nrSin(180°/n)

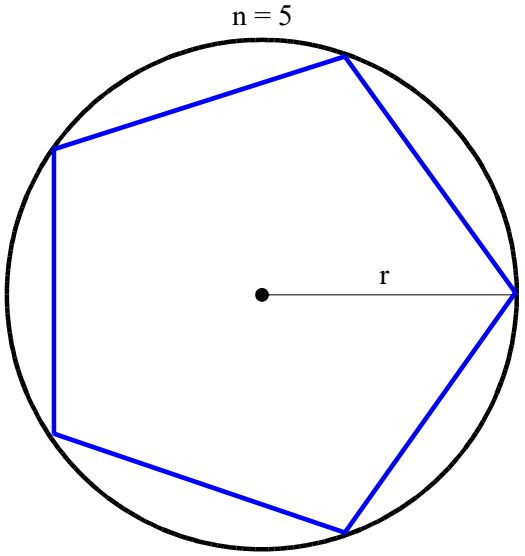
If r = 0.5, then the circumference of the circle is π.

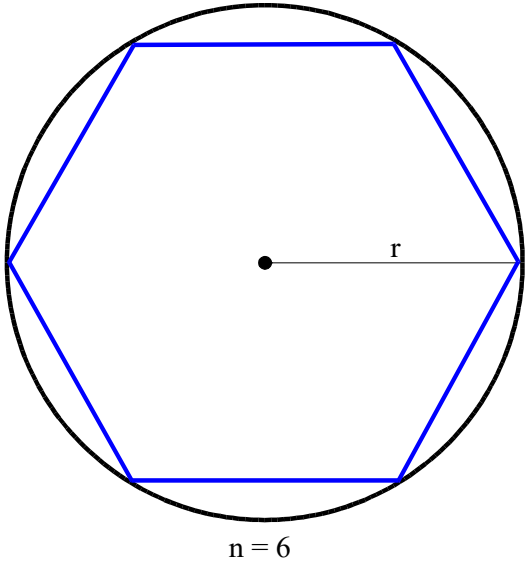
Now consider the perimeter of the regular polygons if r = 0.5.

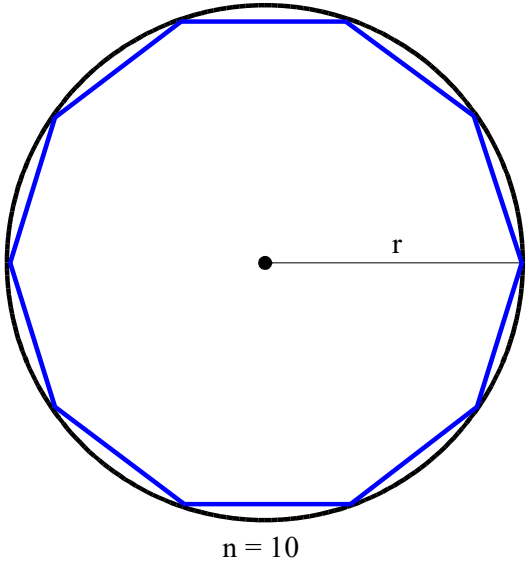
nSin(180°/n)

As n increases, the value of this expression will increase and get closer to π , the circumference of the circle.









The Value of π

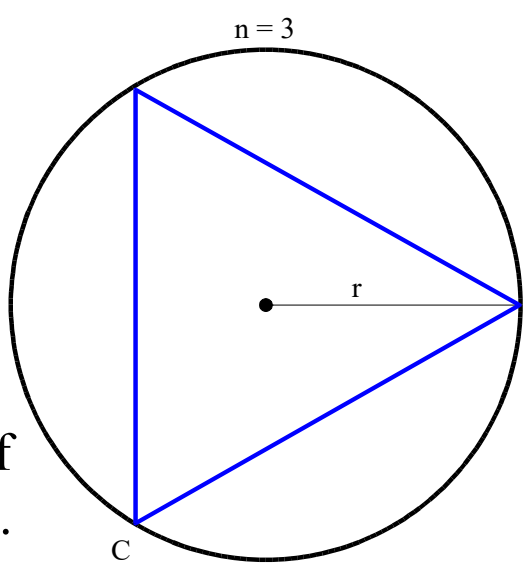
Regular Polygon Perimeter
2nrSin(180°/n)

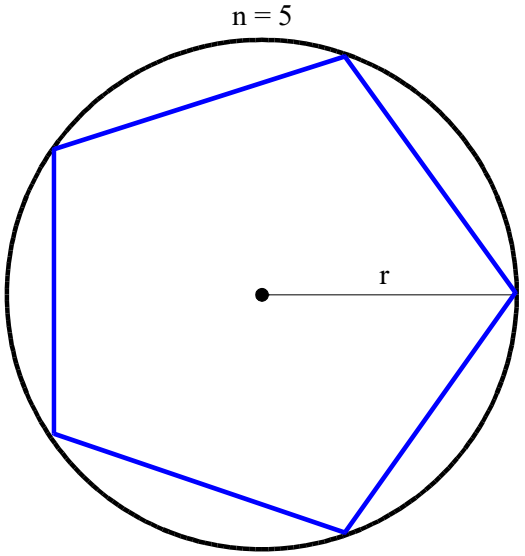
If r = 0.5, then the circumference of the circle is π.

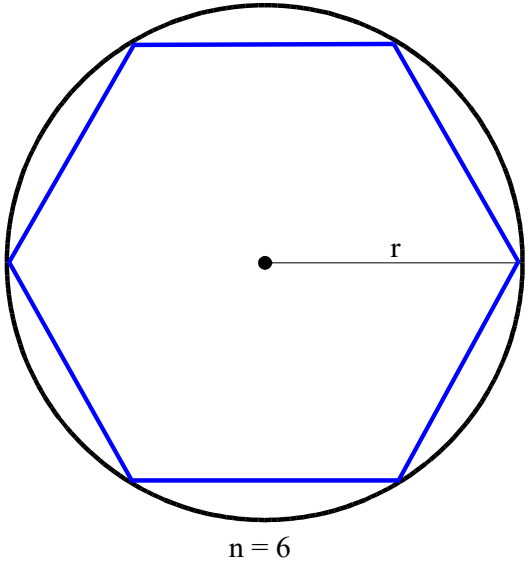
Now consider the perimeter of the regular polygons if r = 0.5.

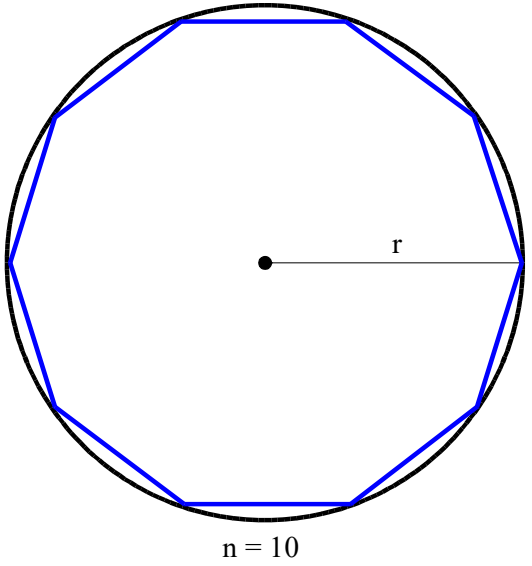
nSin(180°/n)

As n increases, the value of this expression will increase and get closer to π , the circumference of the circle. Let's create a table.









The Value of π

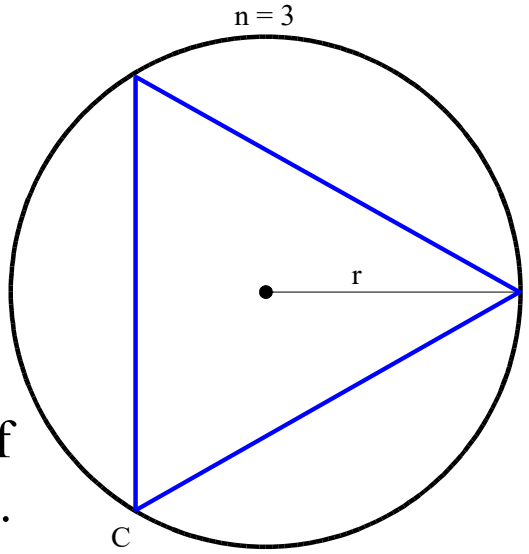
Regular Polygon Perimeter
2nrSin(180°/n)

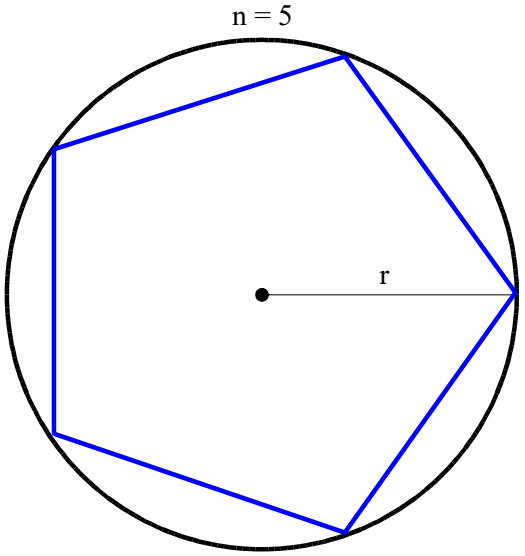
If r = 0.5, then the circumference of the circle is π.

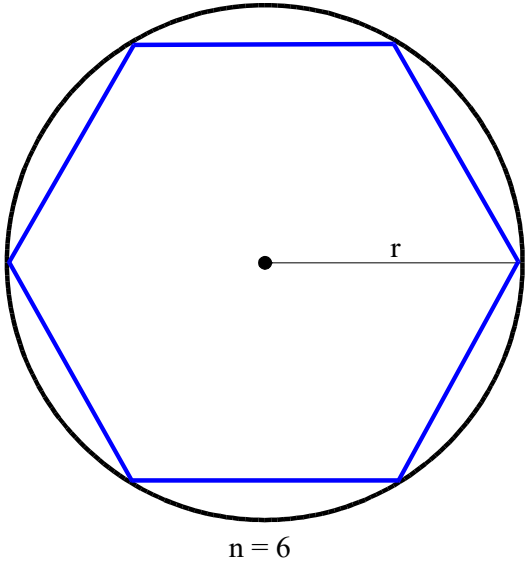
Now consider the perimeter of the regular polygons if r = 0.5.

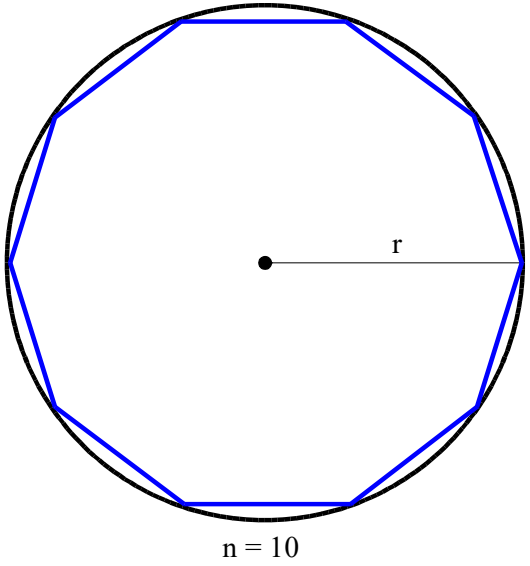
nSin(180°/n)

n	P









The Value of π

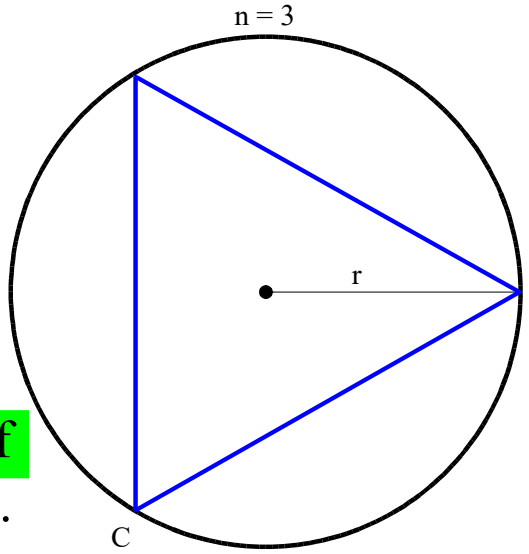
Regular Polygon Perimeter
2nrSin(180°/n)

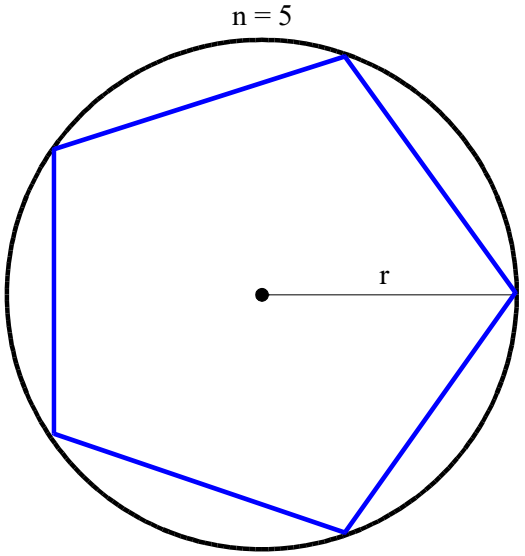
If r = 0.5, then the circumference of the circle is π.

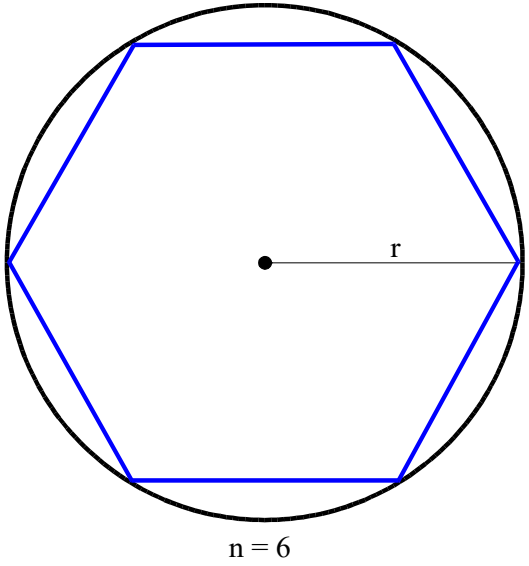
Now consider the perimeter of the regular polygons if r = 0.5.

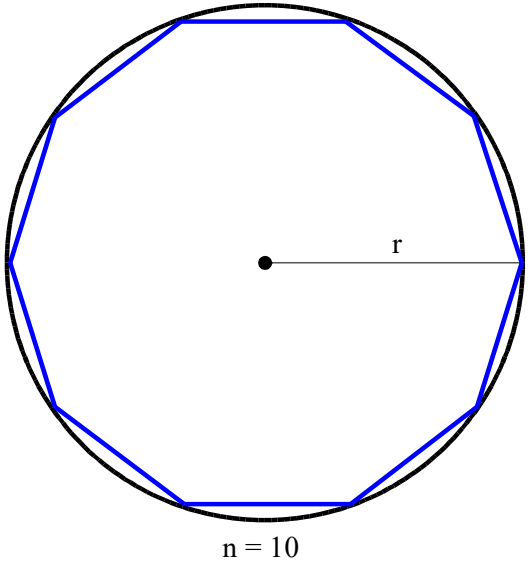
nSin(180°/n)

n	P









The Value of π

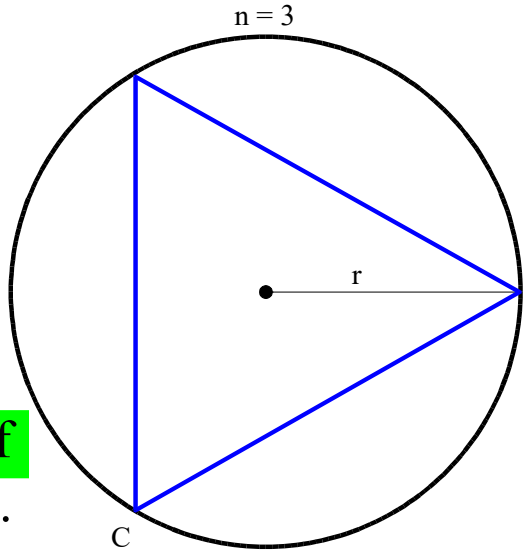
Regular Polygon Perimeter
2nrSin(180°/n)

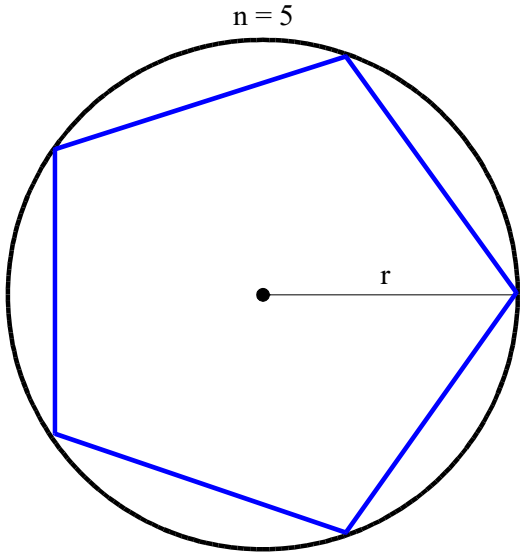
If r = 0.5, then the circumference of the circle is π.

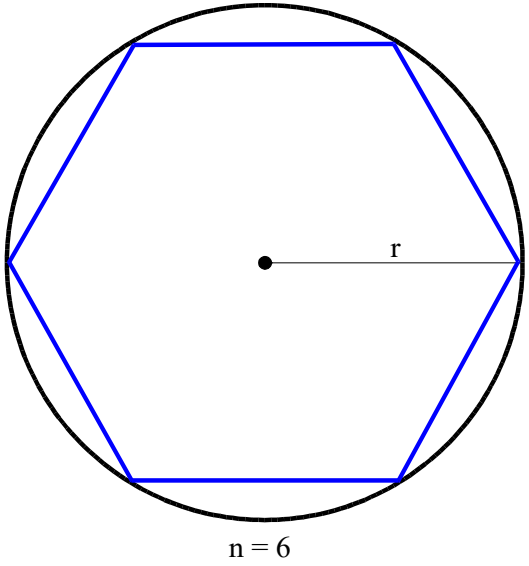
Now consider the perimeter of the regular polygons if r = 0.5.

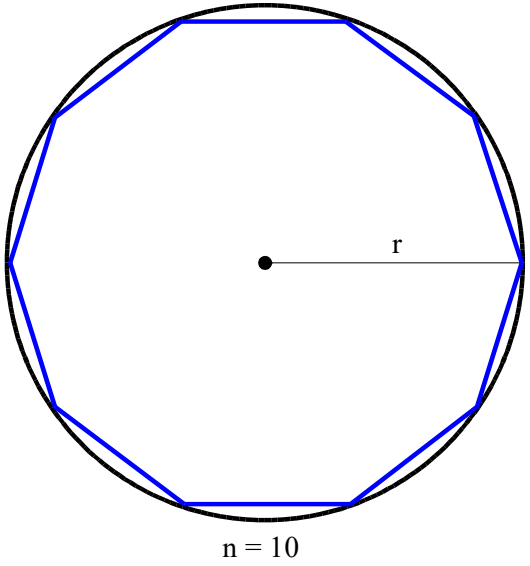
nSin(180°/n)

n	P
3	









The Value of π

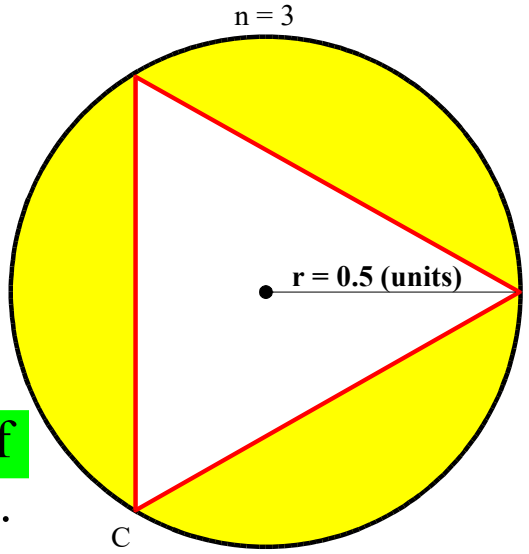
Regular Polygon Perimeter
2nrSin(180°/n)

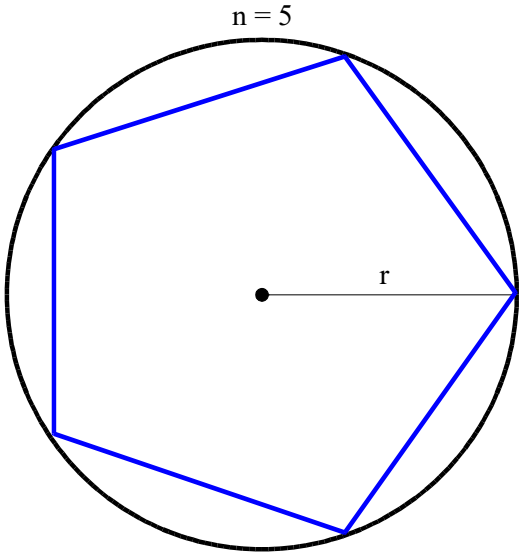
If r = 0.5, then the circumference of the circle is π.

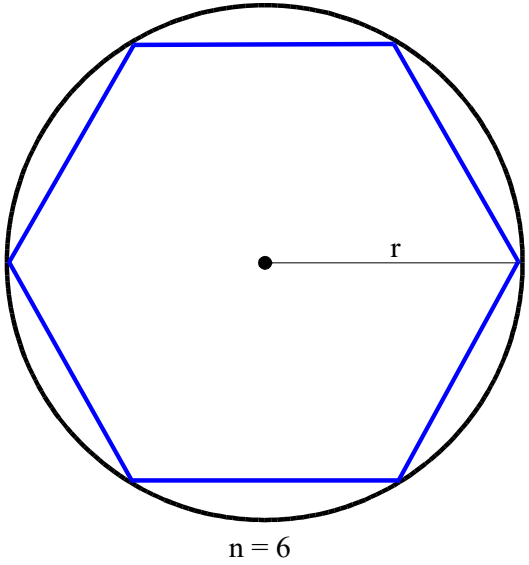
Now consider the perimeter of the regular polygons if r = 0.5.

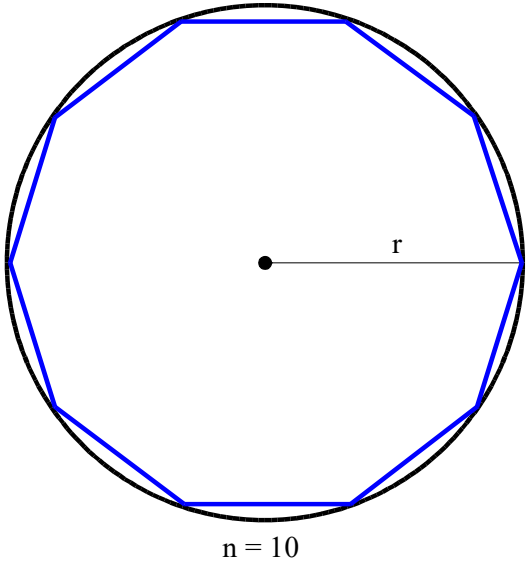
nSin(180°/n)

n	P
3	









The Value of π

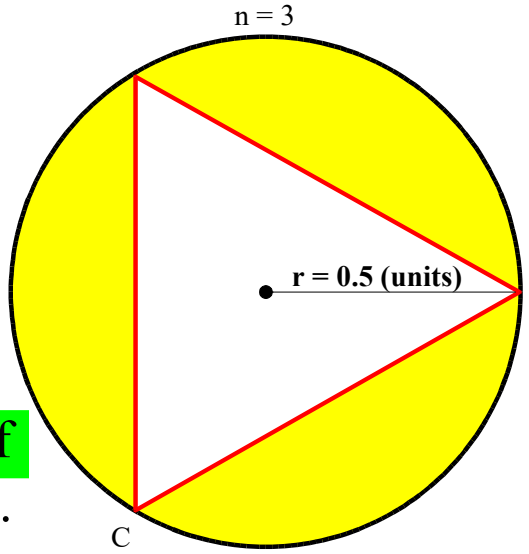
Regular Polygon Perimeter
2nrSin(180°/n)

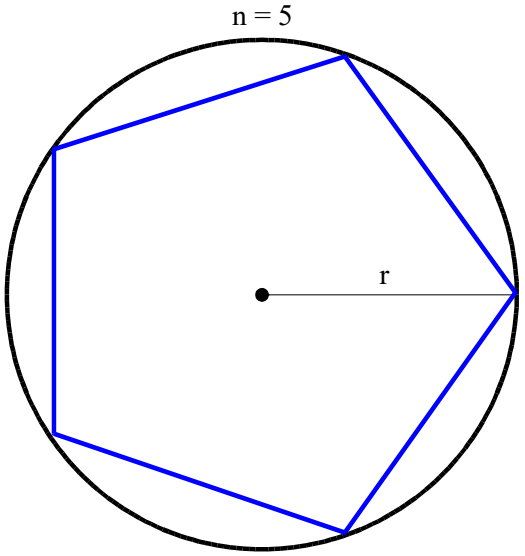
If r = 0.5, then the circumference of the circle is π.

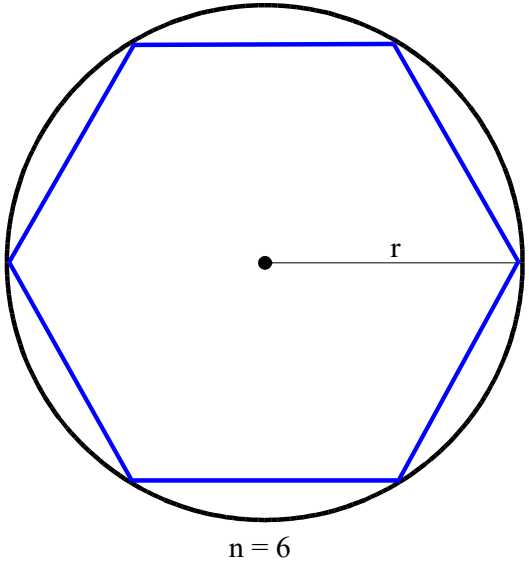
Now consider the perimeter of the regular polygons if r = 0.5.

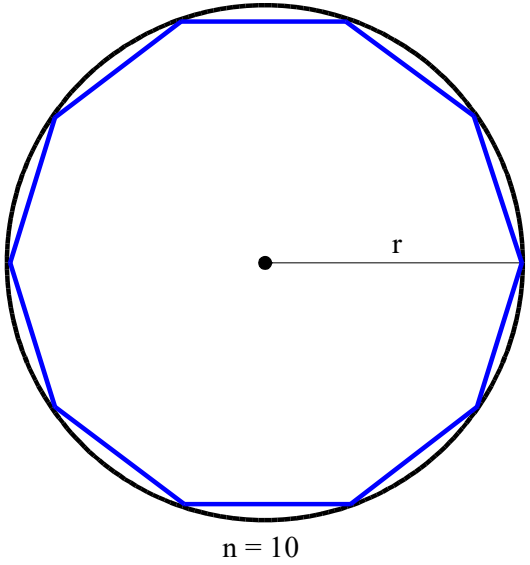
nSin(180°/n)

n	P
3	2.598









The Value of π

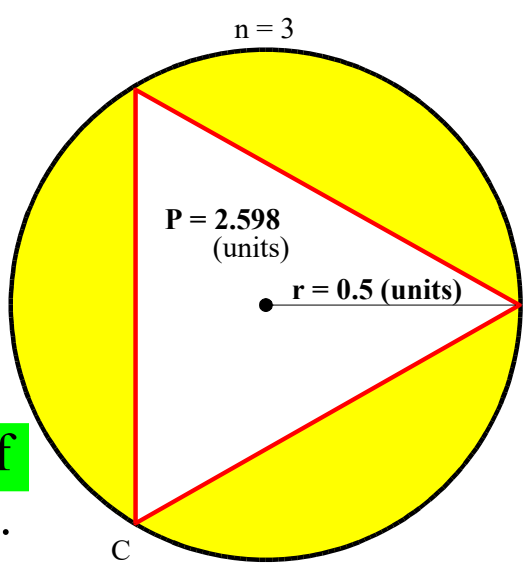
Regular Polygon Perimeter
2nrSin(180°/n)

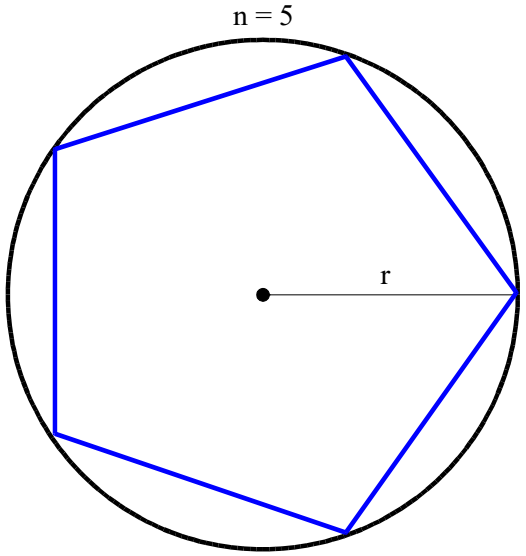
If r = 0.5, then the circumference of the circle is π.

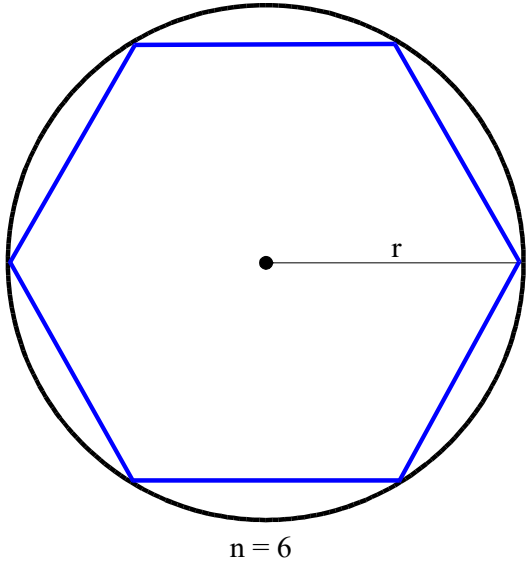
Now consider the perimeter of the regular polygons if r = 0.5.

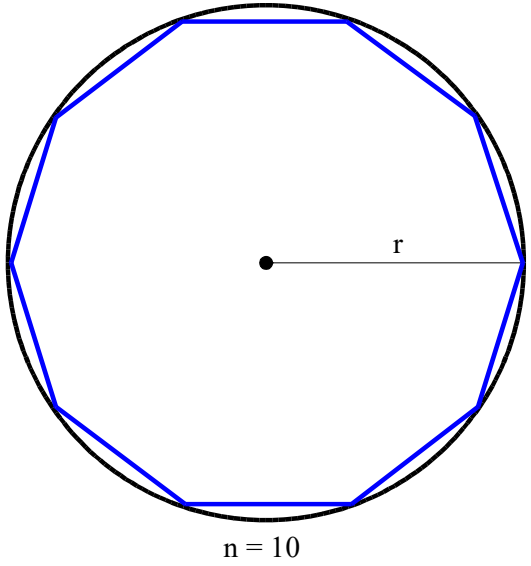
nSin(180°/n)

n	P
3	2.598









The Value of π

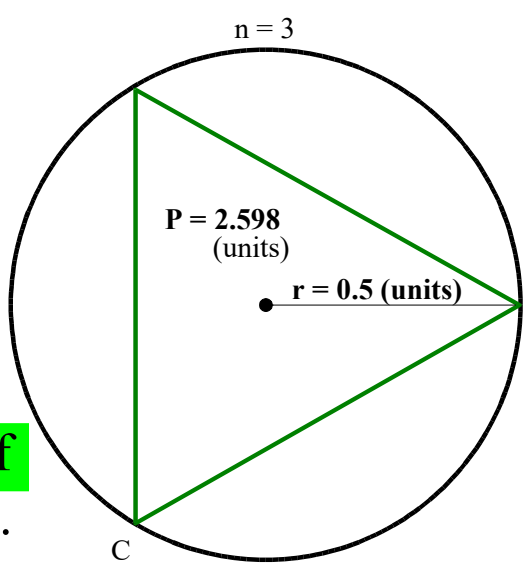
Regular Polygon Perimeter
2nrSin(180°/n)

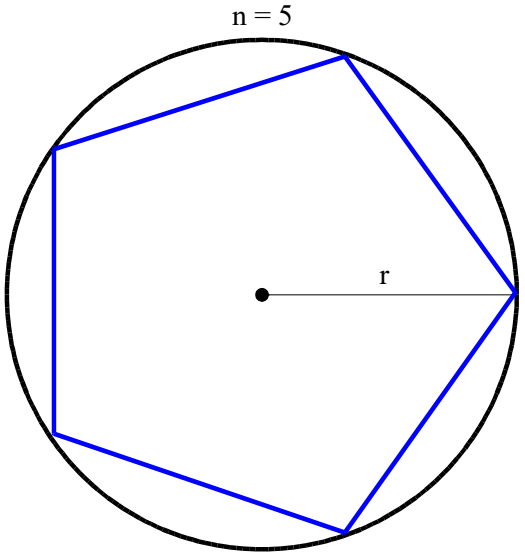
If r = 0.5, then the circumference of the circle is π.

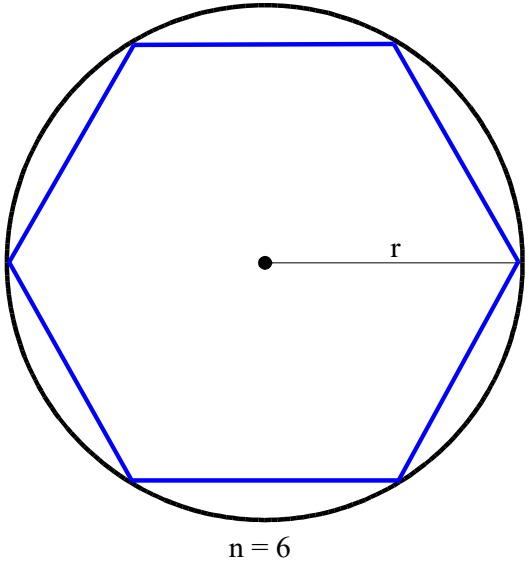
Now consider the perimeter of the regular polygons if r = 0.5.

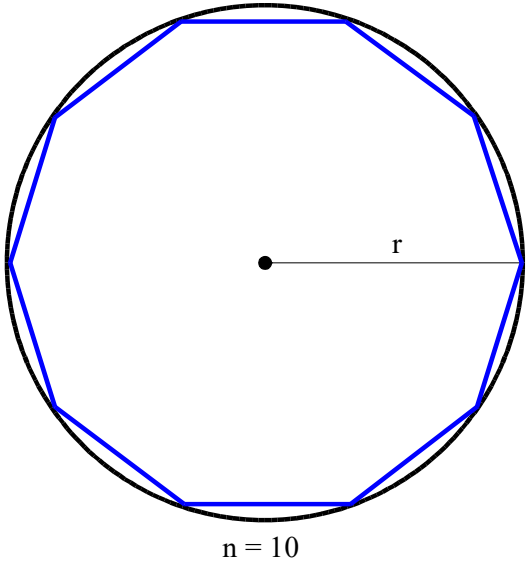
nSin(180°/n)

n	P
3	2.598









The Value of π

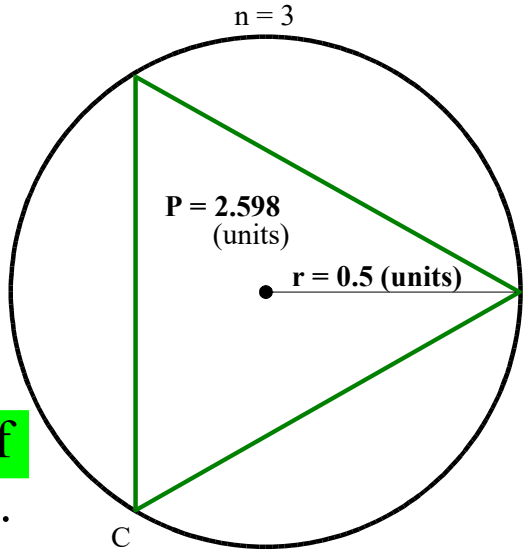
Regular Polygon Perimeter
2nrSin(180°/n)

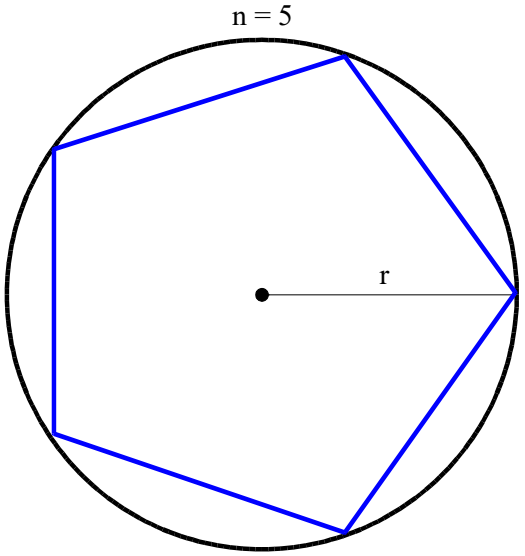
If r = 0.5, then the circumference of the circle is π.

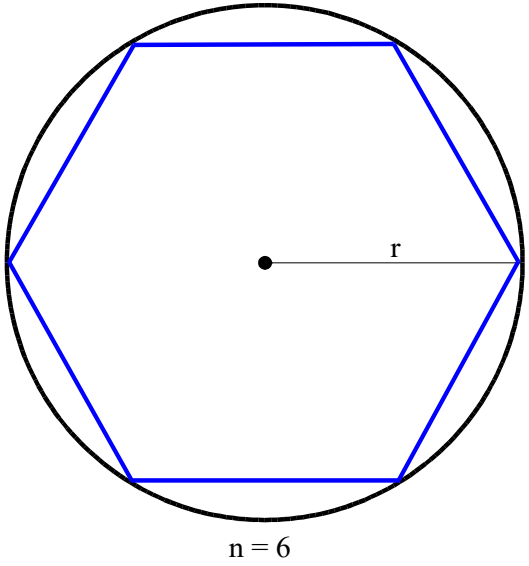
Now consider the perimeter of the regular polygons if r = 0.5.

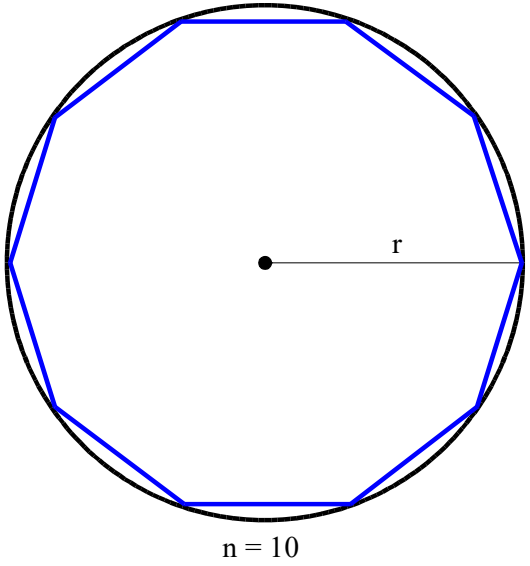
nSin(180°/n)

n	P
3	2.598
5	









The Value of π

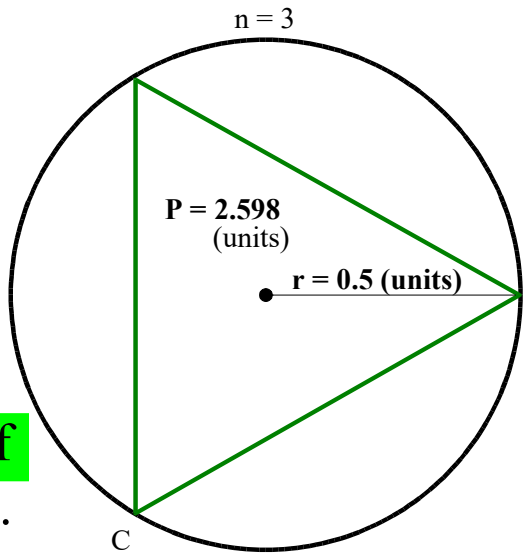
Regular Polygon Perimeter
2nrSin(180°/n)

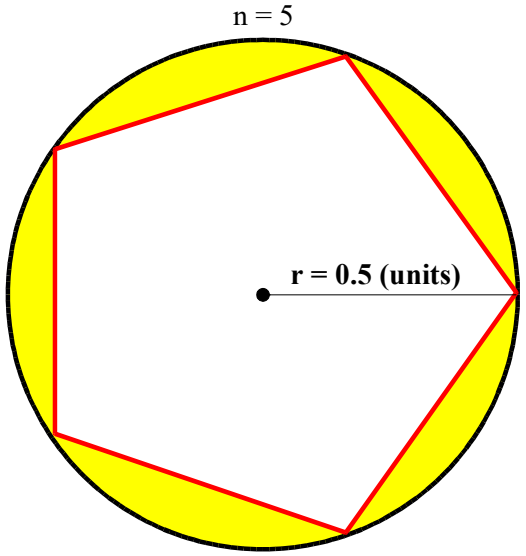
If r = 0.5, then the circumference of the circle is π.

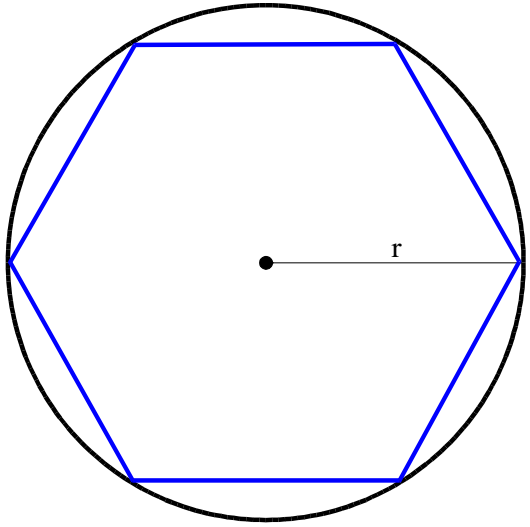
Now consider the perimeter of the regular polygons if r = 0.5.

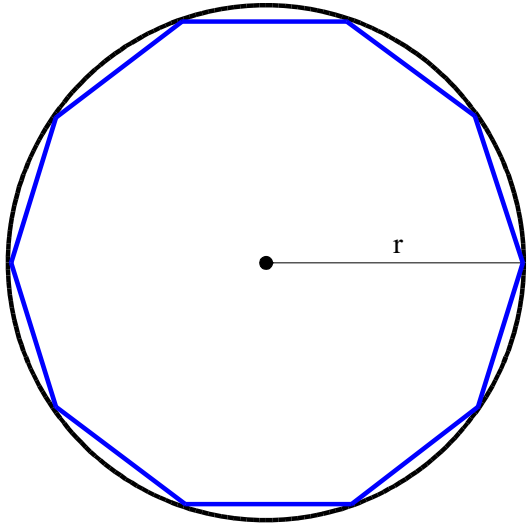
nSin(180°/n)

n	P
3	2.598
5	









The Value of π

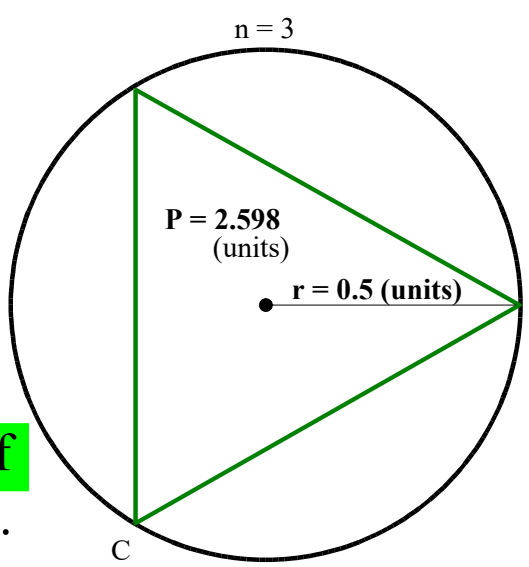
Regular Polygon Perimeter
2nrSin(180°/n)

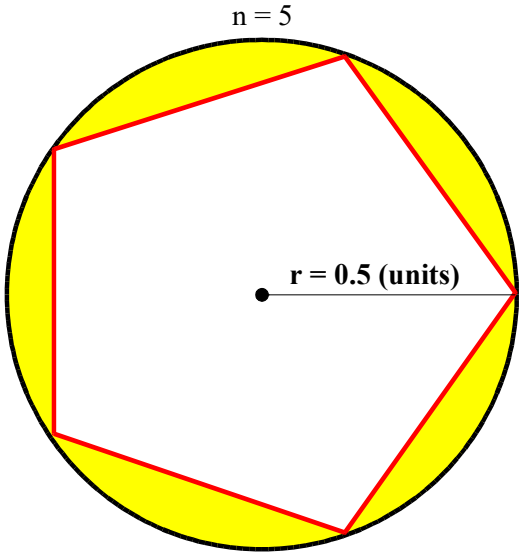
If r = 0.5, then the circumference of the circle is π.

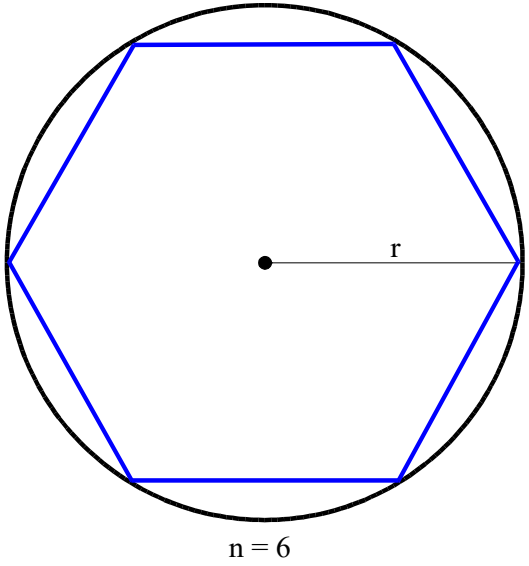
Now consider the perimeter of the regular polygons if r = 0.5.

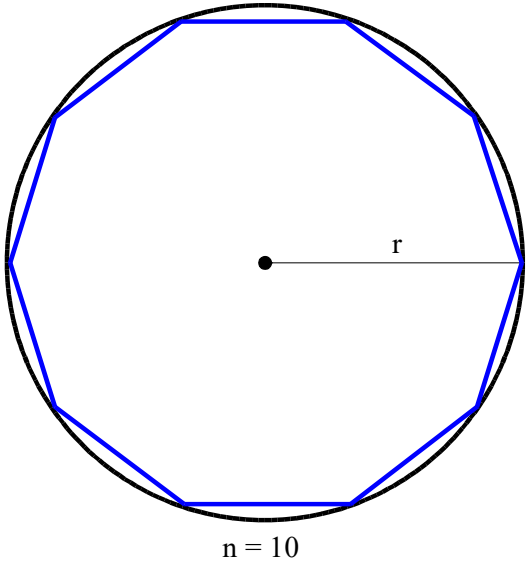
nSin(180°/n)

n	P
3	2.598
5	2.939









The Value of π

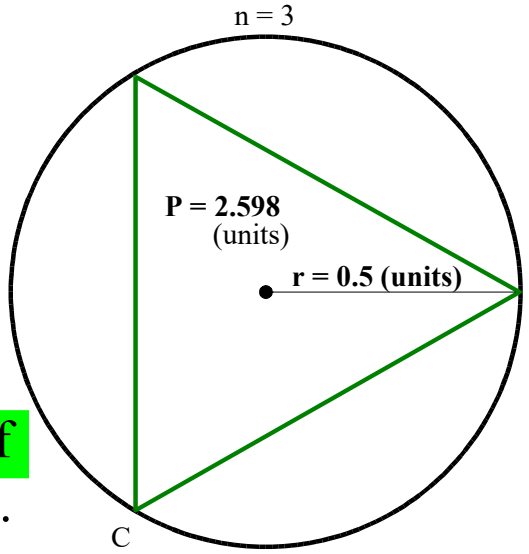
Regular Polygon Perimeter
2nrSin(180°/n)

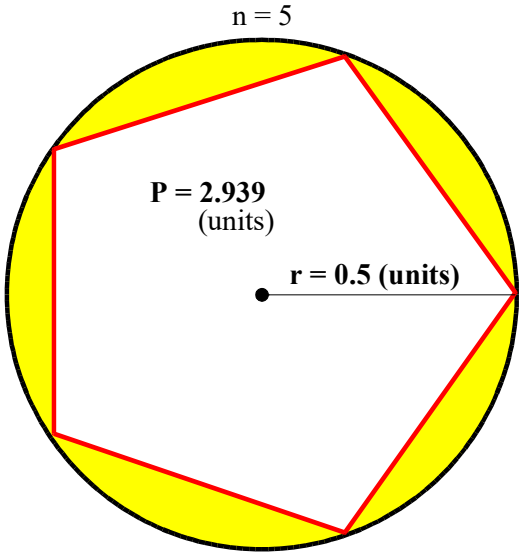
If r = 0.5, then the circumference of the circle is π.

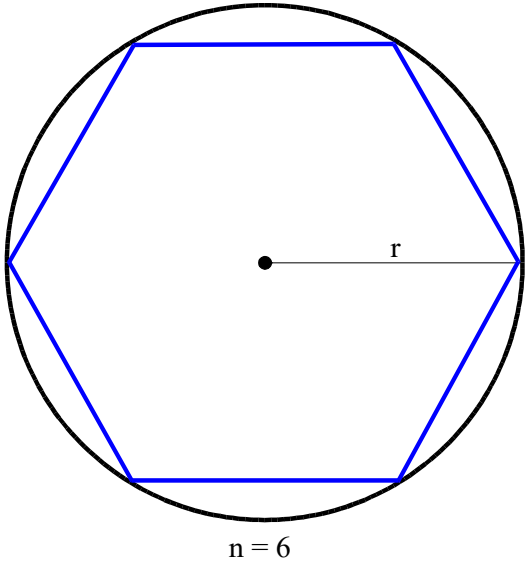
Now consider the perimeter of the regular polygons if r = 0.5.

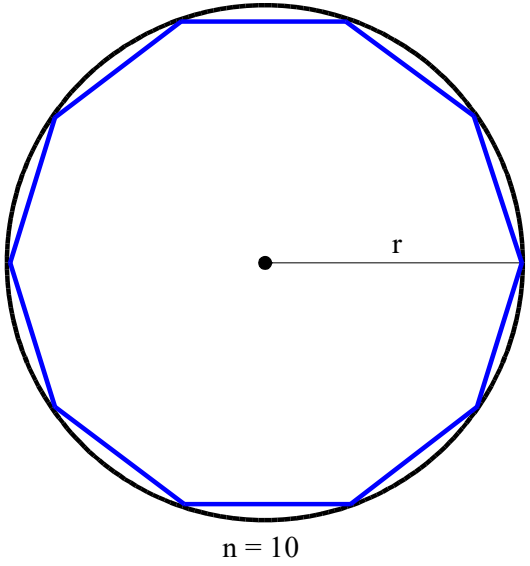
nSin(180°/n)

n	P
3	2.598
5	2.939









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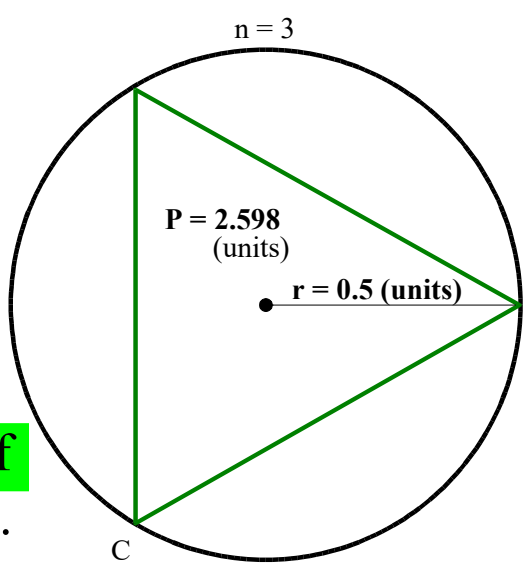

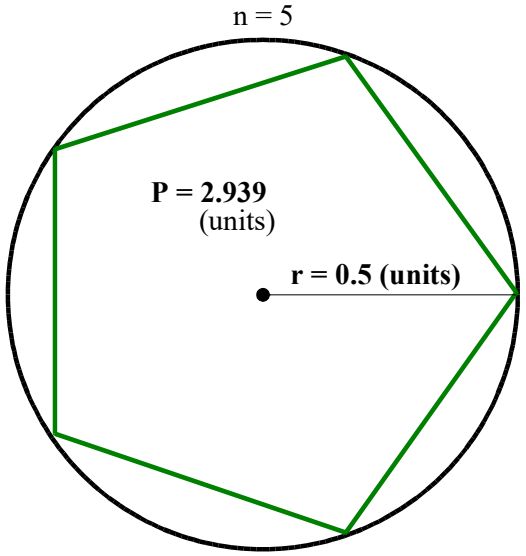

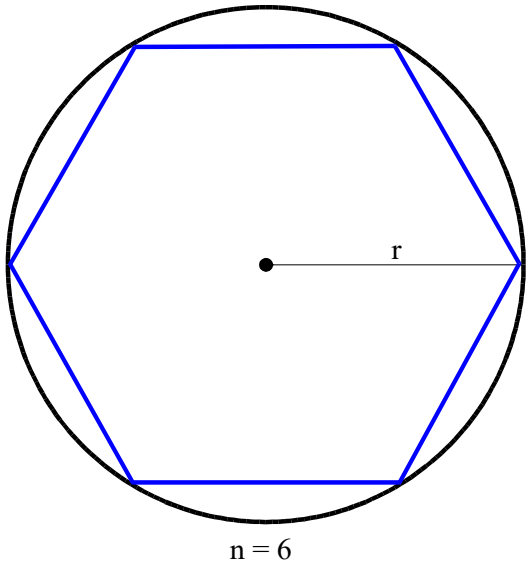

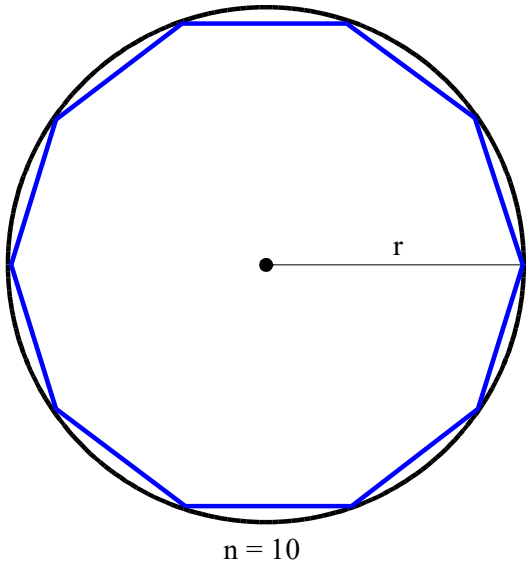

The Value of π

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nSin(180°/n)

n	P
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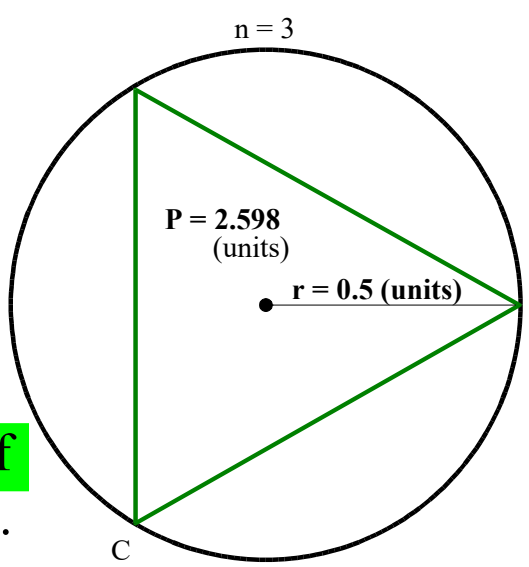
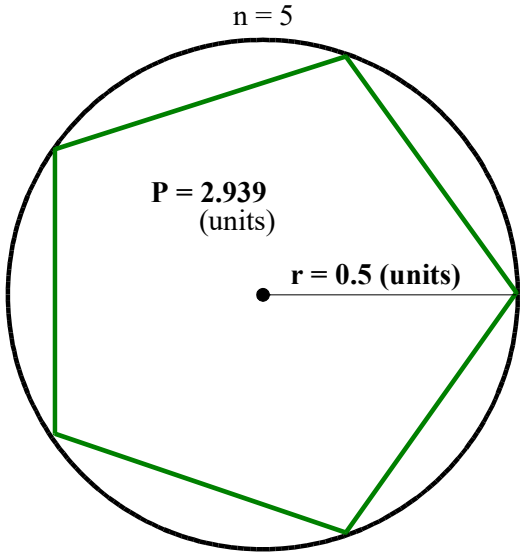
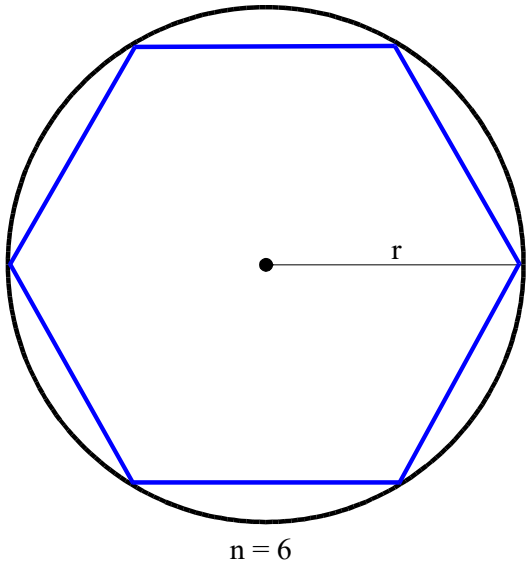
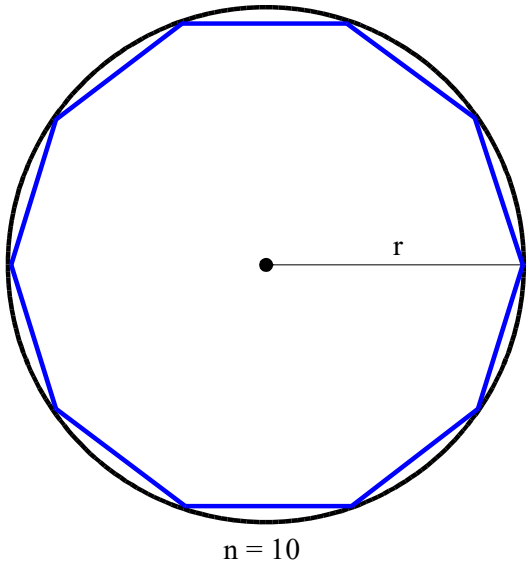
5	2.939
6	









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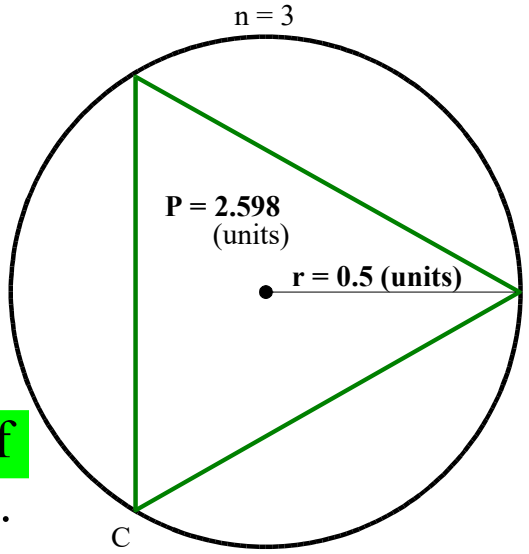

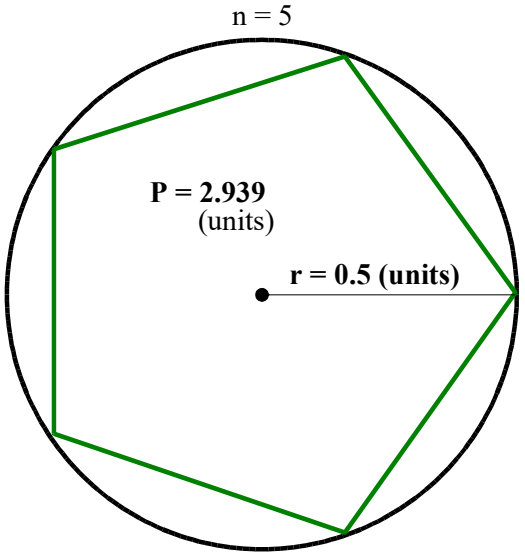

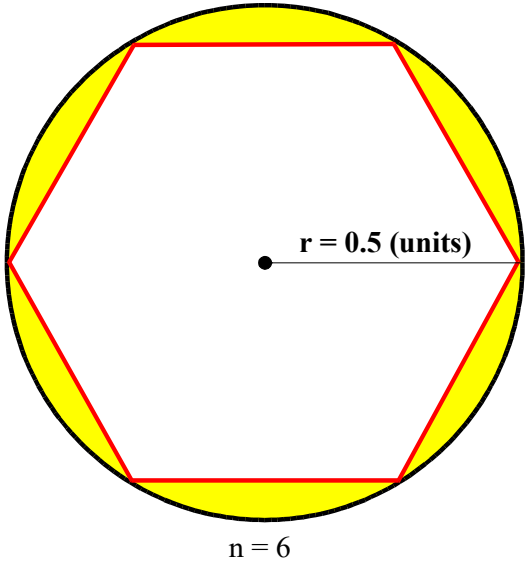

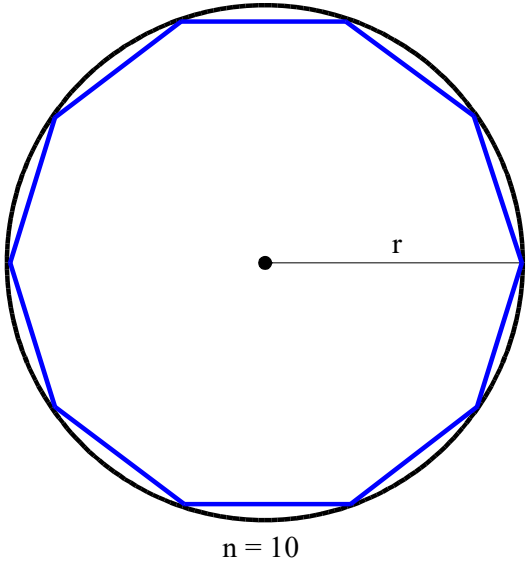

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2nrSin(180°/n)

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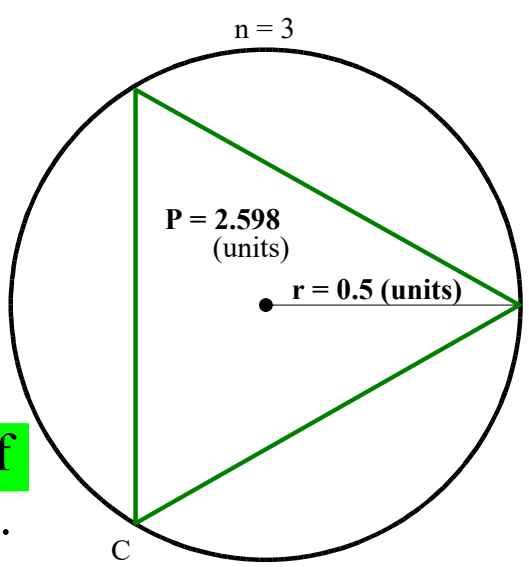
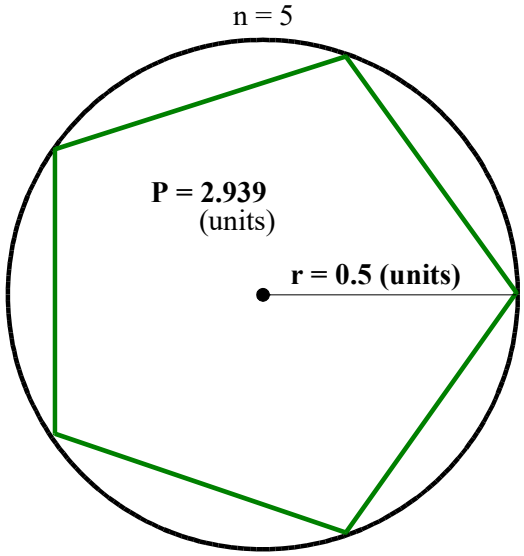
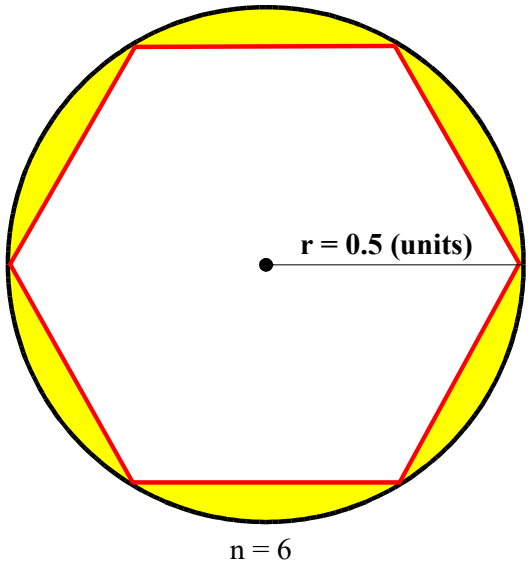
Now consider the perimeter of the regular polygons if r = 0.5.

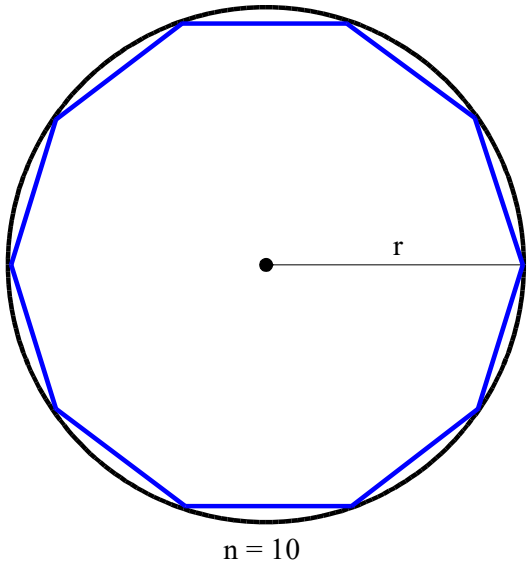
nSin(180°/n)

n	P
3	2.598
5	2.939
6	3









The Value of π

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n	P
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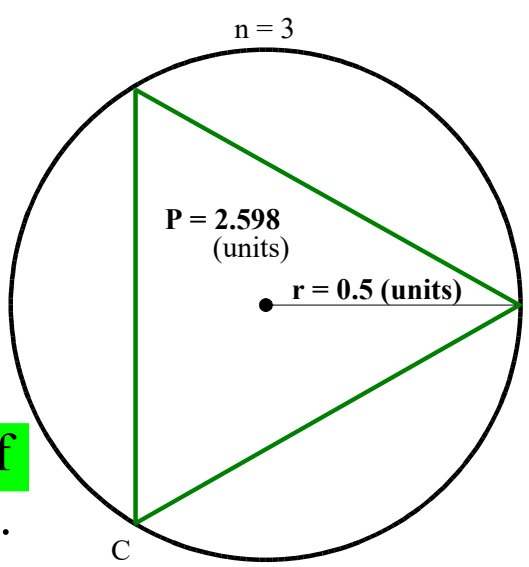

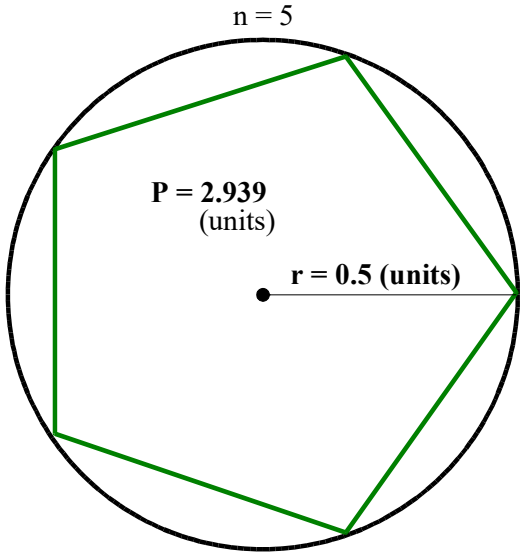

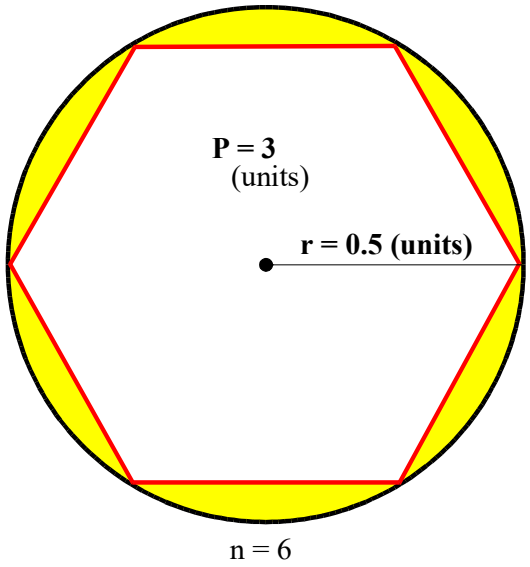

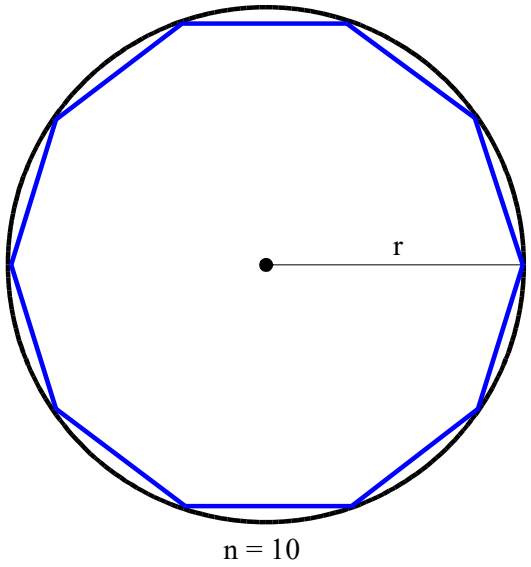

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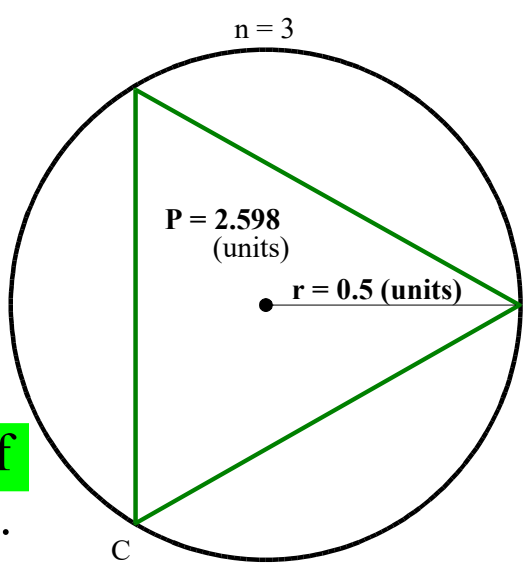

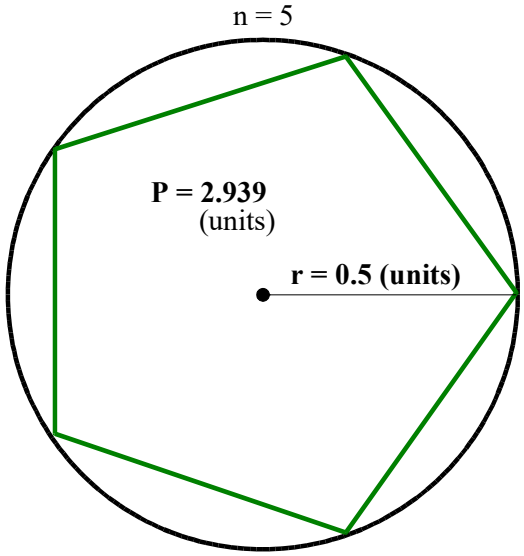

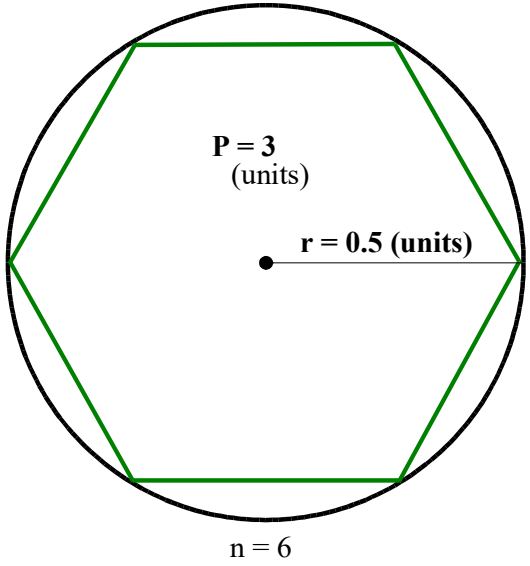

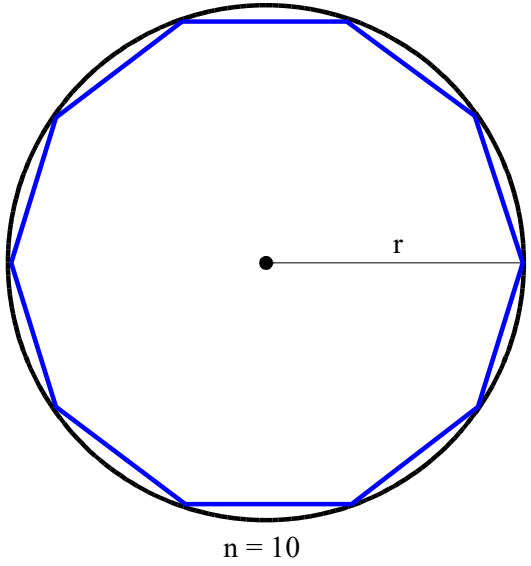

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n	P
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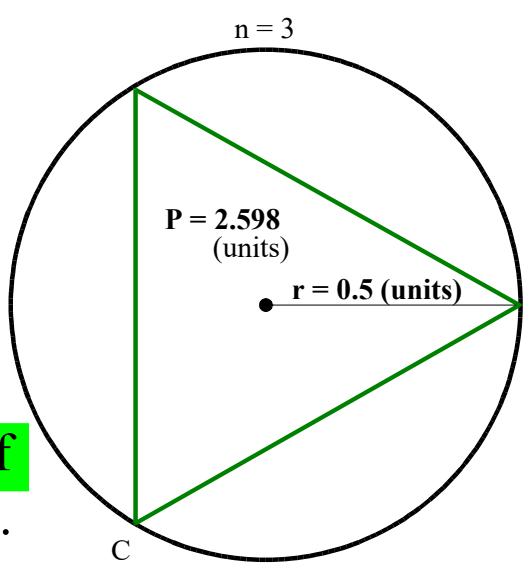
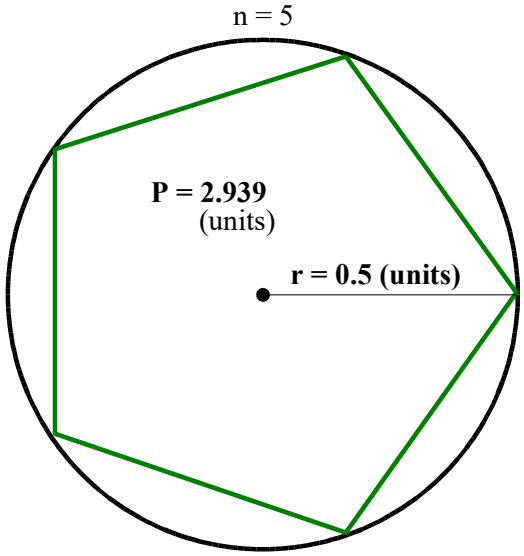
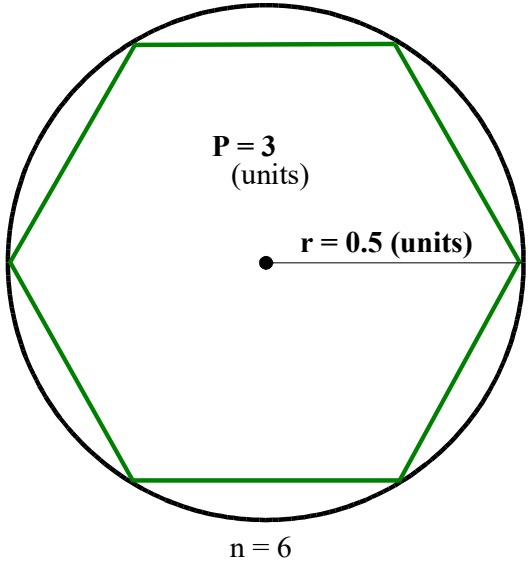
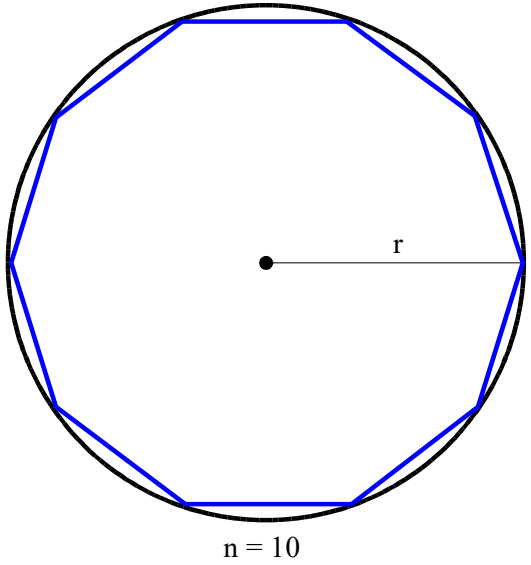
10	









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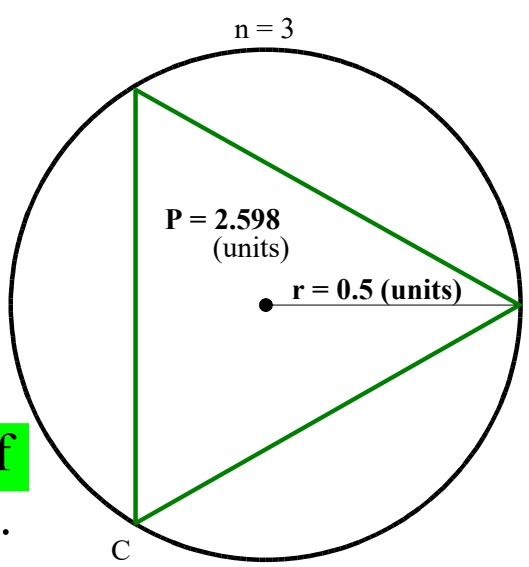

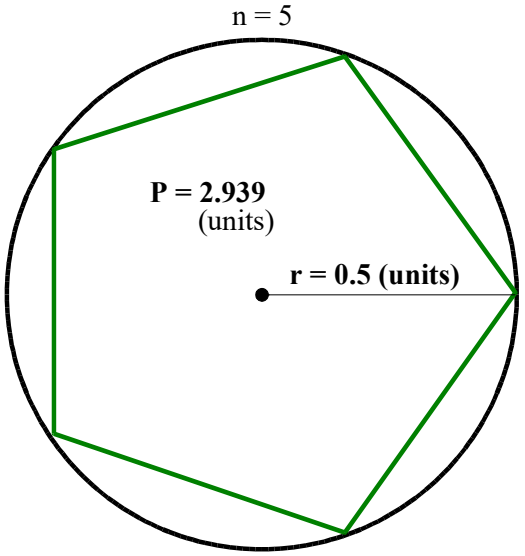

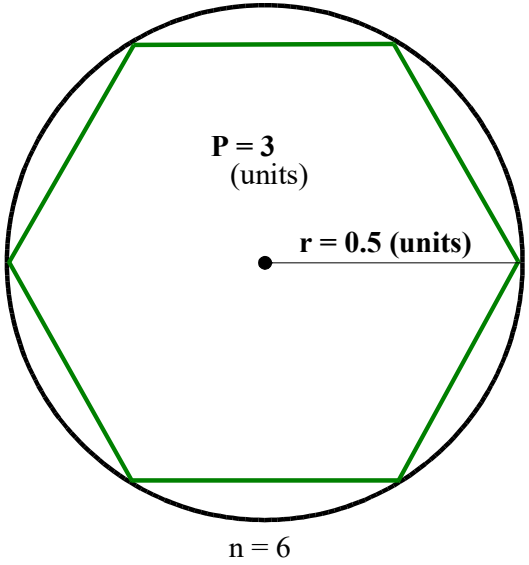

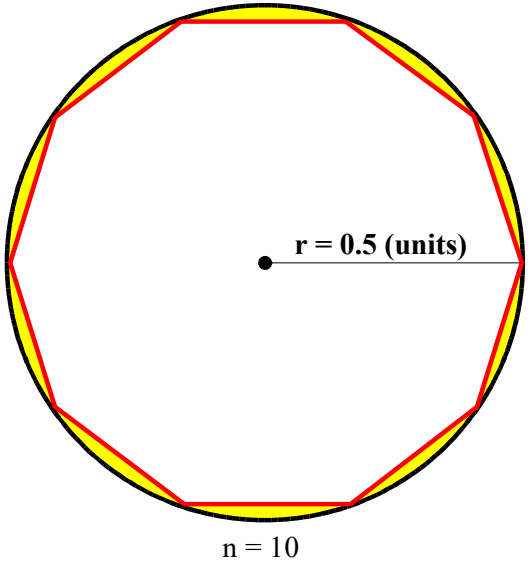

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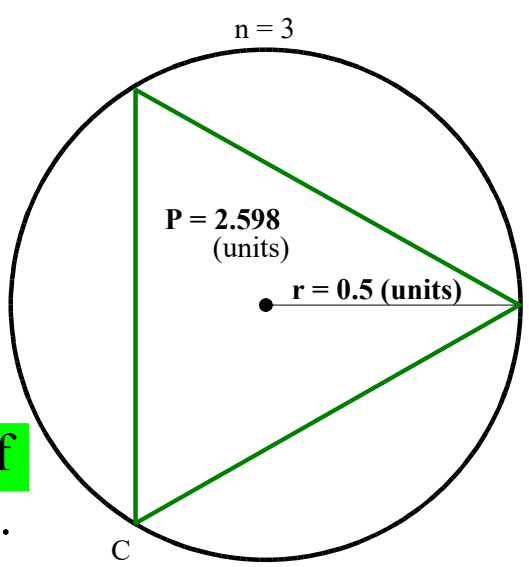

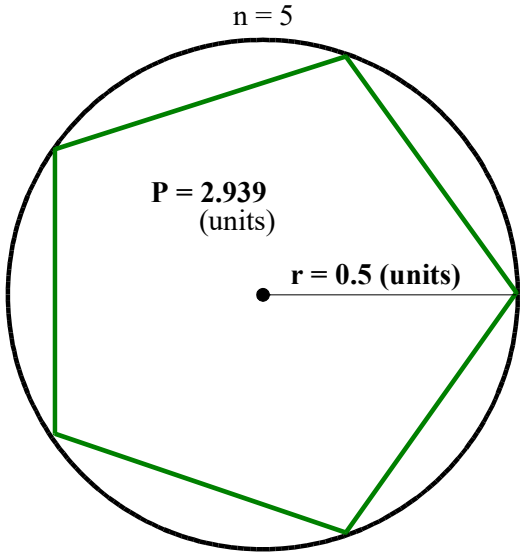

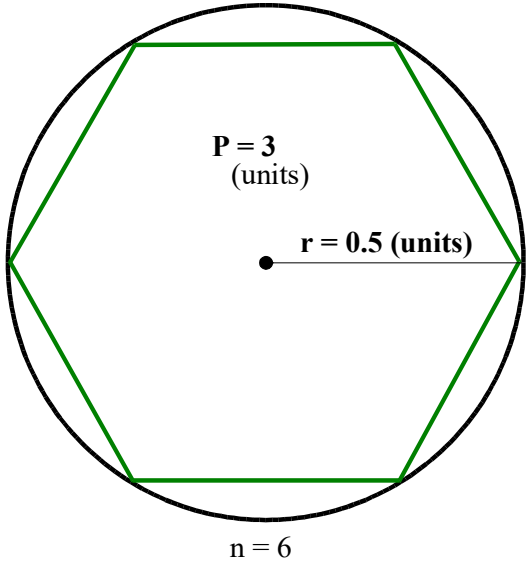

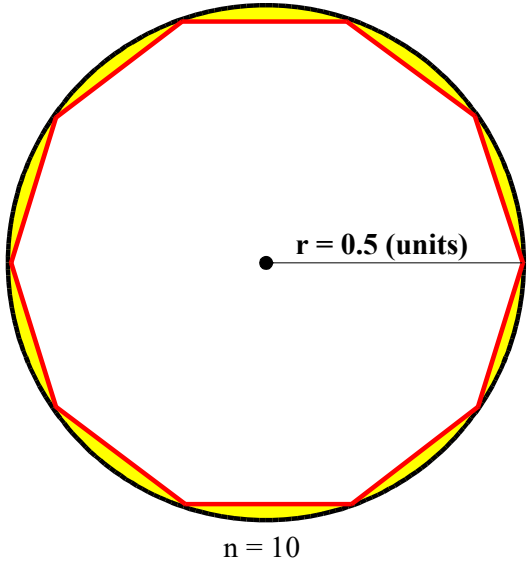

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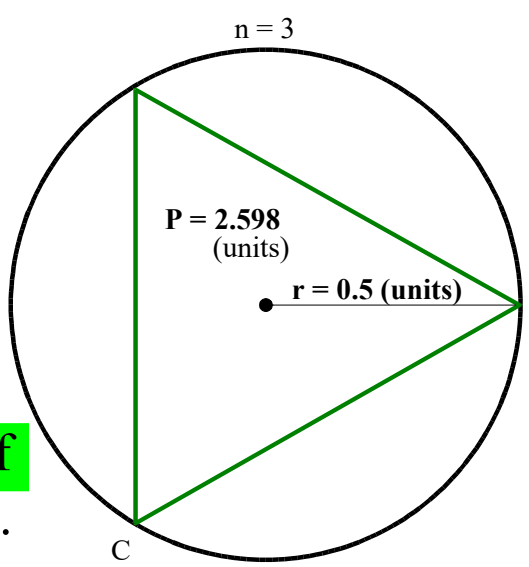

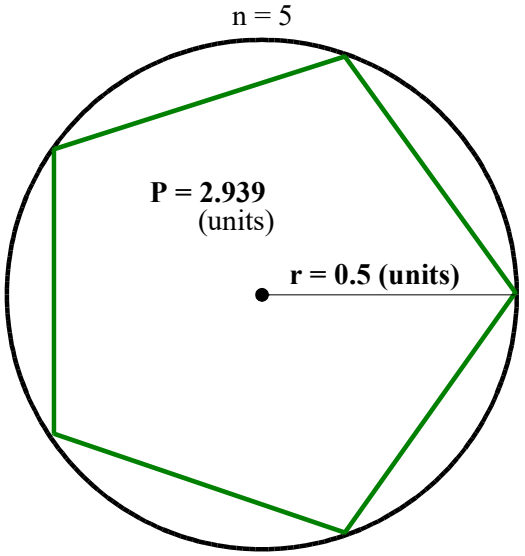

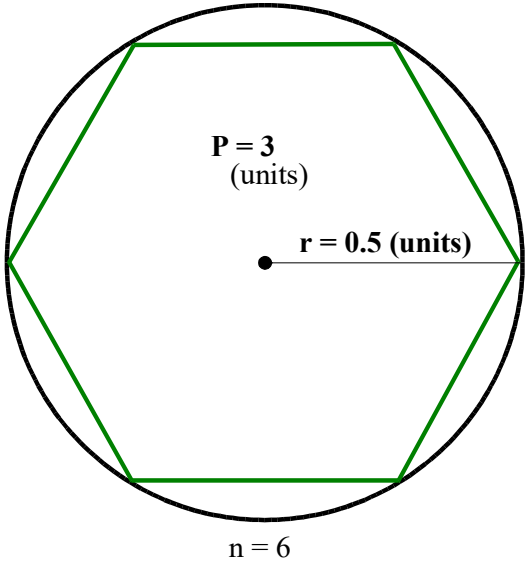

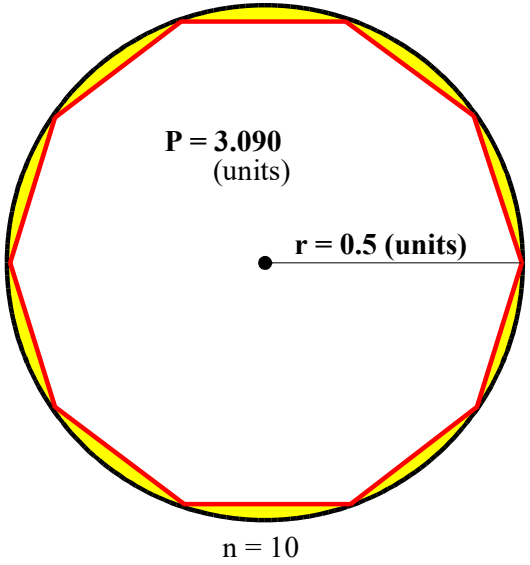

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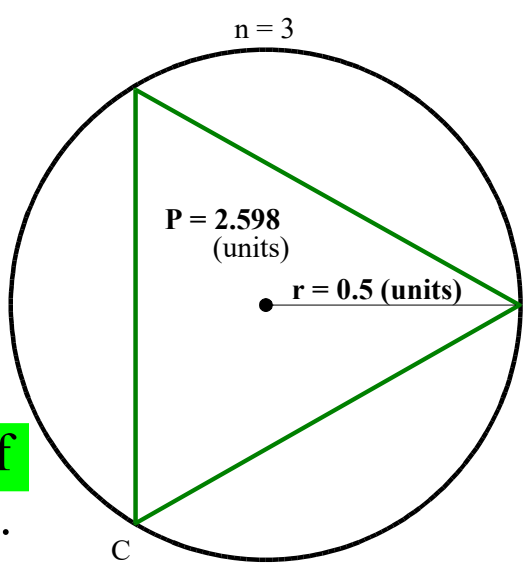
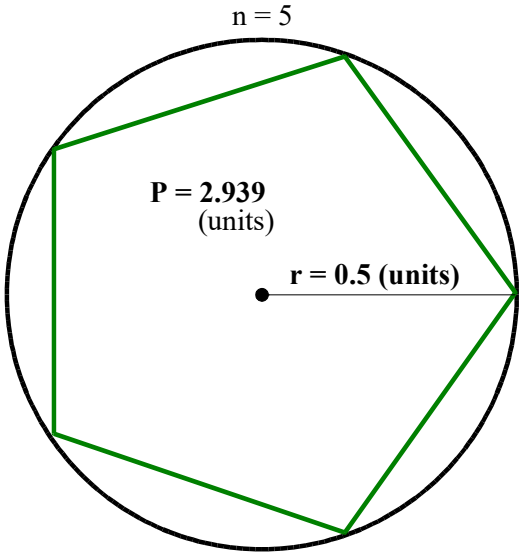
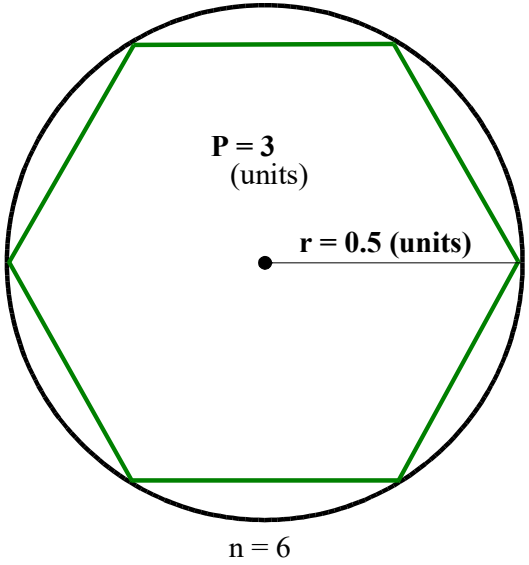
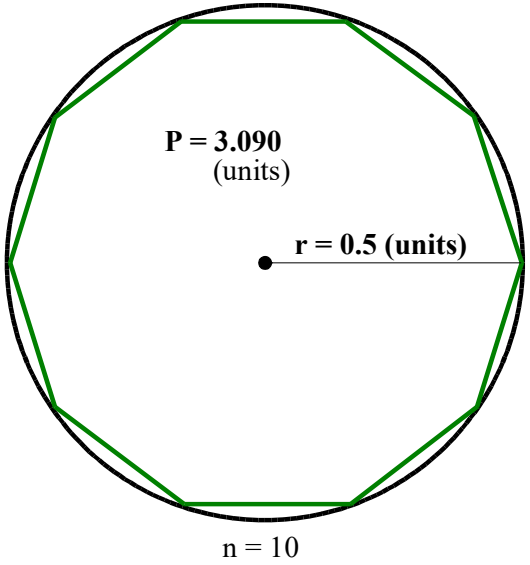








The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

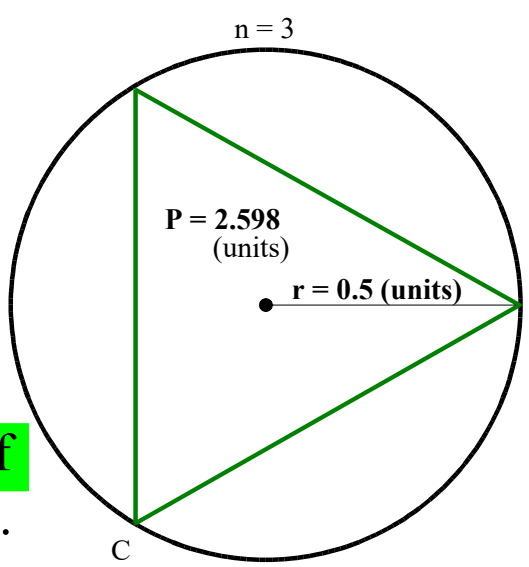
If r = 0.5, then the circumference of the circle is π.

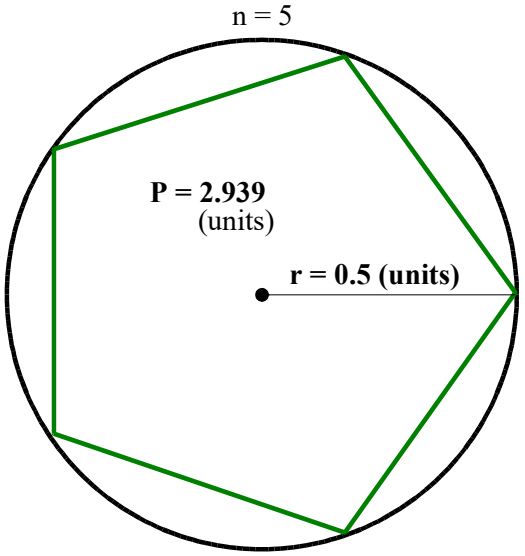
Now consider the perimeter of the regular polygons if r = 0.5.

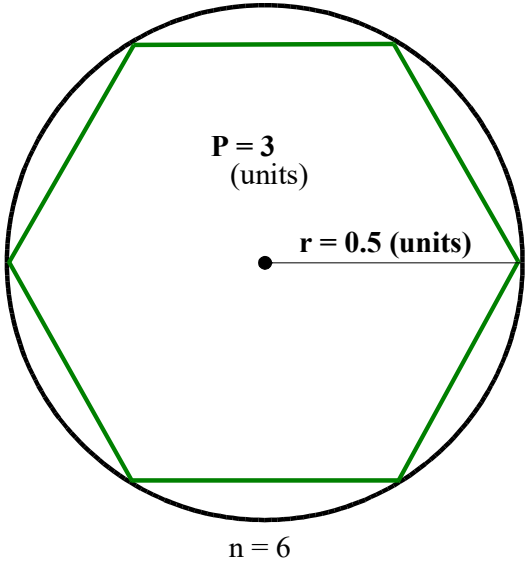
nSin(180°/n)

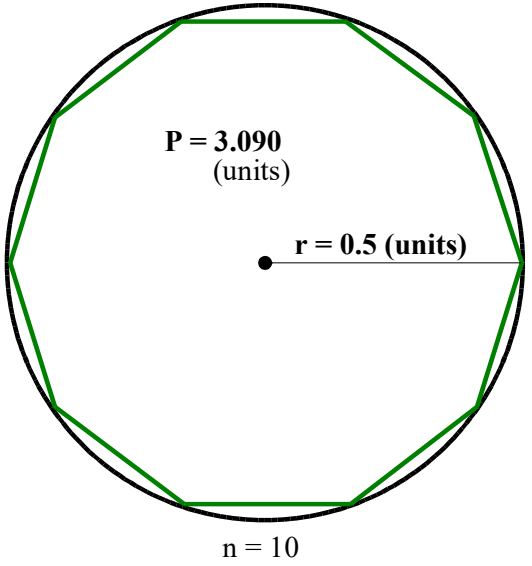
n	P
3	2.598
5	2.939
6	3
10	3.090

increasing









The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

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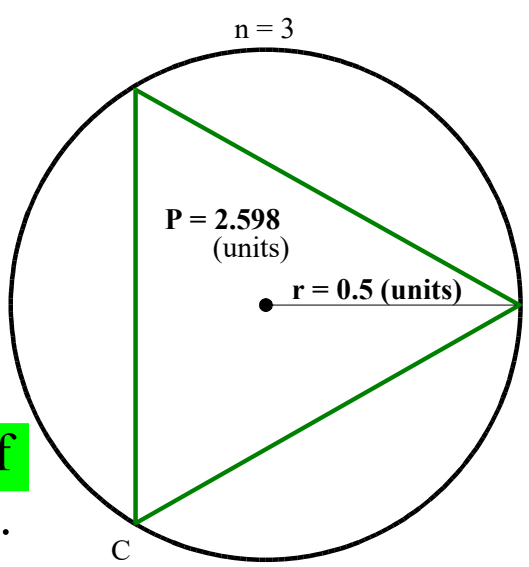
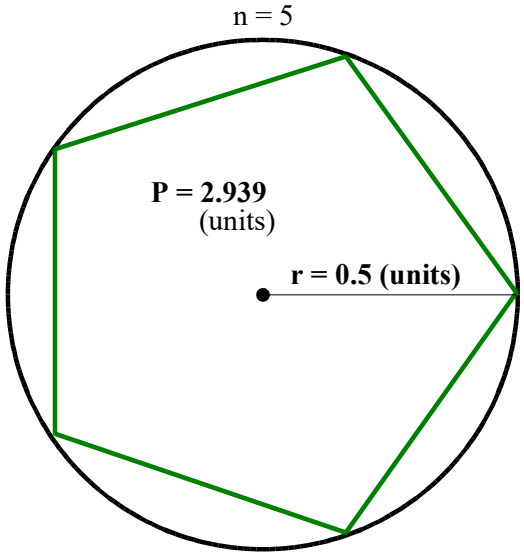
Now consider the perimeter of the regular polygons if r = 0.5.

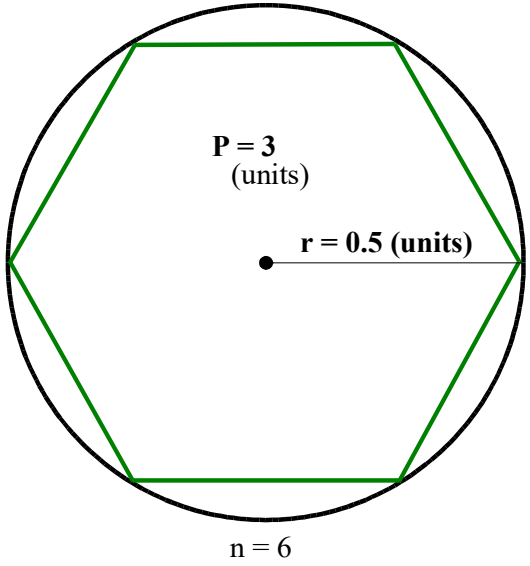
nSin(180°/n)

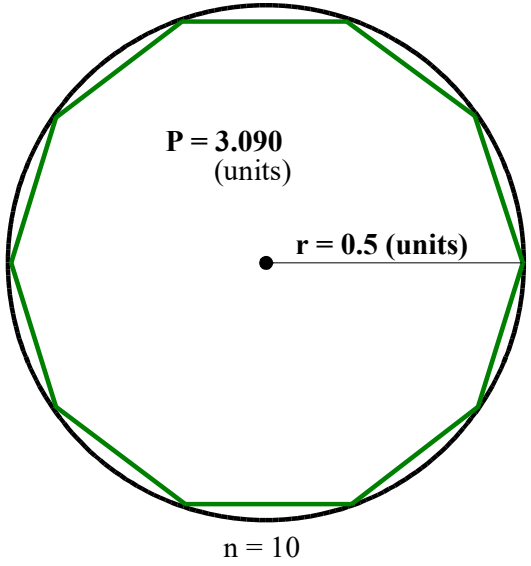
n	P
3	2.598
5	2.939
6	3
10	3.090

increasing (as expected)









The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

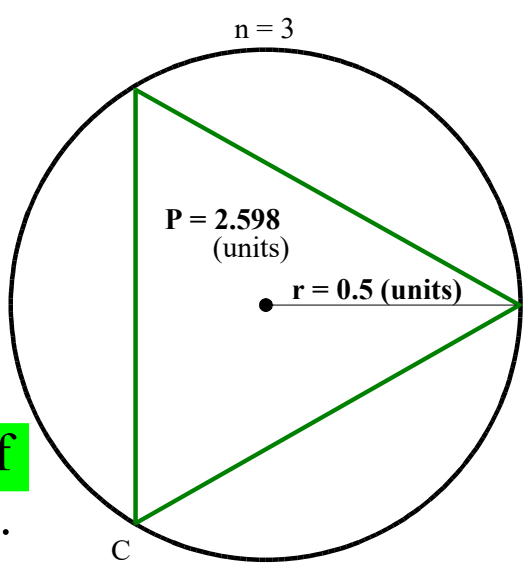
If r = 0.5, then the circumference of the circle is π.

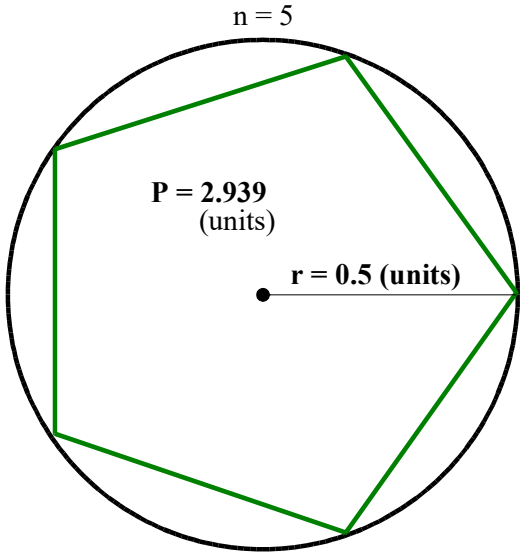
Now consider the perimeter of the regular polygons if r = 0.5.

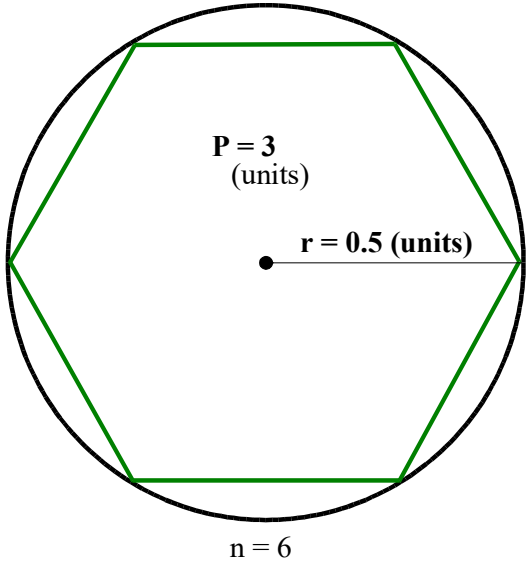
nSin(180°/n)

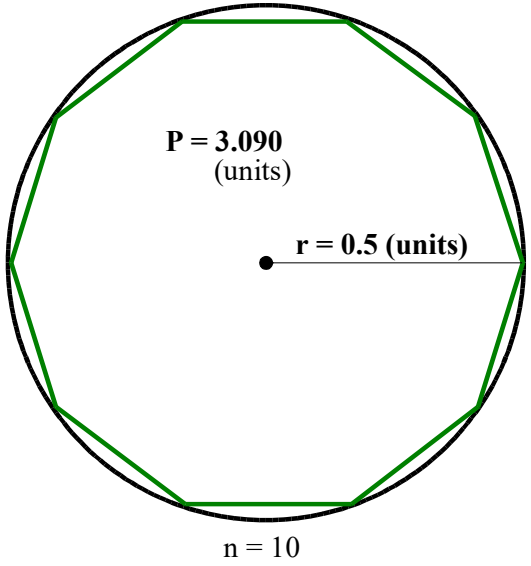
n	P
3	2.598
5	2.939
6	3
10	3.090

n	P









The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

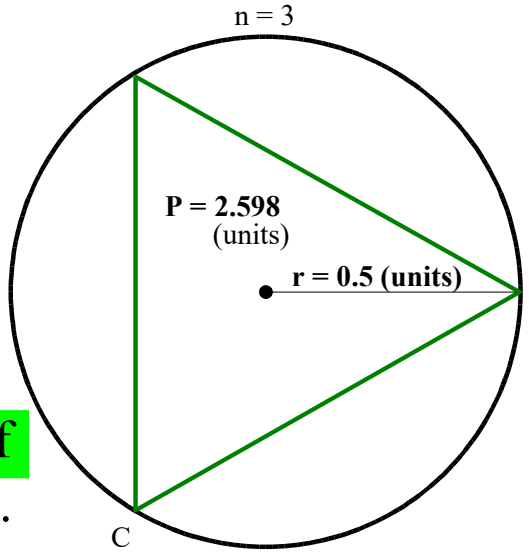
If r = 0.5, then the circumference of the circle is π.

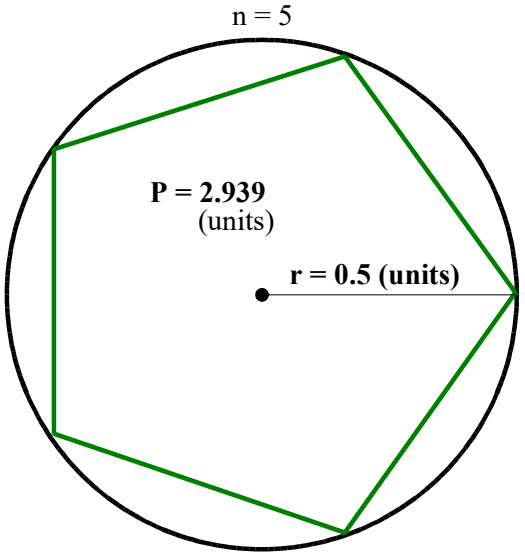
Now consider the perimeter of the regular polygons if r = 0.5.

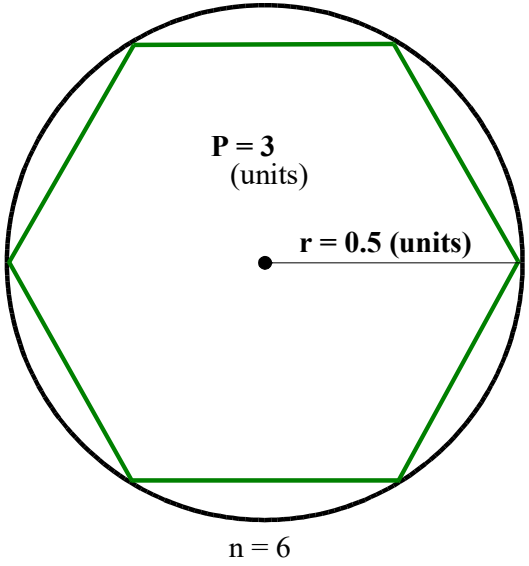
nSin(180°/n)

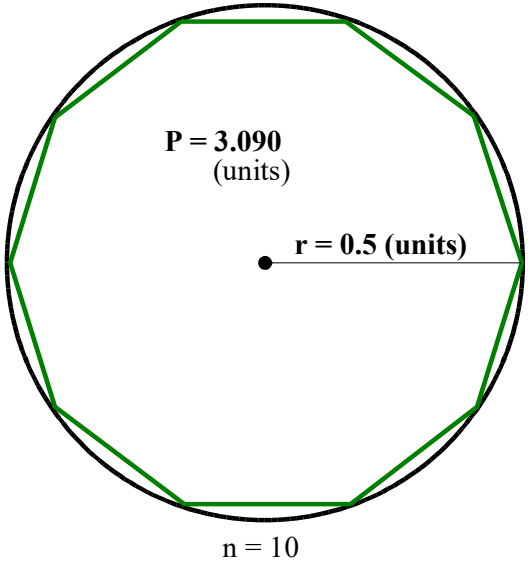
n	P
3	2.598
5	2.939
6	3
10	3.090

n	P
20	









The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

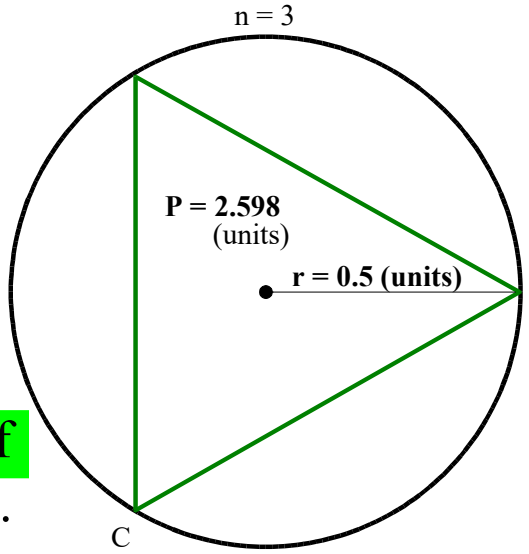
If r = 0.5, then the circumference of the circle is π.

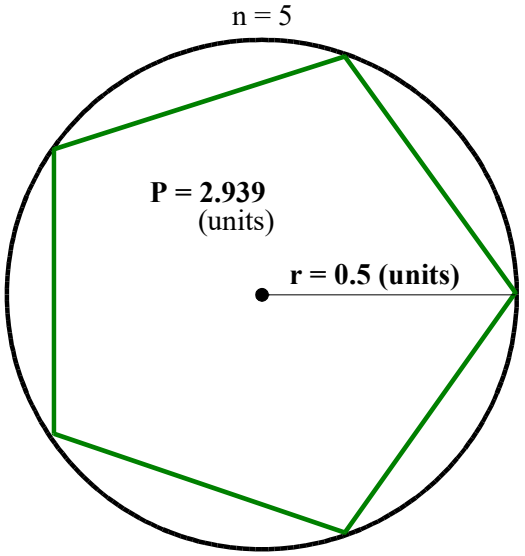
Now consider the perimeter of the regular polygons if r = 0.5.

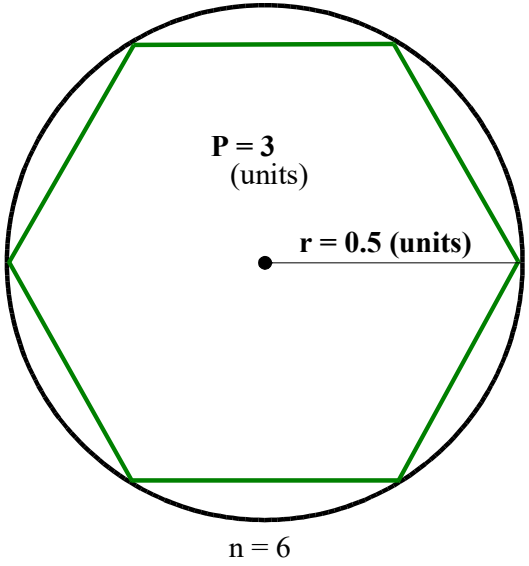
nSin(180°/n)

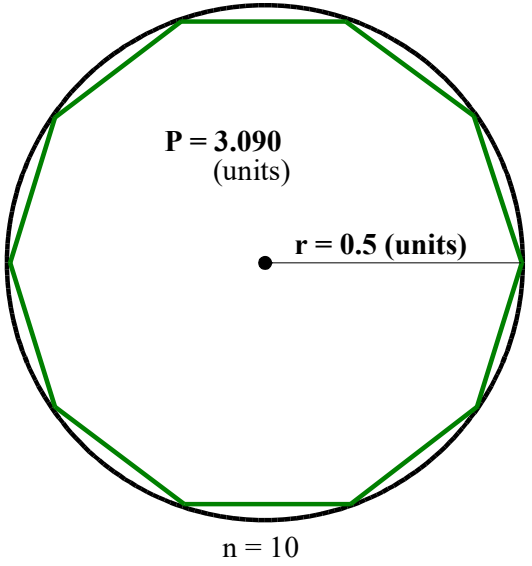
n	P
3	2.598
5	2.939
6	3
10	3.090

n	P
20	3.1287









The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

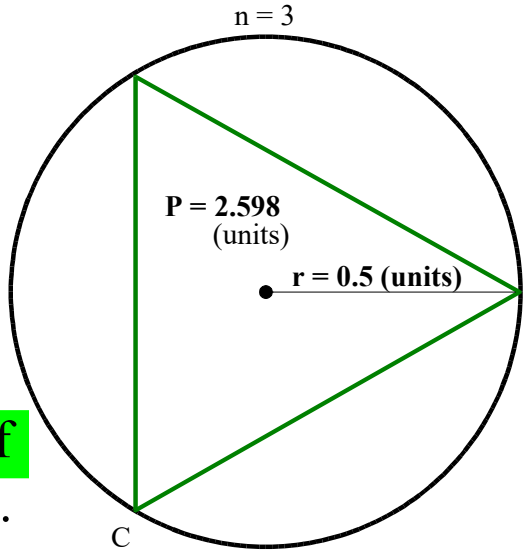
If r = 0.5, then the circumference of the circle is π.

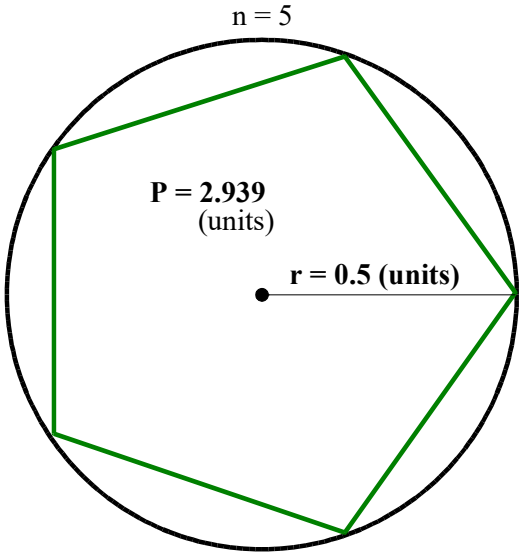
Now consider the perimeter of the regular polygons if r = 0.5.

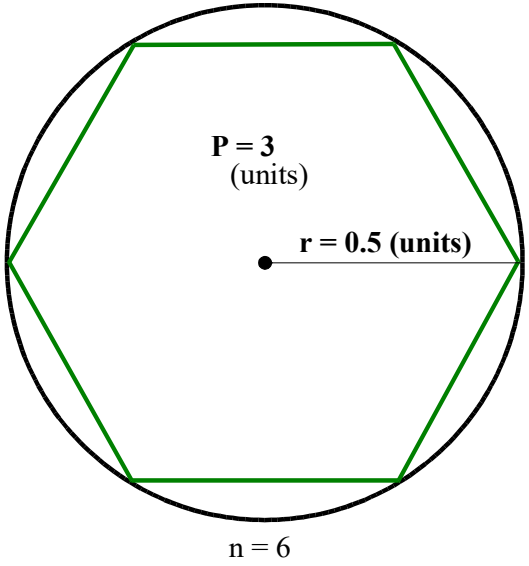
nSin(180°/n)

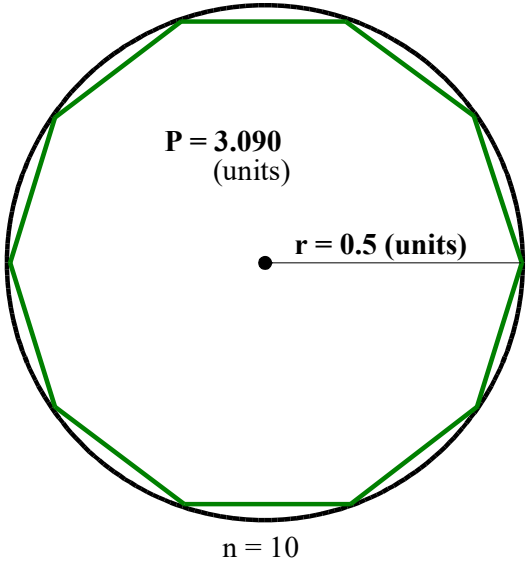
n	P
3	2.598
5	2.939
6	3
10	3.090

n	P
20	3.1287
50	









The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

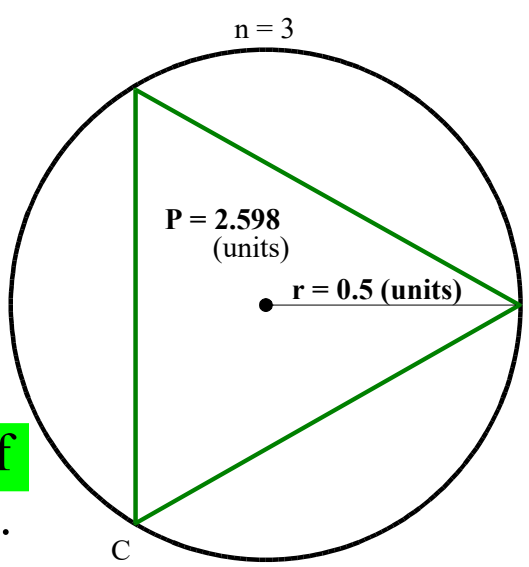
If r = 0.5, then the circumference of the circle is π.

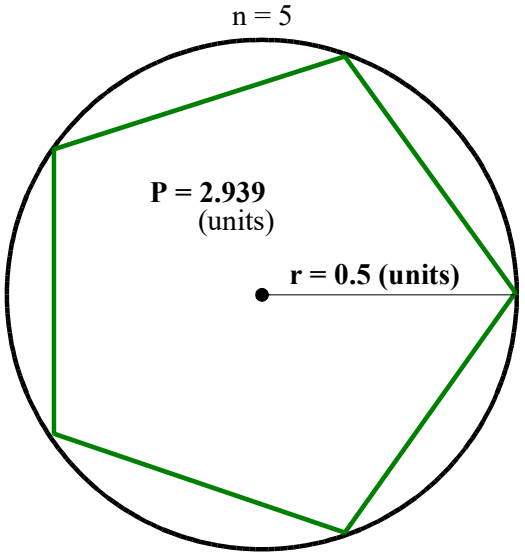
Now consider the perimeter of the regular polygons if r = 0.5.

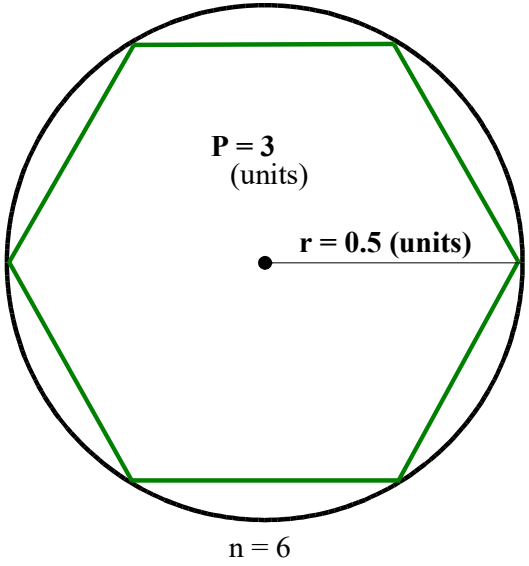
nSin(180°/n)

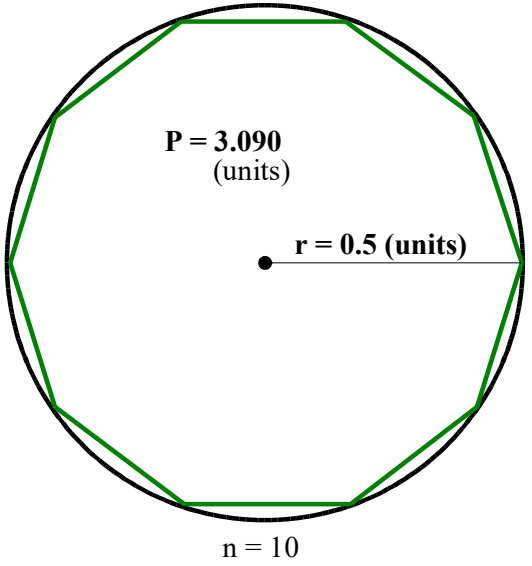
n	P
3	2.598
5	2.939
6	3
10	3.090

n	P
20	3.1287
50	3.1395









The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

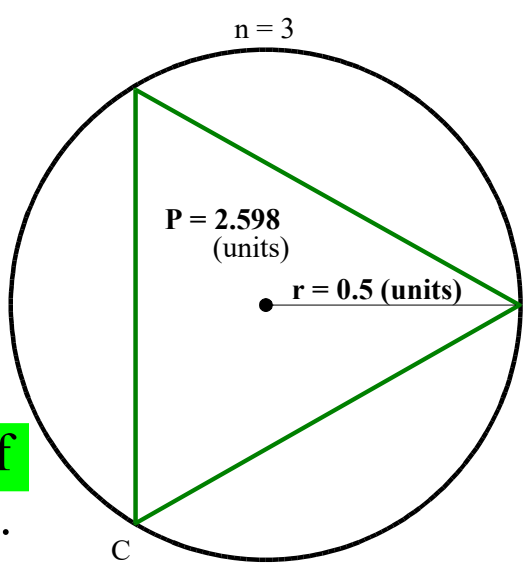
If r = 0.5, then the circumference of the circle is π.

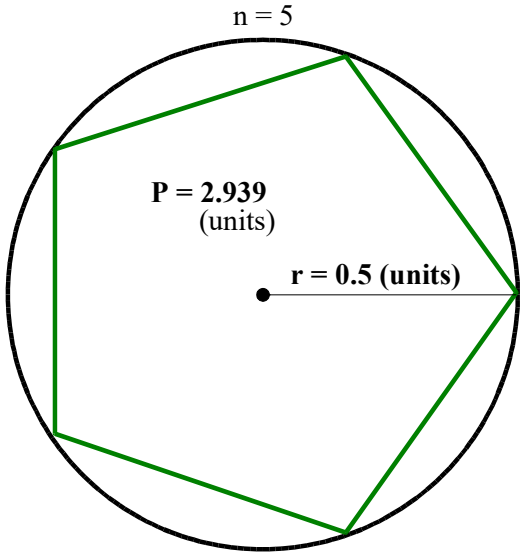
Now consider the perimeter of the regular polygons if r = 0.5.

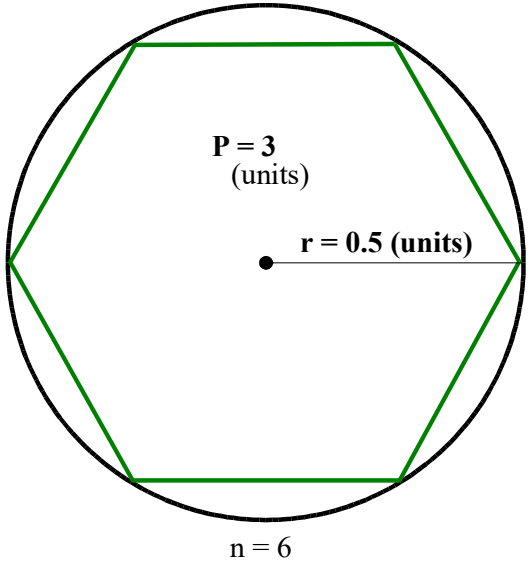
nSin(180°/n)

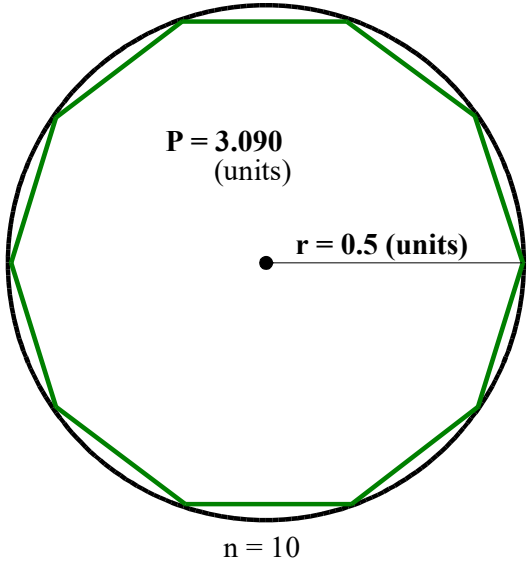
n	P
3	2.598
5	2.939
6	3
10	3.090

n	P
20	3.1287
50	3.1395
100	









The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

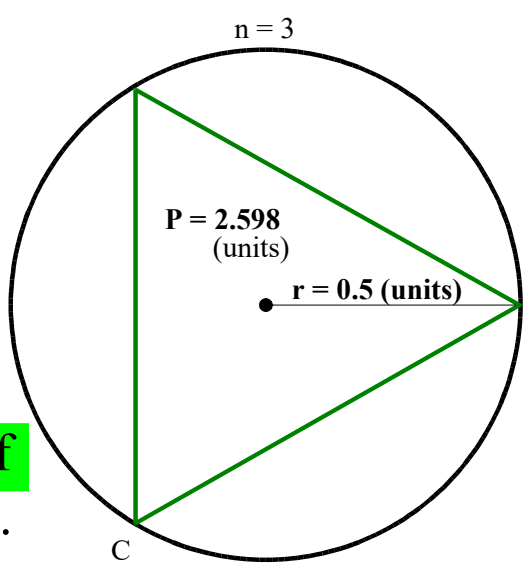
If r = 0.5, then the circumference of the circle is π.

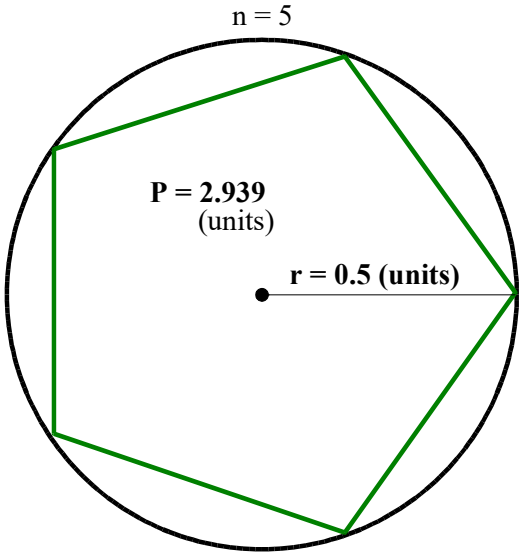
Now consider the perimeter of the regular polygons if r = 0.5.

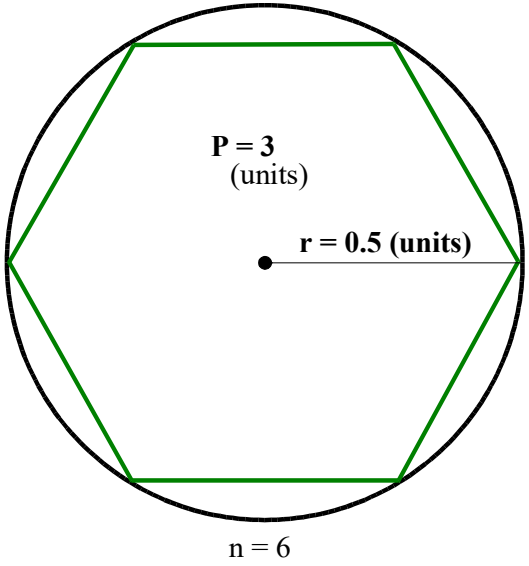
nSin(180°/n)

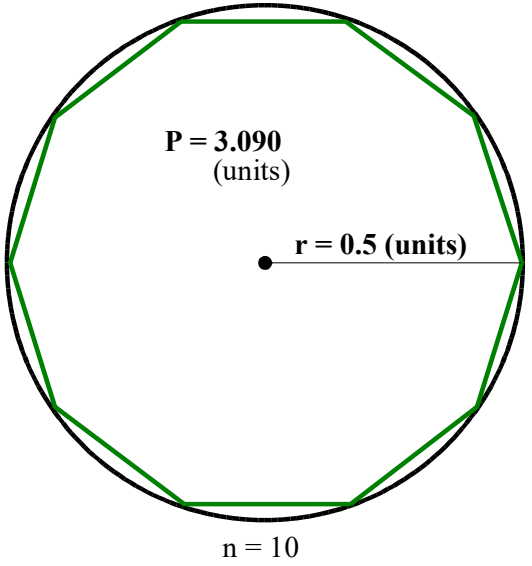
n	P
3	2.598
5	2.939
6	3
10	3.090

n	P
20	3.1287
50	3.1395
100	3.1411









The Value of π

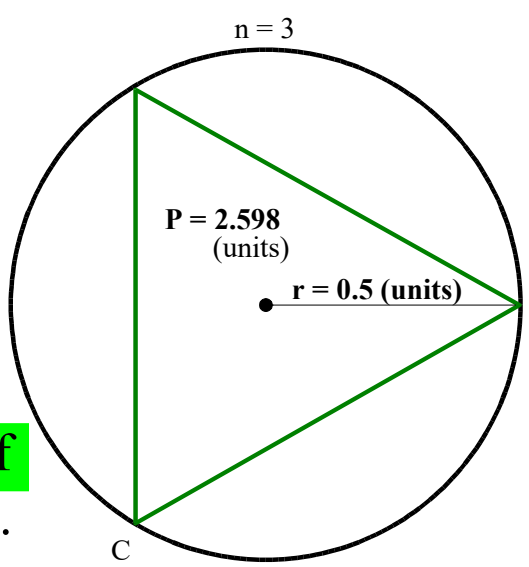
Regular Polygon Perimeter
2nrSin(180°/n)

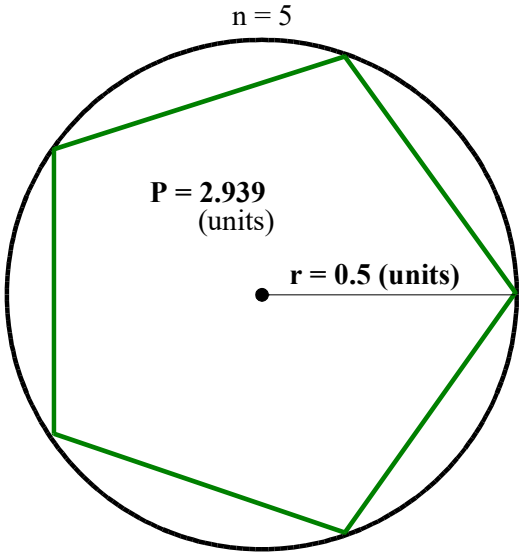
If r = 0.5, then the circumference of the circle is π.

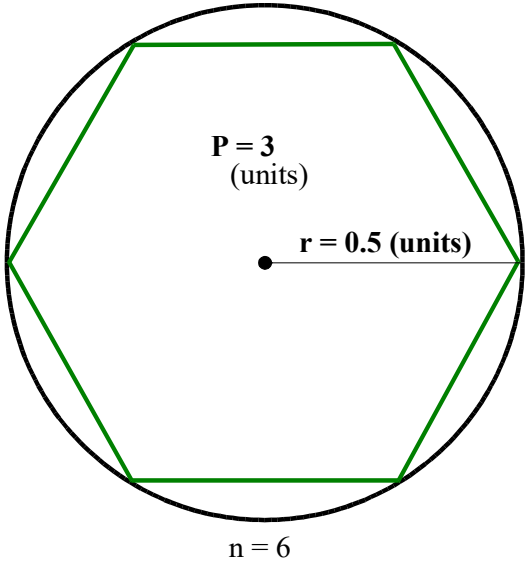
Now consider the perimeter of the regular polygons if r = 0.5.

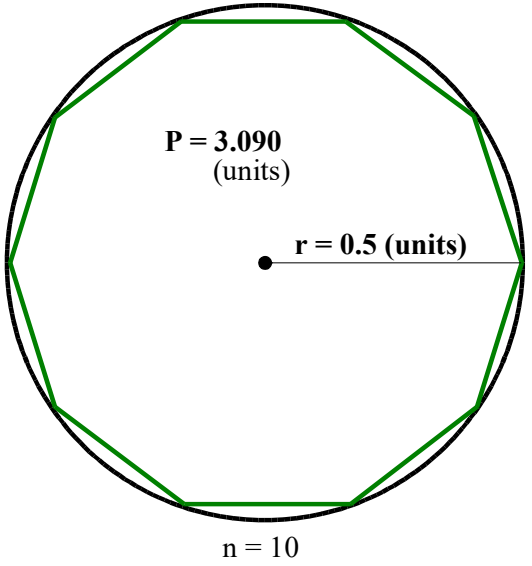
nSin(180°/n)

n	P	n	P
3	2.598	20	3.1287
5	2.939	50	3.1395
6	3	100	3.1411
10	3.090	1000	









The Value of π

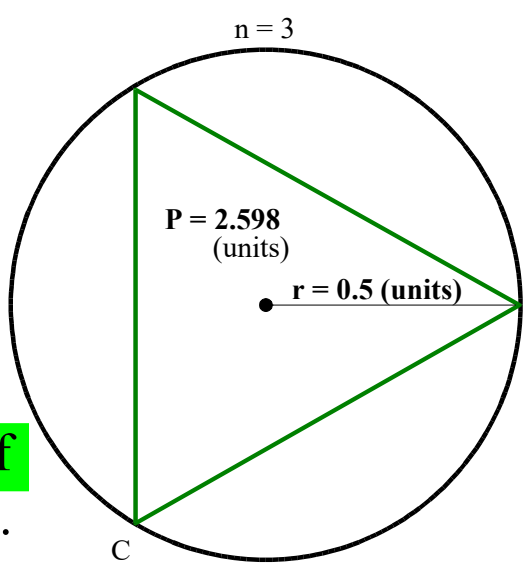
Regular Polygon Perimeter
2nrSin(180°/n)

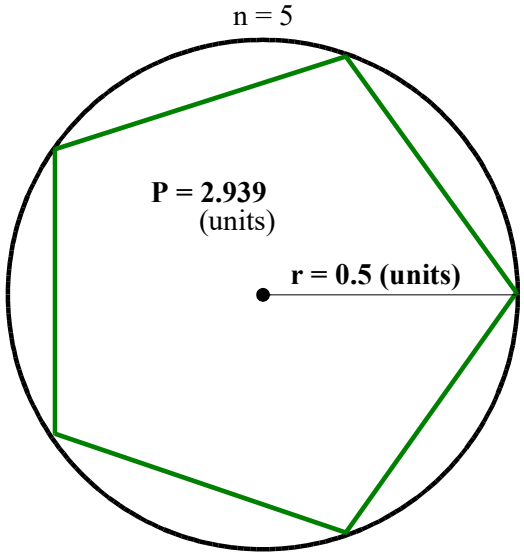
If r = 0.5, then the circumference of the circle is π.

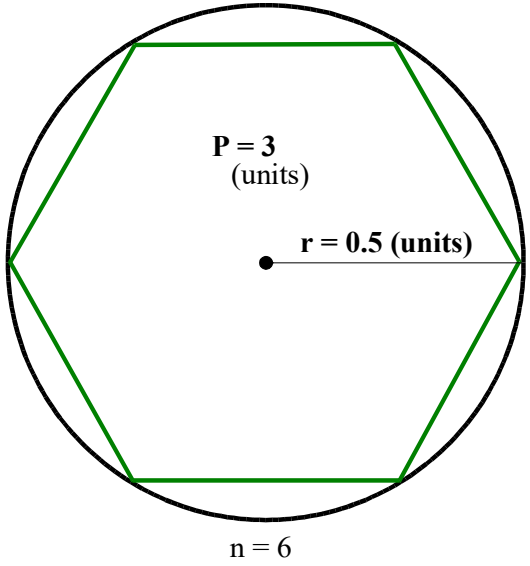
Now consider the perimeter of the regular polygons if r = 0.5.

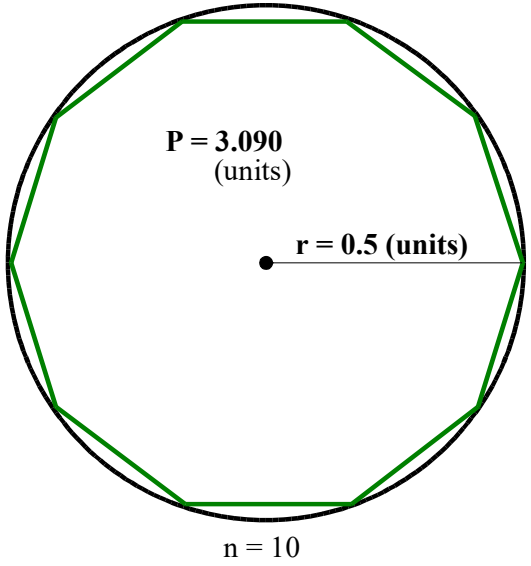
nSin(180°/n)

n	P	n	P
3	2.598	20	3.1287
5	2.939	50	3.1395
6	3	100	3.1411
10	3.090	1000	3.1416









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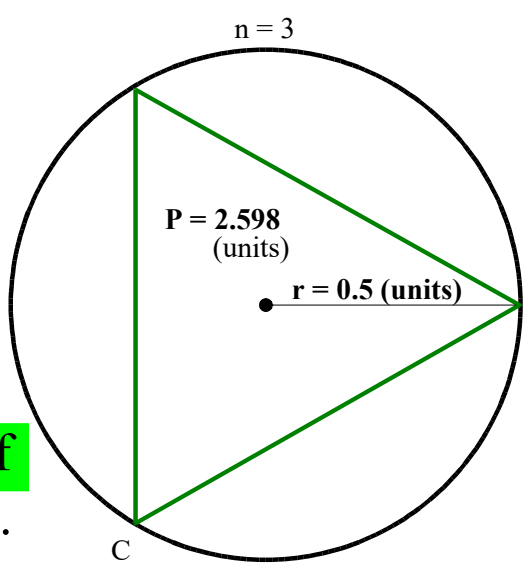
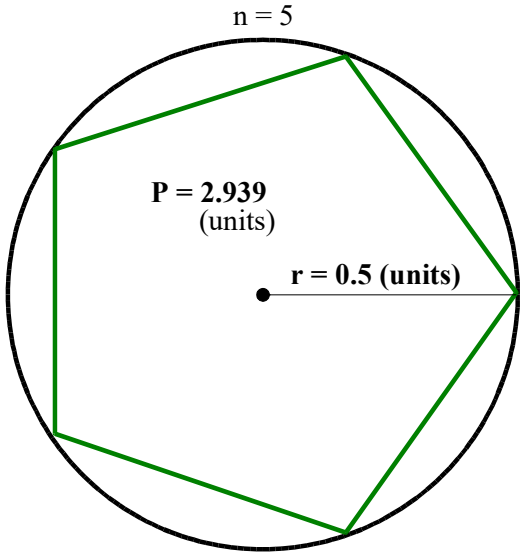
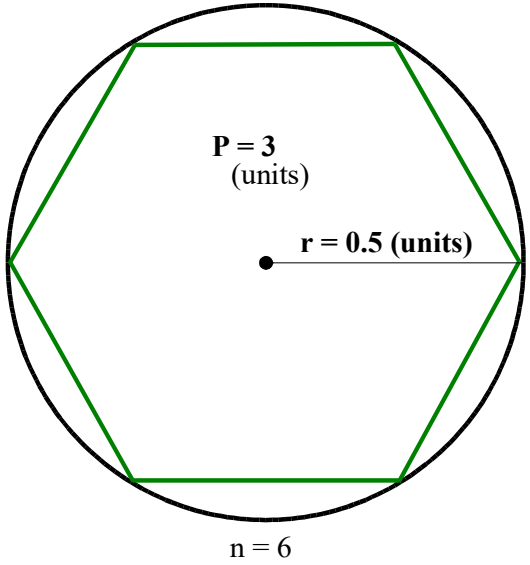
nSin(180°/n)

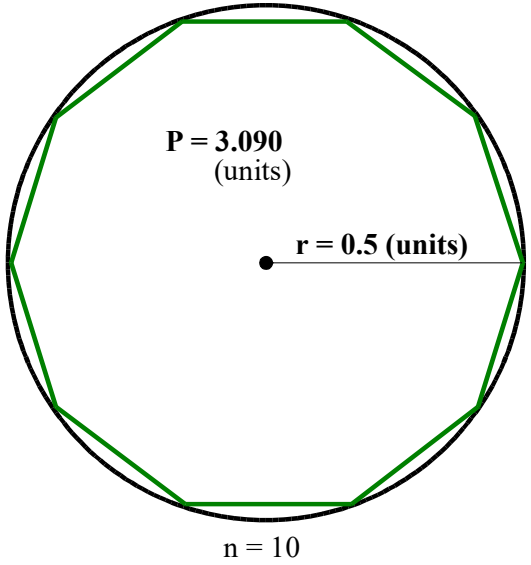
n	P	n	P
3	2.598	20	3.1287
5	2.939	50	3.1395
6	3	100	3.1411
10	3.090	1000	3.1416

3.14158749









The Value of π

Regular Polygon Perimeter
2nrSin(180°/n)

If r = 0.5, then the circumference of the circle is π.

Now consider the perimeter of the regular polygons if r = 0.5.

nSin(180°/n)

n	P	n	P
3	2.598	20	3.1287
5	2.939	50	3.1395
6	3	100	3.1411
10	3.090	1000	3.1416

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Once again, the value of the perimeter when n = 1000 is very close to π.

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