Algebra II
Lesson #6 Unit 9
Class Worksheet #6
For Worksheet #7

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The first term is 3.

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$$S_8 = 3 + 6 + 12 + 24$$

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$$S_8 = 3 + 6 + 12 + 24 + 48$$

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$$S_8 = 3 + 6 + 12 + 24 + 48 + 96$$

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$$S_8 = 3 + 6 + 12 + 24 + 48 + 96 + 192$$

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Multiply both sides of the equation by r. (2 in this case)

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Notice that these terms all 'cancelled each other out' in the subtraction process.

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Next, we will factor each side.

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$$S_8 - 2S_8 = 3 - 768$$

$$S_8(1 - 2) = 3(1 - 256)$$

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$$S_n = a_1 + a_1r + a_1r^2 + a_1r^3 + \ldots + a_1r^{n-2} + a_1r^{n-1}$$

Next, we will perform the same steps on this geometric series.

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$$S_n = a_1 + a_1 r + a_1 r^2 + a_1 r^3 + \ldots + a_1 r^{n-2} + a_1 r^{n-1}$$

For a geometric sequence, $a_n = a_1 r^{n-1}$

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Once again, notice that these terms all 'cancelled each other out' in the subtraction process.

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$$S_8 - 2S_8 = 3 - 768 \quad 2^8$$

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The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

or

$$S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

#1: $a_1 = 1$, $r = 0.5$

#2: $a_1 = 1$, $r = -0.5$

#3: $a_1 = 1$, $r = 2$

#4: $a_1 = 1$, $r = -2$

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#1: $a_1 = 1$, $r = 0.5$

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The first term is 1. Now multiply by 0.5 recursively.

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$$S_5 = 1 + 0.5$$

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We will evaluate and compare S_5 in 4 different geometric series.

#1: $a_1 = 1$, $r = 0.5$

$$S_5 = 1 + 0.5 + 0.25$$

The first term is 1. Now multiply by 0.5 recursively.

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We will evaluate and compare S_5 in 4 different geometric series.

#1: $a_1 = 1$, $r = 0.5$

$$S_5 = 1 + 0.5 + 0.25 + 0.125$$

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$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625$$

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where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

#1: $a_1 = 1$, $r = 0.5$

$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25$$

The first term is 1. Now multiply by -0.5 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - r a_n}{1 - r}$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125$$

The first term is 1. Now multiply by -0.5 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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The first term is 1. Now multiply by -0.5 recursively.

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$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

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$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

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$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 =$$

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1$$

The first term is 1.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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We will evaluate and compare S_5 in 4 different geometric series.

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#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1$$

The first term is 1. Now multiply by 2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

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#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2$$

The first term is 1. Now multiply by 2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

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$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4$$

The first term is 1. Now multiply by 2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - r a_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

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$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8$$

The first term is 1. Now multiply by 2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16$$

The first term is 1. Now multiply by 2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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#3: $a_1 = 1, \; r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 =$$

The sum of the first n terms of a geometric series is

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#3: $a_1 = 1,\ r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 =$$

The sum of the first n terms of a geometric series is

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 = 1$$

The first term is 1.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 = 1$$

The first term is 1. Now multiply by -2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 = 1 + -2$$

The first term is 1. Now multiply by -2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 = 1 + -2 + 4$$

The first term is 1. Now multiply by -2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

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$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 = 1 + -2 + 4 + -8$$

The first term is 1. Now multiply by -2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

#1: $a_1 = 1$, $r = 0.5$

$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 = 1 + -2 + 4 + -8 + 16$$

The first term is 1. Now multiply by -2 recursively.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 = 1 + -2 + 4 + -8 + 16 =$$

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

#1: $a_1 = 1$, $r = 0.5$

$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 = 1 + -2 + 4 + -8 + 16 = 11$$

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

#1: $a_1 = 1$, $r = 0.5$

$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

#3: $a_1 = 1$, $r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1$, $r = -2$

$$S_5 = 1 + -2 + 4 + -8 + 16 = 11$$

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

or

$$S_n = \frac{a_1 - r a_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

#1: $a_1 = 1$, $r = 0.5$

$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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#1: $a_1 = 1$, $r = 0.5$

$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

In these two examples, $|r| < 1$.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will evaluate and compare S_5 in 4 different geometric series.

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

In these two examples, $|r| < 1$. Because of this, each successive term is closer to 0 than the one before it.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

In these two examples, $|r| < 1$. Because of this, each successive term is closer to 0 than the one before it. Series like these are called <u>converging</u>.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

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In these two examples, $|r| < 1$. Because of this, each successive term is closer to 0 than the one before it. Series like these are called <u>converging</u>. As n increases,

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

In these two examples, $|r| < 1$. Because of this, each successive term is closer to 0 than the one before it. Series like these are called <u>converging</u>. As n increases, these terms in the formula approach 0,

The sum of the first n terms of a geometric series is

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$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

In these two examples, $|r| < 1$. Because of this, each successive term is closer to 0 than the one before it. Series like these are called <u>converging</u>. As n increases, these terms in the formula approach 0, and S_n approaches a specific number, S, as a limiting value

The sum of the first n terms of a geometric series is

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We will evaluate and compare S_5 in 4 different geometric series.

#1: $a_1 = 1$, $r = 0.5$

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where a_1 is the first term and r is the common ratio.

We will calculate S_{20} and S for these two series.

#1: $a_1 = 1$, $r = 0.5$

$$S_5 = 1 + 0.5 + 0.25 + 0.125 + 0.0625 = 1.9375$$

$$S_{20} = \frac{1(1 - 0.5^{20})}{1 - 0.5} \approx 1.999998 \qquad S = \frac{1}{1 - 0.5} = 2$$

#2: $a_1 = 1$, $r = -0.5$

$$S_5 = 1 + -0.5 + 0.25 + -0.125 + 0.0625 = 0.6875$$

$$S_{20} = \frac{1[1 - (-0.5)^{20}]}{1 - -0.5} \approx 0.666666 \qquad S = \frac{1}{1 - -0.5} = 2/3$$

If $|r| < 1$, then $S = \dfrac{a_1}{1 - r}$

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We will evaluate and compare S_5 in 4 different geometric series.

#3: $a_1 = 1,\ r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

#4: $a_1 = 1,\ r = -2$

$$S_5 = 1 + -2 + 4 + -8 + 16 = 11$$

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In these two examples, $|r| > 1$.

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In these two examples, $|r| > 1$. Because of this, each successive term is further from 0 than the one before it.

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$$S_5 = 1 + -2 + 4 + -8 + 16 = 11$$

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$$S_{19} = \frac{1[1 - (-2)^{19}]}{1 - -2} = 174{,}763 \quad S_{20} = \frac{1[1 - (-2)^{20}]}{1 - -2}$$

In these two examples, |r| > 1. Because of this, each successive term is further from 0 than the one before it. Series like these are called <u>diverging</u>. As n increases, the absolute value of S_n increases as well.

The sum of the first n terms of a geometric series is

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{or} \quad S_n = \frac{a_1 - ra_n}{1 - r}$$

where a_1 is the first term and r is the common ratio.

We will calculate S_{19} and S_{20} for these two series.

#3: $a_1 = 1, \; r = 2$

$$S_5 = 1 + 2 + 4 + 8 + 16 = 31$$

$$S_{19} = \frac{1(1 - 2^{19})}{1 - 2} = 524{,}287 \qquad S_{20} = \frac{1(1 - 2^{20})}{1 - 2} = 1{,}048{,}575$$

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The series is geometric. ⇒ $S_n = \dfrac{a_1(1 - r^n)}{1 - r}$

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

1. Find the sum of the first 6 terms of a geometric sequence in which $a_1 = 2$ and $r = 3$.

$n = 6$

The series is geometric. ⟹ $S_n = \dfrac{a_1(1 - r^n)}{1 - r}$

$$S_6 = \frac{2(1 - 3^6)}{1 - 3} = \frac{-1{,}456}{-2}$$

$S_6 = 728$

2. Find the sum of the first 10 terms of the sequence defined by $a_n = (-3)^n$.

$a_1 = (-3)^1 = -3$ $a_2 = (-3)^2 = 9$ $a_3 = (-3)^3 = -27$

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Algebra 2 Class Worksheet #6 Unit 9

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$$S_{10} = \frac{-3[1 - (-3)^{10}]}{1 - -3} = \frac{177{,}144}{4}$$

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3. Find the sum of the first 7 terms of the sequence defined by $a_{n+1} = 0.4a_n$ where $a_1 = 125$.

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$n = 7$

The first term is 125.

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$n = 7$

The first term is 125.

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Solve each of the following problems.

3. Find the sum of the first 7 terms of the sequence defined by $a_{n+1} = 0.4a_n$ where $a_1 = 125.$

$n = 7$

The first term is 125. Then multiply by 0.4 recursively.

Algebra 2   Class Worksheet #6   Unit 9

Solve each of the following problems.

3. Find the sum of the first 7 terms of the sequence defined by $a_{n+1} = 0.4a_n$ where $a_1 = 125$.

$n = 7$

$r = 0.4$

The first term is 125. Then multiply by 0.4 recursively.

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

3. Find the sum of the first 7 terms of the sequence defined by $a_{n+1} = 0.4a_n$ where $a_1 = 125$.

$n = 7$

$r = 0.4$

The series is geometric.

The first term is 125. Then multiply by 0.4 recursively.

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The series is geometric.

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$r = 0.4$

The series is geometric. ⇒ $$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

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$S_7 =$

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The series is geometric. → $S_n = \dfrac{a_1(1 - r^n)}{1 - r}$

$$S_7 = \frac{125(1 - 0.4^7)}{1 - 0.4} \approx$$

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$n = 7$

$r = 0.4$

The series is geometric. ⇒ $S_n = \frac{a_1(1 - r^n)}{1 - r}$

$$S_7 = \frac{125(1 - 0.4^7)}{1 - 0.4} \approx 124.8$$

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$$S_7 = \frac{125(1 - 0.4^7)}{1 - 0.4} \approx \frac{124.8}{0.6} \Rightarrow S_7 \approx 208$$

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⇒ $S_7 \approx 208$

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4. Find the sum of the first 8 terms of the sequence 7, 14, 28, 56, ...

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4. Find the sum of the first 8 terms of the sequence 7, 14, 28, 56, ...

$n = 8$

$a_1 = 7$

The first term is 7. Then multiply by 2 recursively.

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Solve each of the following problems.

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The series is geometric. → $S_n = \dfrac{a_1(1 - r^n)}{1 - r}$

$$S_7 = \frac{125(1 - 0.4^7)}{1 - 0.4} \approx \frac{124.8}{0.6} \rightarrow S_7 \approx 208$$

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5. Evaluate the series 5 – 10 + 20 – 40 + ... + 1280.

$a_1 = 5$

$r = -2$

$a_n = 1280$

The series is geometric. ➡ $S_n = \dfrac{a_1 - ra_n}{1 - r}$

$S_n = \dfrac{5 - -2(1280)}{1 - -2} = \dfrac{2565}{3}$ ➡ $S_n = 855$

6. Evaluate the infinite series 10 + 2 + 0.4 + 0.08 + ...

$a_1 = 10$

The first term is 10. Then multiply by 0.2 recursively.

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$$S = \frac{10}{\quad}$$

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$$S = \frac{10}{1 - 0.2} = \frac{10}{0.8}$$

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Solve each of the following problems.

7. Evaluate: $\sum_{i=1}^{10} (-3)(-2)^{i-1}$

8. Evaluate: $\sum_{i=1}^{\infty} \left(\frac{1}{2}\right)\left(\frac{2}{3}\right)^{i-1}$

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Solve each of the following problems.

7. Evaluate: $\sum_{i=1}^{10} (-3)(-2)^{i-1}$

For any <u>geometric sequence</u>, $a_n = a_1(r)^{n-1}$.

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For any **geometric sequence**, $a_n = a_1(r)^{n-1}$.

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The series is geometric.

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The series is geometric. → $S_n = \frac{a_1(1 - r^n)}{1 - r}$

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$$S_{10} = \frac{-3[1 - (-2)^{10}]}{1 - -2} = \frac{3069}{}$$

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For any <u>geometric sequence</u>, $a_n = a_1(r)^{n-1}$.

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8. Evaluate: $\sum_{i=1}^{\infty} \left(\frac{1}{2}\right)\left(\frac{2}{3}\right)^{i-1}$

$a_1 = 1/2$

For any <u>geometric sequence</u>, $a_n = a_1(r)^{n-1}$.

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Solve each of the following problems.

7. Evaluate: $\sum_{i=1}^{10} (-3)(-2)^{i-1}$

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8. Evaluate: $\sum_{i=1}^{\infty} (\frac{1}{2})(\frac{2}{3})^{i-1}$

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$n = 10$

The series is geometric. ⇨ $S_n = \dfrac{a_1(1 - r^n)}{1 - r}$

$S_{10} = \dfrac{-3[1 - (-2)^{10}]}{1 - -2} = \dfrac{3069}{3}$ ⇨ $S_{10} = 1023$

8. Evaluate: $\sum_{i=1}^{\infty} \left(\frac{1}{2}\right)\left(\frac{2}{3}\right)^{i-1}$

$a_1 = 1/2$

$r = 2/3$

This is an infinite geometric series.

For any <u>geometric sequence</u>, $a_n = a_1(r)^{n-1}$.

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

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This is an infinite geometric series. ⇒ If $|r| < 1$, then $S = \dfrac{a_1}{1 - r}$.

$$S = \frac{1/2}{1 - 2/3} = \frac{1/2}{1/3} \Rightarrow S = 1.5$$

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Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

9. A job has a starting salary of $38,000 with a guaranteed increase of 3% per year. Find the total salary for the first ten years.

Algebra 2   Class Worksheet #6   Unit 9

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Let a_n represent the salary, in dollars, for the n^{th} year.

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$r = 1.03$

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$$S_{10} \approx 435{,}627$$

Algebra 2 Class Worksheet #6 Unit 9

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The total salary is about $435,627.

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Algebra 2   Class Worksheet #6   Unit 9

Solve each of the following problems.

10. A ball is dropped from a height of 108 inches onto a concrete floor. On each bounce the ball rebounds to 75% of its previous height. What is the total vertical distance that the ball has traveled when it hits the floor for the eighth time?

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

10. A ball is dropped from a height of 108 inches onto a concrete floor. On each bounce the ball rebounds to 75% of its previous height. What is the total vertical distance that the ball has traveled when it hits the floor for the eighth time?

Algebra 2 Class Worksheet #6 Unit 9

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We will use <u>two geometric series</u> for this problem. One for the downward motion of the ball, and the other for the upward motion of the ball.

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Downward Motion

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Downward Motion

$a_1 = 108$ (inches)

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Downward Motion

$a_1 = 108$ **(inches)**

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Solve each of the following problems.

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We will use <u>two geometric series</u> for this problem. One for the downward motion of the ball, and the other for the upward motion of the ball.

Downward Motion | **Upward Motion**

$a_1 = 108$ (inches)

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Solve each of the following problems.

10. A ball is dropped from a height of 108 inches onto a concrete floor. On each bounce the ball rebounds to 75% of its previous height. What is the total vertical distance that the ball has traveled when it hits the floor for the eighth time?

We will use two geometric series for this problem. One for the downward motion of the ball, and the other for the upward motion of the ball.

Downward Motion | **Upward Motion**

$a_1 = 108$ (inches)

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

10. A ball is dropped from a height of 108 inches onto a concrete floor. On each bounce the ball rebounds to 75% of its previous height. What is the total vertical distance that the ball has traveled when it hits the floor for the eighth time?

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Downward Motion	**Upward Motion**
$a_1 = 108$ (inches)	$a_1 = 81$ (inches)

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

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Downward Motion	**Upward Motion**
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)

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$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)

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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 75\%$	

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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 75\% = 0.75$	

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Downward Motion

$a_1 = 108$ (inches)

$r = 75\% = 0.75$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 75\% = 0.75$	$r = 0.75$
$n = 8$	

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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 75\% = 0.75$	$r = 0.75$
$n = 8$	$n = 7$

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$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 75\% = 0.75$	$r = 0.75$
$n = 8$	$n = 7$

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

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Solve each of the following problems.

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Downward Motion

$a_1 = 108$ (inches)

$r = 75\% = 0.75$

$n = 8$

$$S_8 = \frac{108(1 - 0.75^8)}{}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

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$r = 75\% = 0.75$	$r = 0.75$
$n = 8$	$n = 7$

$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)}$$

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

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Solve each of the following problems.

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$n = 8$

$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

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Downward Motion

$a_1 = 108$ (inches)

$r = 75\% = 0.75$

$n = 8$

$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

$S_7 =$

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

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Downward Motion

$a_1 = 108$ (inches)

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$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

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$$S_7 = \frac{81(\quad}{\quad}$$

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$n = 8$

$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

$$S_7 = \frac{81(1 - 0.75^7)}{}$$

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

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$n = 8$

$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

$$S_7 = \frac{81(1 - 0.75^7)}{(1 - 0.75)}$$

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

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$a_1 = 108$ (inches)

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$n = 8$

$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

$$S_7 = \frac{81(1 - 0.75^7)}{(1 - 0.75)}$$

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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 75\% = 0.75$	$r = 0.75$
$n = 8$	$n = 7$
$S_8 = \dfrac{108(1 - 0.75^8)}{(1 - 0.75)}$	$S_7 = \dfrac{81(1 - 0.75^7)}{(1 - 0.75)}$

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

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Downward Motion

$a_1 = 108$ (inches)

$r = 75\% = 0.75$

$n = 8$

$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)} \approx$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

$$S_7 = \frac{81(1 - 0.75^7)}{(1 - 0.75)}$$

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Downward Motion

$a_1 = 108$ (inches)

$r = 75\% = 0.75$

$n = 8$

$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)} \approx 97.19$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

$$S_7 = \frac{81(1 - 0.75^7)}{(1 - 0.75)}$$

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$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)} \approx \frac{97.19}{0.25}$$

Upward Motion

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$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)} \approx \frac{97.19}{0.25}$$

$S_8 \approx$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

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Downward Motion

$a_1 = 108$ (inches)

$r = 75\% = 0.75$

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$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)} \approx \frac{97.19}{0.25}$$

$S_8 \approx 388.75$ (inches)

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

$$S_7 = \frac{81(1 - 0.75^7)}{(1 - 0.75)}$$

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Upward Motion

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Upward Motion

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Upward Motion

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$$S_7 = \frac{81(1 - 0.75^7)}{(1 - 0.75)} \approx \frac{70.19}{0.25}$$

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$r = 75\% = 0.75$

$n = 8$

$$S_8 = \frac{108(1 - 0.75^8)}{(1 - 0.75)} \approx \frac{97.19}{0.25}$$

$S_8 \approx 388.75$ (inches)

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$n = 7$

$$S_7 = \frac{81(1 - 0.75^7)}{(1 - 0.75)} \approx \frac{70.19}{0.25}$$

$S_7 \approx 280.75$ (inches)

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

10. A ball is dropped from a height of 108 inches onto a concrete floor. On each bounce the ball rebounds to 75% of its previous height. What is the total vertical distance that the ball has traveled when it hits the floor for the eighth time?

We will use two geometric series for this problem. One for the downward motion of the ball, and the other for the upward motion of the ball.

Downward Motion

$a_1 = 108$ (inches)

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$n = 8$

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$$S_7 = \frac{81(1 - 0.75^7)}{(1 - 0.75)} \approx \frac{70.19}{0.25}$$

$S_7 \approx 280.75$ (inches)

The total vertical distance is about 669.5 inches.

Algebra 2 Class Worksheet #6 Unit 9

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Algebra 2   Class Worksheet #6   Unit 9

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Downward Motion

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Downward Motion

$a_1 =$

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

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Downward Motion

$a_1 = 108$ (inches)

Algebra 2 Class Worksheet #6 Unit 9

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Downward Motion

$a_1 = 108$ (inches)

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Downward Motion

$a_1 = 108$ (inches)

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We will use two infinite geometric series for this problem. One for the downward motion and the other for the upward motion of the ball.

Downward Motion	**Upward Motion**
$a_1 = 108$ **(inches)**	

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

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We will use two infinite geometric series for this problem. One for the downward motion and the other for the upward motion of the ball.

Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches)

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Solve each of the following problems.

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We will use two infinite geometric series for this problem. One for the downward motion and the other for the upward motion of the ball.

Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

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Downward Motion

$a_1 = 108$ (inches)

$r =$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 0.75$	

Algebra 2   Class Worksheet #6   Unit 9

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$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 0.75$	$r = 0.75$

$$S = \frac{a_1}{1 - r}$$

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Solve each of the following problems.

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$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 0.75$	$r = 0.75$

S =

$$S = \frac{a_1}{1 - r}$$

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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 0.75$	$r = 0.75$

$$S = \frac{108}{}$$

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Downward Motion

$a_1 = 108$ (inches)

$r = 0.75$

$$S = \frac{108}{(1 - 0.75)}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$$S = \frac{a_1}{1 - r}$$

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Downward Motion

$a_1 = 108$ (inches)

$r = 0.75$

$$S = \frac{108}{(1 - 0.75)} =$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$$S = \frac{a_1}{1 - r}$$

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We will use two infinite geometric series for this problem. One for the downward motion and the other for the upward motion of the ball.

Downward Motion

$a_1 = 108$ (inches)

$r = 0.75$

$$S = \frac{108}{(1 - 0.75)} = 432 \text{ inches}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$$S = \frac{a_1}{1 - r}$$

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 0.75$	$r = 0.75$

$$S = \frac{108}{(1 - 0.75)} = 432 \text{ inches}$$

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Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 0.75$	$r = 0.75$
$S = \dfrac{108}{(1 - 0.75)} = 432$ inches	

$$S = \frac{a_1}{1 - r}$$

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Downward Motion

$a_1 = 108$ (inches)

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Upward Motion

$a_1 = 81$ (inches) (75% of 108)

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$S =$

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Downward Motion

$a_1 = 108$ (inches)

$r = 0.75$

$$S = \frac{108}{(1 - 0.75)} = 432 \text{ inches}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$$S = \frac{81}{\quad}$$

$$S = \frac{a_1}{1 - r}$$

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Upward Motion

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$r = 0.75$

$$S = \frac{81}{(1 - 0.75)}$$

$$S = \frac{a_1}{1 - r}$$

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Downward Motion

$a_1 = 108$ (inches)

$r = 0.75$

$$S = \frac{108}{(1 - 0.75)} = 432 \text{ inches}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$$S = \frac{81}{(1 - 0.75)} =$$

$$S = \frac{a_1}{1 - r}$$

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Downward Motion

$a_1 = 108$ (inches)

$r = 0.75$

$$S = \frac{108}{(1 - 0.75)} = 432 \text{ inches}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$$S = \frac{81}{(1 - 0.75)} = 324 \text{ inches}$$

$$S = \frac{a_1}{1 - r}$$

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

11. A ball is dropped from a height of 108 inches onto a concrete floor. On each bounce the ball rebounds to 75% of its previous height. What is the total vertical distance that the ball will travel before it comes to rest?

We will use <u>two infinite geometric series</u> for this problem. One for the downward motion and the other for the upward motion of the ball.

Downward Motion

$a_1 = 108$ (inches)

$r = 0.75$

$$S = \frac{108}{(1 - 0.75)} = 432 \text{ inches}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$$S = \frac{81}{(1 - 0.75)} = 324 \text{ inches}$$

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

11. A ball is dropped from a height of 108 inches onto a concrete floor. On each bounce the ball rebounds to 75% of its previous height. What is the total vertical distance that the ball will travel before it comes to rest?

We will use two infinite geometric series for this problem. One for the downward motion and the other for the upward motion of the ball.

Downward Motion

$a_1 = 108$ (inches)

$r = 0.75$

$$S = \frac{108}{(1 - 0.75)} = 432 \text{ inches}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$$S = \frac{81}{(1 - 0.75)} = 324 \text{ inches}$$

The total vertical distance is 756 inches.

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

11. A ball is dropped from a height of 108 inches onto a concrete floor. On each bounce the ball rebounds to 75% of its previous height. What is the total vertical distance that the ball will travel before it comes to rest?

We will use <u>two infinite geometric series</u> for this problem. One for the downward motion and the other for the upward motion of the ball.

Downward Motion	Upward Motion
$a_1 = 108$ (inches)	$a_1 = 81$ (inches) (75% of 108)
$r = 0.75$	$r = 0.75$
$S = \dfrac{108}{(1 - 0.75)} = 432$ inches	$S = \dfrac{81}{(1 - 0.75)} = 324$ inches

The total vertical distance is 756 inches.

Algebra 2 Class Worksheet #6 Unit 9

Solve each of the following problems.

11. A ball is dropped from a height of 108 inches onto a concrete floor. On each bounce the ball rebounds to 75% of its previous height. What is the total vertical distance that the ball will travel before it comes to rest?

We will use <u>two infinite geometric series</u> for this problem. One for the downward motion and the other for the upward motion of the ball.

Downward Motion

$a_1 = 108$ (inches)

$r = 0.75$

$$S = \frac{108}{(1 - 0.75)} = 432 \text{ inches}$$

Upward Motion

$a_1 = 81$ (inches) (75% of 108)

$r = 0.75$

$$S = \frac{81}{(1 - 0.75)} = 324 \text{ inches}$$

The total vertical distance is 756 inches.