## Algebra II <br> Lesson \#2 Unit 8 Class Worksheet \#2 <br> For Worksheet \#5- \#8

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All of the problems in the second part of this unit involve problems like this. They require the creation and application of a second degree function for the 'quantity' that we wish to maximize (or minimize), in this case the area of a rectangle.

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Add - 2 x to each side.

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Now, we can draw a rectangle that meets the requirements of the problem. Pick any point in the first quadrant on the line $y=(-2 / 3) x+5$. Then, draw the rectangle. Clearly, the dimensions of the rectangle are the $x$ and $y$ coordinates of the point we pick.

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Now, we can express the area of the rectangle as a function of $\mathbf{x}$.

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\end{array}
$$

$$
\text { Area }=(\text { Length })(\text { Width })
$$

$$
A=x y
$$



$$
A=x\left(-\frac{2}{3} x+5\right)
$$

Now, we can express the area of the rectangle as a function of $\mathbf{x}$.

## Algebra II Class Worksheet \#2 Unit 8

1. A rectangle has two sides on the coordinate axes and one vertex in the first quadrant on the line $2 x+3 y=15$. What are the dimensions of the rectangle if its area is a maximum? What is the maximum area?

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\begin{array}{r}
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A=x y
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$A=x\left(-\frac{2}{3} x+5\right)$

$$
A=\frac{-2}{3} \mathbf{x}^{2}
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A=\frac{-2}{3} x^{2}+5 x
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A=\frac{-2}{3} x^{2}+5 x
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The maximum value of $A$, the area, corresponds to the vertex of this second degree function.

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Find the vertex !!
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Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A} \mathbf{x}^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

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\end{array}
$$

Find the vertex !! Complete the square.
Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A} \mathbf{x}^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

The vertex of the function is $\left(x_{1}, y_{1}\right)!!!$

## Algebra II Class Worksheet \#2 Unit 8

1. A rectangle has two sides on the coordinate axes and one vertex in the first quadrant on the line $2 x+3 y=15$. What are the dimensions of the rectangle if its area is a maximum? What is the maximum area?

$$
\begin{array}{r}
2 x+3 y=15 \\
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y=(-2 / 3) x+5
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$$

$$
\text { Area }=(\text { Length })(\text { Width })
$$



$$
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\begin{array}{ccc}
A=x y & & A-\frac{75}{8}=\frac{-2}{3}\left(x-\frac{15}{4}\right)^{2} \\
A=x\left(-\frac{2}{3} x+5\right) & A=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x\right) & \text { Vertex: }\left(\frac{15}{4}, \frac{75}{8}\right) \\
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A=\frac{-2}{3} x^{2}+5 x & A-\frac{75}{8}=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x+\frac{225}{16}\right) \\
\text { ind the vertex }!! & \text { Vertex: }\left(\frac{15}{4}, \frac{75}{8}\right) \\
&
\end{array} \\
& \text { Find the vertex !! }
\end{aligned}
$$



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$$
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$$



$$
\begin{aligned}
& \quad \begin{array}{ll}
A=x y & \\
A=x\left(-\frac{2}{3} x+5\right) & A=-\frac{2}{3}\left(x^{2}-\frac{15}{2} x\right)
\end{array} \\
& \left.\begin{array}{rlr}
\text { A }=\frac{-2}{3} x^{2}+5 x & A-\frac{75}{8}=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x+\frac{225}{16}\right) & \text { Vertex: }\left(\frac{15}{3}\left(x-\frac{15}{4}\right)^{2}, \frac{75}{8}\right) \\
\text { Find the vertex !! } & & X
\end{array}\right)
\end{aligned}
$$

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$$



$$
\begin{array}{lll}
\quad \begin{array}{l}
\text { A }=x y \\
A=x\left(-\frac{2}{3} x+5\right)
\end{array} & A=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x\right) & A-\frac{75}{8}=\frac{-2}{3}\left(x-\frac{15}{4}\right)^{2} \\
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\text { Find the vertex !! } & & X
\end{array}
$$

$$
\mathbf{x}=
$$

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\begin{array}{lll}
\quad A=x y & & 4 \\
A=x\left(\frac{-2}{3} x+5\right) & A=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x\right) & A-\frac{75}{8}=\frac{-2}{3}\left(x-\frac{15}{4}\right)^{2} \\
A=-\frac{2}{3} x^{2}+5 x & A-\frac{75}{8}=-\frac{2}{3}\left(x^{2}-\frac{15}{2} x+\frac{225}{16}\right) & \text { Vertex: }\left(\frac{15}{4}, \frac{75}{8}\right) \\
\text { Find the vertex !! } & &
\end{array}
$$

$$
x=\frac{15}{4}
$$

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$$



$$
\begin{aligned}
& A=x y \\
& A=x\left(-\frac{2}{3} x+5\right) \\
& A=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x\right) \\
& \begin{array}{lll}
A=\frac{-2}{3} x^{2}+5 x & A-\frac{75}{8}=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x+\frac{225}{16}\right) & \text { Vertex: }\left(\begin{array}{cc}
\left(\frac{15}{4}, \frac{75}{8}\right) \\
\text { ind the vertex }!! & \\
& \\
\text { X } & A
\end{array}\right)
\end{array} \\
& \text { Find the vertex !! } \\
& x=\frac{15}{4} \Rightarrow
\end{aligned}
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$$

$$
A=x y
$$

$$
A=x\left(\frac{-2}{3} x+5\right)
$$

$$
A=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x\right)
$$

$$
\begin{array}{lll}
A=\frac{-2}{3} x^{2}+5 x & A-\frac{75}{8}=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x+\frac{225}{16}\right) & \text { Vertex: }\left(\begin{array}{cc}
\left(\frac{15}{4}, \frac{75}{8}\right) \\
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\end{array}
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$$
x=\frac{15}{4} \Rightarrow y=
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\end{aligned}
$$

$$
\begin{aligned}
& x=\frac{15}{4} \Rightarrow y=\left(\frac{-2}{3}\right)\left(\frac{15}{4}\right)+5
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$$

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$$

$$
\begin{aligned}
& \text { Find the vertex !! } \\
& \text { A }-\frac{75}{8}=\frac{-2}{3}\left(x-\frac{15}{4}\right)^{2}
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\left(\frac{15}{4}, \frac{75}{8}\right) \\
\text { ind the vertex !! }
\end{array}\right. \\
\text { lin }
\end{array}
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x=\frac{15}{4} \Rightarrow y=\left(\frac{-2}{3}\right)\left(\frac{15}{4}\right)+5=\frac{-5}{2}+5
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\end{array} \quad \begin{array}{l}
1 \\
\text { A }
\end{array}\right.
\end{array}
\end{aligned}
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$$

$$
\begin{array}{lll}
\quad A=x y & A=-2 \\
A=x\left(\frac{-2}{3} x+5\right) & \left.A=\frac{15}{3} x\right) & A-\frac{75}{8}=\frac{-2}{3}\left(x-\frac{15}{4}\right)^{2} \\
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& \\
\text { X } & \text { A }
\end{array}\right)
\end{array}
\end{aligned}
$$

$$
x=\frac{15}{4} \Rightarrow y=\left(\frac{-2}{3}\right)\left(\frac{15}{4}\right)+5=\frac{-5}{2}+5=\frac{5}{2}
$$

The rectangle with maximum area is

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$$



$$
\begin{aligned}
& A=x y \\
& A=x\left(\frac{-2}{3} x+5\right) \quad A=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x\right)
\end{aligned}
$$

$$
\begin{aligned}
& x=\frac{15}{4} \Rightarrow y=\left(\frac{-2}{3}\right)\left(\frac{15}{4}\right)+5=-\frac{-5}{2}+5=\frac{5}{2}
\end{aligned}
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\begin{aligned}
& A=x y \\
& A=x\left(\frac{-2}{3} x+5\right) \quad A=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x\right)
\end{aligned}
$$

$$
\begin{aligned}
& x=\frac{15}{4} \Rightarrow y=\left(\frac{-2}{3}\right)\left(\frac{15}{4}\right)+5=-\frac{-5}{2}+5=\frac{5}{2}
\end{aligned}
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The rectangle with maximum area is $\mathbf{3 . 7 5}$ units long

## Algebra II Class Worksheet \#2 Unit 8

1. A rectangle has two sides on the coordinate axes and one vertex in the first quadrant on the line $2 x+3 y=15$. What are the dimensions of the rectangle if its area is a maximum? What is the maximum area?

$$
\begin{array}{r}
2 x+3 y=15 \\
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y=(-2 / 3) x+5
\end{array}
$$

$$
\text { Area }=(\text { Length })(\text { Width })
$$



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& A=\frac{-2}{3} x^{2}+5 x
\end{aligned} \quad A-\frac{75}{8}=\frac{-2}{3}\left(x^{2}-\frac{15}{2} x+\frac{225}{16}\right) \quad \text { Vertex: }\left(\frac{15}{4}, \frac{75}{8}\right)
$$

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x=\frac{15}{4} \Rightarrow y=\left(\frac{-2}{3}\right)\left(\frac{15}{4}\right)+5=\frac{-5}{2}+5=\frac{5}{2}
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\left(\frac{15}{4}, \frac{75}{8}\right) \\
\text { ind the vertex }!! &
\end{array}\right. \\
& & \text { A }
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\end{array} \\
& \text { Find the vertex }!! \\
& \\
& \qquad
\end{aligned}
$$

The rectangle with maximum area is $\mathbf{3 . 7 5}$ units long and 2.5 units wide.

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\text { ind the vertex }!! & X
\end{array} \\
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The rectangle with maximum area is 3.75 units long and $\mathbf{2 . 5}$ units wide. Its area is $\mathbf{9 . 3 7 5}$ square units.

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The rectangle with maximum area is $\mathbf{3 . 7 5}$ units long and 2.5 units wide. Its area is $\mathbf{9 . 3 7 5}$ square units.

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Let $x$ represent the length of the plot of land.

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Let $x$ represent the length of the plot of land. Let $y$ represent its width.

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Let $x$ represent the length of the plot of land. Let $y$ represent its width. The total amount of fencing needed is $2 x+4 y$.

## Algebra II Class Worksheet \#2 Unit 8

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Let $x$ represent the length of the plot of land. Let $y$ represent its width. The total amount of fencing needed is $2 x+4 y$. Since she has 1000 feet of fencing to work with,

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Let $x$ represent the length of the plot of land. Let $y$ represent its width. The total amount of fencing needed is $2 x+4 y$. Since she has 1000 feet of fencing to work with, to maximize the total area enclosed, she will need to use all of the fencing.

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Let $x$ represent the length of the plot of land. Let $y$ represent its width. The total amount of fencing needed is $2 x+4 y$. Since she has 1000 feet of fencing to work with, to maximize the total area enclosed, she will need to use all of the fencing. Therefore, $2 x+4 y=1000$.

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2 x+4 y=1000
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Alice wants to maximize the total area enclosed.

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Alice wants to maximize the total area enclosed. Clearly,

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Alice wants to maximize the total area enclosed. Clearly, if A represents the total area enclosed,

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$$
2 x+4 y=1000
$$

Alice wants to maximize the total area enclosed. Clearly, if A represents the total area enclosed, then $A=x y$.

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$$
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Solve for $\mathbf{y}$.

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2 x+4 y=1000
$$

Solve for $y$.
Add - 2 x to each side.

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4y

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Add - 2 x to each side.

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\end{aligned}
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Solve for $y$.

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$$
\begin{aligned}
& 2 x+4 y=1000 \\
& 4 y=-2 x+1000
\end{aligned}
$$

Solve for y.
Divide each side by 4.

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& y
\end{aligned}
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Solve for $\mathbf{y}$.
Divide each side by 4.

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A-31,250=\frac{-1}{2}\left(x^{2}-500 x+62,500\right)
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Complete the square.

$$
\begin{gathered}
2 x+4 y=1000 \\
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\end{gathered}
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Express the function in 'vertex form'.
Given any 2nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x}{ }^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

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Vertex: ( $\mathbf{2 5 0}, \underline{\mathbf{3 1 , 2 5 0}}$ )

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\text { Vertex: }(\underline{\mathbf{2 5 0}}, \underline{\mathbf{3 1}, 250}) & y=\frac{-1}{2} x+250
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\text { Vertex: }\left(\frac{250}{\uparrow}, \frac{\mathbf{3 1 , 2 5 0})}{\AA}\right. & y=\frac{-1}{2} x+250 \\
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Vertex: $\frac{(\mathbf{2 5 0}}{\frac{\mathbf{x}}{\uparrow}}, \frac{\mathbf{3 1 , 2 5 0}}{\mathbf{A}}$

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The total area enclosed is a maximum if the plot is $\mathbf{2 5 0}$ feet long and $\mathbf{1 2 5}$ feet wide.

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y=125
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2 x+4 y=1000 \\
4 y=-2 x+1000 \\
y=-\frac{1}{2} x+250 \\
x=250 \Rightarrow y=\frac{-1}{2}(\mathbf{2 5 0})+250
\end{gathered}
$$

The total area enclosed is a maximum if the plot is $\mathbf{2 5 0}$ feet long and $\mathbf{1 2 5}$ feet wide.

$$
y=125
$$

The maximum area is $\mathbf{3 1 , 2 5 0}$ square feet.

## Algebra II Class Worksheet \#2 Unit 8

2. Alice wants to fence in a rectangular plot of land and to divide it into three equal areas using two lengths of fencing parallel to two opposite sides. If she has a total of $\mathbf{1 0 0 0}$ feet of fencing to work with, then find the dimensions that will maximize the total area enclosed. What is the maximum area? $\quad A=x y$

$$
\begin{aligned}
& A=x\left(\frac{-1}{2} x+250\right) \\
& A=\frac{-1}{2} x^{2}+250 x
\end{aligned}
$$

Find the vertex !!

$$
A=\frac{-1}{2}\left(x^{2}-500 x\right)
$$

$$
A-31,250=\frac{-1}{2}\left(x^{2}-500 x+62,500\right)
$$



$$
A-31,250=\frac{-1}{2}(x-250)^{2}
$$

Vertex: $\frac{(\mathbf{2 5 0}}{\frac{\mathbf{x}}{\uparrow}}, \frac{\mathbf{3 1 , 2 5 0}}{\mathbf{A}}$

$$
\begin{gathered}
2 x+4 y=1000 \\
4 y=-2 x+1000 \\
y=\frac{-1}{2} x+250 \\
x=250 \Rightarrow y=\frac{-1}{2}(\mathbf{2 5 0})+\mathbf{2 5 0}
\end{gathered}
$$

The total area enclosed is a maximum if the plot is $\mathbf{2 5 0}$ feet long and $\mathbf{1 2 5}$ feet wide.

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y=125
$$

The maximum area is $\mathbf{3 1 , 2 5 0}$ square feet.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

## Algebra II Class Worksheet \#2 Unit 8

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We need a function for the total monthly income, $I$.

## Algebra II Class Worksheet \#2 Unit 8

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We need a function for the total monthly income, $I$.

$$
I=
$$

## Algebra II Class Worksheet \#2 Unit 8

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We need a function for the total monthly income, $I$.
I = (number of units rented)(

## Algebra II Class Worksheet \#2 Unit 8

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We need a function for the total monthly income, $I$.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

## Algebra II Class Worksheet \#2 Unit 8

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We need a function for the total monthly income, $I$.
$I$ = (number of units rented)(monthly rental charge)
This is a common type of problem situation.

## Algebra II Class Worksheet \#2 Unit 8

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We need a function for the total monthly income, $I$.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

This is a common type of problem situation.
Let x represent the number of vacant units.

## Algebra II Class Worksheet \#2 Unit 8

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We need a function for the total monthly income, $I$.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-x$.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

We need a function for the total monthly income, $I$.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-\mathrm{x}$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+\mathbf{2 0 x}$.

## Algebra II Class Worksheet \#2 Unit 8

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I=(\text { number of units rented })(\text { monthly rental charge })
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This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-x$.
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Make sure you understand this.

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We need a function for the total monthly income, $I$.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-\mathrm{x}$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0 + 2 0 x}$.
Number
Vacant
$\mathbf{X}$

Make sure you understand this.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

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This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-\mathrm{x}$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+20 \mathrm{x}$.

| Number | Number |
| :---: | :---: |
| Vacant | Rented |
| $\mathbf{x}$ | $\mathbf{4 0 - x}$ |

Make sure you understand this.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

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| Number | Number <br> Rented | Monthly <br> Charge (\$) | Make sure you |
| :---: | :---: | :---: | :---: |
| Vacant | understand this. |  |  |
| $\mathbf{x}$ | $\mathbf{4 0 - x}$ | $\mathbf{6 0 0}+\mathbf{2 0 x}$ |  |

## Algebra II Class Worksheet \#2 Unit 8

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| I = (number of units rented)(monthly rental charge) |  |  |  |
| :---: | :---: | :---: | :---: |
| This is a common type of problem situation. |  |  |  |
| Let $x$ represent the number of vacant units. |  |  |  |
| Then, the number of units rented is $40-\mathrm{x}$. |  |  |  |
| Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+\mathbf{2 0}$ |  |  |  |
| Number | Number | Monthly |  |
| Vacant | Rented | Charge (\$) | Make |
| X | $40-\mathrm{x}$ | $600+20 x$ | unders |

0

If $\mathbf{x}=\mathbf{0}$,

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

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Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-\mathrm{x}$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0 + 2 0 x}$.

| Number <br> Vacant | Number <br> Rented | Monthly <br> Charge (\$) | Make sure you <br> understand this. |
| :---: | :---: | :---: | :---: |
| $\mathbf{x}$ | $\mathbf{4 0 - x}$ | $\mathbf{6 0 0}+\mathbf{2 0 x}$ |  |
| $\mathbf{0}$ | $\mathbf{4 0 - 0}=\mathbf{4 0}$ |  |  |

If $x=0$, there are 40 units rented

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?


If $\mathbf{x}=\mathbf{0}$, there are 40 units rented and the monthly charge is $\$ 600$.

## Algebra II Class Worksheet \#2 Unit 8

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We need a function for the total monthly income, I.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-\mathrm{x}$.
Also, the monthly rental charge (in dollars) is $600+20 x$.

| Number | Number | Monthly |  |
| :---: | :---: | :---: | :---: |
| Vacant | Rented | Charge (\$) | Make sure you |
| $\mathbf{x}$ | $40-x$ | $600+20 x$ | understand this. |
| 0 | $40-0=40$ | $600+20(0)=\mathbf{6 0 0}$ |  |

If $x=0$, there are 40 units rented and the monthly charge is $\$ 600$.

## Algebra II Class Worksheet \#2 Unit 8

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This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-x$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+20 \mathrm{x}$.

| Number | Number | Monthly | Make sure you |
| :---: | :---: | :---: | :---: |
| Vacant | Rented | Charge (\$) | understand this. |
| $\mathbf{x}$ | $\mathbf{4 0 - x}$ | $\mathbf{6 0 0}+\mathbf{2 0 x}$ |  |
| $\mathbf{0}$ | $\mathbf{4 0 - 0}=\mathbf{4 0}$ | $\mathbf{6 0 0}+\mathbf{2 0 ( 0 )}=\mathbf{6 0 0}$ |  |

## Algebra II Class Worksheet \#2 Unit 8

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Then, the number of units rented is $40-x$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0 + 2 0 x}$.

| Number | Number | Monthly |  |
| :---: | :---: | :---: | :---: |
| Vacant | Rented | Charge (\$) | Make sure you |
| $\mathbf{x}$ | $\mathbf{4 0 - x}$ | $\mathbf{6 0 0}+\mathbf{2 0 x}$ | understand this. |
| $\mathbf{0}$ | $\mathbf{4 0 - 0}=\mathbf{4 0}$ | $\mathbf{6 0 0}+\mathbf{2 0 ( 0 )}=\mathbf{6 0 0}$ |  |

1
If $\mathrm{x}=1$,

## Algebra II Class Worksheet \#2 Unit 8

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| Number | Number | Monthly |  |
| :---: | :---: | :---: | :---: |
| Vacant | Rented | Charge (\$) | Make sure you |
| understand this. |  |  |  |
| $\mathbf{x}$ | $\mathbf{4 0 - x}$ | $\mathbf{6 0 0}+\mathbf{2 0 x}$ | un |
| $\mathbf{0}$ | $\mathbf{4 0 - 0}=\mathbf{4 0}$ | $\mathbf{6 0 0}+\mathbf{2 0 ( 0 )}=\mathbf{6 0 0}$ |  |
| $\mathbf{1}$ | $\mathbf{4 0 - 1 = 3 9}$ |  |  |

If $x=1$, there are 39 units rented

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

We need a function for the total monthly income, I.

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I=(\text { number of units rented })(\text { monthly rental charge })
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This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is 40 - x .
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+\mathbf{2 0 x}$.

| Number | Number | Monthly |
| :---: | :---: | :---: |
| Vacant | Rented | Charge (\$) |
| $\mathbf{x}$ | $\mathbf{4 0 - x}$ | $\mathbf{6 0 0}+\mathbf{2 0 x}$ |
| 0 | $\mathbf{4 0 - 0}=\mathbf{4 0}$ | $\mathbf{6 0 0}+\mathbf{2 0 ( 0 )}=\mathbf{6 0 0}$ |
| $\mathbf{1}$ | $\mathbf{4 0 - 1}=\mathbf{3 9}$ | $\mathbf{6 0 0}+\mathbf{2 0 ( 1 ) = 6 2 0}$ |

If $x=1$, there are 39 units rented and the monthly charge is $\$ 620$.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

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| Number | Number | Monthly |
| :---: | :---: | :---: |
| Vacant | Rented | Charge (\$) |
| $\mathbf{x}$ | $\mathbf{4 0 - x}$ | $\mathbf{6 0 0}+\mathbf{2 0 x}$ |
| 0 | $\mathbf{4 0 - 0}=\mathbf{4 0}$ | $\mathbf{6 0 0}+\mathbf{2 0 ( 0 ) = \mathbf { 6 0 0 }}$ |
| $\mathbf{1}$ | $\mathbf{4 0 - 1 = 3 9}$ | $\mathbf{6 0 0}+\mathbf{2 0 ( 1 ) = 6 2 0}$ |

If $x=1$, there are 39 units rented and the monthly charge is $\$ 620$.

## Algebra II Class Worksheet \#2 Unit 8

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I=(\text { number of units rented })(\text { monthly rental charge })
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This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-x$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+20 \mathrm{x}$.

| Number Vacant | Number Rented | Monthly <br> Charge (\$) | Make sure you |
| :---: | :---: | :---: | :---: |
| $\mathbf{x}$ | $40-x$ | $600+20 x$ | understand this. |
| 0 | $40-0=40$ | $600+20(0)=600$ |  |
| 1 | $40-1=39$ | $\mathbf{6 0 0}+\mathbf{2 0}(1)=620$ |  |

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

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Then, the number of units rented is $40-x$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+20 \mathrm{x}$.

Number
Vacant
x Number

1

$$
40-1=39
$$

$$
600+20(1)=620
$$

Make sure you understand this.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

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This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-\mathrm{x}$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0 + 2 0 x}$.

Number
Vacant Rented
x
40 - x
$1 \quad 40-1=39 \quad 600+20(1)=620$

If $\mathbf{x}=\mathbf{2}$,

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

| $I=($ number of units rented)(monthly rental charge) |  |  |  |
| :---: | :---: | :---: | :---: |
| This is a common type of problem situation. |  |  |  |
| Let x represent the number of vacant units. |  |  |  |
| Then, the number of units rented is $40-\mathrm{x}$. |  |  |  |
| Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+\mathbf{2 0 x}$. |  |  |  |
| Number | Number | Monthly |  |
| Vacant | Rented | Charge (\$) | Make sure you |
| $\mathbf{x}$ | $40-x$ | $600+20 x$ | understand this. |
| 1 | $40-1=39$ | $\mathbf{6 0 0}+\mathbf{2 0}(1)=$ |  |
| 2 | $40-2=38$ |  |  |

If $x=2$, there are 38 units rented

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?


If $x=2$, there are 38 units rented and the monthly charge is $\$ 640$.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

We need a function for the total monthly income, I.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

This is a common type of problem situation.
Let $x$ represent the number of vacant units.
Then, the number of units rented is 40 - x .
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+\mathbf{2 0 x}$.

| Number | Number | Monthly |
| :---: | :---: | :---: |
| Vacant | Rented | Charge (\$) |
| $\mathbf{x}$ | $40-\mathbf{x}$ | $600+20 x$ |
| 1 | $40-1=39$ | $600+20(1)=620$ |
| 2 | $40-2=38$ | $600+20(2)=640$ |

If $\mathbf{x}=\mathbf{2}$, there are 38 units rented and the monthly charge is $\mathbf{\$ 6 4 0}$.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

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| Number | Number | Monthly |
| :---: | :---: | :---: |
| Vacant | Rented | Charge (\$) |
| $\mathbf{x}$ | $40-\mathbf{x}$ | $600+20 x$ |
| 1 | $40-1=39$ | $600+20(1)=620$ |
| 2 | $40-2=38$ | $600+20(2)=640$ |

Make sure you understand this.

Got it?

If $\mathbf{x}=\mathbf{2}$, there are 38 units rented and the monthly charge is $\mathbf{\$ 6 4 0}$.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

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| Number | Number | Monthly |
| :---: | :---: | :---: |
| Vacant | Rented | Charge (\$) |
| $\mathbf{x}$ | $40-\mathbf{x}$ | $600+20 x$ |
| 1 | $40-1=39$ | $600+20(1)=620$ |
| 2 | $40-2=38$ | $600+20(2)=640$ |

Make sure you understand this.

Got it.

If $\mathbf{x}=\mathbf{2}$, there are 38 units rented and the monthly charge is $\mathbf{\$ 6 4 0}$.

## Algebra II Class Worksheet \#2 Unit 8

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Let $x$ represent the number of vacant units.
Then, the number of units rented is $40-\mathrm{x}$.
Also, the monthly rental charge (in dollars) is $\mathbf{6 0 0}+\mathbf{2 0 x}$.

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

We need a function for the total monthly income, $I$.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

## Algebra II Class Worksheet \#2 Unit 8

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$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

Number of units rented : 40-x

## Algebra II Class Worksheet \#2 Unit 8

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$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): 600 + 20x

## Algebra II Class Worksheet \#2 Unit 8

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We need a function for the total monthly income, $I$.
$I=($ number of units rented)(monthly rental charge)
Number of units rented : 40-x Monthly rental charge (\$): 600 + 20x

$$
\mathbf{I}=
$$

## Algebra II Class Worksheet \#2 Unit 8

3. The owner of a large apartment building with forty units has found that if the rent for each unit is $\$ 600$ per month, then all of the units will be rented. But one unit will become vacant for each increase of $\$ 20$ per month. What rate should be charged per month per unit in order to maximize the total monthly income? What is the maximum monthly income?

We need a function for the total monthly income, $I$.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

Number of units rented : 40-x Monthly rental charge (\$): 600 + 20x

$$
I=(40-x)(
$$

## Algebra II Class Worksheet \#2 Unit 8

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Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): 600 + 20x

$$
I=(40-x)(600+20 x)
$$

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Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): 600 + 20x

$$
I=(40-x)(600+20 x)
$$

## Multiply.

## Algebra II Class Worksheet \#2 Unit 8

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$I=($ number of units rented)(monthly rental charge)
Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): $\mathbf{6 0 0}+\mathbf{2 0 x}$

$$
I=(40-x)(600+20 x)=
$$

## Multiply.

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Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): $\mathbf{6 0 0}+\mathbf{2 0 x}$

$$
I=(40-x)(600+20 x)=24,000
$$

## Multiply.

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Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): $\mathbf{6 0 0}+\mathbf{2 0 x}$

$$
I=(40-x)(600+20 x)=24,000+800 x
$$

## Multiply.

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Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): 600 + 20x

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x
$$

## Multiply.

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I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
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## Multiply.

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I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Rearrange the terms, and combine like terms.

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Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): $\mathbf{6 0 0}+\mathbf{2 0 x}$

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I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
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Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): $\mathbf{6 0 0}+\mathbf{2 0 x}$

$$
\begin{gathered}
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2} \\
I=-20 x^{2}
\end{gathered}
$$

Rearrange the terms, and combine like terms.

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\begin{gathered}
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2} \\
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Rearrange the terms, and combine like terms.

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We need a function for the total monthly income, I.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

Number of units rented : 40 - $x \quad$ Monthly rental charge (\$) : 600 + 20x

$$
\begin{gathered}
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2} \\
I=-20 x^{2}+200 x+24,000
\end{gathered}
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Rearrange the terms, and combine like terms.

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I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
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Find the vertex !! $\quad I=-20 x^{2}+200 x+24,000$

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We need a function for the total monthly income, I.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

Number of units rented : 40 - $x$ Monthly rental charge (\$): 600 + 20x

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Find the vertex !! $I=-20 x^{2}+200 x+24,000$

Express the function in 'vertex form'.
Given any 2nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x} \mathbf{x}^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

The vertex of the function is $\left(x_{1}, y_{1}\right)!!!$

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Number of units rented : 40 - $x$ Monthly rental charge (\$): 600 + 20x

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Find the vertex !! $I=-20 x^{2}+200 x+24,000$

Subtract 24,000 from each side.
Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x}{ }^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

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Number of units rented : 40 - $x$ Monthly rental charge (\$): 600 + 20x

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Find the vertex !! $I=-20 x^{2}+200 x+24,000$

## I

Subtract 24,000 from each side.
Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x}{ }^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

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We need a function for the total monthly income, I.

$$
I=(\text { number of units rented })(\text { monthly rental charge })
$$

Number of units rented : 40 - $x$ Monthly rental charge (\$) : 600 + 20x

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Find the vertex !! $I=-20 x^{2}+200 x+24,000$
I - 24,000

Subtract 24,000 from each side.
Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x}{ }^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

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$$

Number of units rented : 40 - $x$ Monthly rental charge (\$) : 600 + 20x

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Find the vertex !! $I=-20 x^{2}+200 x+24,000$

$$
\text { I }-\mathbf{2 4 , 0 0 0}=
$$

Subtract 24,000 from each side.
Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x}{ }^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

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Number of units rented : 40 - $x$ Monthly rental charge (\$) : 600 + 20x

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Find the vertex !! $I=-20 x^{2}+200 x+24,000$

$$
I-24,000=-20 x^{2}
$$

Subtract 24,000 from each side.
Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x}{ }^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

The vertex of the function is $\left(x_{1}, y_{1}\right)!!!$

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I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
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Find the vertex !! $I=-20 x^{2}+200 x+24,000$

$$
I-24,000=-20 x^{2}+200 x
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Subtract 24,000 from each side.
Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x}{ }^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

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Number of units rented : 40 - $x \quad$ Monthly rental charge (\$) : $600+20 x$

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Find the vertex !! $I=-20 x^{2}+200 x+24,000$

$$
I-24,000=-20 x^{2}+200 x
$$

Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x} \mathbf{x}^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

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$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Find the vertex !! $I=-20 x^{2}+200 x+24,000$

$$
I-24,000=-20 x^{2}+200 x
$$

Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x}{ }^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

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Number of units rented : 40 - $x \quad$ Monthly rental charge (\$) : $600+20 x$

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
$$

Find the vertex !! $I=-20 x^{2}+200 x+24,000$

$$
I-24,000=-20 x^{2}+200 x
$$

Factor.
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Number of units rented : 40 - $x$ Monthly rental charge (\$) : 600 + 20x

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Find the vertex !! $\quad I=-20 x^{2}+200 x+24,000$

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I-24,000=-20 x^{2}+200 x & I-24,000-500=-20\left(x^{2}-10 x+25\right) \\
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Express the function in 'vertex form'.
Given any 2 nd degree function with one variable, $\mathbf{y}=\mathbf{f}(\mathbf{x})=\mathbf{A x}{ }^{2}+\mathbf{B x}+\mathbf{C}$, the 'vertex form' of the equation is $y-y_{1}=A\left(x-x_{1}\right)^{2}$.

The vertex of the function is $\left(x_{1}, y_{1}\right)!!!$

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& \frac{1}{I}
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& \text { Vertex: } \frac{(5,5, \underline{14,500})}{\frac{1}{1}} \\
& \mathbf{x} \\
& 600+20 x=
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& \text { Vertex: }\left(\frac{5}{\frac{5}{1}}, \underline{\mathbf{2 4 , 5 0 0})}\right. \\
& \frac{1}{I} \\
& 600+20 x= \\
& =600+20(5)=700
\end{array}
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We need a function for the total monthly income, $I$.
I = (number of units rented)(monthly rental charge)

Number of units rented : $\mathbf{4 0} \mathbf{- x}$ Monthly rental charge (\$): $\mathbf{6 0 0}+\mathbf{2 0 x}$

$$
I=(40-x)(600+20 x)=24,000+800 x-600 x-20 x^{2}
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Find the vertex !! $\quad I=-20 x^{2}+200 x+24,000$

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\begin{array}{lr}
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\text { They should charge } \$ 700 \text { per month. } \quad X \quad I
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$$

Algebra II Class Worksheet \#2 Unit 8
4. A television set manufacturer can sell 200 sets per month for $\$ 800$ per set. Marketing research indicates that the company can sell 20 more sets per month for each $\mathbf{\$ 2 5}$ decrease in price. What price per set will give the greatest monthly income? What is the maximum monthly income?

Algebra II Class Worksheet \#2 Unit 8
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## Algebra II Class Worksheet \#2 Unit 8

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I = (number of TV's sold per month)(

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This problem is similar to problem \#3.

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This problem is similar to problem \#3.
We will represent the number of TV's sold per month as $200+20 x$.

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We need a function for the total monthly income, $I$.
$I=($ number of TV's sold per month)(price per TV)
This problem is similar to problem \#3.
We will represent the number of TV's sold per month as $200+20 x$. We will represent the price per television set as $800-25 x$ (dollars)

Algebra II Class Worksheet \#2 Unit 8
4. A television set manufacturer can sell 200 sets per month for $\$ 800$ per set. Marketing research indicates that the company can sell 20 more sets per month for each $\mathbf{\$ 2 5}$ decrease in price. What price per set will give the greatest monthly income? What is the maximum monthly income?

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Number Sold
Per Month

## Algebra II Class Worksheet \#2 Unit 8

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Number Sold
Per Month
200

## Algebra II Class Worksheet \#2 Unit 8

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Number Sold
Per Month
$200+$

## Algebra II Class Worksheet \#2 Unit 8

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Number Sold
Per Month
$200+20 x$

## Algebra II Class Worksheet \#2 Unit 8

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| Number Sold | Price per |
| :---: | :---: |
| Per Month | TV (\$) |
| $200+20 x$ |  |

## Algebra II Class Worksheet \#2 Unit 8

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| Number Sold | Price per |
| :---: | :---: |
| Per Month | TV (\$) |
| $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}$ |

## Algebra II Class Worksheet \#2 Unit 8

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| :---: | :---: |
| Per Month | TV (\$) |
| $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-$ |

## Algebra II Class Worksheet \#2 Unit 8

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| :---: | :---: |
| Per Month | TV (\$) |
| $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |

## Algebra II Class Worksheet \#2 Unit 8

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| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $x$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |

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| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $x$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |

If $\mathbf{x}=\mathbf{0}$,

## Algebra II Class Worksheet \#2 Unit 8

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| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| $\mathbf{0}$ | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ |  |

If $\mathbf{x}=\mathbf{0}$, there are 200 TV's sold per month

## Algebra II Class Worksheet \#2 Unit 8

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| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| 0 | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |

If $\mathbf{x}=\mathbf{0}$, there are 200 TV's sold per month, and the price is $\$ 800$ per set.

## Algebra II Class Worksheet \#2 Unit 8

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| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| 0 | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |

If $\mathbf{x}=\mathbf{0}$, there are 200 TV's sold per month, and the price is $\$ 800$ per set.

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| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| 0 | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |

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| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| 0 | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |

If $\mathbf{x}=\mathbf{1}$,

## Algebra II Class Worksheet \#2 Unit 8

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|  | Number Sold | Price per |
| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| $\mathbf{0}$ | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |
| $\mathbf{1}$ | $\mathbf{2 0 0}+\mathbf{2 0}=\mathbf{2 2 0}$ |  |

If $\mathbf{x}=\mathbf{1}$, there are 220 TV's sold per month,

## Algebra II Class Worksheet \#2 Unit 8

4. A television set manufacturer can sell 200 sets per month for $\$ 800$ per set. Marketing research indicates that the company can sell 20 more sets per month for each $\mathbf{\$ 2 5}$ decrease in price. What price per set will give the greatest monthly income? What is the maximum monthly income?

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|  | Number Sold | Price per |
| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| $\mathbf{0}$ | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |
| $\mathbf{1}$ | $\mathbf{2 0 0}+\mathbf{2 0}=\mathbf{2 2 0}$ | $\mathbf{8 0 0}-\mathbf{2 5}=\mathbf{7 7 5}$ |

If $\mathbf{x}=\mathbf{1}$, there are 220 TV's sold per month, and the price is $\$ 775$ per set.

## Algebra II Class Worksheet \#2 Unit 8

4. A television set manufacturer can sell 200 sets per month for $\$ 800$ per set. Marketing research indicates that the company can sell 20 more sets per month for each $\$ 25$ decrease in price. What price per set will give the greatest monthly income? What is the maximum monthly income?

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|  | Number Sold | Price per |
| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| $\mathbf{0}$ | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |
| $\mathbf{1}$ | $\mathbf{2 0 0}+\mathbf{2 0}=\mathbf{2 2 0}$ | $\mathbf{8 0 0}-\mathbf{2 5}=\mathbf{7 7 5}$ |

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## Algebra II Class Worksheet \#2 Unit 8

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|  | Number Sold | Price per |
| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| $\mathbf{0}$ | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |
| $\mathbf{1}$ | $\mathbf{2 0 0}+\mathbf{2 0}=\mathbf{2 2 0}$ | $\mathbf{8 0 0}-\mathbf{2 5}=\mathbf{7 7 5}$ |

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|  | Number Sold <br> Ver Month | Price per <br> TV (\$) |
| :---: | :---: | :---: |
| Value | Per |  |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| $\mathbf{0}$ | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |
| $\mathbf{1}$ | $\mathbf{2 0 0}+\mathbf{2 0}=\mathbf{2 2 0}$ | $\mathbf{8 0 0 - \mathbf { 2 5 } = \mathbf { 7 7 5 }}$ |

If $\mathbf{x}=\mathbf{2}$,

## Algebra II Class Worksheet \#2 Unit 8

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|  | Number Sold | Price per |
| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| $\mathbf{0}$ | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0}-\mathbf{0}=\mathbf{8 0 0}$ |
| $\mathbf{1}$ | $\mathbf{2 0 0}+\mathbf{2 0}=\mathbf{2 2 0}$ | $\mathbf{8 0 0}-\mathbf{2 5}=\mathbf{7 7 5}$ |
| $\mathbf{2}$ | $\mathbf{2 0 0}+\mathbf{4 0}=\mathbf{2 4 0}$ |  |

If $\mathbf{x}=\mathbf{2}$, there are $\mathbf{2 4 0}$ TV's sold per month,

## Algebra II Class Worksheet \#2 Unit 8

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| Value | Number Sold Per Month $200+20 x$ | $\begin{aligned} & \text { Price per } \\ & \text { TV (\$) } \\ & 800-25 x \end{aligned}$ |
| :---: | :---: | :---: |
| 0 | $200+0=200$ | $800-0=800$ |
| 1 | $\mathbf{2 0 0}+\mathbf{2 0}=\mathbf{2 2 0}$ | $800-25=775$ |
| 2 | $\mathbf{2 0 0}+\mathbf{4 0}=\mathbf{2 4 0}$ | $\mathbf{8 0 0}-\mathbf{5 0}=\mathbf{7 5 0}$ |

If $\mathbf{x}=\mathbf{2}$, there are 240 TV's sold per month, and the price is $\$ 750$ per set.

## Algebra II Class Worksheet \#2 Unit 8

4. A television set manufacturer can sell 200 sets per month for $\$ 800$ per set. Marketing research indicates that the company can sell 20 more sets per month for each $\$ 25$ decrease in price. What price per set will give the greatest monthly income? What is the maximum monthly income?

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I = (number of TV's sold per month)(price per TV)
This problem is similar to problem \#3.
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|  | Number Sold | Price per |
| :---: | :---: | :---: |
| Value | Per Month | TV (\$) |
| of $\mathbf{x}$ | $\mathbf{2 0 0}+\mathbf{2 0 x}$ | $\mathbf{8 0 0}-\mathbf{2 5 x}$ |
| 0 | $\mathbf{2 0 0}+\mathbf{0}=\mathbf{2 0 0}$ | $\mathbf{8 0 0 - 0}=\mathbf{8 0 0}$ |
| $\mathbf{1}$ | $\mathbf{2 0 0}+\mathbf{2 0}=\mathbf{2 2 0}$ | $\mathbf{8 0 0}-\mathbf{2 5}=\mathbf{7 7 5}$ |
| $\mathbf{2}$ | $\mathbf{2 0 0}+\mathbf{4 0}=\mathbf{2 4 0}$ | $\mathbf{8 0 0}-\mathbf{5 0}=\mathbf{7 5 0}$ |

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| Value of $\mathbf{x}$ | Number Sold Per Month $200+20 x$ | $\begin{gathered} \text { Price per } \\ \text { TV (\$) } \\ 800-25 x \end{gathered}$ |  |
| :---: | :---: | :---: | :---: |
| 0 | $200+0=200$ | $800-0=800$ |  |
| 1 | $200+\mathbf{2 0}=\mathbf{2 2 0}$ | $800-25=775$ | It works! |
| 2 | $\mathbf{2 0 0}+\mathbf{4 0}=\mathbf{2 4 0}$ | $\mathbf{8 0 0}-\mathbf{5 0}=\mathbf{7 5 0}$ |  |

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Algebra II Class Worksheet \#2 Unit 8
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$I=($ number of TV's sold per month)(price per TV)
number of TV's sold per month :

Algebra II Class Worksheet \#2 Unit 8
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$I=($ number of TV's sold per month)(price per TV)
number of TV's sold per month : 200 + 20x

## Algebra II Class Worksheet \#2 Unit 8

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I = (number of TV's sold per month)(price per TV)
number of TV's sold per month : 200 + 20x Price per TV (\$) : 800 - 25x $\mathbf{I}=$

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$$
\begin{aligned}
& \text { We need a function for the total monthly income, } I \text {. } \\
& \text { I =(number of TV's sold per month)(price per TV) } \\
& \text { number of TV's sold per month :200+20x Price per TV }(\$): 800-25 x \\
& I=(\mathbf{2 0 0}+\mathbf{2 0 x})
\end{aligned}
$$

Algebra II Class Worksheet \#2 Unit 8
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number of TV's sold per month : 200 + 20x Price per TV (\$) : 800-25x

$$
I=(200+20 x)(800-25 x)
$$

## Algebra II Class Worksheet \#2 Unit 8

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I = (number of TV's sold per month)(price per TV)
number of TV's sold per month : 200 + 20x Price per TV (\$) : 800-25x

$$
I=(200+20 x)(800-25 x)=
$$

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number of TV's sold per month : 200 + 20x Price per TV (\$) : 800-25x

$$
I=(200+20 x)(800-25 x)=
$$

Multiply.

## Algebra II Class Worksheet \#2 Unit 8

4. A television set manufacturer can sell 200 sets per month for $\$ 800$ per set. Marketing research indicates that the company can sell 20 more sets per month for each $\mathbf{\$ 2 5}$ decrease in price. What price per set will give the greatest monthly income? What is the maximum monthly income?

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$I=($ number of TV's sold per month $)($ price per TV)
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$$
I=(200+20 x)(800-25 x)=160,000
$$

Multiply.

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$$
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$$

Multiply.

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$$
I=(200+20 x)(800-25 x)=160,000-5,000 x+16,000 x
$$

Multiply.

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Multiply.

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Rearrange the terms, and combine like terms.

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\begin{gathered}
I=(200+20 x)(800-25 x)=160,000-5,000 x+16,000 x-500 x^{2} \\
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Subtract 160,000 from each side.

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Factor.

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I-160,000
Factor.

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Factor.

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Find the vertex !! $\quad I=-500 x^{2}+\mathbf{1 1 , 0 0 0 x}+\mathbf{1 6 0 , 0 0 0}$
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Factor.

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$I-160,000=-500\left(x^{2}\right.$
Factor.

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$\mathrm{I}-\mathbf{1 6 0 , 0 0 0}=-\mathbf{5 0 0} \mathrm{x}^{2}+\mathbf{1 1 , 0 0 0 x}$
I-160,000 = -500( $\left.\mathbf{x}^{2}-\mathbf{2 2 x}\right)$
Factor.

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I-160,000 $=\mathbf{- 5 0 0}\left(x^{2}-22 x\right)$

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Complete the square.

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$\mathrm{I}-\mathbf{1 6 0 , 0 0 0}=\mathbf{- 5 0 0}\left(\mathrm{x}^{2}-\mathbf{2 2 x}\right)$
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Find the vertex !! $I=-500 x^{2}+\mathbf{1 1 , 0 0 0 x}+\mathbf{1 6 0 , 0 0 0}$
$\mathrm{I}-\mathbf{1 6 0 , 0 0 0}=\mathbf{- 5 0 0} \mathrm{x}^{\mathbf{2}}+\mathbf{1 1 , 0 0 0 x}$
I $-\mathbf{1 6 0 , 0 0 0}=-500\left(x^{2}-22 x\right)$
$\mathrm{I}-\mathbf{1 6 0 , 0 0 0}=\mathbf{- 5 0 0}\left(\mathrm{x}^{2}-22 \mathrm{x}+121\right)$
Complete the square.

## Algebra II Class Worksheet \#2 Unit 8

4. A television set manufacturer can sell 200 sets per month for $\$ 800$ per set. Marketing research indicates that the company can sell 20 more sets per month for each $\mathbf{\$ 2 5}$ decrease in price. What price per set will give the greatest monthly income? What is the maximum monthly income?

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$$
\begin{array}{ll}
I-160,000=-500 x^{2}+11,000 x & I-220,500= \\
I-160,000=-500\left(x^{2}-22 x\right) & \\
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\end{array}
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$\mathrm{I}-\mathbf{1 6 0 , 0 0 0}=\mathbf{- 5 0 0}\left(\mathrm{x}^{2}-\mathbf{2 2 x}\right) \quad$ Vertex:
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$\begin{array}{lr}I-160,000=-500\left(x^{2}-22 x\right) & \text { Vertex: }\left(\frac{11}{\frac{11}{4}}, \frac{\mathbf{2 2 0 , 5 0 0}}{\frac{1}{4}}\right) \\ I-160,000-60,500=-500\left(x^{2}-22 x+121\right) & X\end{array}$

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Vertex: $\frac{\left(\frac{11}{\uparrow}, \frac{220,500}{\frac{1}{\mathrm{I}}}\right)}{\frac{1}{\mathrm{I}}}$

$$
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$$
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& \mathrm{I}-\mathbf{1 6 0 , 0 0 0}=\mathbf{- 5 0 0} \mathrm{x}^{2}+\mathbf{1 1 , 0 0 0 x} \\
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& \text { I-220,500 = -500(x-11) }{ }^{2} \\
& \text { Vertex: } \frac{\left(\frac{11}{1}, \frac{220,500}{\frac{1}{1}}\right)}{\frac{1}{1}} \\
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\end{aligned}
$$

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$800-25 \mathrm{x}=$
$=800-25(11)$

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I-220,500 $=\mathbf{- 5 0 0}(x-11)^{2}$
Vertex: $\left(\frac{11}{\frac{11}{\uparrow}}, \frac{220,500}{\frac{1}{x}}\right)$
$800-25 \mathrm{x}=$
$=800-25(11)=525$

## Algebra II Class Worksheet \#2 Unit 8

4. A television set manufacturer can sell 200 sets per month for $\$ 800$ per set. Marketing research indicates that the company can sell 20 more sets per month for each $\$ \mathbf{2 5}$ decrease in price. What price per set will give the greatest monthly income? What is the maximum monthly income?

We need a function for the total monthly income, $I$.
$I=$ (number of TV's sold per month)(price per TV)
number of TV's sold per month : 200 + 20x Price per TV (\$) : 800-25x

$$
I=(200+20 x)(800-25 x)=160,000-5,000 x+16,000 x-500 x^{2}
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Find the vertex !! $\quad I=-500 x^{2}+11,000 x+160,000$
$\mathrm{I}-\mathbf{1 6 0 , 0 0 0}=\mathbf{- 5 0 0} \mathrm{x}^{2}+\mathbf{1 1 , 0 0 0 x}$
$\mathrm{I}-160,000=-500\left(\mathrm{x}^{2}-\mathbf{2 2 x}\right)$
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$$
\begin{aligned}
\text { Vertex: } & \left(\frac{\mathbf{1 1}}{\frac{1}{x}}, \frac{\mathbf{2 2 0 , 5 0 0}}{\frac{1}{I}}\right) \\
& \quad \mathbf{8 0 0}-\mathbf{2 5 x}= \\
& =800-\mathbf{2 5}(\mathbf{1 1})=\mathbf{5 2 5}
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