

Bell Work Grab your calc.

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Grab your calc.

Solve the following when  $y=0$ .

$$y = -5x^2 + 320$$

$$0 = -5x^2 + 320$$

$$\begin{array}{r} -320 \\ -320 \end{array} \quad \begin{array}{r} -320 \\ -320 \end{array}$$

$$-320 = -5x^2$$

$$\frac{-320}{-5} = \frac{-5x^2}{-5}$$

$$\sqrt{64} = \sqrt{x^2}$$

$$8 = x$$

**Before** we learned how to solve linear equations.

**Now** we are going to learn to solve polynomial equations.

**Because** this will help us analyze vertical motion, which can be found often in every day life.

Given the following equations, let  $y=0$  and solve for  $x$ .

List your solution as an ordered pair.

$$(-3, 0)$$

$$y = 7x + 21$$

$$0 = 7x + 21$$

$$\begin{array}{r} -21 \\ -21 \end{array}$$

$$\frac{-21}{7} = \frac{7x}{7}$$

$$-3 = x$$

$$0 = y$$

$$\frac{2}{3}x + 6 = y$$

$$\frac{2}{3}x + 6 = 0$$

$$\begin{array}{r} -6 \\ -6 \end{array}$$

$$\left(\frac{3}{2}\right) \frac{2}{3} x = -6 \left(\frac{3}{2}\right)$$

$$x = \frac{-6 \cdot 3}{2}$$

$$x = -9$$

$$y = 0$$

If you are given two variables,  $a$  and  $b$ , and I ask you to multiply them but your answer must be zero....

...What could you do?

Make  $a$  or  $b$  equal to zero.

Anything multiplied by zero, equals zero!

### KEY CONCEPT

*For Your Notebook*

#### Zero-Product Property

Let  $a$  and  $b$  be real numbers. If  $ab = 0$ , then  $a = 0$  or  $b = 0$ .

The zero-product property is used to solve an equation when one side is zero and the other side is a product of polynomial factors. The solutions of such an equation are also called **roots**.

Use the zero product property to solve:

$$a \cdot b = 0$$
$$(x-4)(x+2) = 0$$

$x-4 = 0$   
 $+4 \quad +4$   
 $x = 4$   
 $y = 0$   
 $(4, 0)$

$x+2 = 0$   
 $-2 \quad -2$   
 $x = -2$   
 $y = 0$   
 $(-2, 0)$

X-intercepts  
because  $y=0$

Use the zero product property to solve:

$$(x-5)(x-1) = 0$$

$$x-5=0$$

$$+5 +5$$

$$x=5$$

$$y=0$$

$$(5, 0)$$

$$x-1=0$$

$$+1 +1$$

$$x=1$$

$$y=0$$

$$(1, 0)$$

Factor out the GCF

$$4x^2 + 24x^3$$

$$4x^2(1 + 6x)$$

	1	6x
$4x^2$	$4x^2$	$24x^3$

An arrow points from the left towards the  $4x^2$  term in the table above.

Solve the following using the zero product property

(you may have to find the GCF first)

$$2x^2 + 8x = 0$$

$$2x(x + 4) = 0$$

$$\frac{2x}{2} = \frac{0}{2}$$

$$x = 0$$

$$y = 0$$

$$(0, 0)$$

$$x + 4 = 0$$

$$-4 - 4$$

$$x = -4$$

$$y = 0$$

$$(-4, 0)$$



Solve the following using the zero product property

(you may have to find the GCF first)

$$6n^2 = 15n$$

$$-15n \quad -15n$$

$$6n^2 - 15n = 0$$

$$3n(2n - 5) = 0$$

$$\frac{3n}{3} = \frac{0}{3}$$

$$n = 0$$

$$y = 0$$

$$(0, 0)$$

$$2n - 5 = 0$$
$$+5 \quad +5$$

$$\frac{2n}{2} = \frac{5}{2}$$

$$n = \frac{5}{2}$$

$$y = 0$$

$$\left(\frac{5}{2}, 0\right)$$