

Algebra 1  $\downarrow$  8.8

2 terms

$$y^2 + 16$$

Factor binomials that are the difference of squares

Use the difference of squares to solve equations

difference

factor

solve

zero product property

whiteboards

$$16a^2 - 81$$
$$(4a + 9)(4a - 9)$$

$$\left( \quad \right)^2 - \left( \quad \right)^2$$
$$x^2 - 49$$
$$(x - 7)(x + 7)$$
$$\begin{array}{r} x - 7 \\ x + 7 \\ \hline x^2 - 49 \end{array}$$

 **KeyConcept** Difference of Squares

**Symbols**      $a^2 - b^2 = (a + b)(a - b)$  or  $(a - b)(a + b)$

**Examples**      $x^2 - 25 = (x + 5)(x - 5)$  or  $(x - 5)(x + 5)$

$t^2 - 64 = (t + 8)(t - 8)$  or  $(t - 8)(t + 8)$

Hint: might be GCF too...

c.  $27g^3 - 3g$

$$3g(9g^2 - 1)$$
$$3g(3g-1)(3g+1)$$

$$3g(x)$$

GCF

Is the first thing something squared?

Is the second thing something squared?

Is it a difference?

Might need to rearrange...

b.  $625 - x^4$

$$(25 - x^2)(25 + x^2)$$

$$(5 - x)(5 + x)(25 + x^2)$$

How do you know when you are finished factoring?  
Examine your answer. Is there another d.o.s. or GCF?

Whiteboards

Guided Practice

2A.  $y^4 - 1$

2B.  $4a^4 - b^4$

13.  $3a^2 + 30a + 63$

$$\left( \frac{3a^2}{3a} + \frac{9a}{3a} \right) + \left( \frac{21a}{21} + \frac{63}{21} \right)$$

$$3a(a+3) \quad 21(a+3)$$

$$(a+3) \left( \frac{3a}{3} + \frac{21}{3} \right)$$

$$3(a+7)(a+3)$$

63 · 3

$$\begin{array}{r} 189 \\ \hline \end{array}$$

1 189

3 63

7 27

+9 +21

**Example 3** Apply Different Techniques

Factor each polynomial.

a.  $\frac{5x^5}{5x} - \frac{45x}{5x}$

$$\begin{array}{l} 5x(x^4 - 9) \\ \downarrow \\ (x^2 - 3)(x^2 + 3) \\ \downarrow \\ 5x(x^2 - 3)(x^2 + 3) \end{array}$$

What are some different kinds of factoring?

(Use everything that you know...)

1. GCF
2.  $\left\{ \begin{array}{l} \text{Factor by grouping} \\ \text{X-factor} \\ \text{Leading coefficient (factor pairs)} \\ \text{Difference of squares} \end{array} \right.$
3. *check if finished*

$$12a^3 + 2a^2 - 192a - 32$$

$$\begin{aligned} & 2 \left( \underbrace{6a^3 + a^2}_{a^2(ba+1)} \left( -\frac{96a-16}{16} \right) \right) \\ & \left| \begin{aligned} & a^2(ba+1) - 16(ba+1) \\ & (a^2-16)(ba+1) \\ & \downarrow \\ & 2(a+4)(a-4)(ba+1) \end{aligned} \right. \end{aligned}$$

$$\left( \frac{15m^3}{3m^2} + \frac{12m^2}{3m^2} \right) + -375m + -300$$

$$3m^2(5m + 4) - 75(5m + 4)$$

$$\left( \frac{3m^2}{3} - \frac{75}{3} \right) (5m + 4)$$

$$3(m^2 - 25)(5m + 4)$$

$$3(m+5)(m-5)(5m+4)$$



**b.**  $7x^3 + 21x^2 - 7x - 21$

**3C.**  $2m^3 + m^2 - 50m - 25$

**3D.**  $r^3 + 6r^2 + 11r + 66$

What if it is an equation?

Scavenger hunt...

$$x^2 - 25 = 0$$
$$(x-5)(x+5) = 0$$
$$\begin{array}{cc} \downarrow & \downarrow \\ x-5=0 & x+5=0 \\ x=5 & x=-5 \end{array}$$

$$(4x-3)(x+5) = 0$$

$$4x-3=0 \quad x+5=0$$

$$4x=3$$

$$x = \frac{3}{4}$$

$$x = -5$$

Zero product property

Guided Practice

4. Which are the solutions of  $18x^3 = 50x$ ? ↓

$$\frac{18x^3}{2x} - \frac{50x}{2x} = 0$$

$$2x(9x^2 - 25) = 0$$

$$2x(3x+5)(3x-5) = 0$$

↓	↓	↓
$2x = 0$	$3x + 5 = 0$	$3x - 5 = 0$
$\frac{2x}{2} = \frac{0}{2}$	$3x = -5$	$3x = 5$
$x = 0$	$x = -\frac{5}{3}$	$x = \frac{5}{3}$

**Standardized Test Example 4** Solve an Equation by Factoring

In the equation  $0 = x^2 - \frac{9}{16}$ , which is a value of  $x$  when  $y = 0$ ?

$$0 = x^2 - \frac{9}{16}$$

$$0 = \left(x + \frac{3}{4}\right) \left(x - \frac{3}{4}\right)$$

$\downarrow$                        $\downarrow$

$$x + \frac{3}{4} = 0 \quad x - \frac{3}{4} = 0$$

$$x = -\frac{3}{4}$$
$$x = \frac{3}{4}$$

W B pr. 8.8  
odds + 26

$$x^3 + 6x^2 = -11x - 66$$
$$+11x + 66 \quad +11x + 66$$

$$\left( \frac{x^3 + 6x^2}{x^2} + 11x + 66 \right) = 0$$

$$x^2(x+6) + 11(x+6) = 0$$

$$(x^2 + 11)(x+6) = 0$$

$$(x^2 - 4)(x+6) = 0$$

$$(x+2)(x-2)(x+6) = 0$$

$x+2=0$   $x-2=0$   $x+6=0$

$$x = -6$$

$$x = 2$$

$$x = -2$$