

LT 3.5 Solving by Factoring

Warm-up

① Profit Investigation

② FOIL / Double Distribution

$$a) (x-6)(x-2) = x^2 - 8x + 12$$

$$b) (x-2)(x-5) = x^2 - 7x + 10$$

① GCF

② \square or \times

③ Both

Recall: Standard Form $f(x) = ax^2 + bx + c$, where $a \neq 0$

Factored Form $a(x-p)(x-q) = 0$

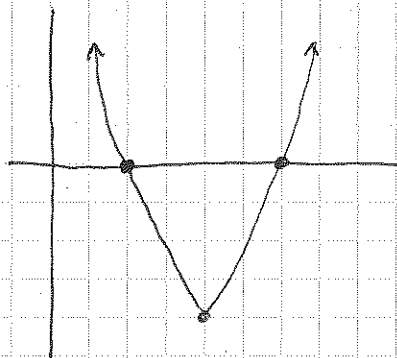
p & q represent the x -intercepts of the graph of the equation.

Recall: The x -intercepts are the zeros.

Ex 1: Standard Form
 $x^2 - 8x + 12 = 0$

Factored Form
 $(x-6)(x-2) = 0$
 $\uparrow \quad \uparrow$
 $p \quad q$

2 Solutions: $x = 6, 2$



Ex 2: Solve for the roots/zeros of the equation?

a) $(x-3)(x-6) = 0$
 $p=3 \quad q=6$

2 solutions $x = 3, 6$

b) $(x-2)(x+1) = 0$
 $p=2 \quad q=-1$

2 solutions $x = 2, -1$

c) $(x+5)(x+1) = 0$
 $p=-5 \quad q=-1$

2 solutions $x = -5, -1$

LT 3.5

Ex 3: Write a quadratic equation in factored form & standard form with 4 and -5 as its roots



① Roots are 4 and -5
 $p=4$ $q=-5$

② Factored form:
 $(x-p)(x-q) = 0$
 $(x-4)(x-(-5)) = 0$
 $(x-4)(x+5) = 0$

$x-4=0$ $x+5=0$
 $x=4$ $x=-5$

③ Standard form:
 $ax^2+bx+c = 0$
 $(x-4)(x+5) = 0$
 $x^2+x-20 = 0$

Foil / Double Distribution

Ex 4 Write a quadratic equation in factored form & standard form with $-\frac{1}{3}$ and 6 as its roots.



① Roots are $-\frac{1}{3}$ and 6
 $p=-\frac{1}{3}$ and $q=6$

② Factored form:
 $(x-p)(x-q) = 0$
 $(x-(-\frac{1}{3}))(x-6) = 0$
 $(x+\frac{1}{3})(x-6) = 0$

$x+\frac{1}{3}=0$ $x-6=0$
 $x=-\frac{1}{3}$ $x=6$

③ Standard form:
 $ax^2+bx+c = 0$
 $(x+\frac{1}{3})(x-6) = 0$
 $x^2-6x+\frac{1}{3}x-2 = 0$
 $x^2-\frac{17}{3}x-2 = 0$

Solve by Factoring

① GCF

② Perfect squares and difference of squares



3. Write a quadratic equation in factored form & standard form with 4 and -5 as its roots

① Roots are 4 and -5
 $p=4$ $q=-5$

② Factored form: $(x-p)(x-q) = 0$
 $(x-4)(x-(-5)) = 0$
 $(x-4)(x+5) = 0$

$x-4=0$ $x+5=0$
 $x=4$ $x=-5$

③ Standard form: $ax^2+bx+c = 0$
 $(x-4)(x+5) = 0$
 $x^2+x-20 = 0$ (Foil/Double Distribution)

4. Write a quadratic equation in factored form & standard form with $-1/3$ and 6 as its roots.

① Roots are $-1/3$ and 6
 $p=-1/3$ and $q=6$

② Factored form: $(x-p)(x-q) = 0$
 $(x-(-1/3))(x-6) = 0$
 $(x+1/3)(x-6) = 0$

$x+1/3=0$ $x-6=0$
 $x=-1/3$ $x=6$

③ Standard form: $ax^2+bx+c = 0$
 $(x+1/3)(x-6) = 0$
 $x^2-6x+1/3x-2 = 0$
 $x^2-17/3x-2 = 0$

by Factoring

- ① GCF
- ② Perfect squares and difference of Squares

Ex 5: Solve each equation by factoring. $16x^2+8x=0$ GCF

$16x^2+8x=0$
 $8x(2x+1)=0$

$8x=0$ $2x+1=0$
 $x=0$ $2x=-1$
 $x=-1/2$

Ex 6 Solve by factoring $4y^2+16y=0$ GCF

$4y(y+4)=0$
 $4y=0$ $y+4=0$
 $y=0$ $y=-4$

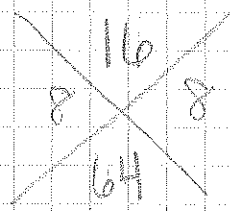
Ex 7: $6a^5+18a^4=0$ GCF

$6a^4(a+3)=0$
 $6a^4=0$ $a+3=0$
 $a=0$ $a=-3$

Ex 8: $x^2+16x+64=0$

	x	$x+8$	
x	x^2	$8x$	$=16x$
$+8$	$8x$	64	$=64$

$(x+8)(x+8)=0$
 $x+8=0$
 $x=-8$



Ex 9: $x^2+9x+20=0$

	x	$x+4$	
x	x^2	$4x$	
$+5$	$5x$	20	$4 \cdot 5$

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

Ex 10: $x^2-11x+30=0$

$(x-5)(x-6)=0$
 $x=5, 6$

Ex 11: $x^2-4x-21=0$

$(x+3)(x-7)=0$
 $x=-3, 7$

LT 3.6 Solving by factoring

Difference of squares $(a^2 - b^2) = (a+b)(a-b)$

Example 1: $x^2 - 64 = 0$

$$\left(\frac{x}{a}\right)^2 - \left(\frac{b}{b}\right)^2 = (x+8)(x-8) = 0$$

$x = 8, -8$

Ex 2: Solve by factoring

$$x^2 - 16 = 0$$

$$\left(\frac{x}{a}\right)^2 - \left(\frac{4}{b}\right)^2 = 0$$

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

$$x = 4, -4$$

Ex 3 Solve by factoring

$$81x^2 - 9 = 0$$

$$\left(\frac{9x}{a}\right)^2 - \left(\frac{3}{b}\right)^2 = 0$$

$$(9x-3)(9x+3) = 0$$

$$9x-3=0$$

$$9x=3$$

$$x = \frac{3}{9}$$

$$9x+3=0$$

$$9x=-3$$

$$x = \frac{-3}{9}$$

$$x = \frac{1}{3}$$

$$x = \frac{-1}{3}$$

Ex 4: $3x^2 - 12 = 0$

$$3(x^2 - 4) = 0$$

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

$$x = 2, -2$$

Perfect Square

$$a^2 + 2ab + b^2 = (a+b)^2$$

$$a^2 - 2ab + b^2 = (a-b)^2$$

Ex 1: $x^2 + 16x + 64 = 0$

$$\left(\frac{x}{a}\right)^2 + 2\left(\frac{x}{a}\right)\left(\frac{8}{b}\right) + \left(\frac{8}{b}\right)^2 = 0$$

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

$$x = -8$$

Ex 2: $x^2 + 12x + 36 = 0$

$$\left(\frac{x}{a}\right)^2 + 2\left(\frac{x}{a}\right)\left(\frac{6}{b}\right) + \left(\frac{6}{b}\right)^2 = 0$$

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

$$x = -6$$

Ex 3:

$$x^2 - 6xy + 9y^2 = 0$$

$$\left(\frac{x}{a}\right)^2 - 2\left(\frac{x}{a}\right)\left(\frac{3y}{b}\right) + \left(\frac{3y}{b}\right)^2 = 0$$

$$(x-3y)(x-3y) = 0$$

$$x-3y=0$$

$$x=3y$$