QUADRATIC RELATIONS: Solve by Factoring

Date: Notes

Warm Up

1. Identify the method of factoring to use

2. Factor it

a. $x^2 + 3x$ common
$= x(x+3)$

b. $4x^2 - 25$ diff. of squares
$= (2x+5)(2x-5)$

c. $x^2 - 6x + 8$ simple trinomial
$= (x-4)(x-2)$

Solving By Factoring

Solving an equation of the form $ax^2 + bx + c = 0$ is also called determining the roots / zeros or finding the x-intercepts

Principle of Zero Products: If $a \times b = 0$

then $a = 0$ or $b = 0$ or both $a = 0$ + $b = 0$

Steps for Solving by Factoring:

1. Set the equation equal to 0
2. Factor the polynomial
   * Always check for GCF **first**
   * 2 terms – Difference of Squares $(x^2 - y^2)$
   * 3 terms – Simple Trinomial $(ax^2 + bx + c)$
3. Set each of the factors equal to zero and solve.

EXAMPLE: Solve $x^2 - 3x - 40 = 0$

1. CHECK: Is the equation equal to 0 ? ✓
2. FACTOR: Find two numbers that multiply to -40 and add to -3 (simple trinomial!)

   $(x - 8)(x + 5) = 0$

3. SET EACH FACTOR EQUAL TO ZERO & SOLVE FOR x.

   $x - 8 = 0$ or $x + 5 = 0$

   $x = 8$ $\quad$ $x = -5$

therefore $x =$ 8 or $x =$ -5

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STEPS:

1. Set the equation equal to 0.
2. Factor. (common, difference of squares, trinomial)
3. Set each of the factors equal to zero and solve.

EXAMPLES: SOLVE the following.

a. $x^2 - 5x + 6 = 0$

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

$x-3=0$ $\quad$ $x-2=0$

$\boxed{x=3}$ $\quad$ $\boxed{x=2}$

$\therefore$ $x=3$ OR $x=2$

b. $x^2 - 8x = 0$

$x(x-8) = 0$

$\boxed{x=0}$ $\quad$ $x-8=0$

$\boxed{x=8}$

$\therefore$ $x=0$ OR $x=8$.

c. $m^2 = -24 + 10m$

$m^2 - 10m + 24 = 0$

$(m-6)(m-4) = 0$

$m-6=0$ $\quad$ $m-4=0$

$\boxed{m=6}$ $\quad$ $\boxed{m=4}$

$\therefore$ $m=6$ OR $m=4$

d. $x^2 - 9 = 0$

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

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

$\boxed{x=-3}$ $\quad$ $\boxed{x=3}$

$\therefore$ $x=-3$ OR $x=3$.

Application

The area of a business card is given by $x^2 + 4x - 45 = 0$.

1. Factor: $(x+9)(x-5)$

2. Set factors equal to 0. $x-5=0$ $\quad$ $x+9=0$

3. Solve for the correct value for x (width) $x = 5$ $\quad$ $x = -9$

4. Solve for the length (x + 4). width = 5

must be positive $\therefore 5$

length = $x+4$

$= 5+4$

$= 9$