PRINCIPLES - LESSON 13C
SOLVING POLYNOMIAL EQUATIONS BY FACTORING

The winner of this simple game will win $20 from Mr. Clee.

How to play:

I have written down two numbers.

Their product is 36.

Tell me EITHER of the two numbers I have written to win $20.

The numbers were:

$\frac{-93}{235} \cdot \frac{-2820}{31} = 36$

How did you do?

WHO WANTS TO WIN A MUCH LESS VALUABLE PRIZE?

The winner of this game will win a low-quality prize from Mr. Clee.

How to play:

I am thinking of two numbers.

Their product is 0.

Tell me EITHER of the two numbers I am thinking of to win.

The numbers were:

$\frac{-97}{217} \cdot 0 = 0$

How did you do this time?

ZERO PRODUCT PROPERTY

Whenever we multiply two or more numbers together and the product is ZERO, then at least one of the numbers we are multiplying has to be ZERO.

ZERO PRODUCT PROPERTY

If $ab = 0$, then $a = 0$, $b = 0$, or both.

The Zero Product Property along with your amazing factoring skills will allow us to solve equations that contain EXPONENTS. Such equations are called **POLYNOMIAL EQUATIONS**.

SOLVING POLYNOMIAL EQUATIONS BY FACTORING

Solve.

Factor by Reverse FOIL

ex1) $x^2 - 3x - 18 = 0$

$(x-6)(x+3) = 0$

Two factors are being multiplied together and the product is ZERO. Therefore, one of these two factors must EQUAL zero.

$x - 6 = 0$ (+6 +6) OR $x + 3 = 0$ (−3 −3)

$x = 6$ OR $x = -3$

BOTH are solutions to the equation.

SOLVING POLYNOMIAL EQUATIONS BY FACTORING

Solve.

Factor by Reverse FOIL

ex2) $d^2 + 5d - 24 = 0$

$(d+8)(d-3) = 0$

$d+8=0$ OR $d-3=0$

$-8 \quad -8 \qquad +3 \quad +3$

$d = -8$ OR $d = 3$

SOLVING POLYNOMIAL EQUATIONS BY FACTORING

Solve.

Factor by Difference of Two Squares

ex3) $y^2 - 49 = 0$

$$(y+7)(y-7) = 0$$

$$y+7=0 \quad \text{OR} \quad y-7=0$$

$$-7 \quad -7 \qquad +7 \quad +7$$

$$\boxed{y = -7 \quad \text{OR} \quad y = 7}$$

SOLVING POLYNOMIAL EQUATIONS BY FACTORING

Solve.

Factor by GCF

ex4) $9k^2 + 3k = 0$

$3k(3k+1) = 0$

$\frac{3k}{3} = \frac{0}{3}$ OR $3k + 1 = 0$

$-1 \quad -1$

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

$k = 0$ OR $k = -\frac{1}{3}$

SOLVING POLYNOMIAL EQUATIONS BY FACTORING

Solve.

We MUST have a zero on one side of the equation BEFORE we factor.

ex5) $w^2 + 8w = 9$

$-9 \quad -9$

Factor by Reverse FOIL

$$w^2 + 8w - 9 = 0$$

$$(w+9)(w-1) = 0$$

$$w+9=0 \quad \text{OR} \quad w-1=0$$

$-9 \quad -9 \qquad +1 \quad +1$

$$\boxed{w = -9 \quad \text{OR} \quad w = 1}$$

SOLVING POLYNOMIAL EQUATIONS BY FACTORING

Solve.

We MUST have a zero on one side of the equation BEFORE we factor.

ex6) $2n^2 - 2n - 16 = 164$

$-164 \quad -164$

Factor by GCF

$2n^2 - 2n - 180 = 0$

Factor by Reverse FOIL

$2(n^2 - n - 90) = 0$

$2(n+9)(n-10) = 0$

cannot be zero

$n + 9 = 0$ OR $n - 10 = 0$

$-9 \quad -9 \qquad +10 \quad +10$

$n = -9$ OR $n = 10$

SOLVING POLYNOMIAL EQUATIONS BY FACTORING

Solve.

We MUST have a zero on one side of the equation BEFORE we factor.

ex7) $2x^3 = 18x$

$-18x \quad -18x$

Factor by GCF

$$2x^3 - 18x = 0$$

Factor by Difference of Two Squares

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

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

$$\frac{2x}{2} = \frac{0}{2} \quad \text{OR} \quad x + 3 = 0 \quad \text{OR} \quad x - 3 = 0$$

$-3 \quad -3 \qquad +3 \quad +3$

$$x = 0 \quad \text{OR} \quad x = -3 \quad \text{OR} \quad x = 3$$

SOLVING POLYNOMIAL EQUATIONS BY FACTORING

STEPS TO SOLVING POLYNOMIAL EQUATIONS (equations containing exponents)

1. Get a ZERO on one side of the equation.
2. Factor the remaining polynomial completely.
3. Set each factor that contains a variable equal to zero.
4. Solve each resulting equation for the variable.
5. Check each solution in the original equation.