

**4.2 Solving Quadratic Equations by Factoring (Day 1)****Concept:** To review factoring polynomial expressions.**STEPS TO FOLLOW TO FACTOR AN EXPRESSION:**

- 1. First, ALWAYS look for a GREATEST COMMON FACTOR (GCF)**

**EX #1: FACTOR OUT THE GCF OF THE FOLLOWING:**

a)  $2x + 4$

$2(x+2)$

b)  $22bc + 33ab^2c^5$

$11bc(2 + 3abc^4)$

c)  $-\frac{1}{2}x^2 + \frac{5}{4}$

$-\frac{1}{2}(x^2 - \frac{5}{2})$

$$\begin{aligned} \frac{5}{4} &\div -\frac{1}{2} \\ \frac{5}{4}x &\div \frac{-2}{1} \\ &= \frac{-10}{4} \div 2 \\ &= -\frac{5}{2} \end{aligned}$$

- 2. IF YOU CAN'T FACTOR OUT A GCF AND YOU HAVE A QUADRATIC IN THE FORM  $ax^2 + bx + c$  where  $a \neq 0$ , USE THE WINDOW (Box) METHOD, DECOMPOSITION OR TRIAL AND ERROR TO FACTOR THE EXPRESSION**

**EX #2: FACTOR THE FOLLOWING USING THE METHOD OF YOUR CHOICE:**

a)  $x^2 + 6x - 16$

$$\begin{array}{r} x \quad 8 \mid 8x \\ x \quad -2 \mid -2x \\ \hline 6x \end{array}$$

$= (x+8)(x-2)$

b)  $x^2 - 4$

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

c)  $3x^2 - 7x - 6$

$$\begin{array}{r} 3x \quad 2 \mid 2x \\ x \quad -3 \mid -9x \\ \hline -7x \end{array}$$

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

d)  $4m^2 - 36$

$$\begin{aligned} \text{GCF} &= 4(m^2 - 9) \quad \leftarrow \text{difference of squares} \\ &= 4(m-3)(m+3) \end{aligned}$$

e)  $4x^2 + 4x - 15$

$$\begin{array}{r} 2x \quad 5 \mid 10x \\ 2x \quad -3 \mid -6x \\ \hline 4x \end{array}$$

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

f)  $\frac{4}{49}x^2 - \frac{25}{81}y^2$  difference of squares

$\left(\frac{2}{7}x - \frac{5}{9}y\right)\left(\frac{2}{7}x + \frac{5}{9}y\right)$

$$\begin{array}{r} \text{GCF} \downarrow \\ 4m \quad 12 \mid 12m \\ 1m \quad -3 \mid -12m \\ \hline 0m \end{array}$$

h)  $16x^2 + 25y^2$

$$\begin{array}{r} = (4x+5y)(4x+5y) \\ \left. \begin{array}{r} 4x \quad 5y \\ 4x \quad 5y \end{array} \right\} \text{Not possible} \end{array}$$

**PRIME**

i)  $x^2 + 10x + 25$

$= (x+5)(x+5)$

Perfect square trinomial

j)  $36x^2 - 12x + 1$

$$\begin{array}{r} 6x \quad -1 \mid -6x \\ 6x \quad -1 \mid -6x \\ \hline -12x \end{array}$$

$= (6x-1)(6x-1)$

3. IF YOU CAN FACTOR OUT A GCF YOU ALSO HAVE TO CHECK TO SEE IF THE EXPRESSION IN BRACKETS CAN CONTINUE TO BE FACTORED USING THE WINDOW METHOD/DECOMPOSITION/TRIAL AND ERROR.

EX #3: FACTOR THE FOLLOWING

a)  $2x^2 + 10x - 28$

$$= 2(x^2 + 5x - 14)$$

$$= 2(x-2)(x+7)$$

b)  $5x^2 - 20$

$$= 5(x^2 - 4)$$

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

c)  $-3x^2 + 42x - 147$

$$= -3(x^2 - 14x + 49)$$

$$= -3(x-7)(x-7)$$

d)  $-6x^2 - 13x + 5$

$$-1(6x^2 + 13x - 5)$$

$$\begin{array}{r} 3x \quad -1 \\ 2x \quad 5 \end{array}$$

$$= -1(3x-1)(2x+5)$$

e)  $-\frac{3}{10}x^2 + \frac{11}{10}x + 2$

$$\text{GCF} = -\frac{1}{10} (3x^2 - 11x - 20)$$

$$\begin{array}{r} 3x \quad 4 \\ x \quad -5 \end{array}$$

$$= -\frac{1}{10}(3x+4)(x-5)$$

$$\frac{11}{10} \div -\frac{1}{10} = -11$$

$$\frac{11}{10} \times -\frac{10}{1} = -11$$

$$2 \div -\frac{1}{10} = -20$$

$$2 \times -10 = -20$$

f)  $0.4x^2 - 1.8x - 1 = 0$  (Equation)

$$4x^2 - 18x - 10 = 0$$

$$2(2x^2 - 9x - 5) = 0$$

$$2(2x+1)(x-5) = 0$$

$$2x+1 \quad x-5$$

same solutions as

g)  $3x^2 = \frac{29}{2}x - 14$

$$(2) \quad 3x^2 - \frac{29}{2}x + 14 = 0 \quad (2)$$

$$6x^2 - 29x + 28 = 0$$

$$(2x-7)(3x-4) = 0$$

h)  $-x^2 + \frac{625}{121}$

$$= -1(x^2 - \frac{625}{121})$$

$$= -1(x - \frac{25}{11})(x + \frac{25}{11})$$

$$= -1(11x-25)(11x+25)$$

or  $\frac{625}{121} - x^2$

$$\frac{1}{10}(4x^2 - 18x - 10) = 0$$

$$\frac{1}{5}(2x^2 - 9x - 5) = 0$$

$$\frac{1}{5}(2x+1)(x-5) = 0$$

show how the x =

NEW: HOW TO FACTOR QUESTIONS THAT AREN'T QUADRATIC BUT IN THE FORM OF A QUADRATIC EQUATION

EX #4: Factor the following polynomials in quadratic form using substitution

a)  $-2(x+3)^2 + 12(x+3) + 14$

let  $m = (x+3)$

$$= -2m^2 + 12m + 14$$

$$= -2(m^2 - 6m + 7)$$

$$= -2(m-7)(m+1)$$

$$= -2((x+3)-7)((x+3)+1)$$

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

$$\begin{array}{r} m-7 \\ m+1 \end{array}$$

← substitute  $m = (x+3)$  back into the expression.

b)  $4(x-2)^2 - 0.25(y-4)^2$

let  $x-2 = n$

$y-4 = c$

$$= 4(n)^2 - 0.25(c)^2$$

$$= (2n - 0.5c)(2n + 0.5c)$$

$$= (2(x-2) - 0.5(y-4))(2(x-2) + 0.5(y-4))$$

$$= (2x-4-0.5y+2)(2x-4+0.5y-2)$$

$$= (2x-0.5y-2)(2x+0.5y-6)$$

combine like terms

distribute

**4.2 Day 1 Assignment Pg 229 #1,2,3 and 1-4 below**

1. Factor.

a)  $2x^2 - 50y^2$

b)  $0.1x^2 - 0.001$

c)  $20x^2 - 125y^2$

d)  $\frac{1}{100}x^2 - \frac{1}{25}y^2$

2. Factor.

a)  $2x^2 + 16x + 24$

b)  $3x^2 - 9x - 30$

c)  $x^2 + \frac{5}{2}x - 6$

d)  $x^2 + 2.5x - 1.5$

3. Factor each polynomial.

a)  $\frac{x^2}{9} - \frac{4}{25}$

b)  $6 + 5x - x^2$

c)  $-x^2 + \frac{121}{64}$

d)  $7 - \frac{5}{3}x - 2x^2$

4. Factor each polynomial expression.

a) i)  $9x^2 - 4y^2$

ii)  $9(x - 3)^2 - 4(2y + 1)^2$

b) i)  $50x^2 - 162y^2$

ii)  $50(2x - 5)^2 - 162(3y - 2)^2$

**SOLUTIONS TO EXTRA QUESTIONS IN 4.2 DAY 1**

a)  $2(x - 5y)(x + 5y)$  b)  $0.001(10x - 1)(10x + 1)$  c)  $5(2x - 5y)(2x + 5y)$  d)  $\frac{1}{100}(x - 2y)(x + 2y)$

a)  $2(x + 6)(x + 2)$  b)  $3(x - 5)(x + 2)$  c)  $\frac{1}{2}(2x - 3)(x + 4)$  d)  $0.5(2x - 1)(x + 3)$

a)  $\left(\frac{x}{3} - \frac{2}{5}\right)\left(\frac{x}{3} + \frac{2}{5}\right)$  b)  $(1 + x)(6 - x)$  c)  $\left(\frac{11}{8} - x\right)\left(\frac{11}{8} + x\right)$  d)  $\frac{1}{3}(7 + 3x)(3 - 2x)$

a) i)  $(3x - 2y)(3x + 2y)$  ii)  $(3x - 4y - 11)(3x + 4y - 7)$  b) i)  $2(5x - 9y)(5x + 9y)$

$$0.1x^2 - 0.001$$

$$\frac{1}{10}x^2 - \frac{1}{1000}$$

$$\frac{1}{10} \left( x^2 - \frac{1}{100} \right)$$

$$\frac{1}{10} \left( x - \frac{1}{10} \right) \left( x + \frac{1}{10} \right)$$

$$1 \div \frac{1}{2}$$

$$1 \times 2 = 2$$

$$\frac{1}{10} \div \frac{1}{1000}$$

$$(0.01x - 0.001)(10x + 1)$$

$$(0.1x^2 + 0.1x - 0.01x - 0.001)$$

$$0.1x^2 + 0.01x - 0.01x - 0.001$$

$$0.1x^2 - 0.001$$

$$\left( \frac{1}{10}x^2 - \frac{1}{1000} \right)$$

$$\frac{1}{1000} \left( \frac{1}{100}100x^2 - 1 \right)$$

$$\frac{1}{1000} (10x - 1)(10x + 1)$$

$$0.1(x-0.1)(x+0.1)$$

$$\frac{1}{10}\left(x - \frac{1}{10}\right)\left(x + \frac{1}{10}\right) = 0$$

$$\frac{1}{10} \times \frac{1}{10} (10x$$

$$9(x-3)^2 - 4(2y+1)^2$$