

# FACTORING TRINOMIALS

$$ax^2 + bx + c$$

$\swarrow$  multiple  
 $\nwarrow$  Add to

- (1) Is the trinomial in standard form?  
(exponents in descending order)
- (2) Find the product of a and c and its factors.
- (3) Rewrite trinomial as a polynomial with four terms by splitting up middle term into two
- (4) Factor by grouping
- (5) Check your work

$$x^2 + 11x + 30$$

30

$\begin{array}{r} 30 \\ 6 \times 5 \\ \hline 11 \end{array}$

$\swarrow$   
 $\searrow$

$$(x^2 + 6x)(5x + 30)$$

$$x(x+6) + 5(x+6)$$

$$(x+6)(x+5)$$

check:  $(x+6)(x+5)$

$$x^2 + 6x + 5x + 30$$

$$x^2 + 11x + 30 \checkmark$$

$$3x^2 + 13x - 30$$

90

$\begin{array}{r} 90 \\ 5 \times 18 \\ 13 \end{array}$

$\swarrow$   
 $\searrow$

$$(3x^2 - 5x)(x + 18 - 30)$$

$$x(3x-5) + 6(3x-5)$$

$$(3x-5)(x+6)$$

check:

$$(3x-5)(x+6)$$

$$3x^2 + 18x - 5x - 30$$

$$3x^2 + 13x - 30 \checkmark$$

1)  $6x^2 + 19x + 10$

60

$\begin{array}{r} 60 \\ 15 \times 4 \\ \hline 19 \end{array}$

$\swarrow$   
 $\searrow$

$$(6x^2 + 15x)(x + 4 + 10)$$

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

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

2)  $x^2 - 16x + 15$

15

$\begin{array}{r} 15 \\ -1 \times -15 \\ \hline -16 \end{array}$

$\swarrow$   
 $\searrow$

$$(x^2 - x)(-15x + 15)$$

$$x(x-1) - 15(x-1)$$

$$(x-1)(x-15)$$

3)  $5x^2 - 14x + 8$

40

$\begin{array}{r} 40 \\ -4 \times -10 \\ \hline -14 \end{array}$

$\swarrow$   
 $\searrow$

$$(5x^2 - 10x)(-4x + 8)$$

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

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

4)  $6x^2 + 17x + 5$

$$(6x^2 + 15x)(x + 2 + 5)$$

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

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

5)  $x^2 + 4x - 12$

$$(x^2 + 6x)(-2x - 12)$$

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

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

6)  $9x^2 - 15x + 4$

$$(9x^2 - 12x)(3x + 4)$$

$$3x(3x-4) - 1(3x-4)$$

$$(3x-4)(3x-1)$$

<p>7) <math>25x^2 - 16</math>  <math>25x^2 + 0x - 16</math>  <math>(5x + 4)(5x - 4)</math></p> <p><del><math>25x^2 + 20x - 20x - 16</math></del>  <math>25x^2 - 16</math>          Difference of Two Squares</p>	<p>8) <math>x^2 - 10x - 24</math></p>	<p>9) <math>2x^2 - 7x - 15</math></p>
<p>10) <math>x^2 + 2x - 35</math></p>	<p>11) <math>4x^2 - x - 3</math></p>	<p>12) <math>10x^2 - 9x - 1</math></p>

(4 terms)

How do you know which factor method to use → GCF, factor by grouping, or trinomial? Write which method you would use for each question.

<p>13) <math>3x^2 - 19x + 20</math>          Trinomial</p>	<p>14) <math>x^2 - 9x + 20</math></p>	<p>15) <math>12x^3 - 9x^2 + 20x - 15</math>          Grouping</p>
<p>16) <math>48x^2 + 16x - 32</math>          GCF</p>	<p>17) <math>8x^2y^4 + 12x^5y^6 - 24x^4y^4</math>          GCF</p>	<p>18) <math>20x^5 - 10x^3</math>          GCF</p>
<p>19) <math>3x^2 + 14x - 16</math></p>	<p>20) <math>x^2 + 11x + 24</math></p>	<p>21) <math>10x^2 + 31x + 15</math></p>
<p>22) <math>9x^2 + 36x - 20 - 5x</math></p>	<p>23) <math>7x - 6x - 2x^2 - 21</math></p>	<p>24) <math>x^2 + 15x + 36</math></p>

GLUE HERE

# Factoring

Always look for a Greatest Common Factor **FIRST!!!**

## 2 TERMS

(Must be in one of the following forms to factor with two terms)

Difference of Two Perfect Squares

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

OR

Sum Of Cubes - SOAP

$$a^3 + b^3 = (a+b)(a^2-ab + b^2)$$

OR

Difference of Cubes - SOAP

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

## 3 TERMS

(X or Pattern)

Guess and check

1. List the factors for the first coefficient and the constant.

$$2x^2 + 3x - 5$$

$$2 = 2, 1 \quad 5 = 5, 1$$

2. Place the 1 set of factor in the parenthesis.

FOIL to check.

$$(2x + 1)(x - 5) \text{ or } (2x - 5)(x + 1)$$

$$2x^2 - 9x - 5 \quad 2x^2 - 3x - 5$$

3. If you numbers are correct except for the signs, simply change the signs.

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

$$2x^2 + 3x - 5$$

## 4 TERMS

(Grouping)

Group first two and last two terms and see if each pair has a G.C.F. (May need to change order of the terms)

$$2x^3 - 8x^2 + 3x - 12$$

THEN

If the G.C.F. of each pair results in a common binomial, factor out the binomial.

$$2x^2(x - 4) + 3(x - 4)$$

THEN

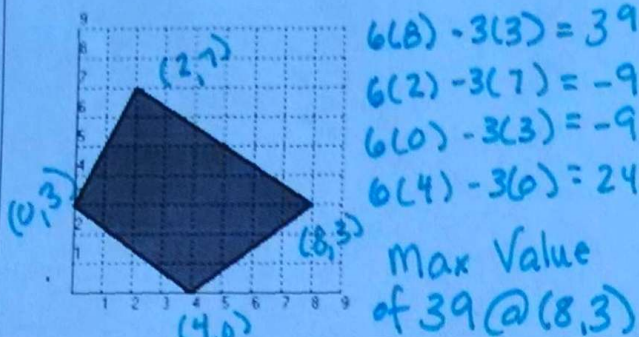
Write the binomial times the binomial created by the terms left when GCF. binomial was pulled out.

$$(x - 4)(2x^2 + 3)$$

1. If **nothing** can be done to the original expression, then it is **PRIME**
2. Check to see if any of your final answers will factor further.
3. Check your answer by multiplying.

Do you know how to...

1. Maximize the amount for the graph for the objective function  $P = 6x - 3y$ .



2. State the dimensions of the matrix

$A = \begin{bmatrix} 1 & -2 & 4 \\ 4 & 3 & 5 \\ 0 & 2 & -1 \end{bmatrix}$  and what element is  $A_{13}$ ?

row ↑ column

$3 \times 3$

$A_{13} = 4$

3. If  $A = \begin{bmatrix} 8 & -9 \\ 4 & -1 \end{bmatrix}$ , find  $-5A$ .

$\begin{bmatrix} -40 & 45 \\ -20 & 5 \end{bmatrix}$

4. Solve for each variable given

$\begin{bmatrix} 5x - 3 & 5 \\ 2 & 6y + 1 \end{bmatrix} = \begin{bmatrix} 7 & 5 \\ 2 & 12y + 15 \end{bmatrix}$

$x = 2$

$y = -7/3$

$5x - 3 = 7$   
 $5x = 10$   
 $x = 2$

$6y + 1 = 12y + 15$   
 $-14 = 6y$   
 $y = -7/3$

5. What are the dimensions of  $ZY$  if  $Z_{2 \times 2}$  and  $Y_{2 \times 4}$ ?

$2 \times 4$

$2 \times 2 \quad 2 \times 4$

6. Find the inverse of the matrix, if it exists.

$\begin{bmatrix} 4 & 6 \\ -1 & -2 \end{bmatrix}$

$\begin{bmatrix} 1 & 3 \\ -1/2 & -2 \end{bmatrix}$

7. Simplify,  $\begin{bmatrix} 1 & -2 \\ 3 & 2 \\ 4 & -1 \end{bmatrix} - [1 \ 4 \ 6]$  if possible.

$3 \times 2$

Not Possible  
Undefined

8. Simplify, if possible.  $\begin{bmatrix} 2 & -5 & 4 \\ 10 & 1 & 1 \end{bmatrix} + \begin{bmatrix} 5 & -1 & 9 \\ 0 & -7 & 3 \end{bmatrix}$

$\begin{bmatrix} 7 & -6 & 13 \\ 10 & -6 & 4 \end{bmatrix}$

9. Write a matrix equation that can be used to solve the system  $6x + 5y = 10$  and solve.

$2x - 7y = -1$

$\begin{bmatrix} 6 & 5 \\ 2 & -7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10 \\ -1 \end{bmatrix}$

$\begin{bmatrix} 5/4 \\ 1/2 \end{bmatrix}$

10.  $3\sqrt{90}$

$3\sqrt{9} \sqrt{10}$   
 $3 \cdot 3 \sqrt{10}$   
 $9\sqrt{10}$

11.  $\frac{\sqrt{8}}{\sqrt{48}} \frac{\sqrt{11}}{\sqrt{16}}$

$\frac{\sqrt{6}}{6}$

12.  $\frac{16x^9}{48x^{12}}$

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

13.  $4\sqrt{3} + \sqrt{27} - 3\sqrt{48}$

$\sqrt{9 \cdot 3} \quad 3\sqrt{10} \sqrt{3}$   
 $4\sqrt{3} + 3\sqrt{3} - 12\sqrt{3}$   
 $-5\sqrt{3}$