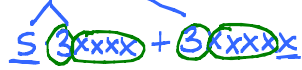


Factor the GCF from each expression

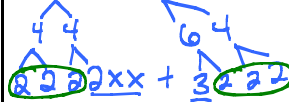
1. $15x^4 + 3x^5$



$3x^4(5 + x)$

a. $3x^4(5+x)$

2. $16x^2 + 24$



$2 \cdot 2 \cdot 2(2x^2 + 3)$

b. $8(2x^2 + 3)$

3. $18x^4y^7 + 36x^3y^6 - 42x^5y^5$



c. $2 \cdot 3 \cdot 3 \cdot y^5(3xy^2 + 6y - 7x^2) = 6x^3y^5(3xy^2 + 6y - 7x^2)$

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

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

d. $(x-3)(3x+2)$

Not all may be possible.

- Find two numbers that sum to **8** and have a product of **12** 2 and 6
- Find two numbers that sum to **5** and have a product of **6** 2 and 3
- Find two numbers that sum to **5** and have a product of **-14** -2 and 7
- Find two numbers that sum to **-6** and have a product of **12** Not possible
- Find two numbers that sum to **16** and have a product of **15** 1 and 15
- Find two numbers that sum to **-4** and have a product of **-21** 3 and -7
- Find two numbers that sum to **1** and have a product of **-56** -7 and 8
- Find two numbers that sum to **-14** and have a product of **40** -4 and -10
- Find two numbers that sum to **0** and have a product of **-25** 5 and -5
- Find two numbers that sum to **8** and have a product of **16** 4 and 4

$\frac{12}{1,12}$	$\frac{6}{1,6}$	$\frac{-14}{1,-14}$
$-1,-12$	$-1,-6$	$-1,14$
$2,6$	$2,3$	$2,-7$
$-2,-6$	$-2,-3$	$-2,7$
$3,4$		
$-3,-4$		
$\frac{15}{1,15}$	$\frac{-21}{-21}$	$\frac{-56}{-1,-56}$
$-1,-15$	$-1,21$	$-1,56$
$3,5$	$-1,21$	$2,-28$
$-3,5$	$3,-7$	$-2,28$
	$-3,7$	$4,-14$
		$-4,14$
		$7,-8$
		$-7,8$
$\frac{40}{1,40}$	$\frac{-25}{-25}$	
$-1,-40$	$1,-25$	
$2,20$	$-1,25$	$\frac{16}{1,16}$
$-2,-20$	$5,-5$	$-1,-16$
$4,10$		$2,8$
$-4,-10$		$-2,-8$
$5,8$		$4,4$
$-5,-8$		$-4,-4$

11. Multiply the following: **F.O.I.L.**

a. $(x+6)(x+3)$

$x^2 + 3x + 6x + 18$

$x^2 + 9x + 18$

Notice: What is the sum of the constants in each binomial above?

Notice: What is the product of the constants in each binomial above?

b. $(x+7)(x-2)$

$x^2 - 2x + 7x - 14$

$x^2 + 5x - 14$

Notice: What is the sum of the constants in each binomial above?

Notice: What is the product of the constants in each binomial above?

12. FACTOR the following (not all may be factored):

a. $x^2 + 9x + 18$

$(x+3)(x+6)$

18
1, 18
-1, -18
2, 9
-2, -9
3, 6
-3, -6

b. $x^2 + 6x - 40$

$(x-4)(x+10)$

-40
1, -40
-1, 40
2, -20
-2, 20
4, -10
-4, 10
5, -8
-5, 8

CHECKING:

$x^2 + 10x - 4x - 40$
 $x^2 + 6x - 40$

c. $x^2 + 5x - 14$

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

-14
1, -14
-1, 14
2, -7
-2, 7

d. $a^2 - 7a + 6$

$(a-1)(a-6)$

6
1, 6
-1, -6
2, 3
-2, -3

d. $m^2 + 8m + 16$

$(m+4)(m+4)$

$(m+4)^2$

16
1, 16
-1, -16
2, 8
-2, -8
4, 4
-4, -4

e. $g^2 - 11g + 24$

$(g-3)(g-8)$

24
1, 24
-1, -24
2, 12
-2, -12
3, 8
-3, -8
4, 6
-4, -6

f. $x^2 + 5x - 6$

$(x-1)(x+6)$

-6
1, -6
-1, 6
2, -3
-2, 3

g. $x^2 + 5x + 6$

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

6
1, 6
-1, -6
2, 3
-2, -3

h. $m^2 - 7m - 60$

$(m+5)(m-12)$

-60
1, -60
5, -12
-1, 60
-5, 12
2, -30
6, -10
-2, 30
-6, 10
3, -20
-3, 20
4, -15
-4, 15

i. $2g^2 - 14g + 24$

$2(g^2 - 7g + 12)$

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

12
1, 12
-1, -12
2, 6
-2, -6
3, 4
-3, -4

j. $3x^3 - 24x^2 - 60x$

$3x(x^2 - 8x - 20)$

$3x(x+2)(x-10)$

-20
1, -20
-1, 20
2, -10
-2, 10
4, -5
-4, 5

k. $5x^4 - 5x^3 - 30x^2$

$5x^2(x^2 - x - 6)$

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

-6
1, -6
-1, 6
2, -3
-2, 3

13. Special Forms

Name	Formula	Example
Difference of two squares	$A^2 - B^2 = (A+B)(A-B)$	$64x^2 - 9 = (8x)^2 - 3^2 = (8x+3)(8x-3)$
Perfect square trinomials	$A^2 + 2AB + B^2 = (A+B)^2$ $A^2 - 2AB + B^2 = (A-B)^2$	$x^2 - 14x + 49 = x^2 - 2(x \cdot 7) + 7^2 = (x-7)^2$

a. $x^2 - 36$

$$\begin{matrix} \nearrow & \nwarrow \\ x & x \\ \nwarrow & \nearrow \\ 6 & 6 \end{matrix}$$

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

b. $m^2 + 9$



SUM OF SQUARES IS PRIME

c. $m^4 - 81$

$$\begin{matrix} \nearrow & \nwarrow \\ m^2 & m^2 \\ \nwarrow & \nearrow \\ 9 & 9 \end{matrix}$$

$$(m^2+9)(m^2-9)$$

$$(m^2+9)(m+3)(m-3)$$

d. $4b^2 - 400$

$$4(b^2 - 100)$$

$$\begin{matrix} \nearrow & \nwarrow \\ b & b \\ \nwarrow & \nearrow \\ 10 & 10 \end{matrix}$$

$$4(b+10)(b-10)$$

e. $4x^2 + 12x + 9$

$$\begin{matrix} \nearrow & \nwarrow \\ 2x & 2x \\ \nwarrow & \nearrow \\ 3 & 3 \end{matrix}$$

$$\begin{matrix} \leftarrow 6x \leftarrow \\ \leftarrow 6x \leftarrow \\ \hline 12x \end{matrix}$$

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

f. $64a^2 - 48a + 9$

$$\begin{matrix} \nearrow & \nwarrow \\ 8a & 8a \\ \nwarrow & \nearrow \\ -3 & -3 \end{matrix}$$

$$\begin{matrix} \leftarrow -24a \leftarrow \\ \leftarrow -24a \leftarrow \\ \hline -48a \end{matrix}$$

$$(8a-3)(8a-3) = (8a-3)^2$$

g.

$$121a^8 - 64b^4$$

$$\begin{matrix} \nearrow & \nwarrow \\ 11a^4 & 11a^4 \\ \nwarrow & \nearrow \\ 8b^2 & 8b^2 \end{matrix}$$

$$(11a^4 + 8b^2)(11a^4 - 8b^2)$$

h. $18m^5 + 48m^3 + 32m$

$$2m(9m^4 + 24m^2 + 16)$$

$$\begin{matrix} \nearrow & \nwarrow \\ 3m^2 & 3m^2 \\ \nwarrow & \nearrow \\ 4 & 4 \end{matrix}$$

$$\begin{matrix} \leftarrow 12m^2 \leftarrow \\ \leftarrow 12m^2 \leftarrow \\ \hline 24m^2 \end{matrix}$$

$$2m(3m^2+4)^2$$

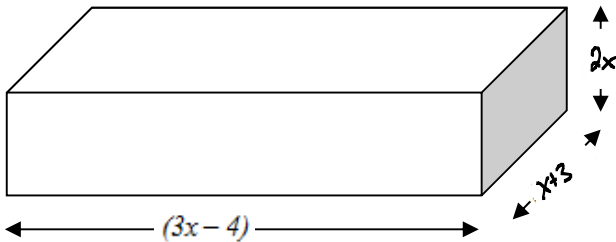
i. $36x^4 - 60x^2y^3 + 25y^6$

$$\begin{matrix} \nearrow & \nwarrow \\ 6x^2 & 6x^2 \\ \nwarrow & \nearrow \\ -5y^3 & -5y^3 \end{matrix}$$

$$\begin{matrix} \leftarrow -30x^2y^3 \leftarrow \\ \leftarrow -30x^2y^3 \leftarrow \\ \hline -60x^2y^3 \end{matrix}$$

$$(6x^2 - 5y^3)^2$$

14. Find the volume of the rectangular prism shown below



$$V = l \cdot w \cdot h$$

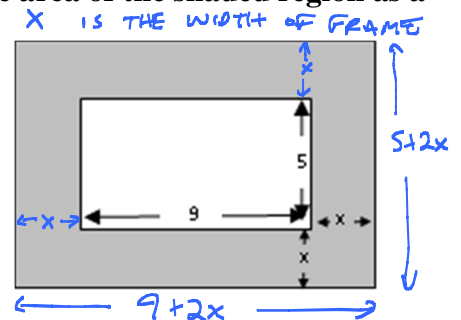
$$V = (3x-4)(x+3)(2x)$$

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

$$= (3x^2 + 5x - 12)(2x)$$

$$= 6x^3 + 10x^2 - 24x \text{ units}^3$$

15. Describe the area of the shaded region as a polynomial



$$A_{\text{LARGE}} = l \cdot w = (9+2x)(5+2x) = 45 + 18x + 10x + 4x^2$$

$$A_{\text{SMALL}} = l \cdot w = (9)(5) = 45 \text{ units}^2$$

$$A_{\text{SHADED}} = (45 + 28x + 4x^2) - 45$$

$$A_{\text{SHADED}} = 28x + 4x^2 \text{ OR } 4x^2 + 28x$$

15. Multiply the following:

a. $(3x-2)(2x+1)$

$$6x^2 + 3x - 4x - 2$$

$$6x^2 - 1x - 2$$

b. $(4x+3)(x-3)$

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

$$4x^2 - 9x - 9$$

16. FACTOR the following: USING THE A.C. METHOD

a. $6x^2 - 1x - 2$

$$\frac{6x+3}{3} \quad \frac{6x-4}{2}$$

DIVIDE BY GCF OF BINOMIAL

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

$$\begin{array}{l} -12 \\ 1, -12 \\ -1, 12 \\ 2, -6 \\ -2, 6 \\ \textcircled{3, -4} \\ -3, 4 \end{array}$$

b. $4x^2 - 9x - 9$

$$\frac{4x+3}{1} \cdot \frac{4x-12}{4}$$

STEP 2
DIVIDE EACH BINOMIAL BY THE GCF

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

$$\begin{array}{l} -36 \\ 1, -36 \\ -1, 36 \\ 2, -18 \\ -2, 18 \\ \textcircled{3, -12} \\ -3, 12 \\ 4, -9 \\ -4, 9 \end{array}$$

c. $2x^2 + 7x - 15$

$$\frac{2x-3}{1} \quad \frac{2x+10}{2}$$

GCF

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

$$\begin{array}{l} -30 \\ 1, -30 \\ -1, 30 \\ 2, -15 \\ -2, 15 \\ 3, -10 \\ \textcircled{-3, 10} \\ 5, -6 \\ -5, 6 \end{array}$$

d. $3a^2 - 10a + 8$

$$\frac{3a-4}{1} \quad \frac{3a-6}{3}$$

GCF

$$(3a-4)(a-2)$$

$$\begin{array}{l} 24 \\ 1, 24 \\ -1, -24 \\ 2, 12 \\ -2, -12 \\ 3, 8 \\ -3, -8 \\ 4, 6 \\ \textcircled{-4, -6} \end{array}$$

e. $5g^2 - 14g + 8$

$$\frac{5g-4}{1} \quad \frac{5g-10}{5}$$

$$(5g-4)(g-2)$$

$$\begin{array}{l} 40 \\ 1, 40 \\ -1, -40 \\ 2, 20 \\ -2, -20 \\ 4, 10 \\ \textcircled{-4, -10} \\ 5, 8 \\ -5, 8 \end{array}$$

f. $6m^2 + 10m - 24$

$$2 \left(\frac{3m^2 + 5m - 12}{1} \right)$$

$$\frac{3m-4}{1} \quad \frac{3m+9}{3}$$

$$2(3m-4)(m+3)$$

$$\begin{array}{l} -36 \\ 1, -36 \\ -1, 36 \\ 2, -18 \\ -2, 18 \\ 3, -12 \\ -3, 12 \\ 4, -9 \\ \textcircled{-4, 9} \end{array}$$

g. $6b^3 - 28b^2 + 30b$

$$2b(3b^2 - 14b + 15)$$

$$\frac{3b-5}{1} \quad \frac{3b-9}{3}$$

$$2b(3b-5)(b-3)$$

$$\begin{array}{l} 45 \\ 1, 45 \\ -1, -45 \\ 3, 15 \\ -3, -15 \\ 5, 9 \\ \textcircled{-5, -9} \end{array}$$

h. $5m^2 + 11m - 12$

$$\frac{5m-4}{1} \quad \frac{5m+15}{5}$$

$$(5m-4)(m+3)$$

$$\begin{array}{l} -60 \\ 1, -60 \\ -1, 60 \\ 2, -30 \\ -2, 30 \\ 3, -20 \\ -3, 20 \\ 4, -15 \\ \textcircled{-4, 15} \\ 5, -12 \\ -5, 12 \\ 6, -10 \\ -6, 10 \end{array}$$