

L09 - Multiplying Polynomials

Multiply and then combine like terms

1)  $2(3x-2) - (4x+7)(2x-5)$

$$\begin{aligned} & (6x-4) - (8x^2-20x+14x-35) \\ & (6x-4) - (8x^2-6x-35) \\ & 6x-4 - 8x^2+6x+35 \\ & -8x^2+12x+31 \end{aligned}$$

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

$$\begin{aligned} & \underline{x^3} - \underline{2x^2} + \underline{5x} + \underline{2x^2} - \underline{4x} + \underline{10} \\ & x^3 + 0x^2 + 1x + 10 \\ & x^3 + x + 10 \end{aligned}$$

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

$$\begin{aligned} & (x-2)(x-2) + 2(2x-3)(x+1) \\ & (x^2-2x-2x+4) + 2(2x^2+2x-3x-3) \\ & (x^2-4x+4) + 2(2x^2-1x-3) \\ & (x^2-4x+4) + 4x^2-2x-6 \\ & 5x^2-6x-2 \end{aligned}$$

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

$$\begin{aligned} & 2(2x^2+1x-2x-1) + (2x+3)(2x+3) - 3(3x^2+2x-3x-2) \\ & 2(2x^2-1x-1) + (4x^2+6x+6x+9) - 3(3x^2-1x-2) \\ & (4x^2-2x-2) + (4x^2+12x+9) - 9x^2+3x+6 \\ & -x^2+13x+13 \end{aligned}$$

Common Factoring

Find the Greatest Common Factor for each set.

1) 15 and 60

15

2)  $3a^2b^3$  and  $6a^4b^3$

$3a^2b^3$

4)  $2\pi r$  and  $\pi r^2$  and  $\frac{4}{3}\pi r^3$

$\pi r$

6)  $34x^3y^2$  and  $85x^3y^2$  and  $153x^5y$

$x^3y$

■ KEY ■

Factor each polynomial.

1)  $a^2b - a^2c + a^2d$

$$a^2(b - c + d)$$

2)  $3x(x - 1) + 4(x - 1)$

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

3)  $-13ab^2c^3 + 39bc^2 - 26ab^4$

$$13b(-abc^3 + 3c^2 - 2ab^3)$$

of

$$-13b(abc^3 - 3c^2 + 2ab^3)$$

4)  $25x^2y + 10x^2y^2 - 35x - 14xy$

$$(25x^2y + 10x^2y^2) + (-35x - 14xy)$$

$$5x^2y(5x + 2y) - 7(5x + 2y)$$

$$(5x + 2y)(5x^2y - 7)$$

Factoring Polynomials

Factor the following fully.

a)  $m^2 + 9m + 20$

$$\begin{matrix} +4 & +5 \\ \square & + \square = 9 \end{matrix}$$

$$\square \times \square = 20$$

$$(m + 4)(m + 5)$$

$$\begin{matrix} 1, 20 \\ 2, 10 \\ \boxed{4, 5} \end{matrix}$$

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

$$\begin{matrix} +6 & -2 \\ \square & + \square = 4 \end{matrix}$$

$$\square \times \square = -12$$

$$\begin{matrix} 1, 12 \\ \boxed{2, 6} \\ 3, 4 \end{matrix}$$

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

c)  $c^2 - 7c + 12$

$$\begin{matrix} -3 & -4 \\ \square & + \square = -7 \end{matrix}$$

$$\square \times \square = 12$$

$$\begin{matrix} 1, 12 \\ 2, 6 \\ \boxed{3, 4} \end{matrix}$$

$$(c - 3)(c - 4)$$

d)  $x^2 + 3x + 2$

$$\begin{matrix} +1 & +2 \\ \square & + \square = 3 \end{matrix}$$

$$\square \times \square = 2$$

$$(x + 1)(x + 2)$$

e)  $15s^2 + 30s - 225$

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

$$15(s + 5)(s - 3)$$

$$\begin{matrix} +5 & -3 \\ \square & + \square = 2 \end{matrix}$$

$$\square \times \square = -15$$

$$\begin{matrix} 1, 15 \\ \boxed{3, 5} \end{matrix}$$

f)  $2x^2 + 22x + 60$

$$2(x^2 + 11x + 30)$$

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

$$\begin{matrix} +5 & +6 \\ \square & + \square = 11 \end{matrix}$$

$$\square \times \square = 30$$

$$\begin{matrix} 1, 30 \\ 2, 15 \\ 3, 10 \\ 5, 6 \end{matrix}$$

g)  $12b^2 - 15b - 18$

$$3(4b^2 - 5b - 6)$$

$$3[4b^2 + 3b - 8b - 6]$$

$$3[(4b^2 + 3b) + (-8b - 6)]$$

$$3[b(4b + 3) - 2(4b + 3)]$$

$$3[(4b + 3)(b - 2)]$$

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

$$\begin{matrix} +3 & -8 \\ \square & + \square = -5 \end{matrix}$$

$$\square \times \square = -24$$

$$\begin{matrix} 1, 24 \\ 2, 12 \\ 3, 8 \end{matrix}$$

h)  $12s^2 + 24s - 180$

$$12(s^2 + 2s - 15)$$

$$12(s + 5)(s - 3)$$

$$\begin{matrix} +5 & -3 \\ \square & + \square = 2 \end{matrix}$$

$$\square \times \square = -15$$

# KEY

i)  $81x^2 - 64$

$$(9x+8)(9x-8)$$

j)  $144r^2 - 36s^2$

$$(12r+6s)(12r-6s)$$

$$(6)(2r+s)(6)(2r-s)$$

$$36(2r+s)(2r-s)$$

k)  $-32y^2 + 64z^2$

$$-32(y^2 - 2z^2)$$

l)  $16x^2y - 100y^3$

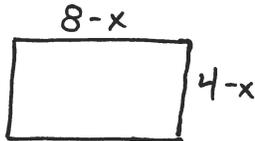
$$4y(4x^2 - 25y^2)$$

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

## Problems

1) You are building a skateboard ramp. You have a piece of plywood with dimensions of 4 ft by 8 ft. You cut  $x$  ft from the length and width.

a) Sketch a diagram showing the cuts made to the piece of plywood. Label the dimensions.



b) What is the area of the remaining piece of plywood that will be used for the ramp?

$$A = LW$$

$$= (8-x)(4-x)$$

$$= 32 - 8x - 4x + x^2$$

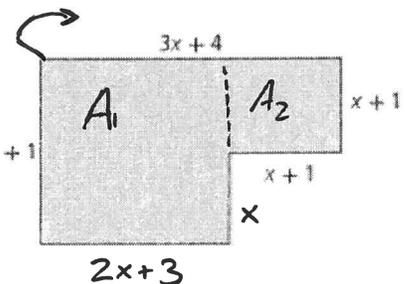
$$= x^2 - 12x + 32$$

2) The following is a diagram of Mr. White's yard.

a. Write an algebraic expression to represent the perimeter of the figure.

$$P = (3x+4) + (x+1) + (x+1) + (x) + (2x+3) + (2x+1)$$

$$= 10x + 10$$



b. Write an algebraic expression to represent the area of the figure.

$$A_1 = (2x+1)(2x+3) \quad A_2 = (x+1)(x+1) \quad A_{TOT} = 5x^2 + 10x + 4$$

$$= 4x^2 + 8x + 3 \quad = x^2 + 2x + 1$$

c. If  $x = 5m$ , then calculate a. and b. above.

$$Area = 5(5)^2 + 10(5) + 4$$

$$= 125 + 50 + 4$$

$$= 179m^2$$

$$Perimeter = 10(5) + 10$$

$$= 50 + 10$$

$$= 60m$$

## KEY

3) A rectangular park has an area of  $15x^2 + 30x$ .

a. Write all possible dimensions of the park. (I found 8).

$$1(15x^2 + 30x)$$

$$x(15x + 30)$$

$$3(5x^2 + 10x)$$

$$3x(5x + 10)$$

$$5(3x^2 + 6x)$$

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

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

$$15x(x + 2)$$

Probably shouldn't include things like  $2x(7.5x + 15)$ .

we don't like decimals in this unit.

b. If the unknown value of "x" is a whole number what dimensions make the park a square?

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



$$L = 15$$

$$W = 15 \text{ if } x = 3$$

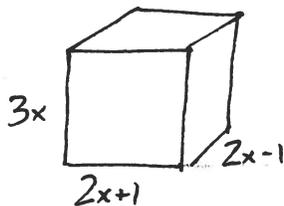
4) The volume of a rectangular prism is represented by  $12x^3 - 3x$ .

a. Factor the expression fully.

$$3x(4x^2 - 1)$$

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

b. Sketch the prism and label its dimensions.



c. Write an algebraic expression to represent its surface area.

$$\text{TOP} = (2x+1)(2x-1) = 4x^2 - 1$$

$$\text{BOTTOM} = 4x^2 - 1$$

$$\text{FRONT} = (3x)(2x+1) = 6x^2 + 3x$$

$$\text{BACK} = 6x^2 + 3x$$

$$\text{RIGHT} = (3x)(2x-1) = 6x^2 - 3x$$

$$\text{LEFT} = 6x^2 - 3x$$

---


$$32x^2 - 2$$