

## Polynomial Operations Lesson #4: Multiplication of Polynomials - Part One

### Three Important Products

$$a^2 = a \cdot a$$

Complete the following using the distributive property (FOIL).

$$\begin{array}{lll}
 \text{i) } (a+b)^2 = (a+b)(a+b) & \text{ii) } (a-b)^2 = (a-b)(a-b) & \text{iii) } (a-b)(a+b) \\
 = a^2 + \underline{ab} + \underline{ab} + b^2 & = a^2 - \underline{ab} - \underline{ab} + b^2 & = a^2 + \underline{ab} - \underline{ab} - b^2 \\
 = a^2 + 2ab + b^2 & = a^2 - 2ab + b^2 & = a^2 - b^2
 \end{array}$$



1. The square of a binomial can be found by squaring the first term, doubling the product of the two terms and squaring the last term.
2. The product of the sum and difference of the same two monomials results in the difference of the squares of the monomials.  
This important result will be considered in more detail in future lessons on factoring.



Expand each of the following.

$$\begin{array}{l}
 \text{a) } (x+7)^2 \\
 = (x+7)(x+7) \text{ FOIL} \\
 = x^2 + \underline{7x} + \underline{7x} + 49 \\
 = x^2 + 14x + 49
 \end{array}$$

$$\begin{array}{l}
 \text{b) } (3x-1)^2 \\
 = (3x-1)(3x-1) \\
 = 9x^2 - \underline{3x} - \underline{3x} + 1 \\
 = 9x^2 - 6x + 1
 \end{array}$$

$$\begin{array}{l}
 \text{c) } (2m-3n)^2 \\
 = (2m-3n)(2m-3n) \\
 = 4m^2 - \underline{6mn} - \underline{6mn} + 9n^2 \\
 = 4m^2 - 12mn + 9n^2
 \end{array}$$

$$\begin{array}{l}
 \text{d) } (4-7x)(4+7x) \\
 = 16 + \underline{28x} - \underline{28x} - 49x^2 \\
 = 16 - 49x^2
 \end{array}$$

$$\begin{array}{l}
 \text{e) } (5a+3b)(5a-3b) \\
 = 25a^2 - 9b^2
 \end{array}$$

$$\begin{array}{l}
 \text{e) } (2p-9q)(2p-9q) \\
 = 4p^2 - 36pq + 81q^2
 \end{array}$$

### Complete Assignment Question #1

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Expand and simplify.

a)  $5(2x-3)(x-6)$   
 $= 5(2x^2 - 12x - 3x + 18)$   
 $= 5(2x^2 - 15x + 18)$   
 $= 10x^2 - 75x + 90$

b)  $-8(7p+3)^2 = -8(7p+3)(7p+3)$   
 $= -8(49p^2 + 21p + 21p + 9)$   
 $= -8(49p^2 + 42p + 9)$  \*distribute  
 $= -392p^2 - 336p - 72$



Expand and simplify.

a)  $(x+5)(x-5) - (x+2)(x+8)$   
 $x^2 - 5x + 5x - 25 - (x^2 + 8x + 2x + 16)$   
 $= x^2 - 25 - (x^2 + 10x + 16)$   
 $= x^2 - 25 - x^2 - 10x - 16$   
 $= -41 - 10x$

b)  $(9a+4)(4a-9) - (6a-5)(6a-5)$   
 $= 36a^2 - 81a + 16a - 36 - (36a^2 - 30a - 30a + 25)$   
 $= 36a^2 - 65a - 36 - (36a^2 - 60a + 25)$   
 $= 36a^2 - 65a - 36 - 36a^2 + 60a - 25$   
 $= -5a - 61$



Expand and simplify.

a)  $5x(3x^2 - 7x + 1) - (4x + 3x^2)(5x - 8)$   
 $15x^3 - 35x^2 + 5x - (20x^2 - 32x + 15x^3 - 24x^2)$   
 $15x^3 - 35x^2 + 5x + 4x^2 + 32x - 15x^3$   
 $= -31x^2 + 37x$

b)  $4(2x-7)(3x+2) - 8(x-1)(3x-1)$   
 $= 4(6x^2 + 4x - 21x - 14) - 8(3x^2 - x - 3x + 1)$   
 $= 4(6x^2 - 17x - 14) - 8(3x^2 - 4x + 1)$   
 $= 24x^2 - 68x - 56 - 24x^2 + 32x - 8$   
 $= -36x - 64$

Quiz Monday.  
L1-3



Given that, for every value of  $x$ , the polynomial  $x^2 + 20x + 50$  can be written in the form  $(x+a)^2 + b$ , determine the values of  $a$  and  $b$ .

Complete Assignment Questions #2 - #7

#1-7 (every second letter)  
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## Assignment

1-7 (every second letter)

1. Expand and simplify where possible.

a)  $(x - 8)^2$

b)  $(x - 9)(x + 9)$

c)  $(3x - y)^2$

d)  $(5x + 2y)^2$

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

f)  $(-2y + 1)^2$

g)  $(2p + 7)^2$

h)  $(4m + 3n)(4m - 3n)$

i)  $(5a - 6b)^2$

j)  $(9 - 5x^2)(9 + 5x^2)$

k)  $(6a - 7b)(6a - 7b)$

l)  $(2a^3 - 7)(2a^3 + 7)$

2. Expand and simplify where possible.

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

b)  $7(5x - 2)(6x + 1)$

c)  $-3(a + 8)(2a + 9)$

d)  $5(4x + 1)^2$

e)  $6(8x - 3y)(2x + y)$

f)  $-4(a + 3b)(2a - 5b)$

3. Expand and simplify where possible.

a)  $(x - 3)(x - 6) + (x + 2)(x + 7)$

b)  $(x - 5)(x + 4) - (x + 1)(x - 8)$

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

d)  $(x - y)(x - 4y) - (x + y)(x - y)$

4. Expand and simplify where possible.

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

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

c)  $(9x - 1)(x - 4) - (3x + 1)(3x - 1)$

d)  $8(5 - 3x)(2 + 5x) - 3(1 + x)^2$

e)  $5(2x - 3)(2x + 5) + 3(x + 7)(x + 2)$

f)  $4(2p + 3q)^2 - (5p - q)(7p + 11q)$

5. Expand and simplify where possible.

a)  $(x + 4)^2 + (x + 2)^2$

b)  $(3a - b)^2 - (2a + 5b)^2$

c)  $3(y - 1)^2 - 2(2y - 1)^2$

d)  $9 - 2(x - 1)(x + 7) + (2x - 5)(x - 3)$

e)  $3(1 + 3y)(4 - y) - (3y - 2)(3y - 5)$

Use the following information to answer the next question .

A student provides the following expansions for four binomial products.

$$(x + 3)^2 = x^2 + 9 \qquad (3x - y)(3x - y) = 9x^2 - 6xy - y^2$$

$$(2x + y)(2x - y) = 2x^2 - y^2 \qquad (5x + 7)^2 = 25x^2 + 35x + 49$$

- Multiple Choice** 6. How many of the student's expansions are incorrect?
- A. One
  - B. Two
  - C. Three
  - D. Four

- Numerical Response** 7. Given that for every value of  $x$ ,  $x^2 - 10x + 39 = (x - a)^2 + b$ , then the value of  $b$  must be \_\_\_\_\_.

(Record your answer in the numerical response box from left to right)

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**Answer Key**

1. a)  $x^2 - 16x + 64$       b)  $x^2 - 81$       c)  $9x^2 - 6xy + y^2$   
 d)  $25x^2 + 20xy + 4y^2$       e)  $9x^2 - 4$       f)  $4y^2 - 4y + 1$   
 g)  $4p^2 + 28p + 49$       h)  $16m^2 - 9n^2$       i)  $25a^2 - 60ab + 36b^2$   
 j)  $81 - 25x^4$       k)  $36a^2 - 84ab + 49b^2$       l)  $4a^6 - 49$
2. a)  $24x^2 - 50x + 24$       b)  $210x^2 - 49x - 14$       c)  $-6a^2 - 75a - 216$   
 d)  $80x^2 + 40x + 5$       e)  $96x^2 + 12xy - 18y^2$       f)  $-8a^2 - 4ab + 60b^2$
3. a)  $2x^2 + 32$       b)  $6x - 12$       c)  $2x^2 + 18$       d)  $-5xy + 5y^2$
4. a)  $x^2 - 8x + 3$       b)  $2x^2 + 43x - 32$       c)  $-37x + 5$   
 d)  $77 + 146x - 123x^2$       e)  $23x^2 + 47x - 33$       f)  $-19p^2 + 47q^2$
5. a)  $2x^2 + 12x + 20$       b)  $5a^2 - 26ab - 24b^2$       c)  $-5y^2 + 2y + 1$   
 d)  $-23x + 38$       e)  $-18y^2 + 54y + 2$

6. D      7. 

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