Name: _____   Multiplying Binomials   Date: _____

Many teachers like to use FOIL (First, Outer, Inner, Last) to teach multiplying binomials, but we find this method can be confusing and really only works when you are multiplying two binomials. What happens when you have to multiply three or more?

Instead of FOIL, we **use a Punnett Square** and this method also engenders some crossover between math and science!

Example #1: $(x + 6)(x + 3)$

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

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

$$x^2 + 9x + 18$$

When multiplying three (or more) binomials, multiply two binomials at a time.

Example #2: $(x + 5)(x - 3)(x + 2)$

	x	+ 5
x	x^2	$+5x$
− 3	$-3x$	-15

Thus, $x^2 + 5x - 3x - 15$

$$x^2 + 2x - 15$$

Next, take the resulting trinomial and multiply it by the remaining binomial.

	x^2	$+2x$	-15
x	x^3	$+2x^2$	$-15x$
+2	$+2x^2$	$+4x$	-30

Thus, $x^3 + 2x^2 - 15x + 2x^2 + 4x - 30$

$$x^3 + 4x^2 - 11x - 30$$

Multiplying Three Binomials

Simplify each expression.

1. $(t + 3)(t + 2)(t + 5)$

2. $(z - 2)(z - 5)(z + 2)$

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

4. $(y - 2)(y - 1)(y + 3)$

5. $(c + 6)(c - 4)(c + 2)$

Simplify each expression.

6. $(t + 4)(t + 2)(t - 1)$

7. $(z - 4)(z - 3)(z + 2)$

8. $(d - 9)(d + 1)(d - 4)$

9. $(y + 2)(y - 2)(y + 2)$

10. $(c + 6)(c - 3)(c + 1)$

Simplify each expression.

11. $(t-3)(t+6)(t-5)$

12. $(z-1)(z-6)(z+2)$

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

14. $(y-4)(y-4)(y+3)$

15. $(c-6)(c-6)(c-6)$

Simplify each expression.

16. $(t + 4)(2t + 2)(2t - 1)$

17. $(z - 4)(z - 3)(2z + 2)$

18. $(2d - 4)(2d + 1)(d - 4)$

19. $(3y + 2)(y - 2)(2y + 2)$

20. $(-3c + 6)(c - 3)(2c + 1)$

1). Which of these is equivalent to $(x - 3)^2$?
      A. $x^2 - 6x + 9$
      B. $x^2 + 6x + 9$
      C. $x^2 - 3$
      D. $x^2 + 3$

2). Which of these is equivalent to $(x - 2)^2$?
      F. $x^2 + 4$
      G. $x^2 - 4$
      H. $x^2 + 4x + 4$
      J. $x^2 - 4x + 4$

3). Which of these is equivalent to $(x + 5)^2$?
      A. $x^2 + 10x - 25$
      B. $x^2 + 10x + 25$
      C. $x^2 - 5$
      D. $x^2 + 5$

4). What is $(x + 9)(x + 4)(x + 2)$?
      F. $x^3 - 15x^2 - 62x - 72$
      G. $x^3 + 15x^2 + 62x - 72$
      H. $x^3 + 15x^2 + 62x + 72$
      J. $x^3 + 15x + 62x + 72$

5). What is $(x + 2)(x - 1)(x + 3)$?
      A. $x^3 + 4x^2 + x + 6$
      B. $x^3 + 4x^2 + x - 6$
      C. $x^3 - 4x^2 - x + 6$
      D. $x^3 - 4x^2 - x - 6$

6). What is the coefficient of the term with the highest degree in the polynomial expression
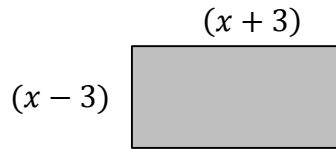$13x - 6x^2 - 7x^4 + 5x^3 + 12$?
      F. -6
      G. -7
      H. 13
      J. 5

7). What is the coefficient of the term with the highest degree in the polynomial expression
$-4x^2 + 6x - 3x^3 + 2x^4 - 23$?
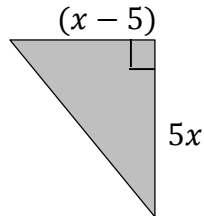   A. -4
      B. 2
      C. -3
      D. -23

8). A developer makes a blueprint using the rectangle shown below. $(A = lw)$

$(x + 3)$

$(x - 3)$

What is an equivalent expression for the area of this rectangle?

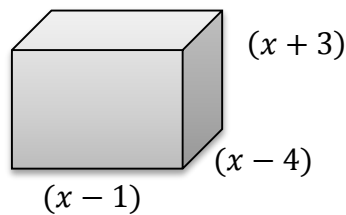F. $x^2 - 9$

G. $x^2 - 3x$

H. $x^2 - 6x - 9$

J. $x^2 + 6x - 9$

9). A developer makes a blueprint using the triangle shown below. $(A = \frac{1}{2}bh)$

$(x - 5)$

$5x$

What is an equivalent expression for the area of this triangle?

A. $\frac{1}{2}x^2 + 5$

B. $5x^2 - 25x$

C. $\frac{x^2 - 5}{2}$

D. $\frac{5x^2 - 25x}{2}$

10). What is the volume of the cube?

$(x + 3)$

$(x - 4)$

$(x - 1)$

F. $x^3 - 2x^2 - 11x - 12$

G. $x^3 + 2x^2 + 11x + 12$

H. $x^3 - 2x^2 - 11x + 12$

J. $x^3 - 2x^2 - 11x - 12$

Name: _____   Multiplying Binomials   Date: _____

1) A
2) J
3) B
4) H
5) B
6) G
7) B
8) F
9) D
10) H

Kopp & Rossi²