**Activity 2.2.2 Multiplying and Factoring**

1. Multiply a monomial by a binomial using the ‘in direction’ of the distributive property:

Multiply out the following:

a. $3x\left(4x+5\right)$ b. $7\left(4x+5\right)$

c. Now multiply 4x + 5 by both 3x and 7 as written: $(3x+7)\left(4x+5\right)$

we can say and write: “3x multiplies (4x + 5) AND 7 multiplies (4x + 5)”

 3x(4x+5) 7(4x+5)

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Combine like terms: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Multiply

a. $x\left(x-3\right)$ b. $-2\left(x-3\right)$

c. $(x-2)\left(x-3\right)$

3. Observe patterns when you multiply the following binomials:

a. $(x+5)\left(x+7\right)$ =

b. $(x-5)\left(x-7\right)$ =

c. $(x+5)\left(x-7\right)$ =

d. $(x-5)\left(x+7\right)$ =

4. Observe patterns when you multiply the following binomials:

a. $(x+11)\left(x+1\right)$ =

b. $(x-11)\left(x-1\right)$ =

c. $(x+11)\left(x-1\right)$ =

d. $(x-11)\left(x+1\right)$ =

5. Observe patterns (assume *c* and *d* are positive numbers).

a. $(x+c)\left(x+d\right)$ =

b. $(x-c)\left(x-d\right)$ =

c. $(x+c)\left(x-d\right)$ =

d. $(x-c)\left(x+d\right)$ =

6. Fill in the blanks or answer the following questions in full sentences to explain the patterns you observed. You may use the letters c or d to indicate the second terms of the binomials. Other words you may want to use are: positive, negative, same sign, different sign, sum, product, factor, trinomial. perfect square trinomial, difference of two squares, middle term, last term.

a. The product of two binomials, (x - c)(x - d), is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. When will the product of two binomials give an answer that has a last term that is negative?

c. When will the product of two binomials give an answer that has a last term that is positive?

d. When will the product of the form $(x+c)\left(x-d\right)$give you an answer that has a middle term that is positive?

e. When you multiply two binomials, what is the coefficient of the middle term of their product?

f. When you multiply two binomials, what is the last term of their product?

g. What other patterns did you notice?

Special Products:

7. Multiply:

a. $(x+5)\left(x-5\right)$ b. $(2x+9)\left(2x-9\right)$

 c. What pattern do you notice when you multiply binomials of the form $(x+c)\left(x-c\right)$?

d. What is the “middle term” in the product?

e. What special name is given to this product?

8. Multiply:

a. $\left(x+6\right)\left(x+6\right)$ b. $\left(5x-6\right)\left(5x-6\right)$ c. $\left(x+7\right)^{2}$

d. What pattern do you notice when you multiply binomials of the form:$ \left(x+c\right)\left(x+c\right) also written as (x+c)^{2}$?

e. What special name is given to the trinomial that results from squaring a binomial?

FACTORING:

9. Recall that multiplying -2 times 3 equals negative 6.

a. We say that one pair of factors of -6 is -2 and 3. List 3 other pairs of factors of negative six.

b. We also say that we can factor 3 out of -6 meaning -6 divided by \_\_ is \_\_\_; or $\frac{-6}{3}= -2$

c. What does it mean to factor an algebraic expression?

10. Factor the following by “taking out” a factor common to both terms. This is the “out direction” of the distributive property.

a. 15x+9 = (3)(5x) + (3)(3) = (\_\_)(\_\_\_ +\_\_\_\_)

b. $28x^{2}+6x$= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. $6x^{2}-2x$=\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

11. Use the patterns you observed when multiplying binomials or any other method to factor the following. If the polynomial does not factor over the integers, write “prime”.

a. $x^{2}$+ 15x+ 56 = b. $x^{2}$-15x + 56 =

c. $x^{2}$+ x - 56 = d. $x^{2}$- x - 56 =

e. $x^{2}$+ x+ 7 = f. $x^{2} $+ x - 6 =

g. $x^{2}$+ 0x - 49 = h.. $36x^{2} $+ 0x - 1=

(could be written $x^{2}$- 49)

 i. $x^{2}$+ 0x+ 49= j. $x^{2}$+ (5+3)x + 5(3)=

12. Observe patterns when you multiply the following binomials:

a. $(3x+5)\left(2x+7\right)$ =

b. $(2x+5)\left(3x+7\right)$ =

c. $(3x-5)\left(2x-7\right)$ =

d. $(2x-5)\left(3x-7\right)$ =

e. $(3x+5)\left(2x-7\right)$ =

f. $(2x+5)\left(3x-7\right)$ =

Now factor the following:

g. $6x^{2}$+ 19x - 7= h. $6x^{2}$- 11x - 7=