Activity 1: Distinguishing Terms and Factors:

1. **Consider the expression below**

$$3x + 4y + 5x - 3y + 2$$

What are the terms in this expression?

What are the factors in each term?

Do any terms have the same variable factors? Which ones?

2. **Consider the expression below**

$$4x^2 + 6xy + 5x^2 - 4xy + 7$$

What are the terms in this expression?

What are the factors in each term?

Do any terms have the same variable factors? Which ones?

3. **Consider the two column list below**

Expressions with Two or More Terms	Expression with one term and multiple factors

2. **Record each of these expressions under the appropriate heading**

12xy	3x+2y-7z	2x-y	3xy+9xy	$2x^2$	$-3x^2 + 5x^2$
a+b+c	$\frac{a+b}{c}$	$\frac{a}{b} + \frac{b}{c}$	ab+ac	$8(x + 4)$	a(b+c)
$\frac{1}{2}h(a + b)$	8x+32	$\frac{1}{2}ah + \frac{1}{2}bh$			

3. **Circle the expressions that are equivalent and connect them with a line**

4. **Write each of the following after its description below: a(b+c), a + b, xy + wz, (x+y)(x-y)**

2 terms, each with two factors

2 factors, each with two terms

1 term containing 2 factors

2 terms, each with 1 factor

Activity 2: Linear Inequalities

Part 1: Place the correct symbol – either < or > between each pair of numbers

a. $3 \ \square \ 7$

b. $-4 \ \square \ 2$

c. $-3 \ \square \ -6$

d. $4 \ \square \ -3$

Part 2: Now consider the inequality:

$3 < 7$

a. Add 4 to each side of the inequality – what is the result? Is the inequality still true?

b. Subtract 2 from each side of the inequality – what is the result? Is the inequality still true?

c. Multiply each side of the inequality by 2 – what is the result? Is the inequality still true?

d. Multiply each side of the inequality by -2 – what is the result? Is the inequality still true?

Based on these examples – explain the meaning of this property:

> If the same negative number is used to multiply (or divide) each side of an inequality, the direction of the inequality sign is changed

If a < b, then ac > bc

Where a and b are real numbers and c < 0

Part 3: Solutions to inequalities

a. Solve $5x < 25$. What inequality did you get? Check your answer by taking a number in the solution set and replacing it in the original inequality

b. Solve $5x < -25$. What inequality did you get? Check your answer by taking a number in the solution set and replacing it in the original inequality

c. Solve $-5x < 25$. What inequality did you get? Check your answer by taking a number in the solution set and replacing it in the original inequality

d. Solve $-5x < -25$ What inequality did you get? Check your answer by taking a number in the solution set and replacing it in the original inequality

Activity 3: Linear Equations

Consider the line drawn below: which represents the value of a car a given number of years after it was bought

Identify each of the following

- The units on the x-axis.
- The units on the y-axis.
- How much was the car worth 1 year after it was bought?
- How much was it worth 2 years after it was bought? How about 3 years after it was bought?
- According to your answer above how much value does the car lose each year?

Using what you know about lines

a. Identify two points on this line that are NOT intercepts

b. Calculate the slope given these points.

c. Some people use the term "rise" over "run" to represent slope. What is the rise and what is the run in this case?

d. From your work here what does slope tell you about this situation?

e. Find an equation for the value of the car t years after it was bought

Activity 4: Exploring Solving Quadratics

Juanita – an algebra student – has solved the following problem as indicated below:

Solve: $3x + 5 = 17$

$$3x + 5 = 17$$

$$3x + 5 - 5 = 17 - 5$$

$$3x + 0 = 12$$

$$3x = 12$$

$$\frac{1}{3} \cdot 3x = \frac{1}{3} \cdot 12$$

$$x = 4$$

Is Juanita's solution correct? If how can you justify each step?

Matthew, another algebra student, solved the following problem as indicated below: Is his solution correct? Why or why not?

Solve: $x^2 - 2x - 8 = 0$

$$x^2 - 2x - 8 = 0$$

$$x^2 - 2x = 8$$

$$x^2 = 2x + 8$$

$$x = \pm\sqrt{2x + 8}$$

Is Matthew's solution correct? Did he solve the problem?

David, another student tries the same problem here is his new solution

$$x^2 - 2x - 8 = 0$$

$$(x - 4)(x + 2) = 0$$

$$x - 4 = 0 \text{ or } x+2=0$$

$$x = 4 \; or \; x = -2$$

This solution is correct – justify each of David's steps

David's friend is solving a similar problem

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

There first few steps are

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

$$x - 4 = 4 \; or \; x + 2 = 4$$

David says this is incorrect – he is right – what mistake did David's friend make?

Activity 5: Function Notation:

You own a company that manufactures and sells umbrellas. The term Revenue in business means the amount of money you gain by selling a certain number of items. We can think of revenue as

Revenue = (price) (quantity)

A basic law of economics is that as you increase the price of an item the amount of people willing to by it will decrease (the number of people willing to buy it is the quantity)

Suppose your marketing research department has determined that when you charge a price of x dollars the number of umbrellas you will sell (your quantity) will be 120-3x. This makes your revenue equation

R= (price)(quantity) = x(120-3x)

So suppose you charge $1 for your umbrellas –what will your revenue be? What if you charge $10? What if you charge $20

It would be nice to have a convenient compact notation to write this down – function notation can help us. Think of the revenue you receive when charging a price of x as R(x). So

R(1) = 117 means you will receive $117 when you charge $1 for your umbrellas

R(10) = 900 means you will receive $900 when you charge $10 for your umbrella

Fill the chart below – give the value and interpretation

	Value	Interpretation
R(1)	117	you will receive $117 when you charge $1 for your umbrellas
R(20)		
R(15)		

R(30)		
R(40)		
R(a)		

The last item in the chart gives you the amount you will receive when you charge a price of a

Suppose you want to experiment with charging different prices – you would like a formula for R(a +h) meaning if you charge a price of a and add just a little more, h, what will your revenue be. It would be nice if R(a + h) = R(a) + R(h). Let' s see if this works with a few examples

Calculate R(4.50). Now calculate R(4) + R(0.5). Are they the same?

Calculate R(3.25). Now calculate R(3) + R(0.25). Are they the same?

So does R(a+h) always equal R(a) + R(h)