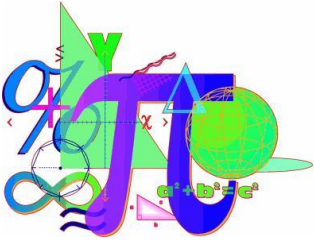


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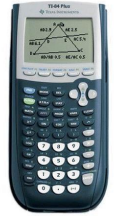
Teacher\_\_\_\_\_



# Watertown Public Schools

## Intermediate Algebra Review

### Packet



This packet contains topics that you are expected to know prior to entering Intermediate Algebra. You have learned these skills over the past few years. These examples focus on both mathematical skills and problem solving. This packet should be completed independently. Upon your completion, your parent/guardian needs to sign the packet.

If you are having a difficult time adding, subtracting, and multiplying numbers, we suggest you study this over the summer. For example, flashcards can be used to help you with basic facts. Also, you can do a Google search for more practice problems.

There are links to instructional videos from Khan Academy to help you remember some topics.

This skills review **will help prepare you for the first assessment** which will be about a week into the school year. *The packet is expected to be completed for the first day of class.*

**Please show your work in the packet.**

Parent/Guardian Signature:\_\_\_\_\_

Date\_\_\_\_\_

**Operations: Solve each and select the correct solution.**

1.  $5 - 3 * 7 + 4 \div 2$

- a. 9
- b. -14
- c. 16
- d. 20

2.  $-|-4| + 5$

- a. 9
- b. -1
- c. 1
- d. 20

3.  $-5 + 1 - 13$

- a. -17
- b. -7
- c. 7
- d. 9

4.  $20 + 12 - 7$

- a. 35
- b. -25
- c. 15
- d. 25

5.  $(2)(-4)(-5)(-1)$

- a. 40
- b. -40
- c. -8
- d. -41

6.  $|9 - (-5) + 8| - 2$

- a. -20
- b. -24
- c. 20
- d. 22

7.  $\frac{3}{4} + \frac{4}{5}$

- a.  $\frac{7}{9}$
- b.  $\frac{3}{5}$
- c.  $\frac{31}{20}$
- d.  $\frac{4}{3}$

8.  $-\frac{3}{4} * \frac{2}{7}$

- a.  $\frac{3}{14}$
- b.  $-\frac{3}{14}$
- c.  $\frac{21}{8}$
- d.  $-\frac{21}{8}$

9.  $-\frac{1}{3} \div \frac{3}{5}$

- a.  $-\frac{1}{5}$
- b.  $-\frac{5}{6}$
- c.  $-\frac{5}{9}$
- d. -5

## Order of Operations:

Online Tutorial: <https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-negative-numbers-multiply-and-divide/cc-7th-order-of-operations/v/introduction-to-order-of-operations>

**Example:** Order of Operations - PEMDAS

$$3^2(4 \cdot 6 \div 12) + 7$$

$$3^2(24 \div 12) + 7$$

$$3^2(2) + 7$$

$$9(2) + 7$$

$$18 + 7$$

$$25$$

10.  $(4 \cdot -7) + 6 \cdot 4 - 3$

11.  $-3(4 + 2 - 5)^2 + 18 \div 2$

12.  $(4 + 4 - 6)^3 - 18 \div 6 - 4$

13.  $4 + (-2 + 3)^2 - 5$

**Properties of Real Numbers - Make sure you are comfortable identifying these properties:**

- a.  $5 + -5 = 0$  Property of Opposites
- b.  $\frac{7}{2} \cdot \frac{2}{7} = 1$  Property of Reciprocals
- c.  $(4 + 2) + 6 = 4 + (2 + 6)$  Associative Property (with Addition)
- d.  $3(4 \cdot 5) = (3 \cdot 4) \cdot 5$  Associative Property (with Multiplication)
- e.  $10 + 2 = 2 + 10$  Commutative Property (with Addition)
- f.  $4 \cdot -3 = -3 \cdot 4$  Commutative Property (with Multiplication)
- g.  $5(1) = 5$  Multiplicative Identity
- h.  $8 + 0 = 8$  Additive Identity
- i.  $4(6 + 2) = 4(6) + 4(2)$  Distributive Property

### **Evaluating Expressions**

Online Tutorial: <https://www.khanacademy.org/math/algebra-basics/core-algebra-expressions/core-algebra-variables-and-expressions/v/expressions-with-two-variables>

**Example:** Evaluate  $15x$  when  $x = 4$ :

$$15(4) = 60$$

14. Evaluate  $w - 8$  when  $w = 20$ :

15. Evaluate  $2ab - 4b + 6$  when  $a = -3$  and  $b = 7$

a. Evaluate  $4x + 3a - 2(x - a)$  when  $a = 4$  and  $x = 5$

### Evaluating Formulas

Online Tutorial: <https://www.khanacademy.org/math/algebra/introduction-to-algebra/variable-and-expressions/v/evaluate-a-formula-using-substitution>

**Example:** Use the formula  $A = lw$ , to find the area of a rectangle with length 7 and width 4.

$$A = lw = 7 \cdot 4 = 28$$

16. Use the formula  $F = 1.8C + 32$ , where  $C$  is degrees Celsius, and  $F$  is degrees Fahrenheit to calculate the temperature in Fahrenheit of a room that is  $60^{\circ}\text{C}$ .

17. The volume of a cylinder is found using the formula  $V = \pi r^2 h$ , where  $\pi = 3.14$ ,  $r$  is the radius of the base, and  $h$  is the height of the cylinder. Find the volume of a cylinder that is 8 inches tall, with a radius of 2 inches.

## Powers: Repeated multiplication

Online Tutorial: <https://www.khanacademy.org/math/algebra-basics/core-algebra-exponent-expressions/core-algebra-exponent-properties/v/exponent-properties-involving-products>

**Example:**  $4^5 = 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = 1024$

18.  $7^3$

19.  $4^2 \cdot 2^5$

**Example:**  $b \cdot b \cdot b \cdot b = b^4$

20.  $jjjkjkj$

21.  $yyykkk$

## Distributive Property

Online Tutorial: <https://www.khanacademy.org/math/algebra/introduction-to-algebra/manipulating-expressions/v/distributive-property-with-rational-terms>

**Example:**  $3(2x - 5) = 3(2x) + 3(-5) = 6x + -15$

22.  $4(6 - 3j)$

23.  $(2x - 4)3$

24.  $-4x(2x - 5)$

25.  $2(4x + 5)$

26.  $-7(y - 5v)$

**Like terms: Parts of an expression with the same variable part**

Online Tutorial: <https://www.khanacademy.org/math/algebra/introduction-to-algebra/manipulating-expressions/v/combining-like-terms-1>  
and <https://www.khanacademy.org/math/algebra/introduction-to-algebra/manipulating-expressions/v/combining-like-terms-3>  
and <https://www.khanacademy.org/math/algebra/introduction-to-algebra/manipulating-expressions/v/combining-like-terms-and-the-distributive-property>

**Example:**  $4g + -6g = -2g$

27.  $3x + 2k - 4x + 7k$

28.  $y + 4 - 3x + 5 - 6y$

29.  $4x + 7y - 2x + 7y + x$

30.  $3x^3 + 2x - 4x^2 + 5x^3 + 7x$

31.  $6y^2 + 2 - 4y^2 + 7y + 5 + 8y - 9$

Simplify the expression completely:

32.  $-3(4x - 5) + 2x + 7$

33.  $5 + 3x + 2(2x - 1)$

34.  $5(x + 3) + 2x + 3(2x - 6)$

### Identifying Parts of Algebraic Expressions

Online Tutorial: <https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-expressions-and-variables/cc-6th-parts-of-expressions/v/expression-terms-factors-and-coefficients>

35. Consider the following algebraic expression:

$$4x - 5v + 7x - 6 + 4x$$

Number of terms: \_\_\_\_\_

List coefficient(s): \_\_\_\_\_

List constant(s): \_\_\_\_\_

Circle the like terms

Simplify:



36. Consider the following algebraic expression:

$$6x + 2y - 5y + 3x + 11 - 4x$$

Number of terms: \_\_\_\_\_

List coefficient(s): \_\_\_\_\_

List constant(s): \_\_\_\_\_

Circle the like terms

Simplify:

## B. Solving Equations

### I. Solving Two-Step Equations

- A couple of hints:
1. To solve an equation, UNDO the order of operations and work in the reverse order.
  2. REMEMBER! Addition is “undone” by subtraction, and vice versa. Multiplication is “undone” by division, and vice versa.

$$\begin{aligned} \text{Ex. 1: } 4x - 2 &= 30 \\ + 2 \quad + 2 & \\ 4x &= 32 \\ + 4 \quad + 4 & \\ x &= 8 \end{aligned}$$

$$\begin{aligned} \text{Ex. 2: } 87 &= -11x + 21 \\ - 21 \quad - 21 & \\ 66 &= -11x \\ + -11 \quad + -11 & \\ - 6 &= x \end{aligned}$$

### II. Solving Multi-step Equations With Variables on Both Sides of the Equal Sign

- When solving equations with variables on both sides of the equal sign, be sure to get all terms with variables on one side and all the terms without variables on the other side.

$$\begin{aligned} \text{Ex. 3: } 8x + 4 &= 4x + 28 \\ - 4 \quad - 4 & \\ 8x &= 4x + 24 \\ - 4x \quad - 4x & \\ 4x &= 24 \\ + 4 \quad + 4 & \\ x &= 6 \end{aligned}$$

### III. Solving Equations that need to be simplified first

- In some equations, you will need to combine like terms and/or use the distributive property to simplify each side of the equation, and then begin to solve it.

$$\begin{aligned} \text{Ex. 4: } 5(4x - 7) &= 8x + 45 + 2x \\ 20x - 35 &= 10x + 45 \\ - 10x \quad - 10x & \\ 10x - 35 &= 45 \\ + 35 \quad + 35 & \\ 10x &= 80 \\ + 10 \quad + 10 & \\ x &= 8 \end{aligned}$$

**Solve each equation below.**

1.)  $5x - 2 = 33$

2.)  $140 = 4x + 36$

3.)  $8(3x - 4) = 196$

4.)  $45x - 720 + 15x = 60$

5.)  $132 = 4(12x - 9)$

6.)  $198 = 154 + 7x - 68$

$$7.) -131 = -5(3x - 8) + 6x$$

$$8.) -7x - 10 = 18 + 3x$$

$$9.) 12x + 8 - 15 = -2(3x - 82)$$

$$10.) -(12x - 6) = 12x + 6$$

**Solving for a variable:**

Ex. 1:  $3xy = 18$ , Solve for  $x$ .

$$\frac{3xy}{3y} = \frac{18}{3y}$$

$$x = \frac{6}{y}$$

Ex. 2:  $5a - 10b = 20$ , Solve for  $a$ .

$$+ 10b = + 10b$$

$$5a = 20 + 10b$$

$$\frac{5a}{5} = \frac{20}{5} + \frac{10b}{5}$$

$$a = 4 + 2b$$

**PRACTICE SET 3**

Solve each equation for the specified variable.

1.  $Y + V = W$ , for  $V$

2.  $9wr = 81$ , for  $w$

3.  $2d - 3f = 9$ , for  $f$

4.  $dx + t = 10$ , for  $x$

5.  $P = (g - 9)180$ , for  $g$

6.  $4x + y - 5h = 10y + u$ , for  $x$

## Writing Linear Equations:

Need at least one point  $(x_1, y_1)$  and a slope  $m$

1. Substitute the point  $(x_1, y_1)$  and the slope  $m$  into the point slope form
2. Solve for  $y$

### EXAMPLE

Write the point-slope form and then the slope-intercept form of the equation of the line with slope  $-3$  that passes through the point  $(2, -4)$ .

### SOLUTION

$$y - y_1 = m(x - x_1)$$
$$y - (-4) = -3(x - 2) \quad \text{Substitute the given values}$$
$$\boxed{y + 4 = -3(x - 2)} \quad \text{Simplify}$$

This is the equation of the line in *point-slope form*.

$$y + 4 = -3x + 6 \quad \text{Distribute}$$
$$\boxed{y = -3x + 2} \quad \text{Subtract 4 from both sides}$$

This is the equation of the line in *slope-intercept form*.

Now find the two forms of the equation of the line. To find the point-slope form of the line, use either point provided.

Use  $(2, -4)$ .

$$y - y_1 = m(x - x_1)$$
$$y - (-4) = -2(x - 2) \quad \text{Substitute the given values}$$
$$\boxed{y + 4 = -2(x - 2)} \quad \text{Simplify}$$

This is the equation of the line in *point-slope form*.

$$y + 4 = -2x + 4 \quad \text{Distribute}$$
$$\boxed{y = -2x} \quad \text{Subtract 4 from both sides}$$

This is the equation of the line in *slope-intercept form*.

**Parallel Lines:** Two lines that are parallel have the SAME slope.

### Example:

$y = 3x + 9$  and  $y = 3x - 6$  are parallel lines because they have the same slope:  $m = 3$ .  
A line that is parallel to  $y = -8x + 7$  has a slope of  $-8$ .

**Perpendicular Lines:** have slopes that are the negative reciprocals of each other.

### Example:

- ▶  $y = 3x + 9$  and  $y = -\frac{1}{3}x + 9$  are perpendicular lines because their slopes are the “negative flip” of each other.
- ▶ A line that is perpendicular to  $y = -8x + 7$  has a slope of  $\frac{1}{8}$ .

1. Write the equation of a line that has the slope  $-4/9$  and passes through the point  $(18, -2)$

2. Write the equation of a line that passes through the points  $(1, 3)$  and  $(5, 11)$

3. Write the equation of a line containing the point  $(-4, 6)$  and parallel to  $3x - 2y = 8$ .

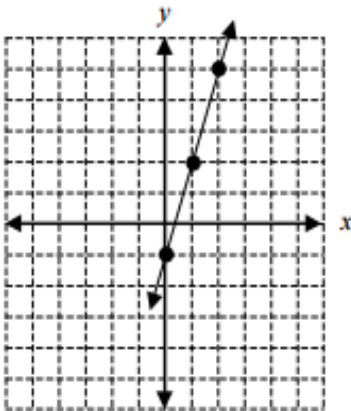
4. Write the equation of a line containing the point  $(2, -1)$  and perpendicular to  $x - 3y = 4$ .

### Graphing Linear Equations in Slope Intercept Form:

The slope-intercept form for the equation of a line with slope  $m$  and  $y$ -intercept  $b$  is  $y = mx + b$ .

Ex.  $y = 3x - 1$

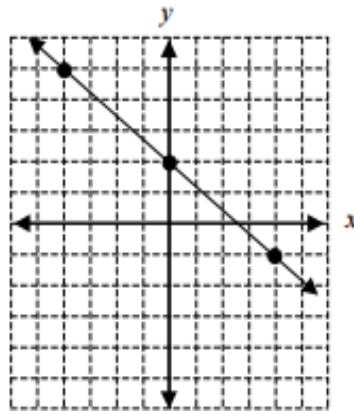
Slope: 3       $y$ -intercept: -1



Place a point on the  $y$ -axis at -1.  
Slope is 3 or  $3/1$ , so travel up 3 on the  $y$ -axis and over 1 to the right.

Ex.  $y = -\frac{3}{4}x + 2$

Slope:  $-\frac{3}{4}$        $y$ -intercept: 2

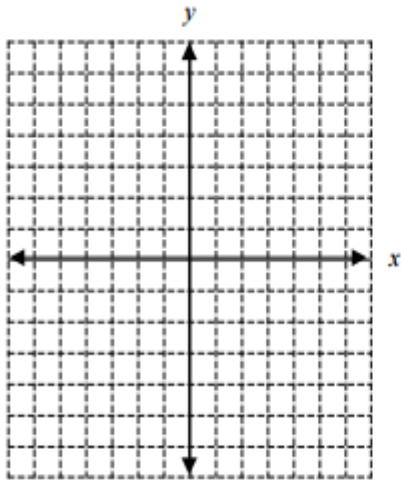


Place a point on the  $y$ -axis at 2.  
Slope is  $-3/4$  so travel down 3 on the  $y$ -axis and over 4 to the right. Or travel up 3 on the  $y$ -axis and over 4 to the left.

Problems:

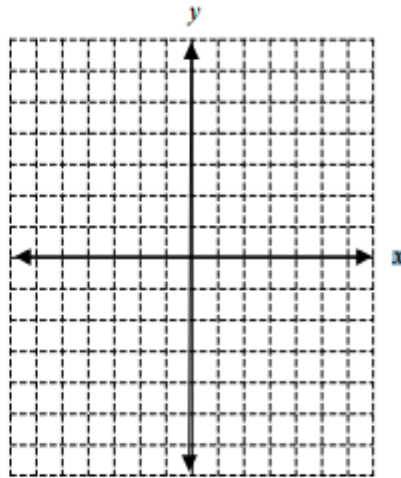
1.  $y = 2x + 5$

Slope: \_\_\_\_\_ y-intercept: \_\_\_\_\_



2.  $y = \frac{1}{2}x - 3$

Slope: \_\_\_\_\_ y-intercept: \_\_\_\_\_





## Graphing Linear Equations in Standard Form:

An equation in standard form can be graphed using several different methods. Two methods are explained below.

- Re-write the equation in  $y = mx + b$  form, identify the  $y$ -intercept and slope, then graph as in Part II above.
- Solve for the  $x$ - and  $y$ - intercepts. To find the  $x$ -intercept, let  $y = 0$  and solve for  $x$ . To find the  $y$ -intercept, let  $x = 0$  and solve for  $y$ . Then plot these points on the appropriate axes and connect them with a line.

Ex.  $2x - 3y = 10$

a. Solve for  $y$ .

$$-3y = -2x + 10$$

$$y = \frac{-2x + 10}{-3}$$

$$y = \frac{2}{3}x - \frac{10}{3}$$

OR

b. Find the intercepts:

let  $y = 0$  :

$$2x - 3(0) = 10$$

$$2x = 10$$

$$x = 5$$

So  $x$ -intercept is  $(5, 0)$

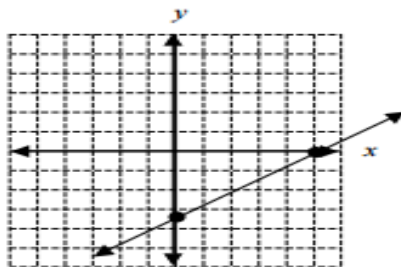
let  $x = 0$ :

$$2(0) - 3y = 10$$

$$-3y = 10$$

$$y = -\frac{10}{3}$$

So  $y$ -intercept is  $(0, -\frac{10}{3})$



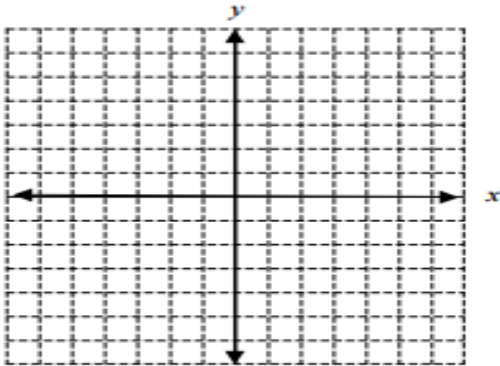
On the  $x$ -axis place a point at 5.

On the  $y$ -axis place a point at  $-\frac{10}{3} = -3\frac{1}{3}$

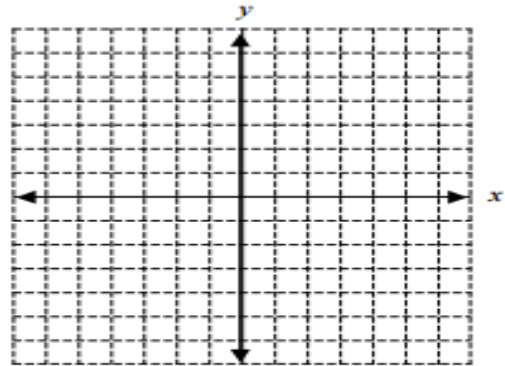
Connect the points with the line.

Problems:

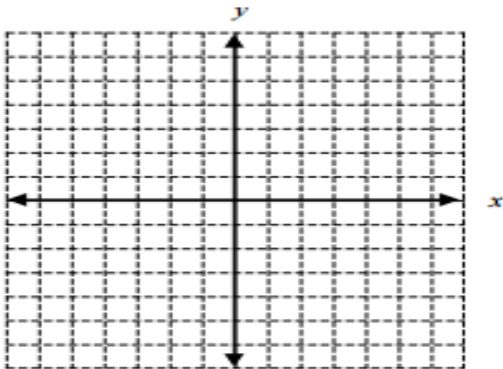
1.  $3x + y = 3$



2.  $5x + 2y = 10$



3.  $y = 4$



4.  $4x - 3y = 9$

