

# Waring School Summer Math Packet

## *for students entering Advanced Algebra*

Hello folks,

Here is a packet of problems for you to ponder and work on over the summer, in order to keep your math skills fresh. Try all of the problems, and on your own paper (lined or graph paper), please write up your solutions. This means not just writing your answers, but showing your steps and your thinking! This is the work you will hand in during the first week of classes.

This packet does emphasize ideas from Algebra at the beginning, with Geometry problems at the end. You may feel rusty. Each section does have worked-out examples to help you and you can check out our [Summer Resources](#) page.

We math teachers want to acknowledge that you all are coming off a challenging school year and trying to learn during the pandemic. Most people have lost class time over the past year, and we expect different people will be uncertain about different things. **So our message to you is - please just do your best!** And make note of ideas that feel unfamiliar to you. That will help us in the fall address any learning gaps you may have! We are all in this together - and we will figure it out together as well. We so appreciate your willingness to spend some time doing math this summer!

*“What kind of calculator do I need to do this work?”*

No calculators necessary--just use your brain! :)

*“How will I get all of these problems done this summer?”*

We recommend that you pace yourself throughout the summer by working through about two to three pages each week. There are optional challenges at the end.

*“I don’t know the answers to some of these!”*

That’s OK! You aren’t supposed to be perfect and may not yet know how to do all of these problems. This is school, after all, and everybody’s learning. Please just do your best! Check out our [FAQ and Resources](#) for resources on what to do if you feel stuck.

If you have questions about specific problems, or anything else in this packet, you can look at our [FAQ and Resources](#) page, or E-mail our department chair Joan Sullivan at [jsullivan@waringschool.org](mailto:jsullivan@waringschool.org).

We hope you and your family have a good summer,  
*The Waring Math Teaching Team*

1. Evaluate each expression for the given values of the variables:

Example:  $6x + 2y - z$  for  $x = -1, y = 2, z = \frac{2}{3}$

Solution: substitute the values for the variables:

$$6 \cdot -1 + 2 \cdot 2 - \frac{2}{3} = -6 + 4 - \frac{2}{3} = -2 - \frac{2}{3} = -2\frac{2}{3}$$

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a)  $5x - 4y$  for  $x = 9$  and  $y = 6$

b)  $-6m - 2n$  for  $m = -\frac{1}{2}$  and  $n = \frac{1}{4}$

c)  $4a^2b$  for  $a = -3$  and  $b = 2$

d)  $2x^2 - 5x - 3$  for  $x = 4$

e)  $\frac{x}{3-y}$  for  $x = 10$  and  $y = 4$

f)  $\frac{11f - 4g^4}{2}$  for  $f = 8$  and  $g = 0$

g)  $\frac{1}{3}(4 - x)^2$  for  $x = -5$

2. Rewrite the expressions as sums in simplest form, by distributing and combining like terms.

Example:  $2(x + 5y) + 3(2y - 1 - 3x)$

Solution: First distribute:

$$2(x + 5y) + 3(2y - 1 - 3x) = 2x + 10y + 6y - 3 - 9x$$

Then combine like terms:

$$2x + 10y + 6y - 3 - 9x = -7x + 16y - 3$$

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a)  $3n - 2 + 4n + 1$

b)  $4(8y - 1) - 5y$

c)  $2(a + 3b) + 9(3a + 2b)$

d)  $t^2 - 59t + 54 - 82t^2 + 60t$

g)  $3n(n + 1) - 2(n^2 + 6) + n$

h)  $\frac{4y^2 + 6y - 8}{2} + y$

3. Solve the equations.

Example:  $5n + 1 = 3n - 7$

Solution:  $5n + 1 = 3n - 7$       *subtract 3n from both sides*  
 $- 3n \quad - 3n$

$2n + 1 = -7$       *subtract 1 from both sides*  
 $- 1 \quad - 1$

$2n = -8$       *divide by 2 on both sides*  
 $n = -4$

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a)  $4f + 9 = 57$

b)  $-5x - 6 = 6x - 61$

c)  $17 = 5 + 4(2x - 3)$

d)  $15x - 3(x + 5) = 4x + 17$

e)  $15 = \frac{x-5}{-2}$

f)  $4(0.5n - 3) = n - 0.25(12 - 8n)$

**4. Solve the problem by writing a mathematical equation to model the situation and solve.**

**Example:**

A consultant charges \$45 for each hour she works on a consultation, plus a flat \$30 consulting fee. How many hours of work are included in a \$210 bill for a consultation?

**Solution:**

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a) You have \$60 and your sister has \$120. You are saving \$7 per week and your sister is saving \$5 per week. How long will it be before you and your sister have the same amount of money?

Write and solve an algebraic equation for this problem.

b) 14 is 35% of what number?

c) You go out to dinner with your family and you pay 25% of the cost of the meal to cover tax and tips. If you have to pay \$175 in all, what was the cost of the meal before taxes and tips?

Write and solve an algebraic equation for this problem.

**5. Solve the inequality**

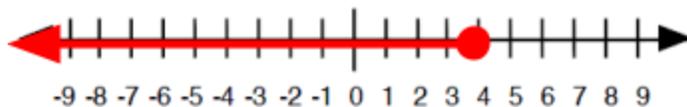
**Example:**  $2x + 1 \leq 9$

**Solution:**  $2x + 1 \leq 9$      *subtract 1 from both sides*  
 $2x \leq 8$      *divide by 2 on both sides*  
 $x \leq 4$

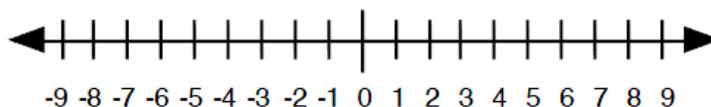
*Next check an easy number to make sure. Let's try 0.*

*Substitute 0 into the original inequality:  $2 \cdot 0 + 1 \leq 9$*

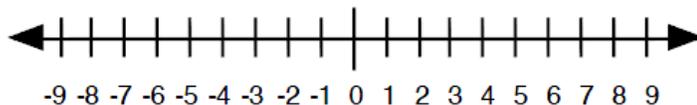
*Is  $0 + 1 \leq 9$  ? Yes! so we want to graph to the left of 4 on the number line:*



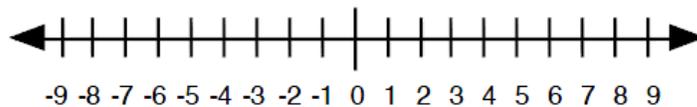
a)  $x + 7 > 12$



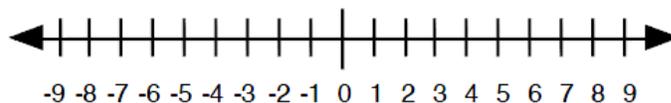
b)  $2x \leq 10$



c)  $-6x + 4 < 28$



d)  $11x - 13 < 7x + 19$



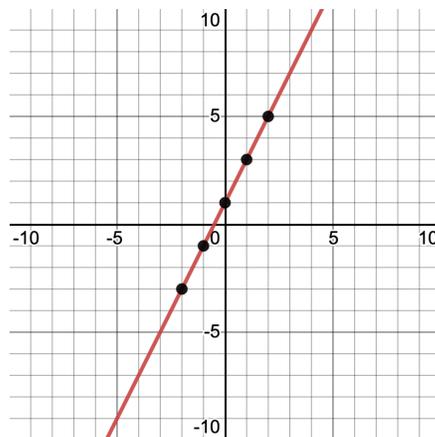
6. Complete the table of values and sketch a graph of the equation.

Example:  $y = 2x + 1$

Solution: First fill out the table by substituting values of  $x$  to find  $y$ -values.

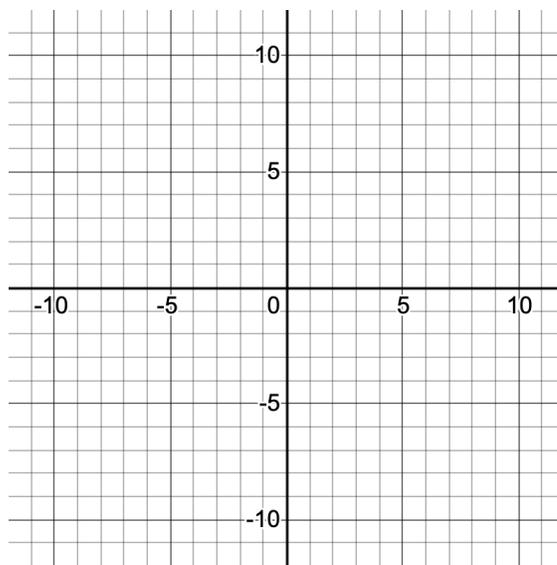
Then plot the points on the coordinate grid.

x	$y = 2x + 1$
-2	<b>-3</b>
-1	<b>-1</b>
0	<b>1</b>
1	<b>3</b>
2	<b>4</b>



a)  $y = 3x + 2$

x	$y = 3x + 2$
-2	
-1	
0	
1	
2	

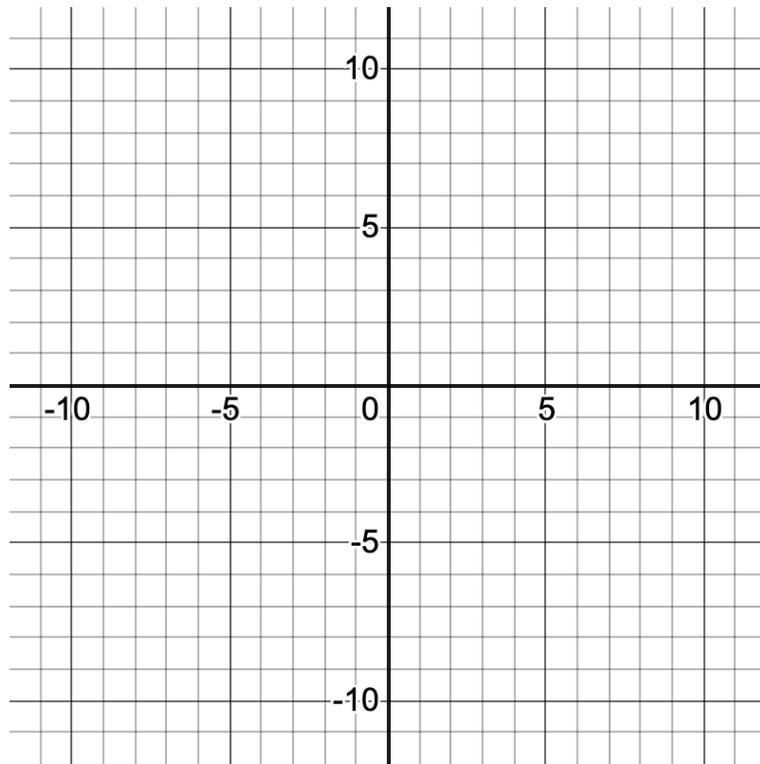


b)  $y = -\frac{1}{2}x - 5$

x	$y = -\frac{1}{2}x - 5$
-2	
0	
1	
2	

(use the same coordinate grid for both a and b)

- c) Graph the line that contains the point  $(-6, 0)$  and has a slope of  $\frac{2}{3}$

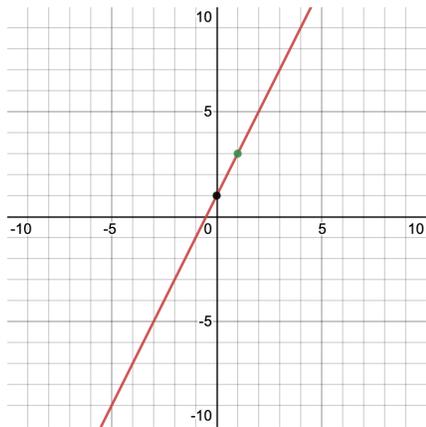


- d) Graph the line that is parallel to the line in c) and includes the point  $(0,0)$ .  
*(Use the same coordinate grid.)*

What is the equation for the parallel line you just sketched?

7. Write an equation for each graph by identifying its slope and its y-intercept.

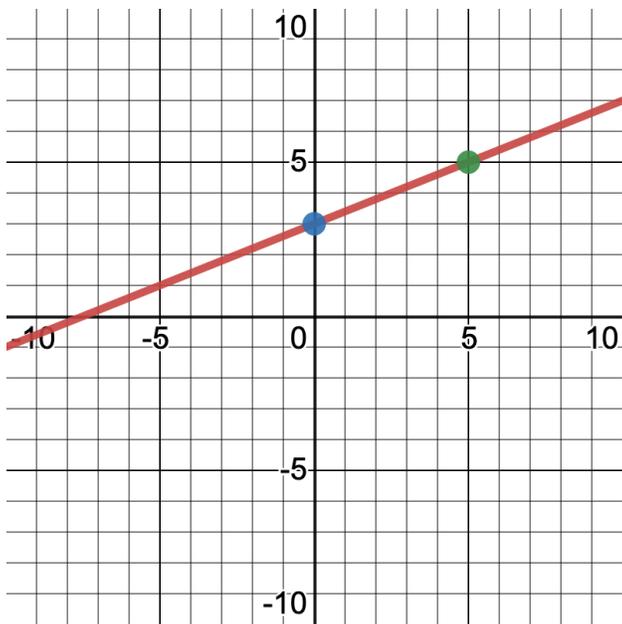
Example:



Solution:  $slope = \frac{rise}{run} = \frac{2}{1} = 2$

$y - intercept = 1$

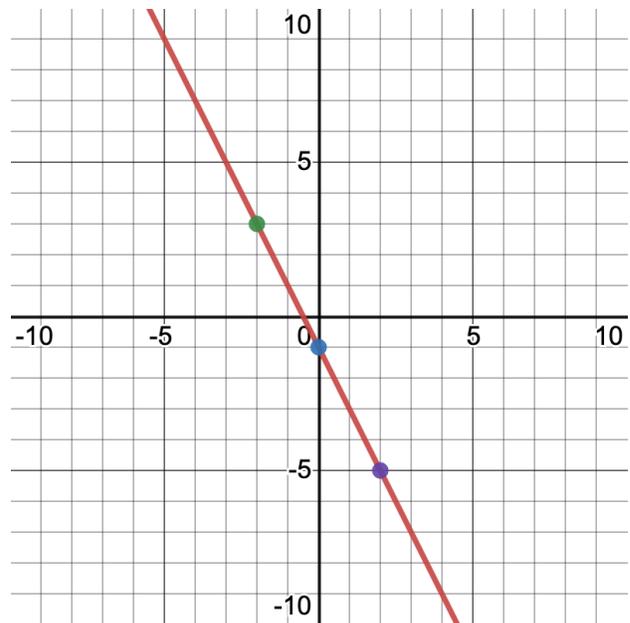
$Equation : y = 2x + 1$



Slope:

y-intercept :

Equation :



Slope:

y-intercept :

Equation :

**8. Change the equation from standard form to slope-intercept form by solving for y.**

Example:  $3x + 4y = 6$

Solution:  $3x + 4y = 6$                       *subtract 3x from both sides*

$$4y = 6 - 3x \quad \textit{divide by 4 on both sides}$$

$$y = \frac{6-3x}{4} \quad \textit{put into slope-intercept form}$$

$$y = \frac{6-3x}{4} = \frac{6}{4} - \frac{3}{4}x = -\frac{3}{4}x + \frac{6}{4} = -\frac{3}{4}x + \frac{3}{2}$$

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

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a)  $-x + 4y = 8$

b)  $5x + 3y = 24$

c)  $-2x - 5y = 10$

**9. Solve the system of equation by using substitution or elimination methods**

Example:  $5x + 2y = 9$   
 $y = -x - 3$

Solution: Using substitution we can substitute for  $y$  in the first equation:  
 $5x + 2(-x - 3) = 9$  *Distribute*  
 $5x + -2x - 6 = 9$  *Combine like terms*  
 $3x - 6 = 9$  *Add 6 to both sides*  
 $3x = 15$  *Divide by 3 on both sides*  
 $x = 5$

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a)  $6y - 9 = x$   
 $x = -3y$

b)  $3x - 2y = 4$   
 $5x + 2y = 12$

c)  $-2x + 3y = 4$   
 $x = y - 3$

d)  $x + y = 2$   
 $2x + 7y = 9$

**10. Solve the problems by writing a system of equations and solving it.**

**Example:** There are a total of 142 laptops and desktop computers in a lab.  
There are 6 more laptops than desktop computers.  
What is the total number of laptops in the lab?

**Solution:** Let  $x$  = number of laptops and  $y$  = number of desktops  
Equation 1:  $x + y = 142$   
Equation 2:  $x = y + 6$

Using substitution:  $(y + 6) + y = 142$   
 $2y + 6 = 142$   
 $2y = 136$   
 $y = 68$

*There are 68 desktops and 74 laptops.*

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a) A company produced 300 items of clothing. Shirts were sold for \$20 each, and pants were sold for \$30 each. The company made total sales of \$7,000 for the clothing. How many shirts did the company sell?

b) The difference of two numbers is 9. Their sum is 47. Find the numbers.

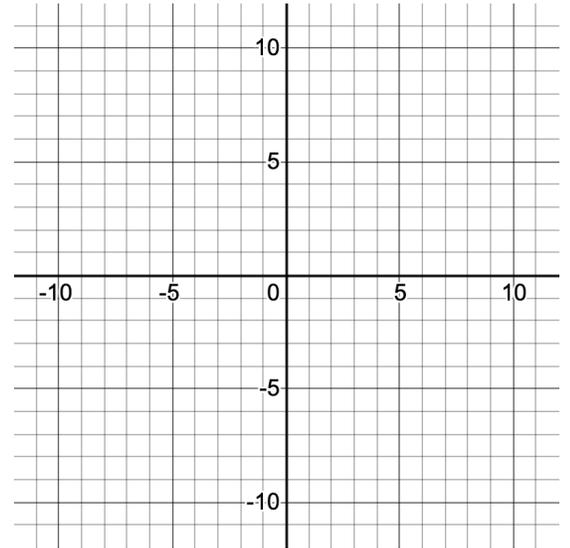
## 11. Quadratics

Fill in the table of values and sketch a graph of the equation.

*(hint: the graph will not be a straight line)*

$$y = x^2 - 2x - 3$$

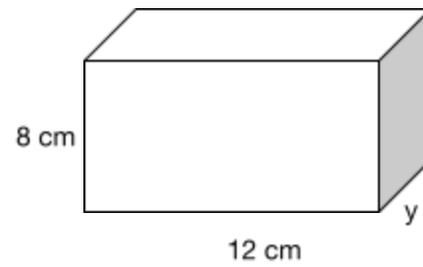
x	$y = x^2 - 2x - 3$
-1	
0	
1	
2	
3	



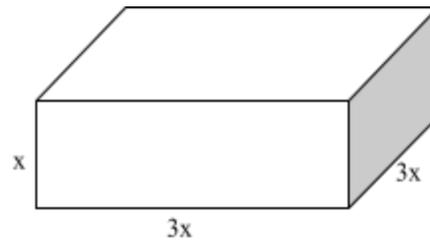
- What are the x-intercepts of the graph?
- What are the coordinates of the vertex?

12. Volume and Surface Area

- a) If the volume is  $480 \text{ cm}^3$ , what is the length of the missing side labeled  $y$ ?

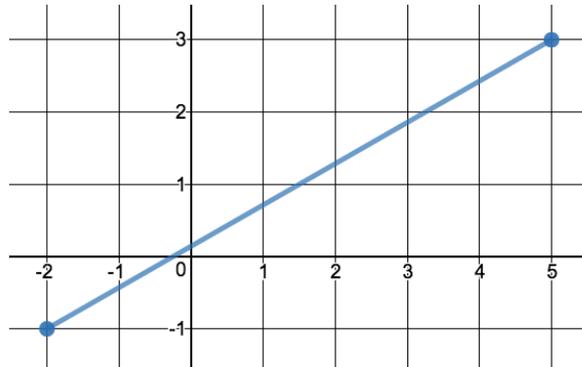


- b) The surface area =  $1,080 \text{ sq. cm.}$  Find  $x$ .



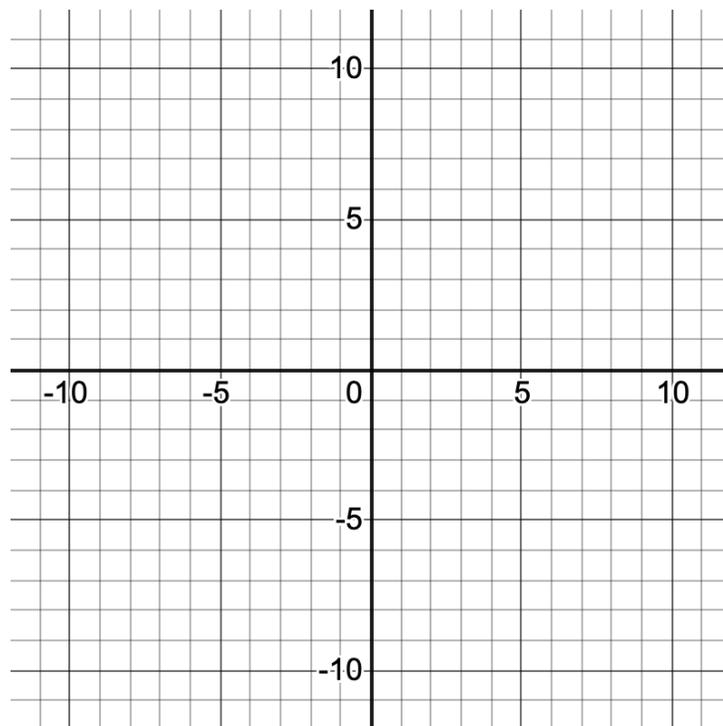
### 13. Coordinate Geometry

- a) What are the coordinates of the midpoint of this segment?



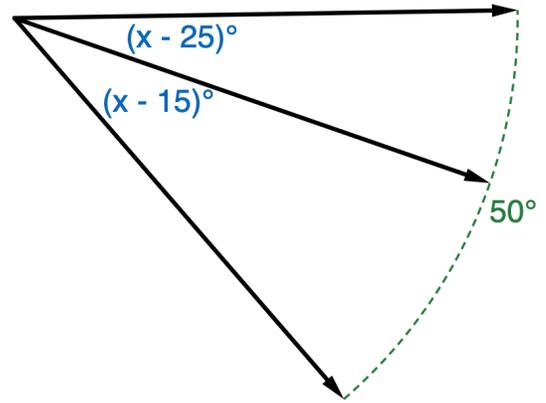
- b) Use the Pythagorean Theorem to calculate the distance between the two points.  
Leave your answer in radical form.

$A(4, 3)$  and  $B(9, -1)$



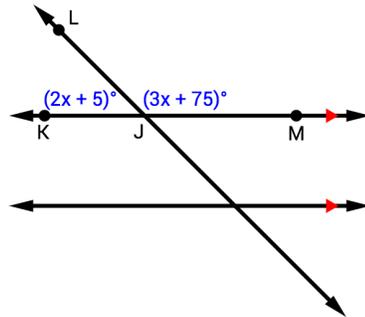
### 14. Angle Relationships

a) What is the value of  $x$  in the figure?



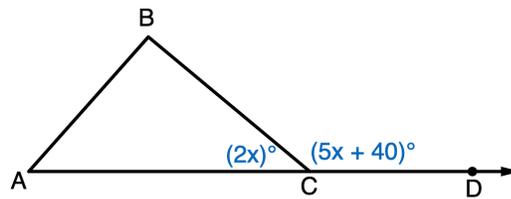
b) Find the value of  $x$  in the figure.

What is the measure of  $\angle KJL$ ?



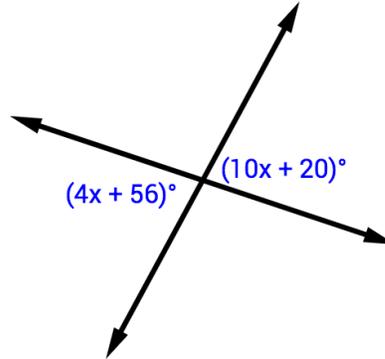
c) What is the value of  $x$ ?

What is the measure of angle  $\angle BCD$  ?



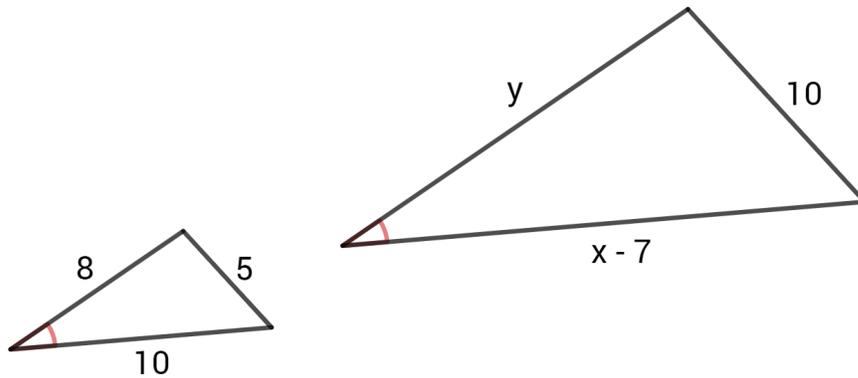
d) What is the value of  $x$ ?

What are the measures of each angle?

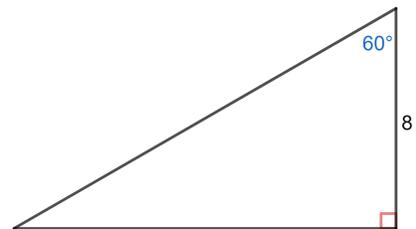
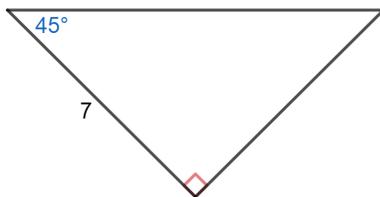


### 15. Triangle Similarity and Congruence.

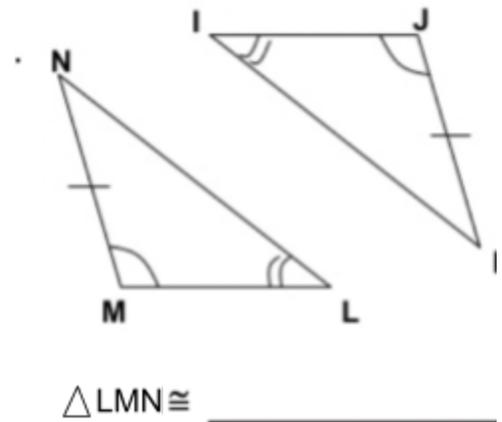
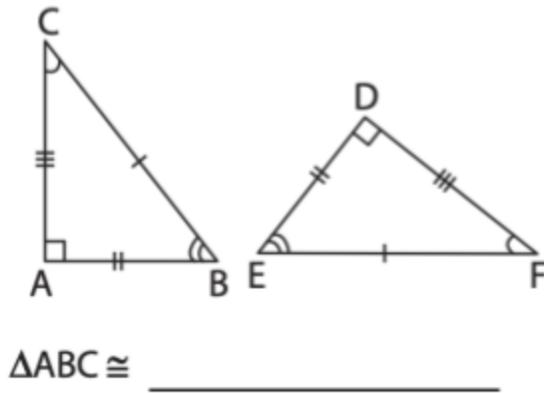
a) The polygons below are similar. What are the values of  $x$  and  $y$ ?



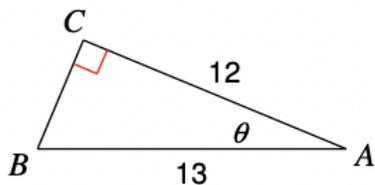
b) Find the length of all missing sides in each triangle.



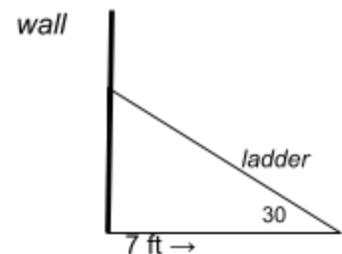
- c) Complete the Triangle Congruence statement. Explain how you know using appropriate Theorem. If there are not two congruent triangles, explain why you think that.



### 16. Right Triangle Trigonometry.



- What is the length of side CB?
  - What is  $\sin(\theta)$ ?
  - What is  $\cos(\theta)$ ?
  - What is  $\tan(\theta)$ ?
- e) A ladder leaning against a house makes an angle of  $30^\circ$  with the ground. The foot of the ladder is 7 feet from the foot of the house. How long is the ladder?  
(You may use a calculator to help with this problem. Round your answer to the nearest tenth.)



Woohoo!! Your math brains are happy!  
Nice job....and if you are hungry for more, keep going!

## PROBLEMS TO PONDER : OPTIONAL CHALLENGES!

1. Use any whole numbers 1 through 9 at most one time each to create an equation whose solution would be the **largest** possible value for  $x$ .

$$\square x + \square = \square$$

2. Use the whole numbers 1 through 9, at most one time each, to make the value of  $x = 2.75$

$$\square + \square(x - \square) = \square$$

3. Using the integers **-9 to 9** at most one time each, fill in the boxes to create coordinates that represent the vertices of a triangle with an area of less than 55 square units.

$$A: (\square, \square)$$

$$B: (\square, \square)$$

$$C: (\square, \square)$$

4. Fill in the box with any number that will create an equation with a slope of  $\frac{1}{2}$ .

$$3x - \square y = 12$$

Woohoo! Your math brains are ecstatic!

**Remember to bring your work to your math teacher during the first week of classes!**

