SIXTH GRADE MATHEMATICS

CHAPTER 9

GEOMETRIC PROPERTIES

TOPICS COVERED:

- Geometry Vocabulary
- Digital Picture Treasure Hunt
- Four Triangle Project
- Naming, Measuring, and Drawing Angles
- Classifying Angles
- Classifying Triangles
- Classifying Quadrilaterals
- Classifying Polygons
- Congruent and Similar Figures
- Transformations
- Line of Symmetry
- Coordinate Grids

Geometry is the area of mathematics that deals with the properties of points, lines, surfaces, and solids. It is derived from the Greek "geometra" which literally means earth measurement.

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Activity 9-1: **Dictionary of Geometry** Name:

Basic Geometric Ideas

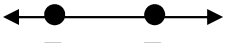
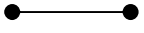
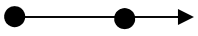
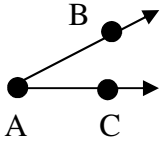
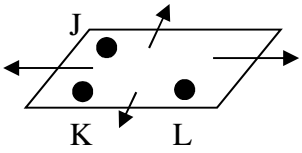
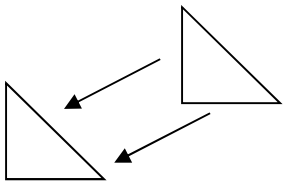
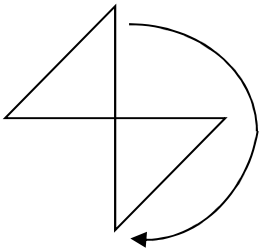
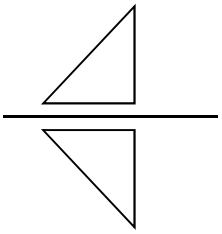
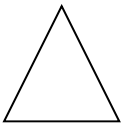
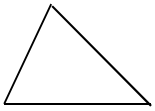
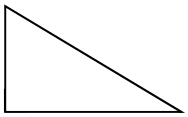
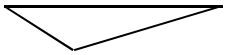
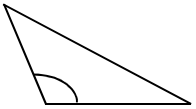
Description	Example	Symbol/Read
A **point** marks an exact location in space.	 A	Point A
A **line** is a collection of points along a straight path extending endlessly in both directions.	 E F	Line EF $\overleftrightarrow{EF}$
A **line segment** is a part of a line between two endpoints.	 A D	Line segment AD $\overline{AD}$
A **ray** is a part of a line that has one endpoint and extends endlessly in one direction.	 A C	Ray AC $\overrightarrow{AC}$
An **angle** is formed by two rays with a common endpoint called a **vertex**.	 B A C	Angle BAC $\angle BAC$ Vertex A
A **plane** is a flat surface extending endlessly in all directions.	 J K L	Plane LJK

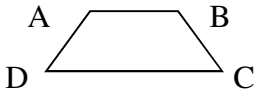
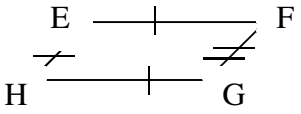
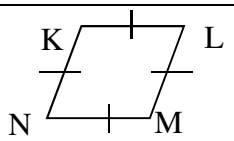
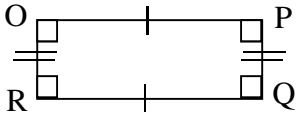
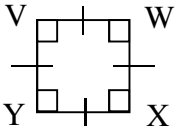
Figure Movement = Transformations

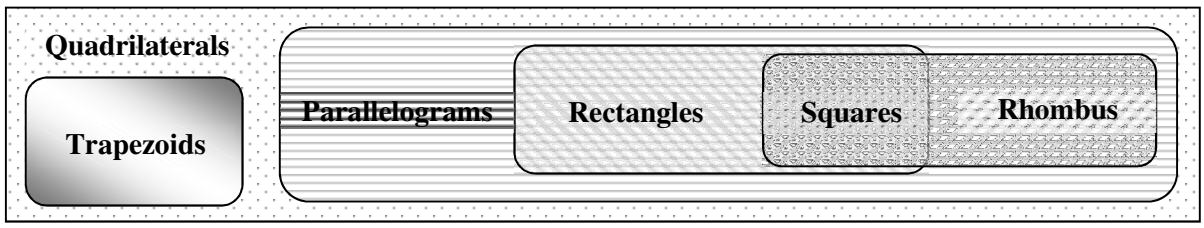
 A change in position resulting from a slide is called a **translation**.	 A change in position resulting from a turn is called a **rotation**.	 A change in position resulting from a flip is called a **reflection**.

Triangles

Classified by Side Length		*Classified by Largest Type of Angle*	
Description	**Example**	**Description**	**Example**
Equilateral Three sides have the same length (all sides congruent).		**Acute** All angles are acute (less than 90 degrees).	
Isosceles Two sides have the same length (two sides congruent).		**Right** There is one right angle (90 degree angle).	
Scalene No sides have the same length (no congruent sides).		**Obtuse** There is one obtuse angle (greater than 90 degrees).	

Quadrilaterals

Description	**Example**
A **trapezoid** has exactly one pair of parallel sides.	$\overline{AB} \parallel \overline{DC}$ 
A **parallelogram** has two pairs of parallel sides. Opposite sides are parallel and congruent.	$\overline{EF} \parallel \overline{HG}$ $\overline{EH} \parallel \overline{FG}$ 
A **rhombus** is a parallelogram with all congruent sides. It has four congruent sides and opposite sides are parallel.	
A **rectangle** is a parallelogram with four right angles. Opposite sides are parallel and congruent.	
A **square** is a rectangle with four congruent sides. It has four right angles and opposite sides are parallel.	



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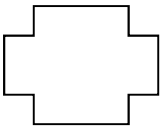
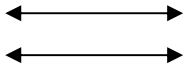
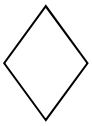
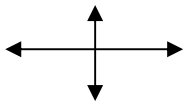
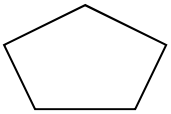
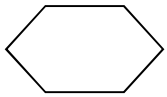
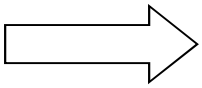
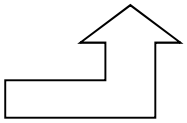
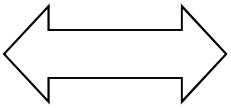
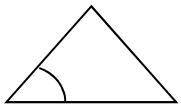
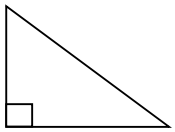
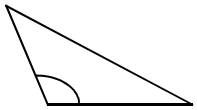
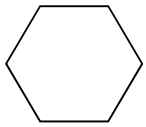
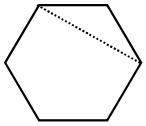
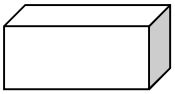
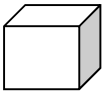
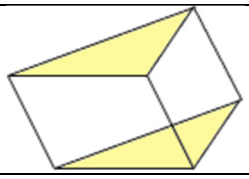
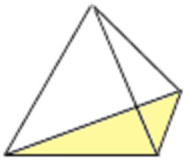
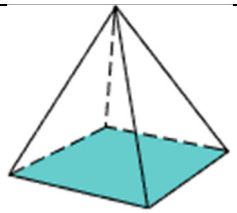
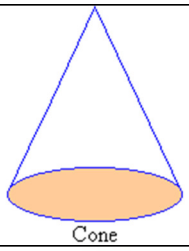
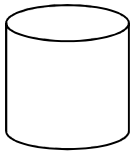
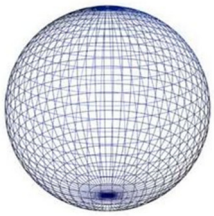
Shapes/Lines/Angles

Description	Example	Description	Example
A **polygon** is a closed figure formed by line segments joined only at their endpoints.		**Parallel lines** are lines in the same plane that never meet.	
A **quadrilateral** is a polygon with four sides.		**Perpendicular lines** are lines that cross at a 90 degree angle.	
A **pentagon** is a polygon with five sides.		A **hexagon** is a polygon with six sides.	
A **heptagon** is a polygon with seven sides.		An **octagon** is a polygon with eight sides.	
A **nonagon** is a polygon with nine sides.		A **decagon** is a polygon with ten sides.	
An **acute angle** is an angle less than 90 degrees.		A **right angle** is an angle that measures 90 degrees.	
An **obtuse angle** is an angle greater than 90 degrees and less than 180 degrees.		A **regular polygon** is a polygon with all sides congruent and all angles congruent.	
A **diagonal** is a line segment that connects two vertices of a polygon and is not a side.			

3-D Figures

Description	Example	Description	Example
A **prism** is a 3-dimensional figure with 2 faces that are both parallel and congruent and the rest of the faces are rectangles or parallelograms.			
Rectangular prism		Cube	
Triangular prism			
A **pyramid** has one base with triangular sides and a vertex at its top.			
Triangular pyramid		Square pyramid	
Curved surface shapes			
Cone		Cylinder	
Sphere			

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Activity 9-2: **Geometry Vocabulary** Name:

Polygons **Word bank:** Triangle Decagon Nonagon Octagon Quadrilateral Hexagon Pentagon Heptagon Regular polygon	A polygon with…	3 sides	1.
		4 sides	2.
		5 sides	3.
		6 sides	4.
		7 sides	5.
		8 sides	6.
		9 sides	7.
		10 sides	8.
		all sides congruent and all angles congruent	9.

Four sided polygons (Quadrilaterals) **Word bank:** Trapezoid Parallelogram Rectangle Rhombus Square	Parallelogram, 4 right angles	10.
	Exactly one pair of opposite sides parallel	11.
	Opposite sides parallel, opposite sides congruent	12.
	Parallelogram, 4 right angles, 4 congruent sides	13.
	Parallelogram, 4 congruent sides	14.

Shape movement **Word bank:** Transformation Reflection Rotation Translation	The movement of a geometric figure	15.
	A figures SLIDES from one location to another without changing its size or shape	16.
	A figure is TURNED without changing its size or shape	17.
	A figure is FLIPPED over a line without changing its size or shape	18.

Angle **Word bank:** Angle Acute angle Right angle Straight angle Obtuse angle Vertex Diagonal	An angle that is exactly 180°	19.
	An angle that is less than 90°	20.
	The point of intersection of two sides of a polygon	21.
	An angle that is between 90° and 180°	22.
	An angle that is exactly 90°	23.
	A segment that joins two vertices of a polygon but is not a side	24.
	A figure formed by two rays that begin at the same point	25.

Triangle **Word bank:** Acute triangle Right triangle Obtuse triangle Scalene triangle Isosceles triangle Equilateral triangle	A triangle with one angle of 90°	26.
	A triangle with all angles less than 90°	27.
	A triangle with no congruent sides	28.
	A triangle with at least 2 congruent sides	29.
	A triangle with an angle greater than 90°	30.
	A triangle with 3 congruent sides	31.

Line **Word bank:** Perpendicular line Ray Line Intersecting lines Parallel lines Line segment Point Plane	An exact spot in space	32.
	A straight path that has one endpoint and extends forever in the opposite direction	33.
	Lines that cross at a point	34.
	Lines that do not cross no matter how far they are extended	35.
	A straight path between two endpoints	36.
	Lines that cross at 90°	37.
	A thin slice of space extending forever in all directions	38.
	A straight path that extends forever in both directions	39.

Figures/Angles **Word bank:** Congruent figures Similar figures Line of symmetry Complementary angles Supplementary angles	Angles that add up to 90°	40.
	Angles that add up to 180°	41.
	Figures that are the same size and same shape	42.
	Figures that are the same shape and may or may not have same size	43.
	Place where a figure can be folded so that both halves are congruent	44.

		FREE SPACE		

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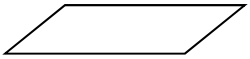
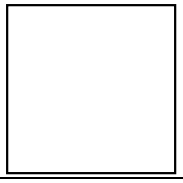
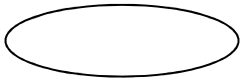
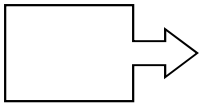
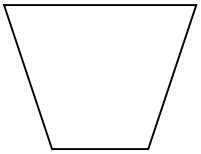
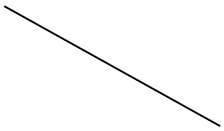
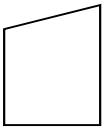
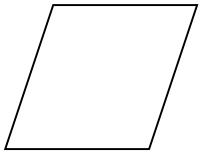
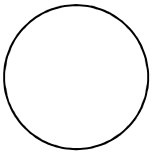
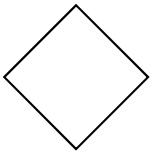
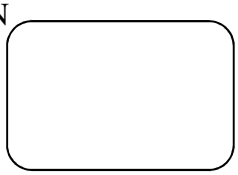
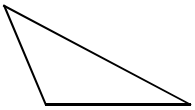
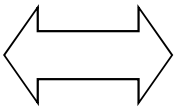
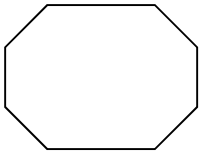
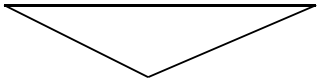
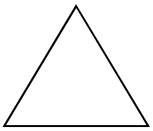
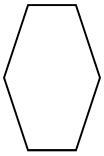
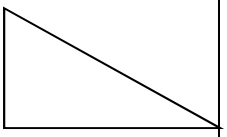
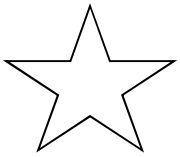
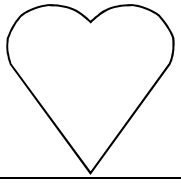
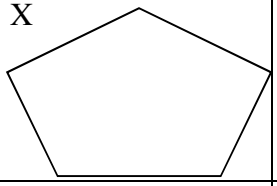
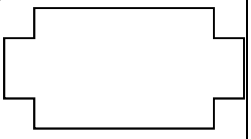
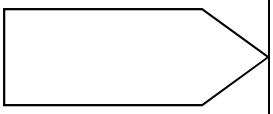
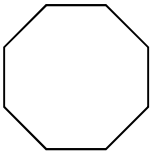
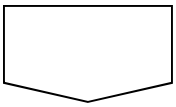
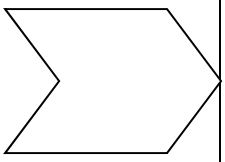
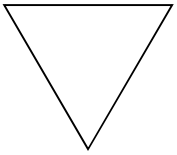
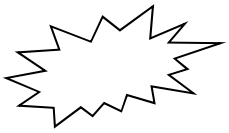
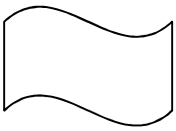
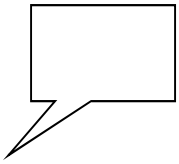
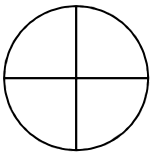
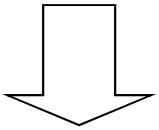
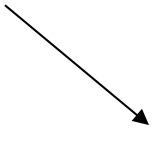
Activity 9-3: **Geometry Vocabulary** Name:

Polygons	Triangles
Regular polygon	Equilateral triangles
Quadrilaterals	Scalene triangles
Pentagons	Isosceles triangles
Hexagons	Acute triangles
Heptagons	Right triangles
Octagons	Obtuse triangles
Nonagons	Rectangles
Decagons	Squares
Circles	Parallelograms
Ovals	Rhombuses
Lines	Trapezoids
Rays	Line segments

A 	B 	C 	D 	E 
F 	G 	H 	I 	J 
K 	L 	M 	N 	O 
P 	Q 	R 	S 	T 
U 	V 	W 	X 	Y 
Z 	A1 	B1 	C1 	D1 
E1 	F1 	G1 	H1 	J1
K1 	L1 	M1 	N1 	O1 
P1	Q1	R1	S1	T1

Created by Lance Mangham, 6th grade teacher, Carroll ISD

Activity 9-4: **Picture Treasure Hunt** Name:

Team Members		

Mission: To find items around the school which demonstrate the geometry vocabulary words we have been studying.

Steps to carry out your mission:

1. You are assigned to a team. Your team **MUST** be together (within sight of each other) at all times. There is enough work so that all members of your team can be actively involved. An example of how to divide up work is shown below:

   A. One person in charge of the camera
   B. One person in charge of vocabulary sheet and marking items as you go along
   C. Two people in charge of locating as many different vocabulary words as possible
   D. One person is charge of writing down which picture will go with which vocabulary word (picture number)

2. At a minimum (to earn a passing grade), your team must find at least 2 items from each section on the vocabulary page. Your group must have at least 5 pictures per person. The more items you find and the higher quality your PowerPoint is, the better your grade will be!! Finding words that no other group finds can also add to your total score.

3. **Picture Taking** - Look around the area designated by your teacher for the examples your group has picked. Take pictures once you are sure you have found the best example possible. You may not use the same picture for more than one item. For the easiest placement into PowerPoint take all pictures horizontally. If you finish early, decide how your team is going to divide up the work in the computer lab. You can work individually or in pairs in the computer lab.

4. Your teacher will place all pictures on the school's server and will tell you how to access them for use in PowerPoint.

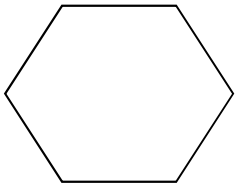
5. **PowerPoint Presentation** – Create a PowerPoint presentation of all the vocabulary words you have found. Each word should be on a separate page. The slide title should be the vocabulary word. The slide should also contain the definition. Use arrows or highlights in some way so that everyone can tell exactly which part of the picture represents your vocabulary word. Once each person/pair has completed their section your teacher will help you combine all files into one complete PowerPoint.

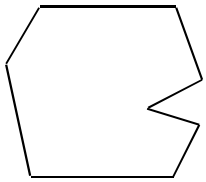
6. **ONLY add cool fonts, backgrounds, and other "fancy stuff" once your group has one complete presentation. This is not an important part of your grade!!!**

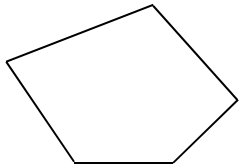
How to insert a picture into PowerPoint:

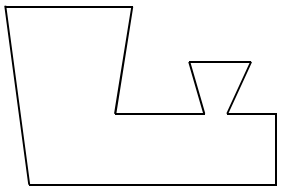
Choose INSERT, then PICTURE, then FROM FILE. Your teacher will tell you how to find the appropriate folder.

Activity 9-5: **Polygons** Name:

A 

B 

C 

D 

1.	A triangle is a _____ with three sides.	
2.	A polygon with four sides and four angles is a _____.	
3.	A polygon with five sides and five angles is a _____.	
4.	A polygon with six sides and six angles is a _____.	
5.	An octagon is a polygon with eight sides and eight _____.	
6.	A polygon with ten sides and ten angles is a _____.	
7.	In the set of figures above, Figure A is a(n) _____.	
8.	Figure B is a(n) _____.	
9.	Figure C is a(n) _____.	
10.	Figure D is a(n) _____.	
11.	The point of intersection of two sides of a polygon is called a _____.	
12.	A line segment (not a side) connecting two vertices of a polygon is called a _____.	
13.	A polygon with all sides the same length and all angles the same measure is called a _____ polygon.	

Activity 9-6: **Four Triangles** Name:

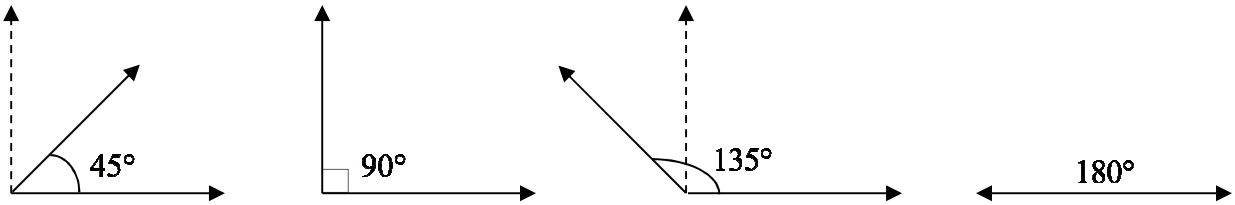
		Sides	Specific shape	Perimeter	Sum of Angles
1	Square		Square		
2	Triangle				

	Made With	Sides	Specific shape	Perimeter	Sum of Angles
3	2 Triangles				
4	2 Triangles				
5	2 Triangles				
6	3 Triangles				
7	3 Triangles				
8	3 Triangles				
9	3 Triangles				
10	4 Triangles				
11	4 Triangles				
12	4 Triangles				
13	4 Triangles				
14	4 Triangles				
15	4 Triangles				
16	4 Triangles				
17	4 Triangles				
18	4 Triangles				
19	4 Triangles				
20	4 Triangles				
21	4 Triangles				
22	4 Triangles				
23	4 Triangles				

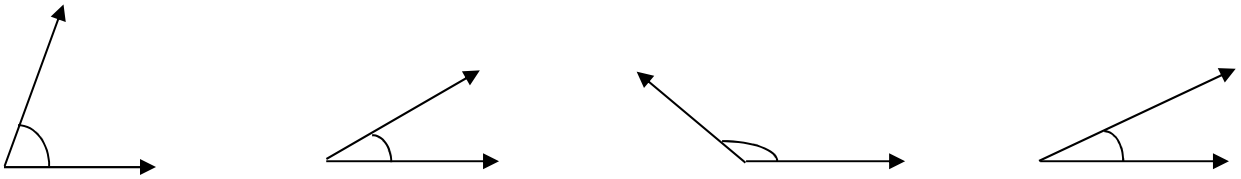
What pattern or rule do you notice between the number of sides on a shape and the sum of the angles?

Activity 9-7: **Estimating Angles** Name:

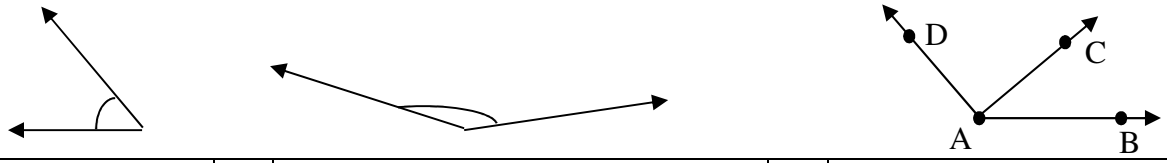
Reference Angles:



Determine the best estimate for each angle. Circle your answer.



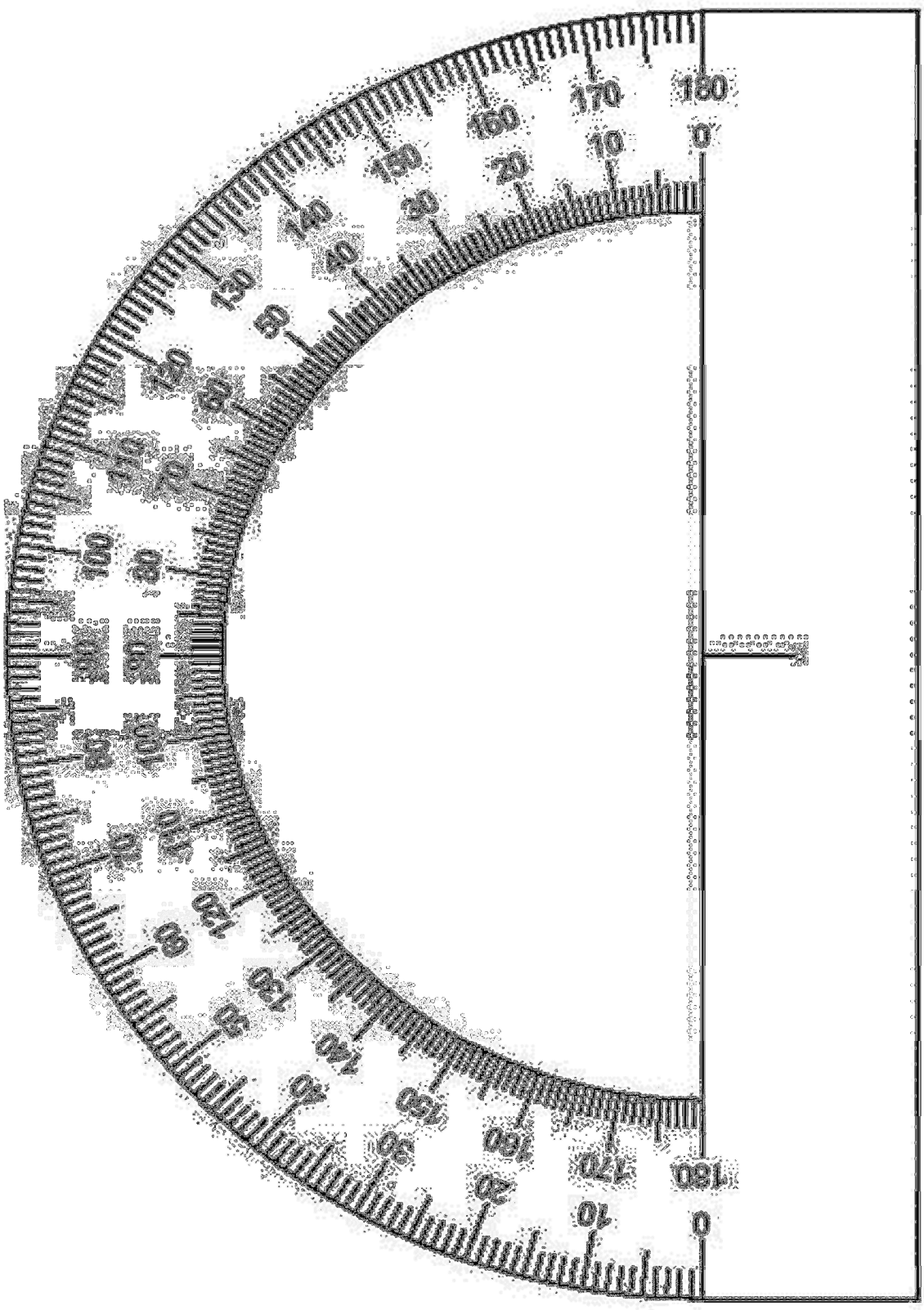
1.	35° 70° 120°	2.	65° 30° 150°	3.	95° 170° 140°	4.	55° 25° 85°



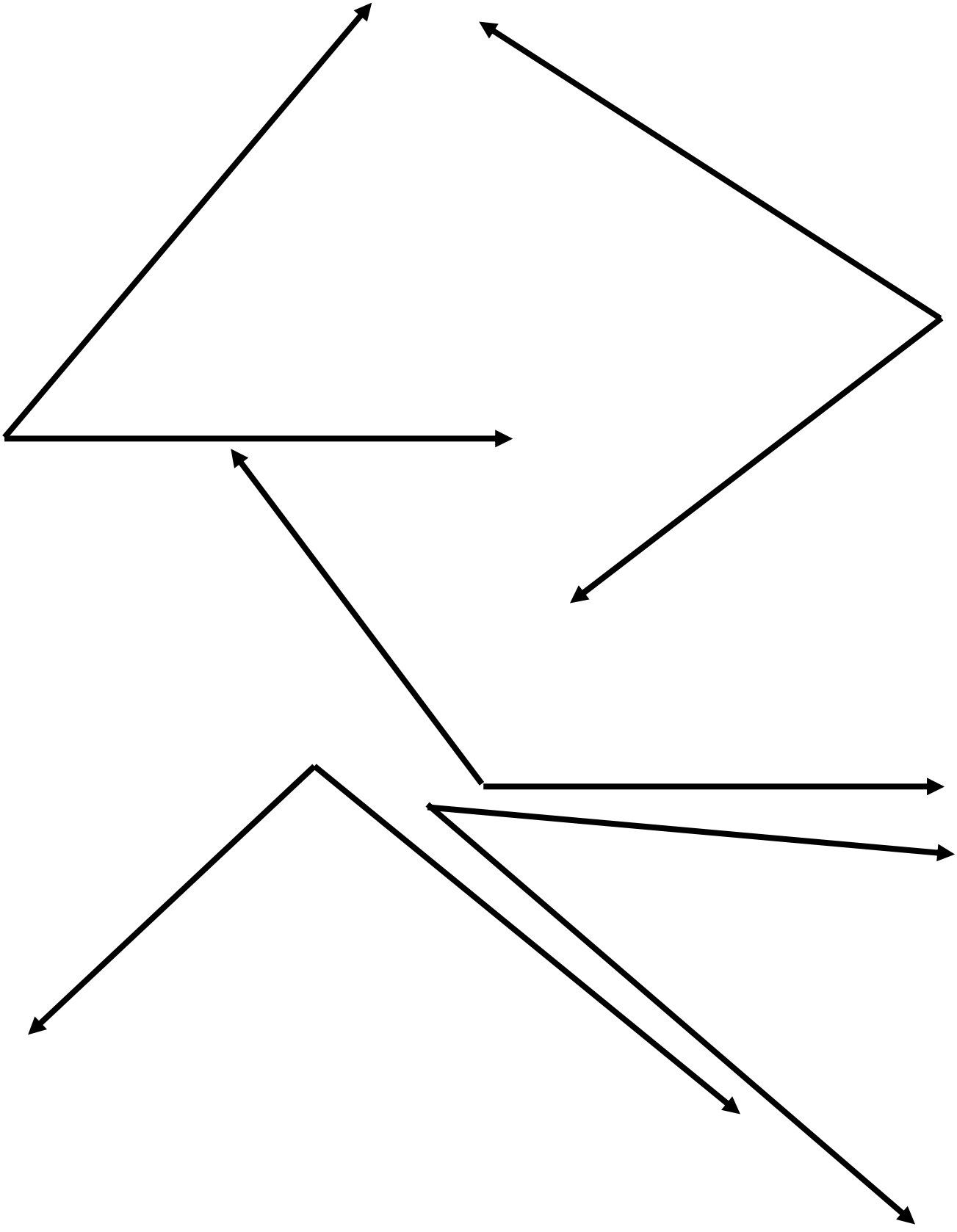
5.	50° 80° 110°	6.	25° 110° 155°	7.	*m*∠*BAC* is about…	40° 15°
				8.	*m*∠*CAD* is about…	65° 90°
				9.	*m*∠*BAD* is about…	100° 130°

10.	*m*∠*POR* is about… 160° 120°	13.	*m*∠*YXZ* is about… 60° 35°
11.	*m*∠*POQ* is about… 40° 15°	14.	*m*∠*ZYX* is about… 45° 25°
12.	*m*∠*QOR* is about… 105° 140°	15.	*m*∠*YZX* is about… 75° 40°

Activity 9-8: **Measuring Angles** Name:



Measure Angles: Write what type of angle each is and then measure it.



Activity 9-10: **Measuring Angles** Name:

Draw the following angles using a protractor on a separate sheet of paper.

1. 43 degree angle

2. 116 degree angle

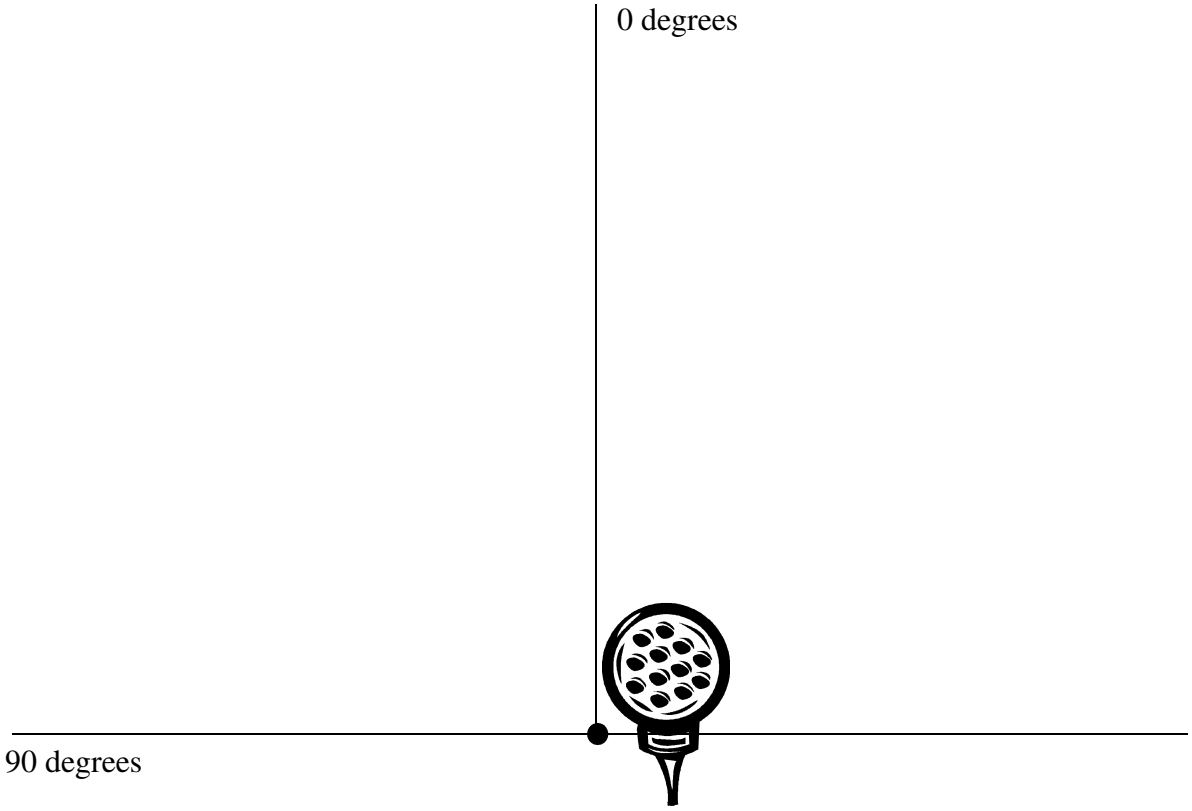
3. 135 degree angle

4. 20 degree angle

5. 165 degree angle

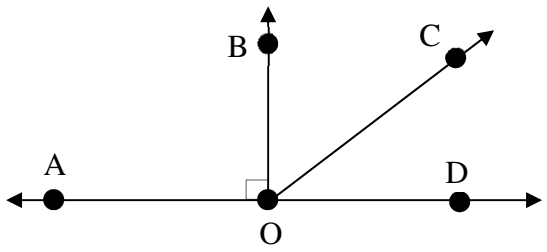
If you play golf, then you know the difference between a 3 iron and a 9 iron. Irons in the game of golf are numbered 1 to 10. The head of each is angled differently for different kinds of shots. The number 1 iron hits the ball farther and lower than a number 2, and so on. Use the table below to draw all the different golf club angles on the line segment below. Please use the 0 degree line as your starting point.

1 iron	15 degrees	6 iron	32 degrees
2 iron	18 degrees	7 iron	36 degrees
3 iron	21 degrees	8 iron	40 degrees
4 iron	25 degrees	9 iron	45 degrees
5 iron	28 degrees	Pitching wedge	50 degrees



Activity 9-11: **Angles** Name:

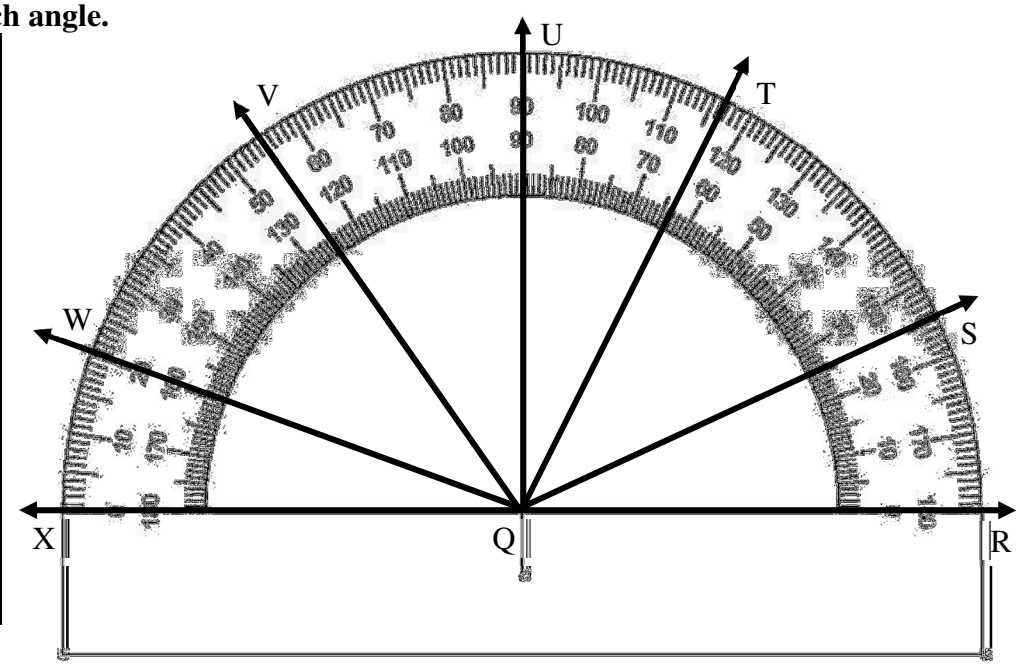
Complete each statement.



1.	The figure formed by two rays from the same endpoint is an…	
2.	The intersection of the two sides of an angle is called its…	
3.	The vertex of $\angle COD$ in the drawing above is point…	
4.	The instrument used to measure angles is called a…	
5.	The basic unit in which angles are measured is the…	
6.	$\angle AOB$ has a measure of $90°$ and is called a _____ angle.	
7.	An angle whose measure is between $0°$ and $90°$ is an _____ angle.	
8.	Two acute angles in the figure are $\angle BOC$ and _____.	
9.	An angle whose measure is between $90°$ and $180°$ is an _____ angle.	
10.	An obtuse angle in the figure is _____.	

Give the measure of each angle.

11	$\angle RQS$	
12	$\angle RQT$	
13	$\angle RQU$	
14	$\angle RQV$	
15	$\angle RQW$	
16	$\angle XQW$	
17	$\angle XQT$	
18	$\angle UQV$	
19	$\angle VQT$	
20	$\angle WQS$	



Activity 9-12: **Classifying Triangles & Quadrilaterals** Name:

Classify the triangles as right, acute, or obtuse, given the three angles.

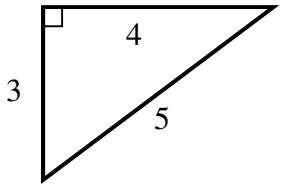
1.	40°, 30°, 110°		2.	60°, 30°, 90°	
3.	50°, 60°, 70°		4.	90°, 46°, 44°	

Classify each triangle as equilateral, isosceles, or scalene, given the lengths of the three sides.

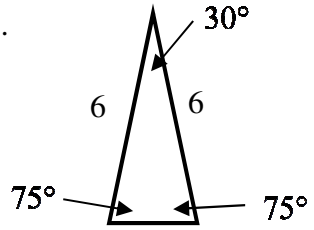
5.	3 cm, 5 cm, 3 cm		6.	50 m, 50 m, 50 m	
7.	2 ft, 5 ft, 6 ft		8.	4 m, 4m, 6m	

Give all possible names for the triangle (for example, right isosceles).

9.



10.



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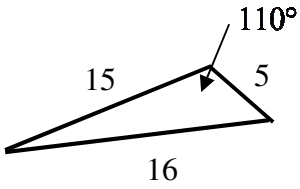

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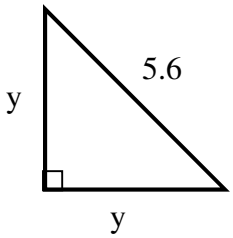
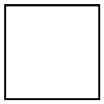
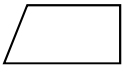
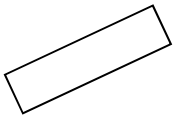
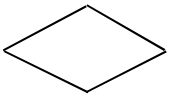
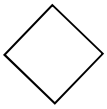
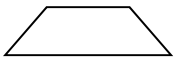
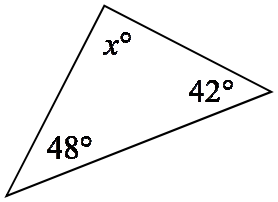
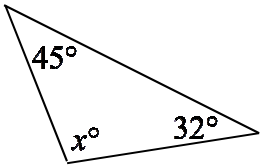


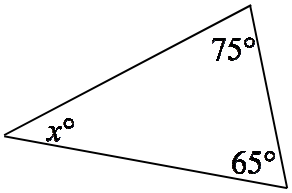
Write the name of each quadrilateral. Choose from the following names: trapezoid, parallelogram, rhombus, rectangle, and square. Some objects may have more than one name.

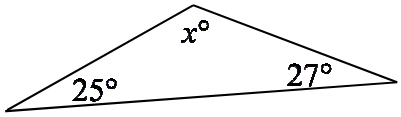
13. 	14. 	15. 	16. 
17. 	18. 	19. 	20. 

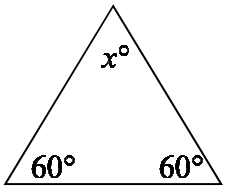
Find the value of x. Then classify each triangle as acute, right, or obtuse.

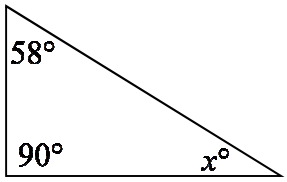
1. 

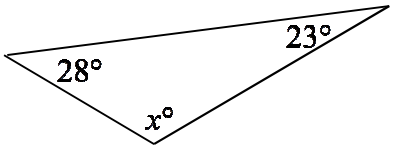
2. 

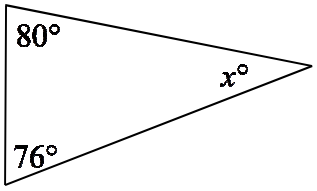
3. 

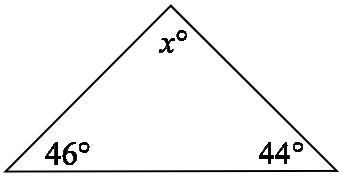
4. 

5. 

6. 

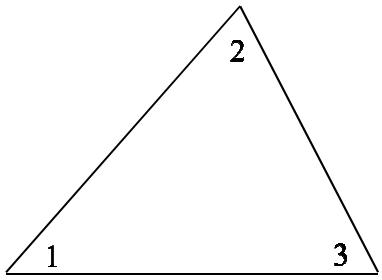
7. 

8. 

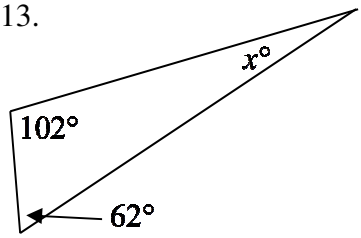
9. 

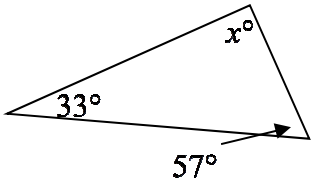
Use the figure at the right to solve each of the following.

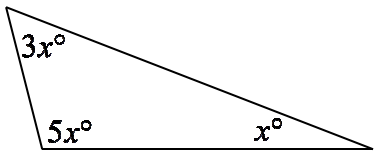
10.	Find $m\angle 1$ if $m\angle 2 = 30°$ and $m\angle 3 = 55°$.	
11.	Find $m\angle 1$ if $m\angle 2 = 45°$ and $m\angle 3 = 90°$.	
12.	Find $m\angle 1$ if $m\angle 2 = 110°$ and $m\angle 3 = 25°$.	



Find the measure of the angles in each triangle.

13. 

14. 

15. 

Activity 9-14: **Triangles** Name:

Draw each of the following types of triangles.

1. Acute and scalene

2. Acute and isosceles

3. Acute and equilateral

4. Right and scalene

5. Right and isosceles

6. Obtuse and scalene

7. Obtuse and isosceles

Find the measure of the missing angle in each triangle and the sum of the angles.

	Angle 1	**Angle 2**	**Angle 3**	**Sum of angles**
8.	100°	50°		
9.		60°	60°	
10.	10°		90°	
11.	171°	4°		
12.		57°	44°	
13.	106°		38°	
14.	37°	37°		
15.		45°	45°	

Activity 9-15: **Quadrilaterals** Name:

Choose ALL, SOME, or NO

1.	All	Some	No	rectangles are parallelograms.
2.	All	Some	No	parallelograms are squares.
3.	All	Some	No	squares are rhombi.
4.	All	Some	No	rhombi are parallelograms.
5.	All	Some	No	trapezoids are rectangles.
6.	All	Some	No	quadrilaterals are squares.
8.	All	Some	No	parallelograms are trapezoids.
9.	All	Some	No	rectangles are rhombi.
10.	All	Some	No	squares are rectangles.
11.	All	Some	No	rectangles are squares.
12.	All	Some	No	squares are quadrilaterals.
13.	All	Some	No	quadrilaterals are rectangles.
14.	All	Some	No	parallelograms are rectangles.
15.	All	Some	No	rectangles are quadrilaterals.
16.	All	Some	No	rhombi are quadrilaterals.
18.	All	Some	No	parallelogram are rhombi.
19.	All	Some	No	squares are parallelograms.
20.	All	Some	No	quadrilaterals are parallelograms.
21.	All	Some	No	parallelograms are quadrilaterals.
22.	All	Some	No	trapezoids are quadrilaterals.

Solve each riddle.

14.	I am a quadrilateral with two pairs of parallel sides and four sides of the same length. All of my angles are the same measure, too. What am I?	
15.	I am a quadrilateral with two pairs of parallel sides. All of my angles are the same measure, but my sides are not all the same length. What am I?	
16.	I am a quadrilateral with exactly one pair of parallel sides. What am I?	
17.	I am a quadrilateral with two pairs of parallel sides. What am I?	

Answer the following on a separate sheet of paper.

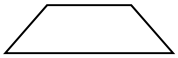
22.	Evan said, "Every rectangle is a square." Joan said, "No, you are wrong. Every square is a rectangle." Who is right? Explain your answer on your graph paper.
24.	How are a square and a rectangle different?
25.	How are a parallelogram and a rhombus different?
26.	How are a square and rhombus alike?
27.	How is a trapezoid different from the other special quadrilaterals?

Activity 9-16: **Classifying Quadrilaterals** Name:

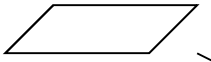
All four sided figures are quadrilaterals.

QUADRILATERALS

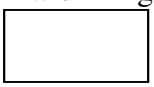
Trapezoids
Some quadrilaterals are trapezoids.



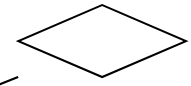
Parallelograms
Some quadrilaterals are parallelograms.



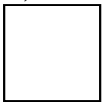
Rectangles
A parallelogram with 4 right angles.



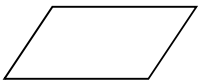
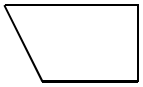
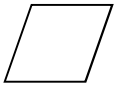
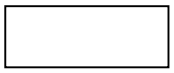
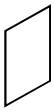
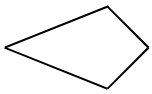
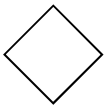
Rhombuses
A parallelogram with all sides the same length.



Squares
A parallelogram, rectangle, and rhombus all at the same time.



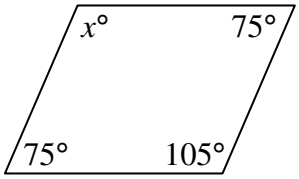
List all the names that apply to each quadrilateral. Choose from *parallelogram, rectangle, rhombus, square,* and *trapezoid*.

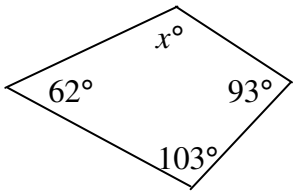
1.			2.		
3.			4.		
5.			6.		
7.			8.		
9.			10.		
11.	All trapezoids are parallelograms (T or F).				
12.	All quadrilaterals are trapezoids.				
13.	All parallelograms are trapezoids.				
14.	All squares are trapezoids.				
15.	All quadrilaterals are parallelograms.				
16.	Every rhombus is a trapezoid.				

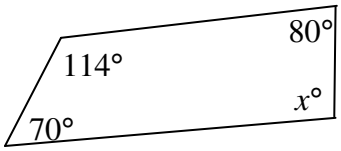
Activity 9-17: **Angles in Polygons** Name:

Find the value of x.

1. 

2. 

3. 

4. 

Write an equation to find *x* and then find all the missing angles.

5.	A trapezoid with angles 115°, 65°, 55°, and $x°$.	
6.	A quadrilateral with angles 104°, 60°, 140°, and $x°$.	
7.	A parallelogram with angles 70°, 110°, (x+40)°, and $x°$.	
8.	A quadrilateral with angles $x°$, 2x°, 3x°, and $4x°$.	
9.	A quadrilateral with angles $(x+30)°$, (x-55)°, x°, and $(x-45)°$.	
10.	Which of the following could be the angle measures in a parallelogram (all numbers are in degrees): a) 19, 84, 84, 173 b) 24, 92, 92, 152 c) 33, 79, 102, 146 d) 49, 49, 131, 131	

For any polygon with *n* sides, the following formula can be used to calculate the sum of the angles:

$$180(n-2)$$

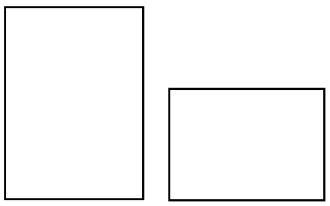
Find the sum of the measures of the angles of each polygon.

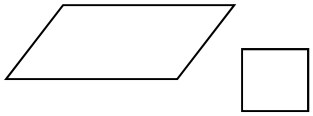
11.	quadrilateral		12.	pentagon		13.	octagon	
14.	12-gon		15.	18-gon		16.	30-gon	
17.	75-gon		18.	100-gon				

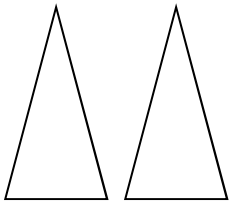
Activity 9-18: **Size and Shape** Name:

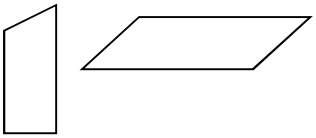
Figures that have the same size and shape are **congruent figures**.
Figures that have the same shape but may be different sizes are **similar figures**.
The symbol ≅ means "is congruent to." The symbol ~ means "is similar to."

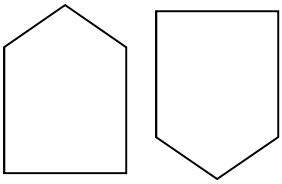
Tell whether each pair of polygons is congruent, similar, or neither. Use the correct symbol.

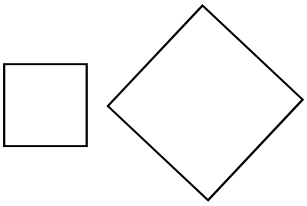
1. 

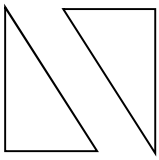
2. 

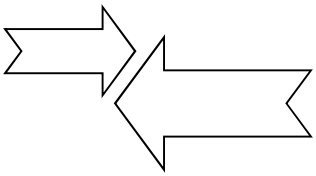
3. 

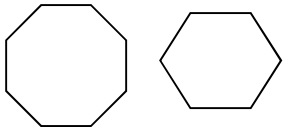
4. 

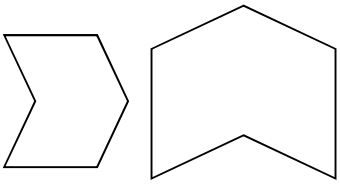
5. 

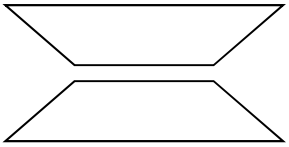
6. 

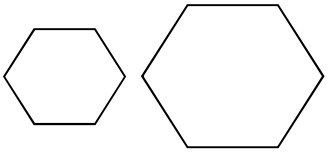
7. 

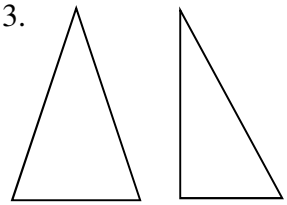
8. 

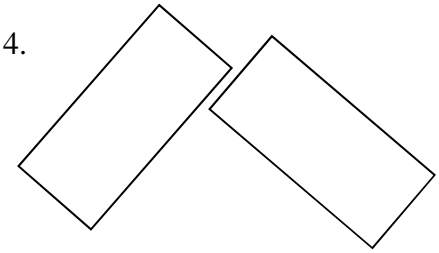
9. 

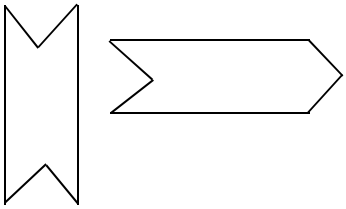
10. 

11. 

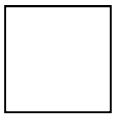
12. 

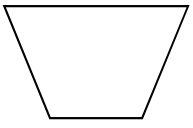
13. 

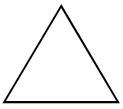
14. 

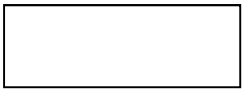
15. 

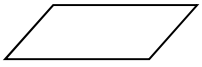
16. List the pairs that appear to be similar.

a. 

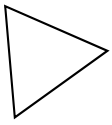
b. 

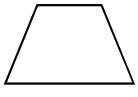
c. 

d. 

e. 

f. 

g. 

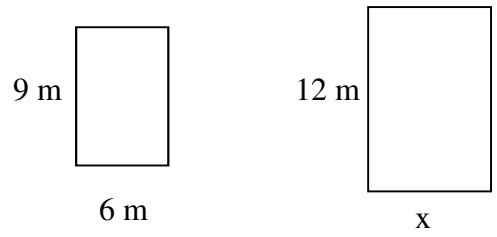
h. 

Created by Lance Mangham, 6th grade teacher, Carroll ISD

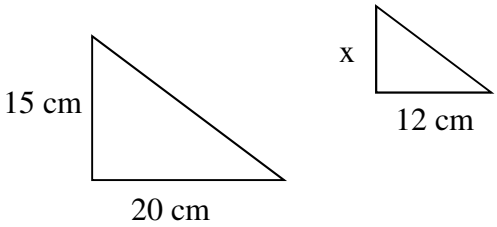
Activity 9-19: **Proportions with Similar Figures** Name:

For each pair of similar figures write a proportion and use the proportion to find the length of *x*. Use a separate sheet of paper.

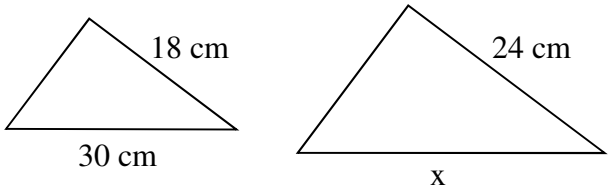
1.



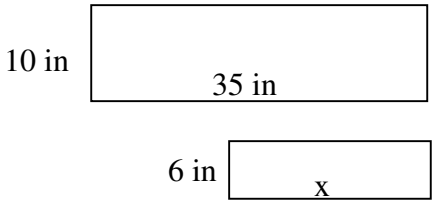
2.



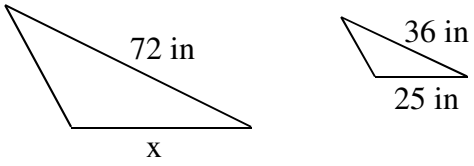
3.



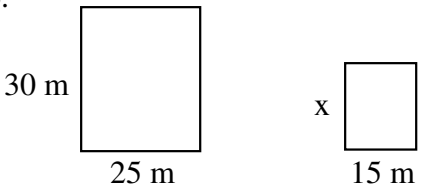
4.



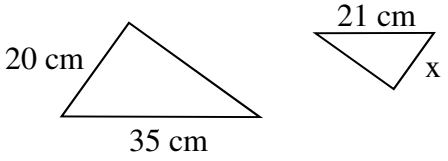
5.



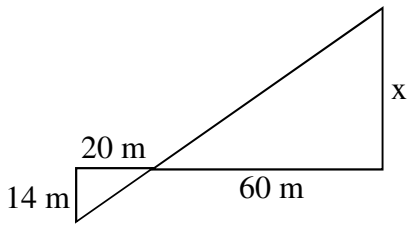
6.



7.



8.

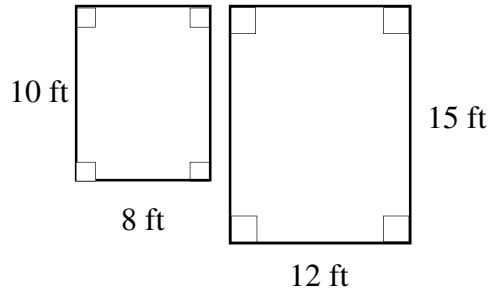


9.	A flagpole casts a shadow 10 ft long. If a man 6 ft tall casts a shadow 4 ft long at the same time of day, how tall is the flagpole?	
10.	A photograph is 25 cm wide and 20 cm high. It must be reduced to fit a space that is 8 cm high. Find the width of the reduced photograph.	

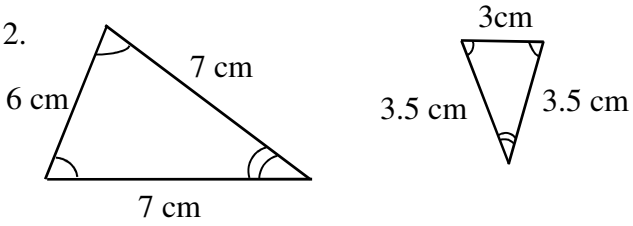
Activity 9-20: **Similar Polygons** Name:

Tell whether each pair of polygons is similar.

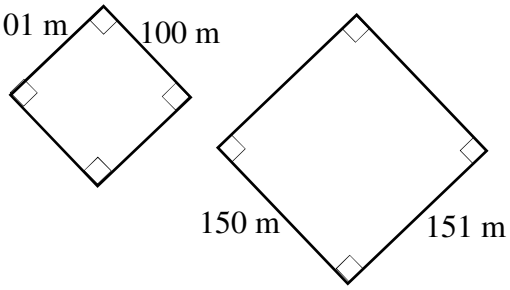
1.



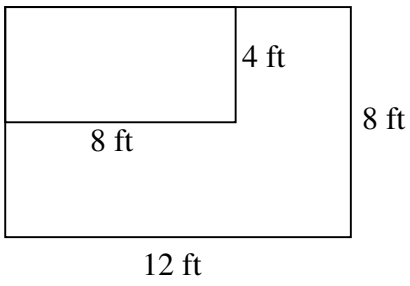
2.



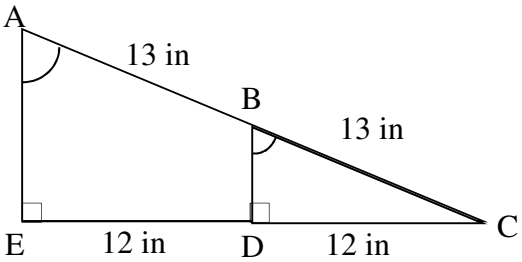
3.



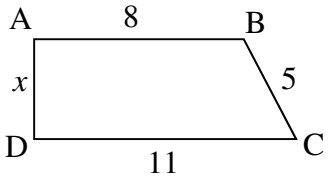
4.

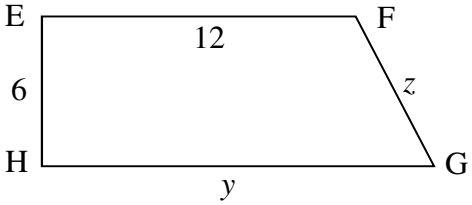


5.



In the figure below, trapezoid ABCD ~ trapezoid EFGH. Use this information to answer the following questions.



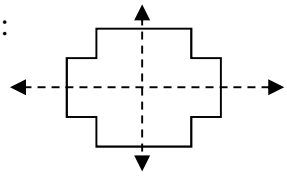


6.	List all the pairs of corresponding angles.	
7.	Write four ratios relating the corresponding angles.	
8.	Write a proportion to find the missing measure *x*. Then find the value of *x*.	
9.	Write a proportion to find the missing measure *y*. Then find the value of *y*.	
10.	Write a proportion to find the missing measure *z*. Then find the value of *z*.	

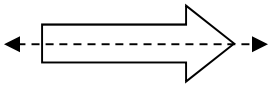
Activity 9-21: **Lines of Symmetry** Name:

If a figure can be folded in half so that the two halves match exactly, the figure has a **line of symmetry**.

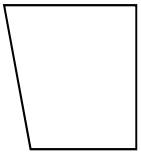
Examples:



Two lines of symmetry

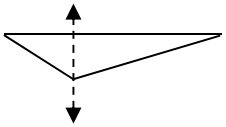


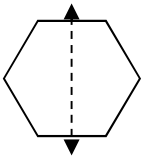
One line of symmetry

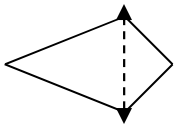


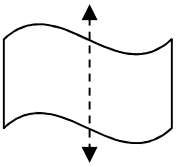
No lines of symmetry

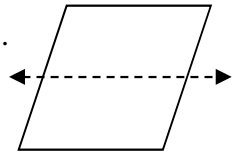
Tell whether the dashed line is a line of symmetry. Write YES or NO.

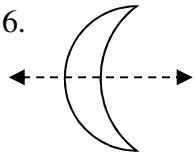
1. 

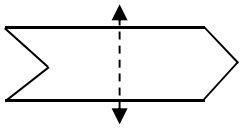
2. 

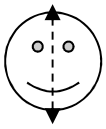
3. 

4. 

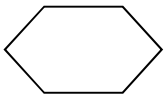
5. 

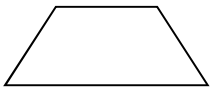
6. 

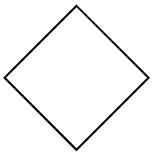
7. 

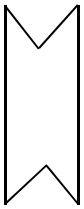
8. 

Draw all lines of symmetry.

9. 

10. 

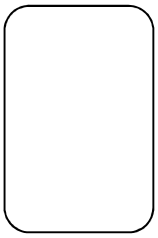
11. 

12. 

13. 

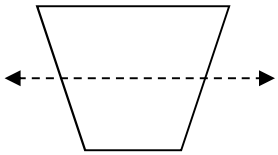
14. 

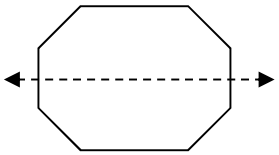
15. 

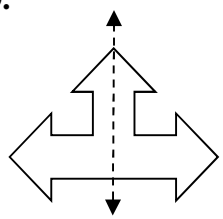
16. 

Activity 9-22: **Lines of Symmetry** Name:

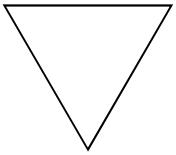
Tell whether the dashed line is a line of symmetry. Write YES or NO.

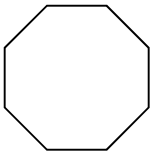
1. 

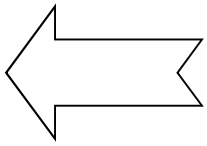
2. 

3. 

Draw all lines of symmetry.

4. 

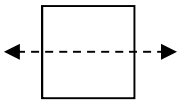
5. 

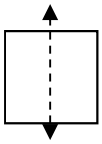
6. 

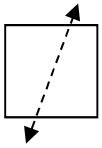
"WHAT DID THE SECRETARY SAY TO HER BOYFRIEND?"

For each exercise, circle the letter of each figure that is divided by a line of symmetry. Arrange these letters to form a word. Then write this word on the line next to the exercise number.

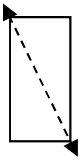
7. _____

O 

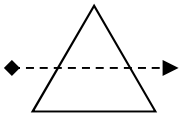
Y 

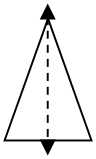
E 

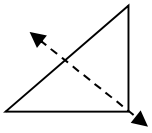
U 

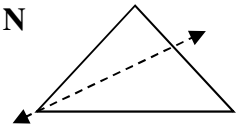
T 

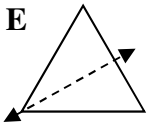
8. _____

T 

R 

A 

N 

E 

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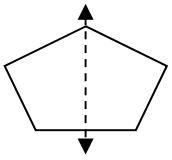
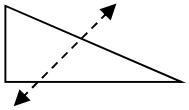
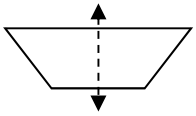
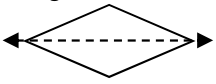
T 

E 

U 

J 

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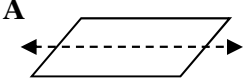
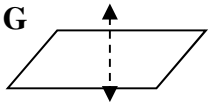
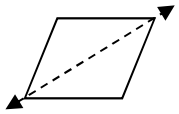
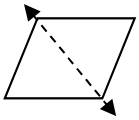
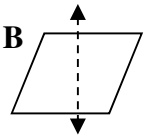
A 

G 

Y 

M 

B 

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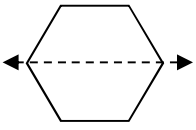
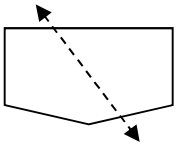
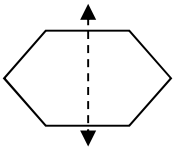
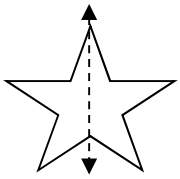
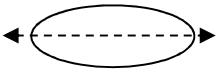
E 

S 

P 

T 

Y 

Activity 9-23: **Initial Symmetry** Name:

Use these letters in answering the questions below.

A B C D E F G H I J K L M N

O P Q R S T U V W X Y Z

Complete the following table.

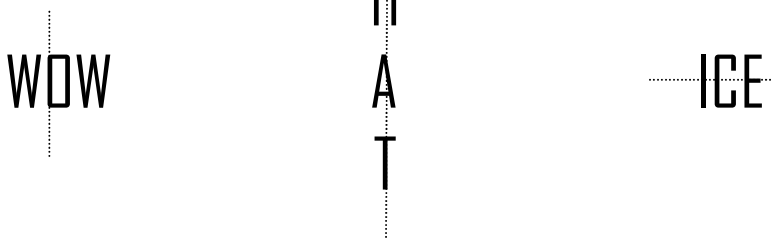
Lines of Symmetry	Letters of the alphabet
only one line	
only two lines	
more than two lines	
no lines	

Complete the table below by determining the experimental probability (that means the probability based on the real data below) that a student in Mrs. Greenwood's class has a first name beginning with a letter with a certain number of lines of symmetry.

Mrs. Greenwood's Class					
Ashley	Elizabeth	Isaac	Laura	Octavia	Terrence
Belita	Evan	Jermaine	Melvin	Ormond	Vanessa
Cory	Hanna	Kamara	Myuko	Pierre	William
Denzel	Henry	Kyle	Nancy	Sandy	Xavier

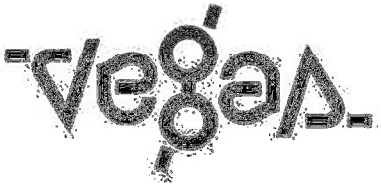
Lines of Symmetry	Probability
only one line	
only two lines	
more than two lines	
no lines	

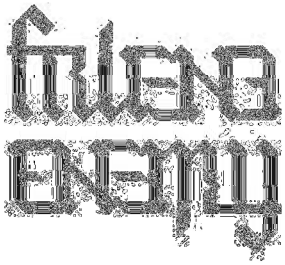
Think of a word at least three letters long that has a line of symmetry. Write the word and draw the line of symmetry. The longest word wins!

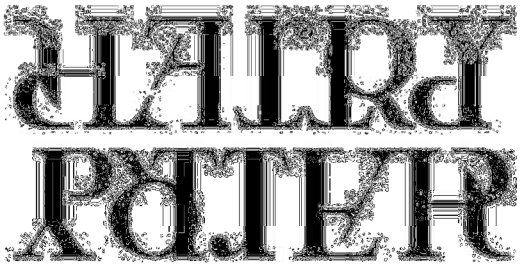


AMBIGRAMS

A graphic artist named John Langdon began to experiment in the 1970s with a special way to write words as ambigrams. Look at all the examples below and see if you can determine what an ambigram is.



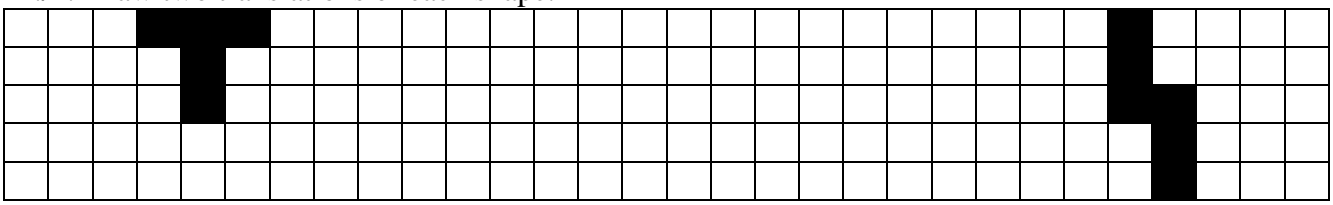




Created by Lance Mangham, 6th grade teacher, Carroll ISD

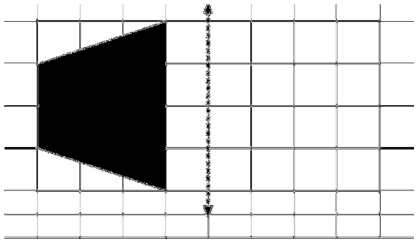
Activity 9-24: **Transformations** Name:

1./2. Draw two translations of each shape.

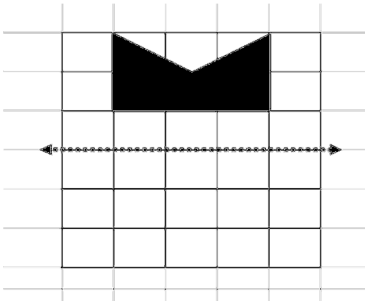


Draw the reflection of each shape. Use the dashed line as the line of reflection.

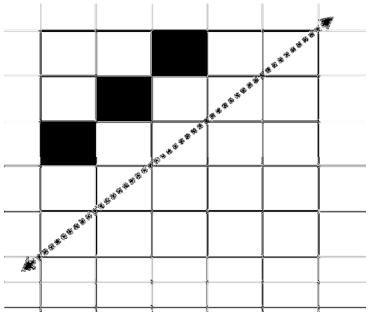
3.



4.

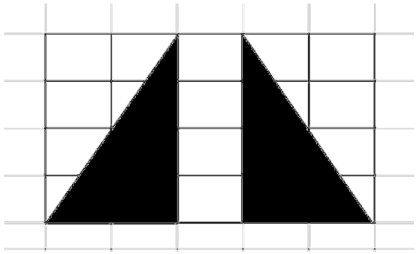


5.



Tell whether each shows a translation or a reflection.

6.



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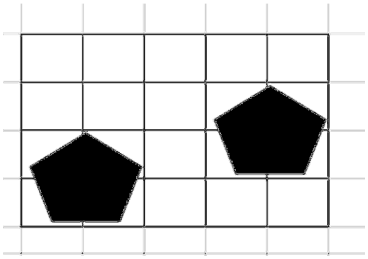
7.



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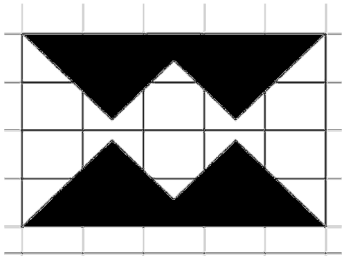
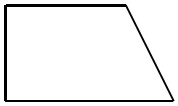
8.

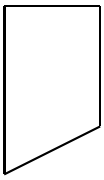


_____

Are the shapes of each of the following rotations the shape at the right? Yes or no.



9.



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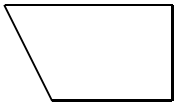
10.



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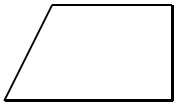
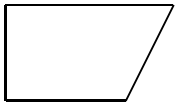
11.



_____

12.



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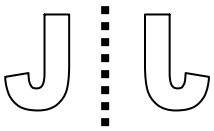
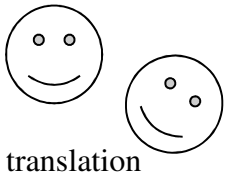
Read the label and write true or false. If it is false, name the correct transformation.



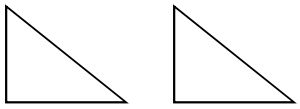
reflection

13._____



translation

14._____



rotation

15._____

Activity 9-25: **Shape Names** Name:

The word “gon” is derived from the Greek word “gonu”. Gonu means “knee”, which transferred to the word “angle” in English.

SIDES	NAME		SIDES	NAME
1	monogon		21	icosikaihenagon
2	digon		22	icosikaidigon
3	trigon or triangle		23	icosikaitrigon
4	tetragon or quadrilateral		24	icosikaitetragon
5	pentagon		25	icosikaipentagon
6	hexagon		26	icosikaihexagon
7	heptagon or septagon		27	icosikaiheptagon
8	octagon		28	icosikaioctagon
9	enneagon or nonagon		29	icosikaienneagon
10	decagon		30	triacontagon
11	hendecagon		31	tricontakaihenagon
12	dodecagon		40	tetracontagon
13	triskaidecagon		41	tetracontakaihenagon
14	tetrakaidecagon or tetradecagon		50	pentacontagon
15	pentakaidecagon or pentadecagon		60	hexacontagon
16	hexakaidecagon or hexadecagon		70	heptacontagon
17	heptakaidecagon		80	octacontagon
18	octakaidecagon		90	enneacontagon
19	enneakaidecagon		100	hectogon or hecatontagon
20	icosagon		1000	myriagon

There is a difference between education and experience. Education is what you get from reading the small print. Experience is what you get from not reading it!

But isn't it true that great learning comes from both education and experience? Let me tell you a parable:

A young school teacher had a dream that an angel appeared to him and said, "You will be given a child who will grow up to become a world leader. How will you prepare her so that she will realize her intelligence, grow in confidence, develop both her assertiveness and sensitivity, be open-minded, yet strong in character? In short, what kind of education will you provide that she can become one of the world's truly GREAT leaders?"

The young teacher awoke in a cold sweat. It had never occurred to him before -- any ONE of his present or future students could be the person described in his dream. Was he preparing them to rise to ANY POSITION to which they may aspire? He thought, 'How might my teaching change if I KNEW that one of my students were this person?' He gradually began to formulate a plan in his mind.

This student would need experience as well as instruction. She would need to know how to solve problems of various kinds. She would need to grow in character as well as knowledge. She would need self-assurance as well as the ability to listen well and work with others. She would need to understand and appreciate the past, yet feel optimistic about the future. She would need to know the value of lifelong learning in order to keep a curious and active mind. She would need to grow in understanding of others and become a student of the spirit. She would need to set high standards for herself and learn self discipline, yet she would also need love and encouragement, that she might be filled with love and goodness.

His teaching changed. Every young person who walked through his classroom became, for him, a future world leader. He saw each one, not as they were, but as they could be. He expected the best from his students, yet tempered it with compassion. He taught each one as if the future of the world depended on his instruction.

After many years, a woman he knew rose to a position of world prominence. He realized that she must surely have been the girl described in his dream. Only she was not one of his students, but rather his daughter. For of all the various teachers in her life, her father was the best.

I've heard it said that "Children are living messages we send to a time and place we will never see." But this isn't simply a parable about an unnamed school teacher. It is a parable about you and me -- whether or not we are parents or even teachers. And the story, OUR story, actually begins like this:

"You will be given a child who will grow up to become...." You finish the sentence. If not a world leader, then a superb father? An excellent teacher? A gifted healer? An innovative problem solver? An inspiring artist? A generous philanthropist?

Where and how you will encounter this child is a mystery. But believe that one child's future may depend upon influence only you can provide, and something remarkable will happen. For no young person will ever be ordinary to you again. And you will never be the same.

Created by Lance Mangham, 6th grade teacher, Carroll ISD