

Important Concepts . . .

# Preview Review



Mathematics

Grade 4

*W3 - Lesson 3: Geometry 1*

## Important Concepts of Grade 4 Mathematics

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## Materials Required

Mathematics Grade 4

Version 5

Preview/Review W3 - Lesson 3

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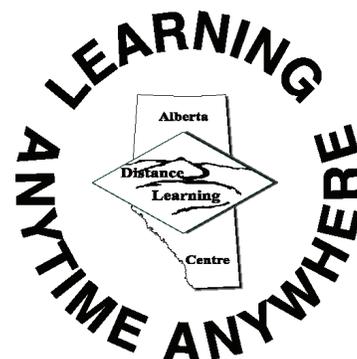
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# Preview/Review Concepts for Grade Four Mathematics



***W3 - Lesson 3:  
Geometry 1***

# OBJECTIVES

By the end of this lesson, you should

- explain what is meant by *geometry*
- identify points, horizontal line, line, vertical lines, parallel lines, perpendicular lines, intersecting lines, and ray and vertex
- classify angles as to whether they are right angles, greater than right angles, or less than right angles
- identify and sort polygons (including triangle, circle, square, rectangle, parallelogram, rhombus, and trapezoid)
- verify symmetrical 2-D shapes by drawing lines of symmetry

## GLOSSARY

**angle** - the V-shape created when two lines or two rays meet or intersect at a point

**endpoint** - the spot where a line segment or ray begins

**intersecting lines** - lines that  
 meet or cross

**line of symmetry** - a line that divides a shape into two equal and symmetrical parts

**parallel lines** - lines that are  
 always the same distance apart

**perpendicular lines** - lines  
 that form a right angle when they intersect

**symmetrical** - having identical parts when cut in half by a line

**trapezoid** - a four sided figure  
 with one pair of parallel lines

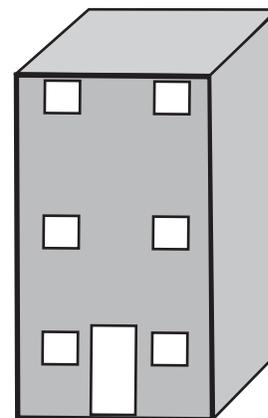
**ray** - a line with only one  
 endpoint

## W2 - Lesson 3: Geometry

### A. Introduction

**Geometry** is the study of shapes and the space they take up. Everything has a shape, and everything around us that we can see takes up space. We use geometry to describe the shapes and figures we see.

For example, a building may look like a box or a cube. In geometry, we describe this building as a “geometric solid”. We call it a **rectangular prism**.



When we describe the lines that we see, or the solid shapes that an object contains, or how lines come together to form angles or corners, we are using geometry.

### B. Points and Lines

Geometry begins with points. Each **point** is like a tiny dot. If you put a lot of tiny points very close to each other, you make a **line**.

1. Try making a line between the arrows below by making a lot of little points next to each other.

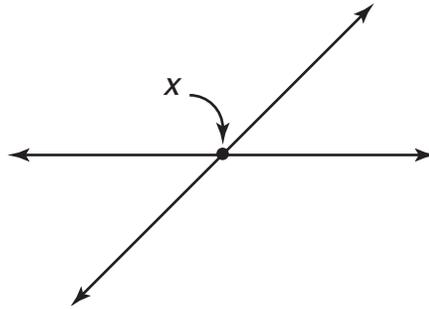


Notice the arrowheads on the ends. These show that the line goes on for a long way in both directions.

In Geometry, you can label points along a line with letter names. Two points along a line, labelled A and B, are shown like this.



Whenever lines **intersect**, or cross each other, they make a point. That point can be labelled with any letter.



- 2. Use a ruler to draw a straight line in the space below. Add arrowheads. On the line mark four points at different places. Label these points **M**, **N**, **O**, and **P**.

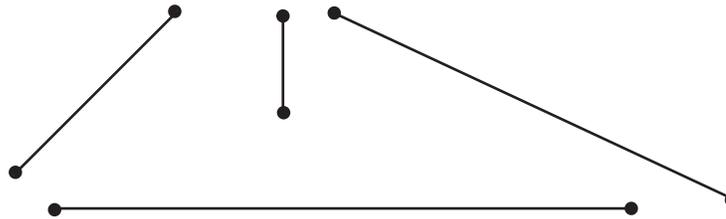


Lines are all around us. Everything has some sort of a line in it. There are many different kinds of lines: straight lines, curved lines, intersecting lines, etc.

- 3. Look around your classroom. Tell where you can see an example of each of these lines.
  - a. a straight line \_\_\_\_\_
  - b. a curved line \_\_\_\_\_
  - c. a short line \_\_\_\_\_
  - d. a long line \_\_\_\_\_
  - e. lines that meet at a corner \_\_\_\_\_
  - f. lines that cross each other \_\_\_\_\_
  - g. lines that run side by side \_\_\_\_\_

**Line segments** are parts of any line. They have a starting and a stopping point. These points are called **endpoints**.

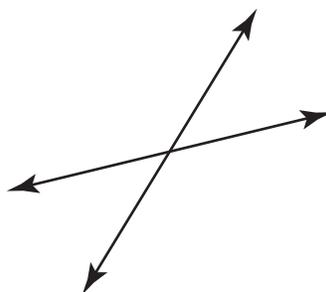
Here are some examples of line segments. Each has a starting point and a stopping point.



4. Use a ruler to draw three line segments. Be sure to show the starting and the stopping points. Do not let any of the lines touch each other.

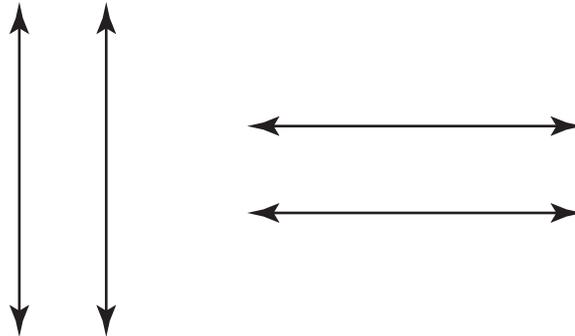
Here are some special lines with special names.

**Intersecting lines** are lines that meet or cross each other.



The arrowheads indicate that these are lines, not line segments. Lines continue forever in the direction of the arrowhead although the entire line cannot be seen.

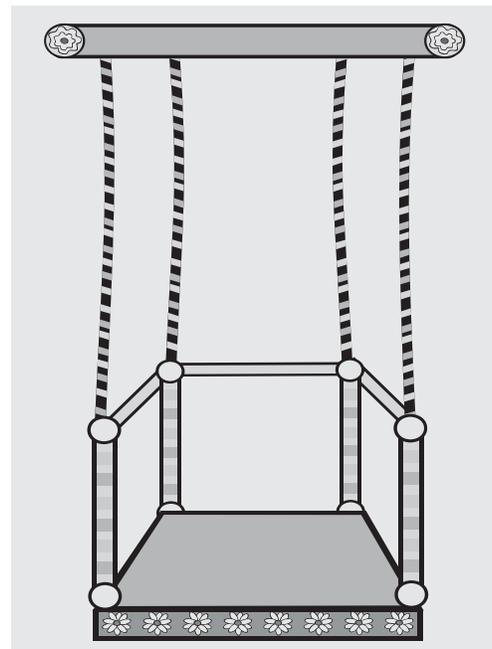
**Parallel** lines are always the same distance apart. Parallel lines never intersect or cross each other.



A **vertical** line goes up and down.



A **horizontal** line goes from side to side. It follows the horizon.



Can you find the vertical and horizontal lines on this swing?

5. Look around the classroom to find two examples of each of the following:

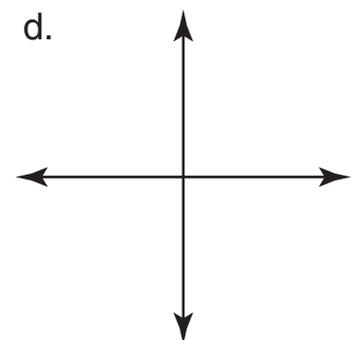
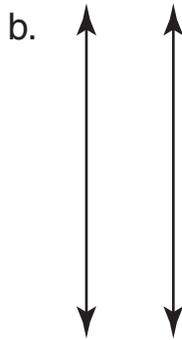
Intersecting lines: 1. \_\_\_\_\_ 2. \_\_\_\_\_

Parallel lines: 1. \_\_\_\_\_ 2. \_\_\_\_\_

Vertical lines: 1. \_\_\_\_\_ 2. \_\_\_\_\_

Horizontal lines: 1. \_\_\_\_\_ 2. \_\_\_\_\_

6. Label the following lines with their correct names. Some lines may have more than one label.



a. \_\_\_\_\_

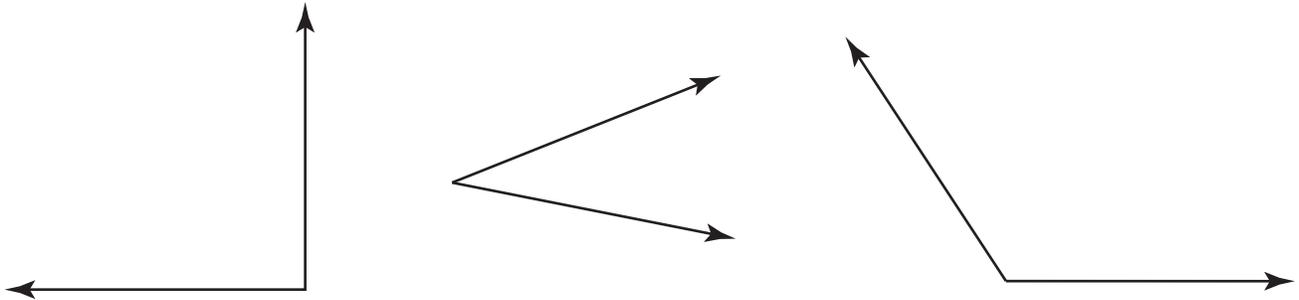
b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

### C. Angles

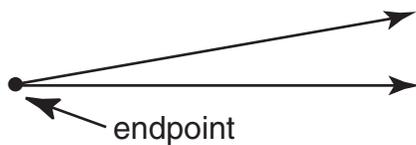
**Angles** are made whenever two lines meet or intersect at a point. When a line changes direction with a very sharp turn, an angle is created.



1. Look around the classroom. List four examples of angles that you can see.

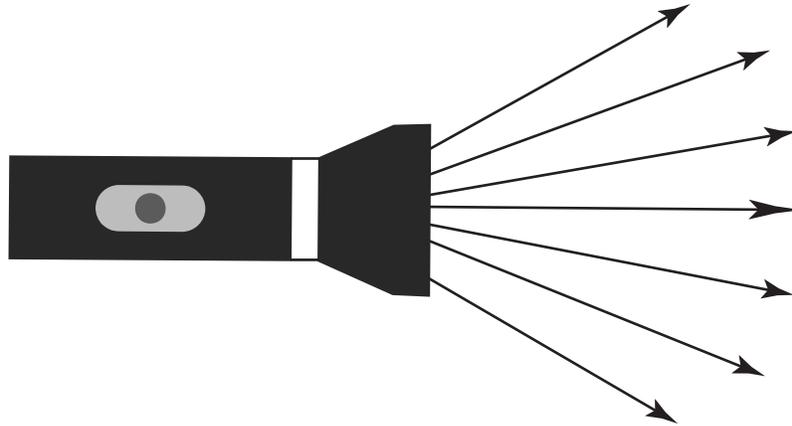
- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

Angles are usually drawn using a special kind of line called a ray. **Rays** are lines that have only one endpoint.

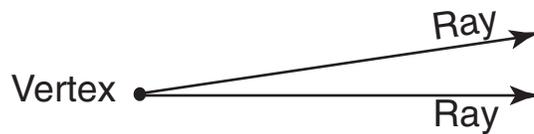


A ray starts at one point and goes on forever in one direction away from the point!

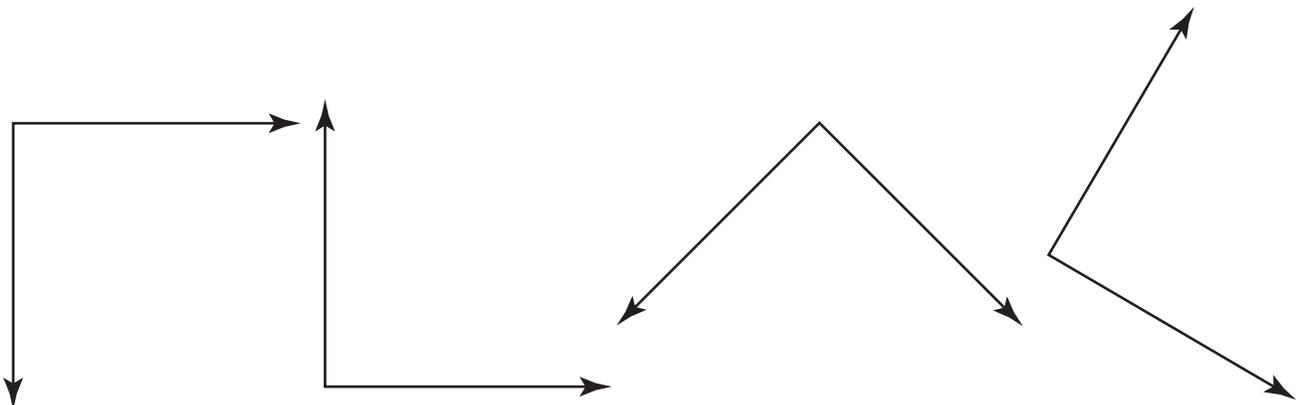
Rays are lines just like the rays of a flashlight. At one end is a flashlight (the point). The rays of light move off into space in straight lines.



Whenever two rays start at the same endpoint, an angle is created. The starting point is called the **vertex** of the angle.

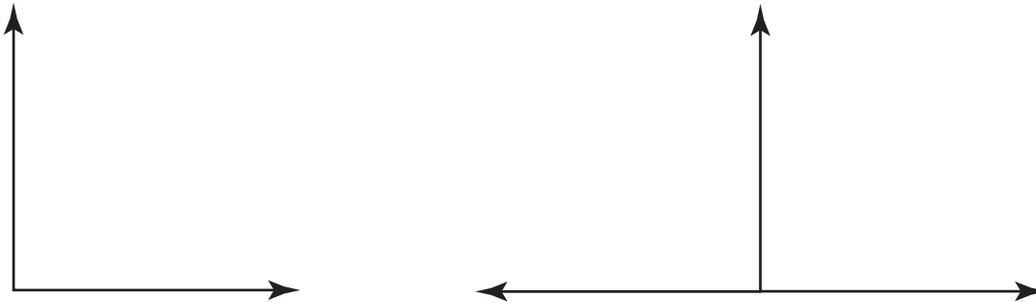


A special kind of angle that forms a "square corner" is called a **right angle**.

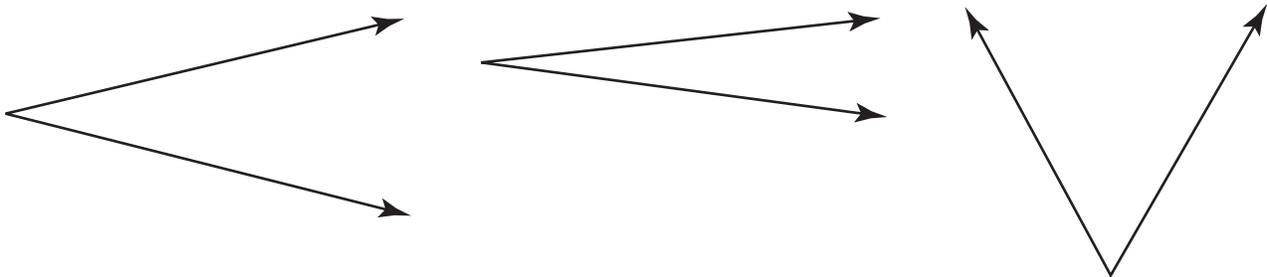


Right angles are very important when building things such as houses and boxes, and when making designs. Carpenters have special tools called carpenter's squares to make right angles.

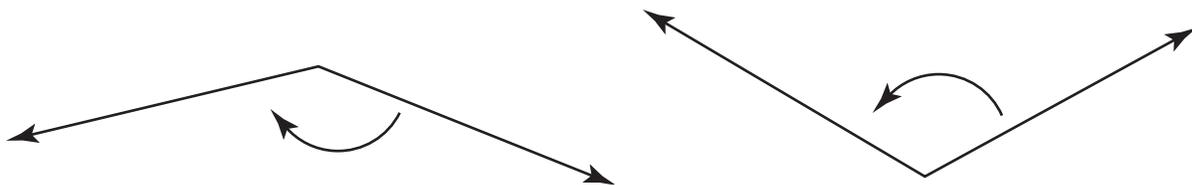
When two rays or two lines intersect and form a right angle, we say they are **perpendicular** to each other. The rays or lines that form right angles are called **perpendicular lines**.



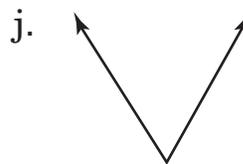
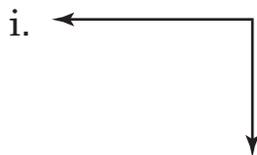
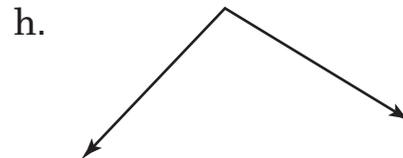
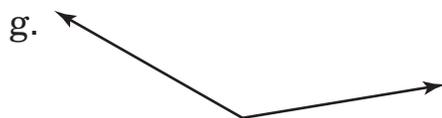
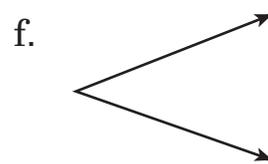
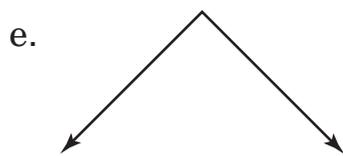
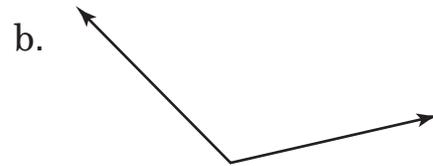
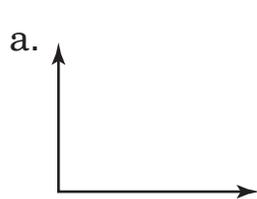
Some angles are smaller than a right angle. The two rays are closer together than they are in a right angle.



Some angles are larger than a right angle. The two rays are farther apart than they are in a right angle.



2. Carefully look at each of the angles below. Some of them are right angles. Some of them are smaller than right angles. Some of them are larger than right angles. Put the letter of each angle into the correct part of the chart.



Angles Smaller than a Right Angle	Right Angles	Angles Bigger than a Right Angle

3. In the space below, draw two right angles.

4. In the space below, draw two angles larger than a right angle.

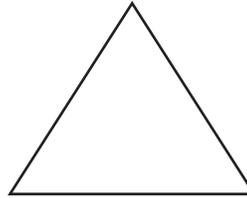
5. In the space below, draw two angles smaller than a right angle.

By the way, in case you're wondering, there's no such thing as a left angle in the world of geometry!

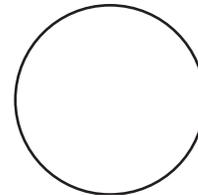
## D. Two-Dimensional Figures

Flat shapes are called **two-dimensional** or **2-D figures**. They have only two dimensions: **length** and **width**. Because they are flat, they do not have any thickness or depth.

A **triangle** is any shape with three sides.



A **circle** is a round shape made with a curved line.



A **square** is a shape with four equal sides and four right angles.



A **rectangle** is a shape with four sides and four right angles. The opposite sides of a rectangle are equal length.



- List two examples of each of the following shapes that you can see in the classroom around you.

Circles: \_\_\_\_\_

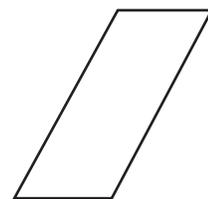
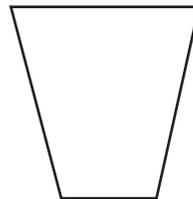
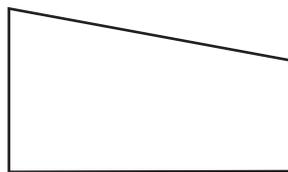
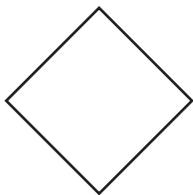
Triangles: \_\_\_\_\_

Squares: \_\_\_\_\_

Rectangles: \_\_\_\_\_

A **polygon** is a two-dimensional figure with three or more straight sides. The prefix “poly” means many. The triangle, the square, and the rectangle are examples of polygons. Here are the names of some new polygons for you to learn.

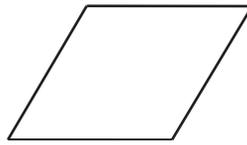
- A **quadrilateral** is any four-sided polygon. The word “quad” means four. Small off-road vehicles are called quads because they have four wheels. Squares and rectangles are all quadrilaterals. Here are some more quadrilaterals.



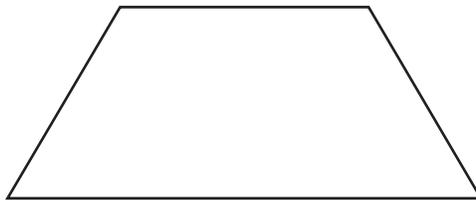
- A **parallelogram** is a four-sided figure in which the opposite sides are parallel and the same length.



- A **rhombus** is a four-sided figure in which the opposite sides are parallel and all the sides are the same length.

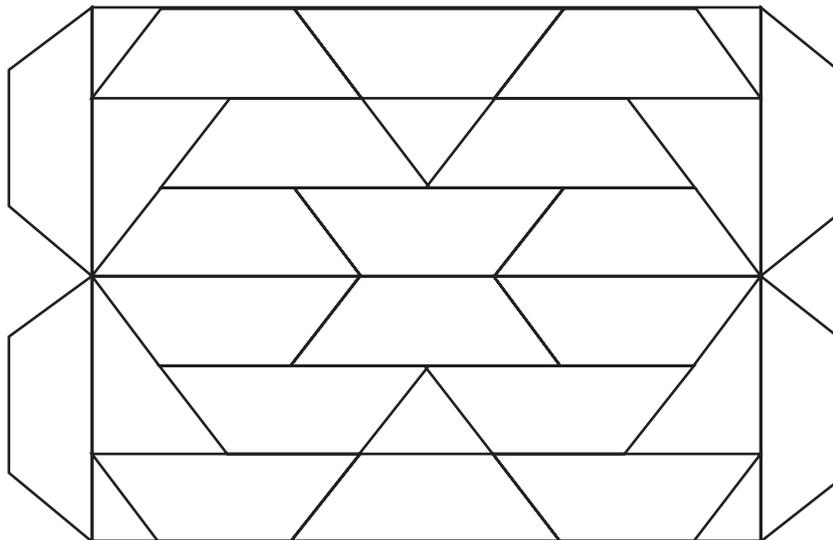


- A **trapezoid** is a four-sided figure with only one pair of parallel lines.



In this trapezoid, the top and bottom sides are parallel.  
Notice that the two parallel sides do not have to be the same length.

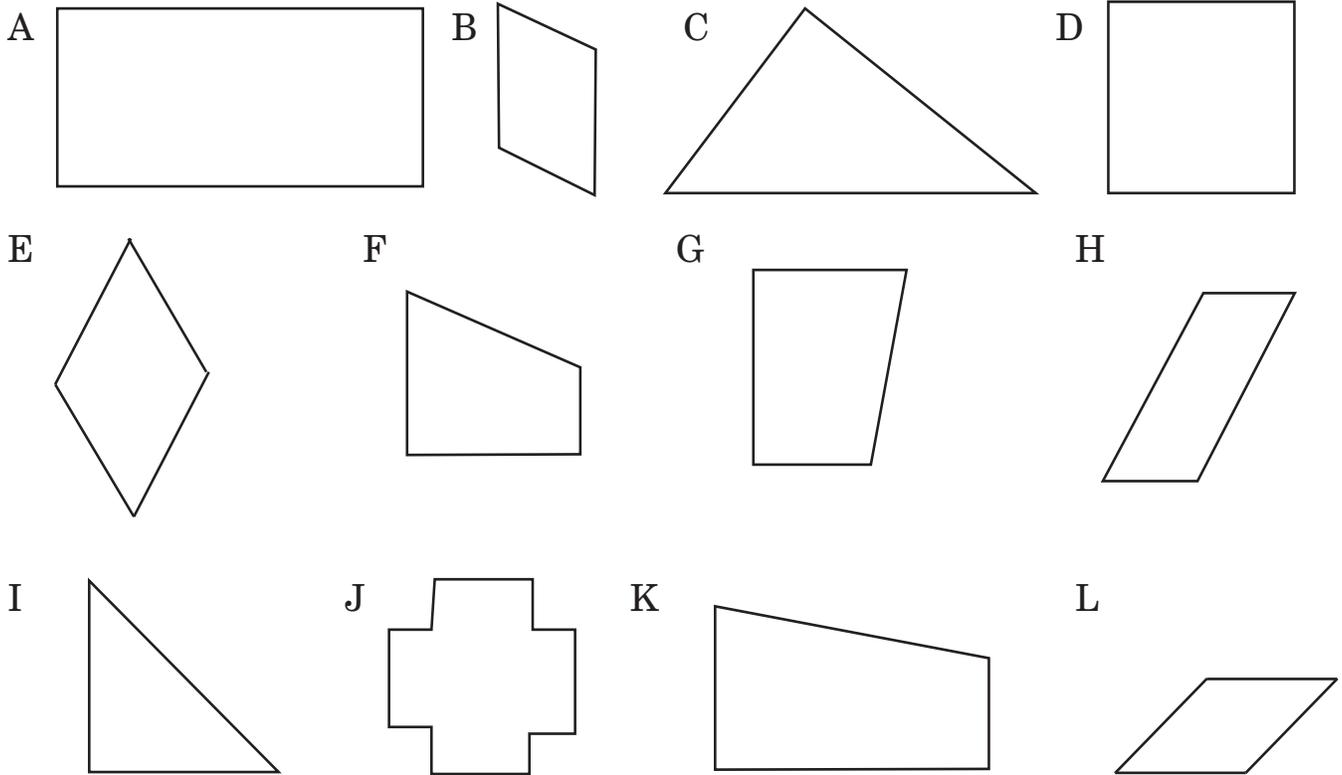
2. Just for Fun!



How many trapezoids can you find in this design?

Answer: \_\_\_\_\_

3. In the pictures below, locate all the triangles and quadrilaterals. Sort them into the correct categories on the chart. Write the letter from each shape under the correct heading for that shape. Most of the shapes can be placed in more than one category. **Try to place each shape into as many categories as you can.** Shape A has been done for you.

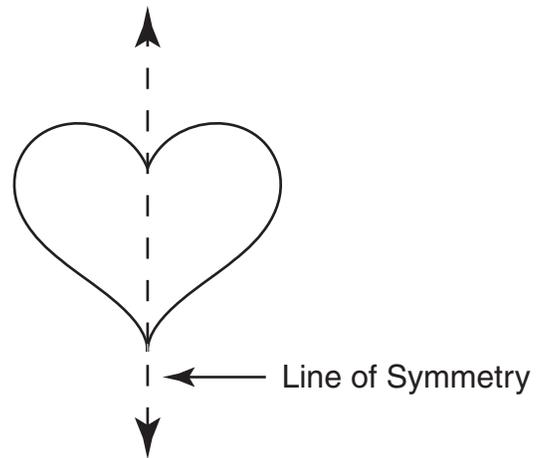


Triangle	Right Triangle	Quadrilateral	Rectangle
		A,	
Trapezoid	Rhombus	Parallelogram	Polygon
		A,	A,

## E. Symmetry

Some shapes can be divided into two equal parts. The two parts have exactly the same size and shape.

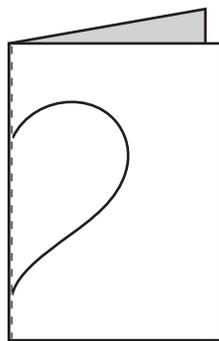
This heart shape can be divided into two equal parts that are exactly the same shape and size.



The line that divides the heart down the middle is called a **line of symmetry**. It divides the heart in two equal parts that are the same shape and size. We say the two halves are **symmetrical**.

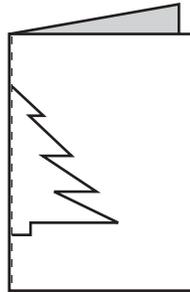
Whenever you fold a piece of paper in half to make a shape by drawing only half a figure, you are making use of a line of symmetry. Try the following activity.

- Fold a piece of paper in half. On one side, starting from the fold in the paper, draw half a heart shape. Then cut out the shape along the line that you drew. Unfold the shape.



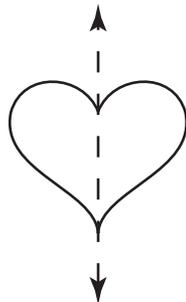
The fold in the paper is the line of symmetry of the heart shape.

- Using the same procedure you used for the heart, cut out three more symmetrical shapes. You can use curved lines as well as straight lines. Use your imagination to make the shapes different and interesting. Here's an example:

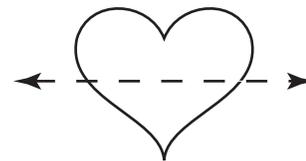


Find the heart shape that you made first. The first fold you made was a vertical fold. Now try folding it in half horizontally.

Vertical Fold



Horizontal Fold



When you fold the heart in half horizontally, the two halves do not match. There is no line of symmetry because the two folded halves are not the same size or shape. The two halves are **not** symmetrical.

- Find one of the other shapes that you cut out. Make a fold perpendicular to the first fold.

Is the new fold also a line of symmetry? \_\_\_\_\_

Why or why not? \_\_\_\_\_

\_\_\_\_\_

- 2. Make new folds in all the shapes you cut out. Are any of the new folds lines of symmetry? Why or why not?

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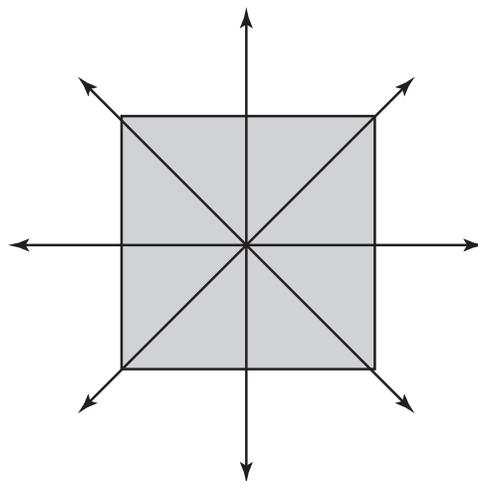
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**Remember:** When a shape is folded along its line of symmetry, the two sides will match exactly in size and in shape. The two sides are symmetrical.

The shapes that you folded probably had only one line of symmetry. However, many shapes do have more than one line of symmetry.

Look at the shape of the square below. It can be folded four different ways so that each half has exactly the same shape and size.

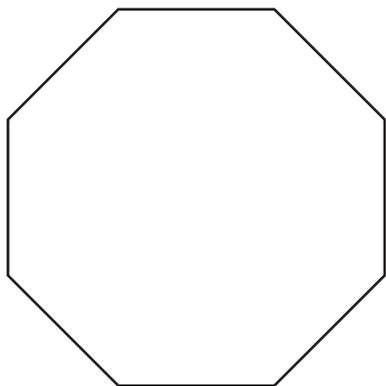


- 3. Use a **square** piece of paper. Carefully make the four folds shown in the drawing above. Each side of the fold should be exactly the same shape and size.

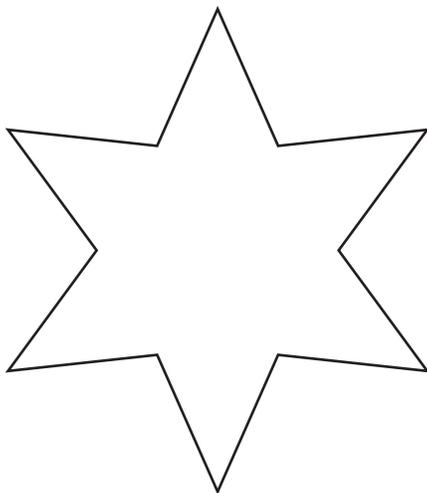
How many lines of symmetry does a square have? \_\_\_\_\_

4. Each of the shapes below has more than one line of symmetry. Use a ruler to draw as many lines of symmetry as you can find. Remember that the dividing line must create two parts that are exactly the same size and shape.

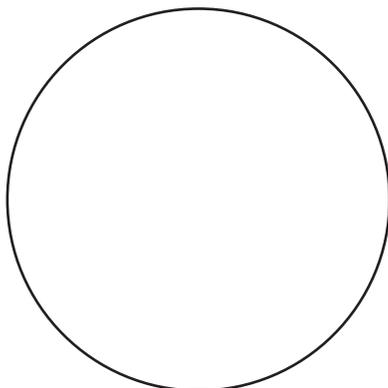
a.



b.



c.



## Homework

1. The capital letters of the alphabet are printed below. Study them carefully and then answer 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

- a. Which capital letters have only **one** line of symmetry?

---

- b. Which capital letters have **two** lines of symmetry?

---

- c. Which capital letters have **more than two** lines of symmetry?

---

- d. Which capital letters have **no** lines of symmetry?

---

2. Carefully study the lowercase or small letters 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

a. Which lowercase letters have only **one** line of symmetry?

---

b. Which lowercase letters have **two** lines of symmetry?

---

c. Which lowercase letters have **more than two** lines of symmetry?

---

d. Which lowercase letters have **no** lines of symmetry?

---

