

GEOMETRY: LINES, DIAGONALS AND PLANES

POLYGONS AND QUADRILATERALS

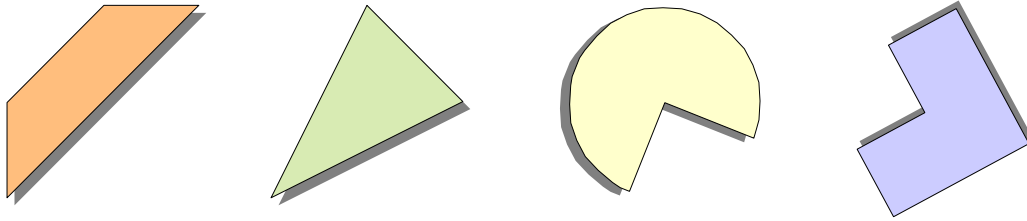
Look around the room. There are many objects of various shapes and sizes. We will discuss some basic vocabulary to build our knowledge of the geometry in our world.

There are many geometric shapes that are the building blocks for more complex shapes and objects all around us. Polygons are shapes made up of line segments that form a closed path. Polygons are given names like octagon, decagon, and hexagon which are based on the number of line segments that make the shape. Diagonals are lines that connect corner points of polygons.

Four-side polygons are called quadrilaterals. Some common quadrilaterals are the rectangle, square, and parallelogram.

Planes are flat surfaces. Perpendicular planes are planes that intersect at right angles. Planes that are equidistant apart are called parallel surfaces.

Geometry Vocabulary



Here are some terms to know while studying math geometry.

Line – a straight path goes in two directions without end

Segment – a part of a line with two endpoints

Skew lines – lines in space that do not intersect and are not parallel
(you must think in terms of space, not flat, two dimensional, like a sheet of paper).

Ray – a part of a line that has one endpoint and continues in one direction without end

Angle – a figure formed by two rays that share a common endpoint called the vertex

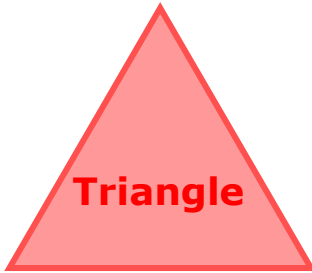
Parallel – lines in the same plane that never intersect. (Think of the lines as lying in a two dimensional area, like a flat sheet of paper.)

Perpendicular – lines that intersect (cross each other) forming right angles at the point of intersection.

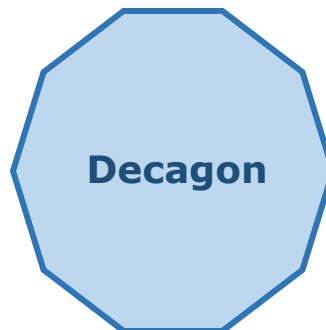
Congruent – a term used to describe geometric figures that have the same size and shape.

Polygons

Polygon – a closed figure made up of three or more line segments.

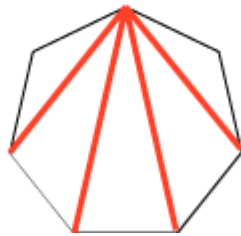
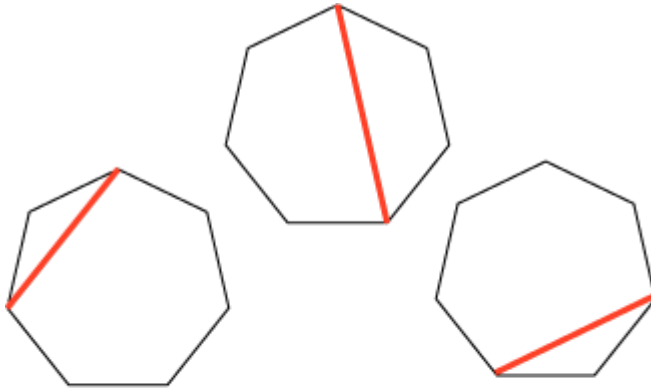


Polygon	Number of Sides
Triangle	3
Quadrilateral	4
Pentagon	5
Hexagon	6
Heptagon	7
Octagon	8
Nonagon	9
Decagon	10
Dodecagon	12



Diagonals

A diagonal is a line segment that joins two nonconsecutive corners (vertices) of a polygon.



Four diagonals are shown in this octagon all drawn from the same corner.

Quadrilaterals

A quadrilateral is a polygon with four sides.

Some quadrilaterals are given other names because of the special angles and line segments that make up the shape.

Rectangle

- Both pair of opposite sides are parallel
- Both pair of opposite sides are congruent
- All four angles are right angles.

Square

- Both pair of opposite sides are parallel
- All four sides are congruent
- All four angles are right angles.

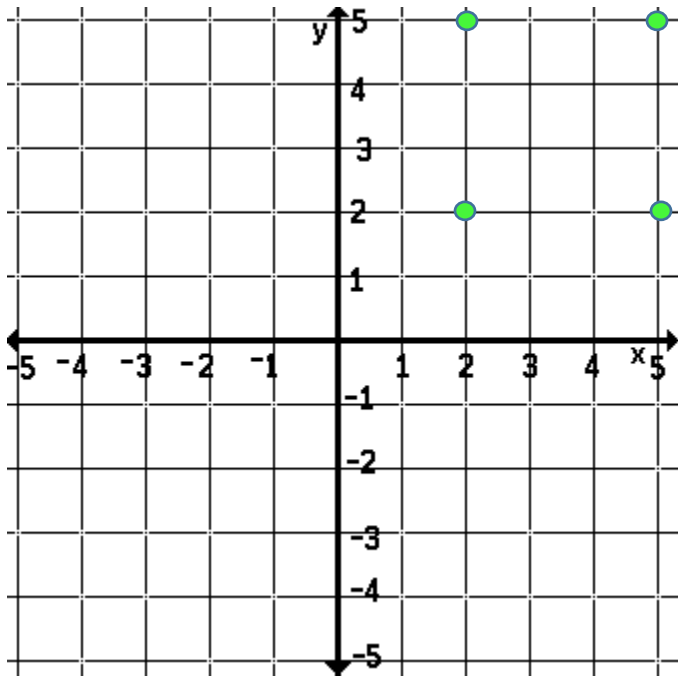
Parallelogram

- Both pairs of opposite sides are parallel
- Both pairs of opposition sides are congruent

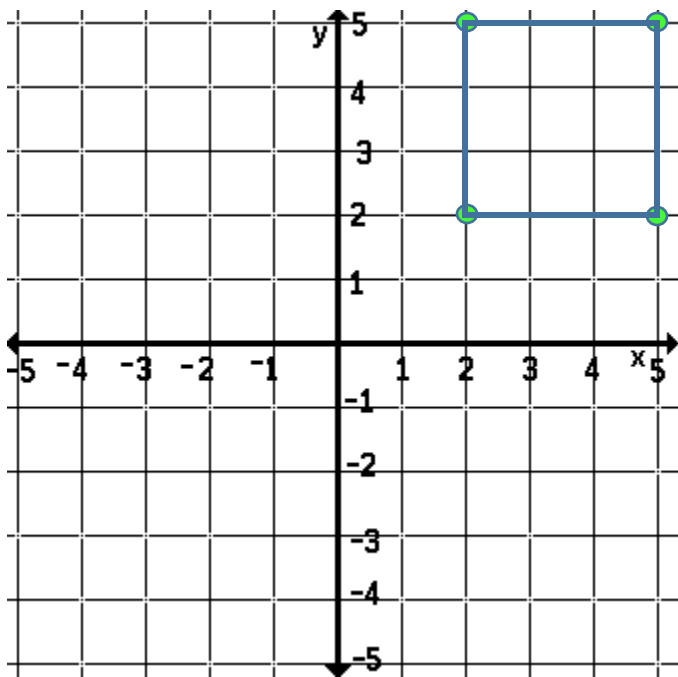
Graphing Polygons and Quadrilaterals

Let's graph this list of ordered pairs.

$(2,2)$ $(5,2)$ $(2,5)$ $(5,5)$



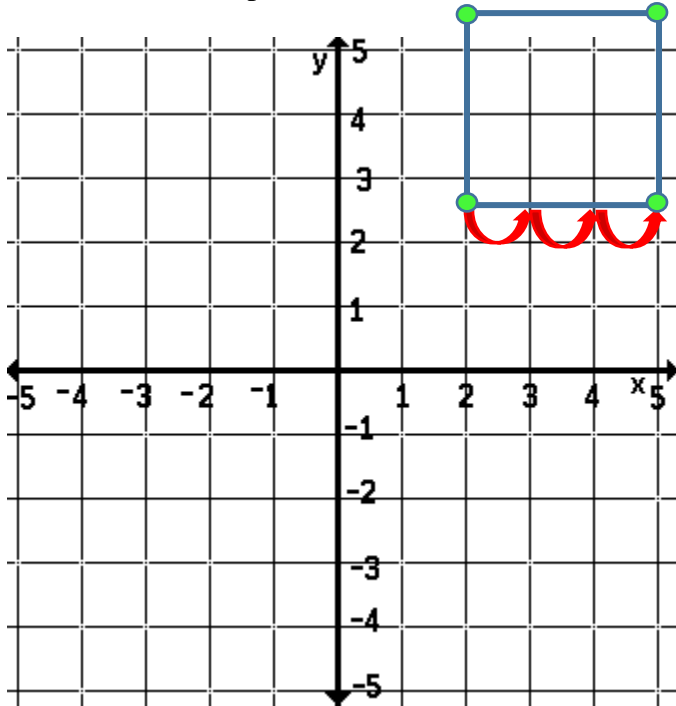
If we connect the ordered pairs, we will get a square.



We can find the length of the sides, the area, and the perimeter of the above figure.

The length of the sides is the distance from one point to the other. We can count the number of spaces between the points.

The distance from point (2,2) to (5,2) is 3 units.



We do the same for all the other points.

(2,2) to (2,5) is 3 units.

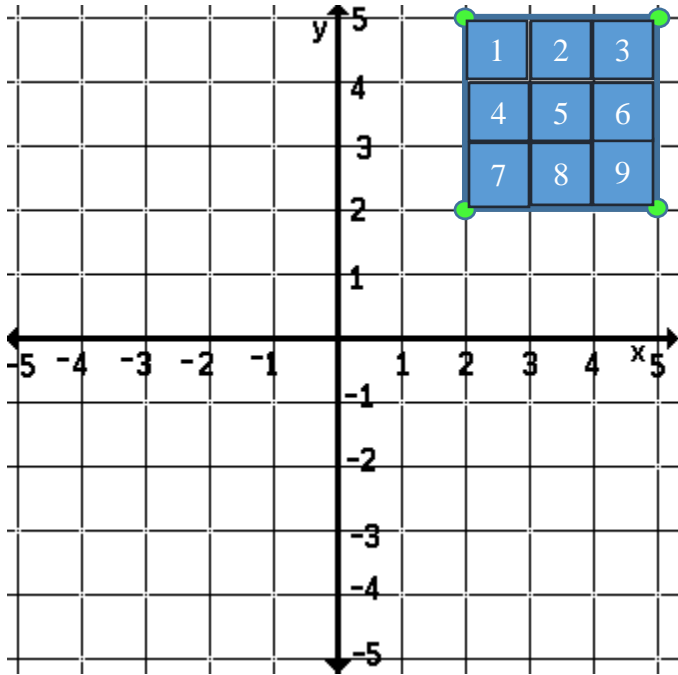
(2,5) to (5,5) is 3 units.

(5,5) to (5,2) is 3 units.

The perimeter of a shape is the length of all the sides added together. So to find the perimeter of the square we can count the number of units around or we add up all the lengths of the sides together.

$$3 + 3 + 3 + 3 = 12 \text{ units}$$

The area is the amount of space inside the square. To find the area we count the number of boxes inside the square.



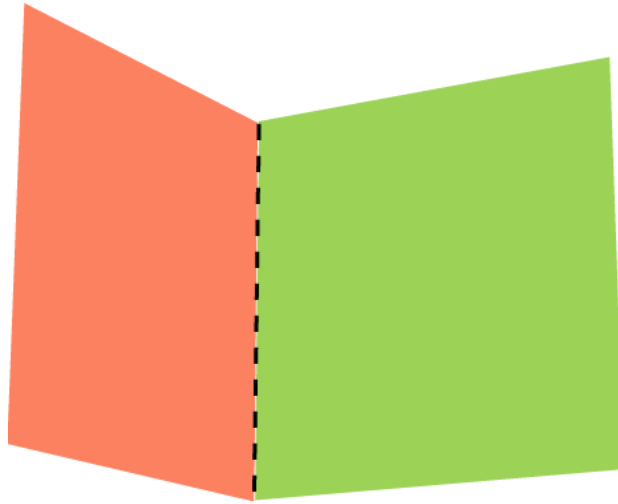
The area of this square is 9 square units. **The units are always squared when working with area.**

In Unit 21 you will learn the formulas to find area and perimeter without a coordinate plane.

Planes: Intersecting, Perpendicular, and Parallel

A plane is a flat surface that extends indefinitely in all directions.

In this picture there are two parts of planes, one orange and one green that meet (intersect) at a common line (the dotted line).



In this colorful model of a room, each of the walls and the floor are considered parts of **planes**

in space. In most houses when a wall meets the floor, 90 degree angles form at the intersection

line of the two planes. When that occurs, the two walls are said to be **perpendicular planes**.

Two walls that are opposite each other are usually **parallel planes**, planes that would never meet if they were extended out indefinitely. In this model, the green and yellow walls are parallel

planes and the blue wall (or any of the other walls) and the floor would be perpendicular planes.

