Lines are fundamental elements in geometry, characterized by their length and direction. Here are some common types of lines:

Straight Line:

A line that extends indefinitely in both directions and does not curve.

Curved line:

A curved line is a type of line that does not follow a straight path

Ray:

A part of a line that has one endpoint and extends infinitely in one direction.
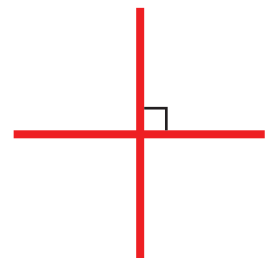
Line Segment:

A part of a line that has two endpoints.

Parallel Lines:

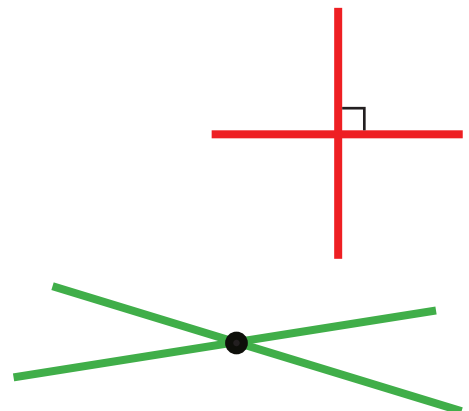Lines in the same plane that do not intersect. They remain equidistant from each other at all points.

Perpendicular Lines:

Lines that intersect at a right angle (90 degrees).

## Intersecting Lines:

Lines that cross or meet at a common point.

Axis

In math and geometry, an axis is like a guide line we use to find where things are located. Think of it as a ruler that helps us measure distances and positions.

In a flat picture called a «Cartesian plane,» there are two axes:

🖊 The X-Axis: This line goes from side to side, like how we read a book.

🖊 The Y-Axis: This line goes up and down, like climbing stairs.

These axes help us figure out where points, lines, and shapes are in the picture. They're like the "directions" on a map that tell us where things are located.
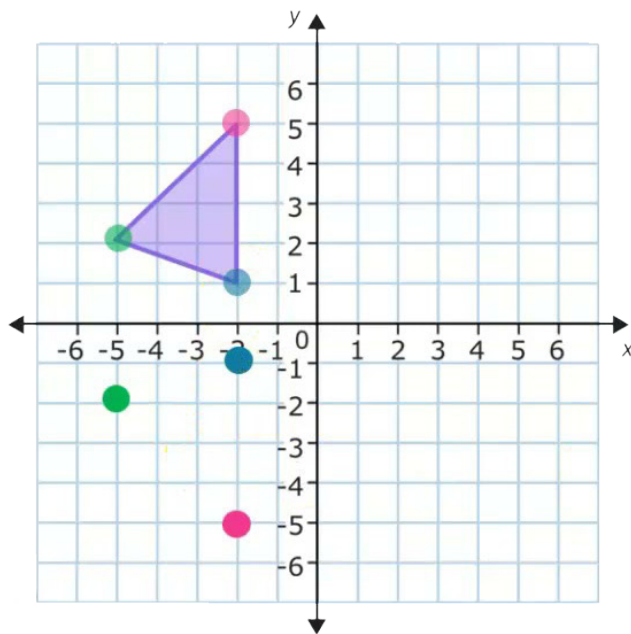
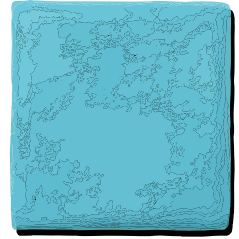| Original	
X	Y
-5	2
-2	5
-2	1

→

Image	
X	Y
-5	-2
-2	-5
-2	-1

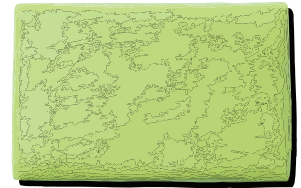# Common 2D shapes include:

Square

- ✎ All sides are equal in length.
- ✎ All angles are right angles (90 degrees).
- ✎ Opposite sides are parallel and equal in length.

Rectangle:

- ✎ Opposite sides are equal in length.
- ✎ All angles are right angles (90 degrees).
- ✎ Opposite sides are parallel.
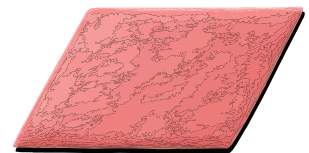
Circle:

- ✎ No straight sides; consists of a curved boundary.
- ✎ No angles.
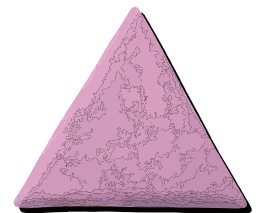- ✎ All points on the boundary are equidistant from the center.

Parallelogram:

- ✎ Opposite sides are equal in length.
- ✎ Opposite angles are equal.
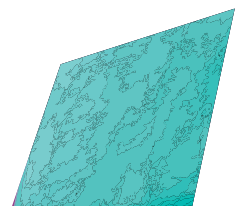- ✎ Opposite sides are parallel.

Triangle:

- ✎ Three sides.
- ✎ Three angles.
- ✎ The sum of interior angles is always 180 degrees.

Trapezoid

- ✎ At least one pair of parallel sides.
- ✎ No sides are equal in length (unless it's an isosceles trapezoid).

Area

Area is the amount of space inside a shape.

For example, if you want to find the area of your bedroom, you're measuring how much space is inside the room.

Perimeter

Perimeter is the distance around the outside of a shape.

For example, if you want to know how much fencing you need to enclose your garden, you're measuring the perimeter of the garden.

Square

Area = Side × Side

Perimeter = 4 × Side

Rectangle

Area = Length × Width

Perimeter = 2 × (Length + Width)

Circle

Area = π × Radius^2

Perimeter = 2 × π × Radius

Triangle

Area = $\frac{1}{2}$ × Base × Height

Perimeter = Side1 + Side2 + Side3

Parallelogram

Area = Base × Height

Perimeter = 2 × (Base + Side)

Trapezoid

Area = $\frac{1}{2}$ × (Sum of parallel sides) × Height
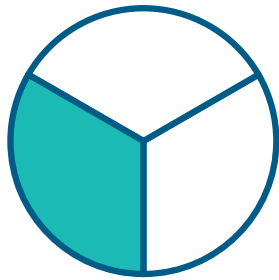
Perimeter = Sum of all four sides
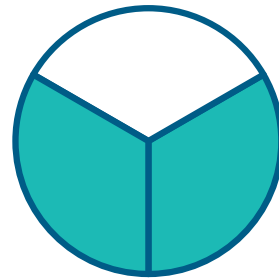
This is how we read fractions:
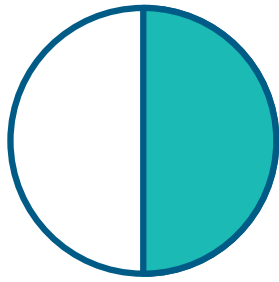
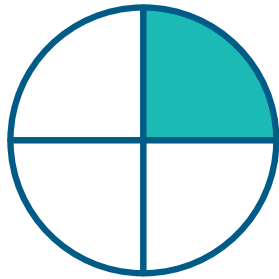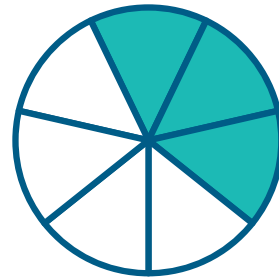$\frac{1}{2}$: half / one half
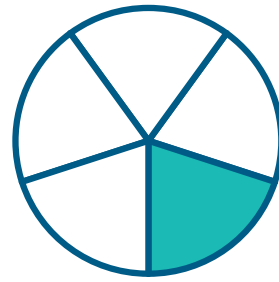
$\frac{1}{5}$: one fifth

$\frac{1}{3}$: a third/ one third

$\frac{2}{3}$: two thirds

$\frac{1}{4}$: a quarter/ one quarter

$\frac{3}{7}$: three sevenths

This is how we read mathematical equations.

Addition

$$2 + 3 = 5$$

Two plus three equals five

Subtraction

$$8 - 4 = 2$$

Eight minus four equals two.

Multiplication

$$2 \times 3 = 6$$

Two times three equals six.
Two multiplied by three equals six.

Division

$$4 \div 2 = 2$$

Four divided by two equals two.

25 = 2 × 2 × 2 × 2 × 2= 32

Two to the power of five equals thirty two.

42 = 8 : Four squared equals eight

43 = 64 : Four cubed equals sixty four

2 × (Length + Width)

Two times open parenthesis length plus width close parenthesis.

Two times the sum of the length and width.

$\frac{1}{2}$ × Base × Height

one-half times base times height

This is how we read points equations on a coordinate system.

On a two-dimensional coordinate system, numbers are read using the x-axis and the y-axis. The x- axis is the horizontal axis, and the y-axis is the vertical axis. To read numbers on these axes:

X-Axis (Horizontal Axis):

The x-axis typically extends from left to right.

Numbers increase from left to right along the x-axis.

The origin (0,0) is usually located at the center or leftmost point on the x-axis.

Positive numbers are to the right of the origin, and negative numbers are to the left.

For example, if you have a point labeled (3,0), it means the point is located 3 units to the right of the origin.

Y-Axis (Vertical Axis):

The y-axis typically extends from bottom to top.

Numbers increase from bottom to top along the y-axis.

The origin (0,0) is usually located at the center or bottommost point on the y-axis.

Positive numbers are above the origin, and negative numbers are below.

For example, if you have a point labeled (0,4), it means the point is located 4 units above the origin.

To read the point (1, 2) on a two-dimensional coordinate system:

The first number, 1, represents the position along the x-axis. Since it›s positive, it means the point is 1 unit to the right of the origin.

The second number, 2, represents the position along the y-axis. Since it›s positive, it means the point is 2 units above the origin.

So, when reading (1, 2), you would say:

1. «The point is located 1 unit to the right and 2 units above the origin.»

2. «The point is at coordinates one, two.»

For the point (-1, 3), you can say:

1. «The point is located 1 unit to the left and 3 units above the origin.»

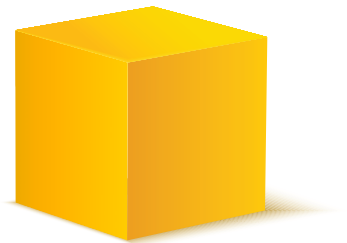2. «The point is at coordinates negative one, three.»

Common 3D shapes include:

Three-dimensional (3D) shapes, also known as solids, are geometric figures that have length, width, and height. They occupy space and have volume. Here are some common examples of 3D shapes:
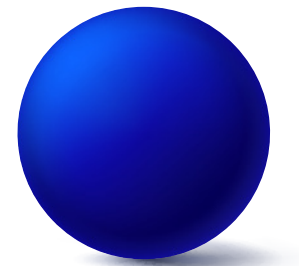
vertex
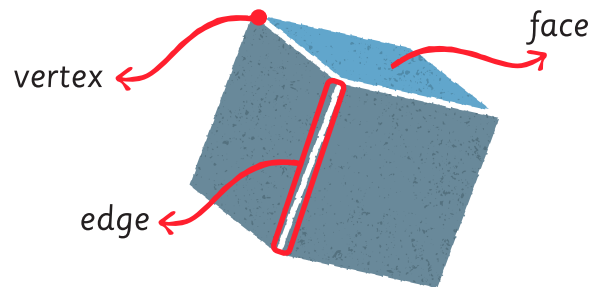
face

edge

Cube:

- ✎ All faces are squares.
- ✎ All edges are equal in length.
- ✎ All angles are right angles.

Sphere:

- ✎ A perfectly round shape.
- ✎ No edges or vertices.
- ✎ All points on the surface are equidistant from the center.
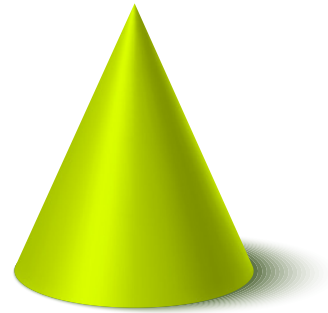
Cylinder:

- ✎ Two circular faces connected by a curved surface.
- ✎ No vertices.
- ✎ The height is perpendicular to the circular faces.
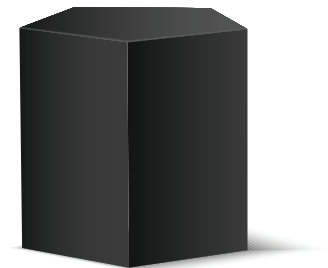
Cone:

- ✎ A circular base tapering to a point (apex).
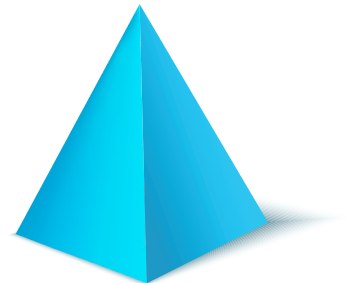- ✎ One curved surface.
- ✎ One vertex.

Rectangular Prism:

- ✎ Six faces, each a rectangle.
- ✎ Opposite faces are parallel and congruent.
- ✎ Twelve edges and eight vertices.

Pyramid:

- ✎ A polygonal base connected to an apex.
- ✎ Triangular sides meet at the apex.
- ✎ Number of edges and vertices depend on the base polygon.

Triangular Prism:

- ✎ Two triangular bases connected by three rectangular faces.
- ✎ Six faces, nine edges, and six vertices.