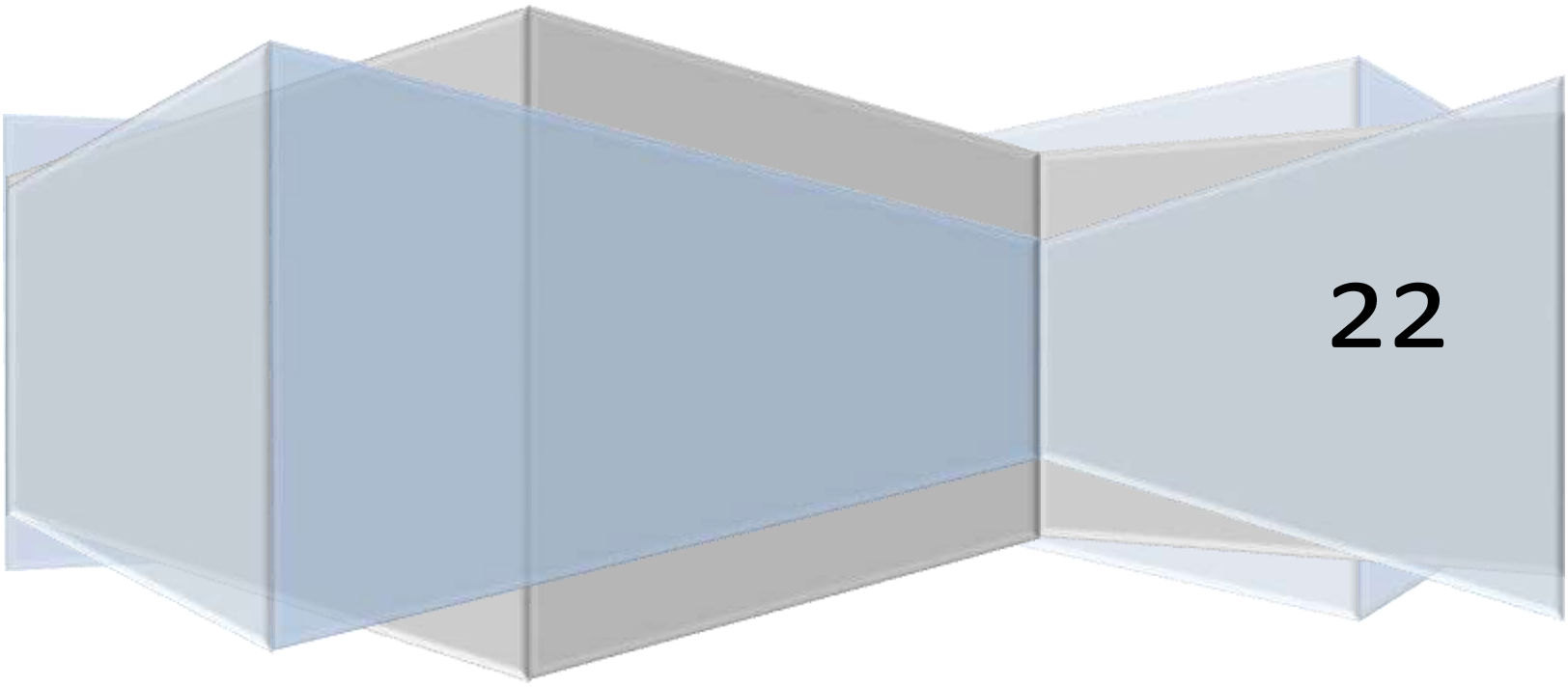
Class 7

Mathematics Prerequisite



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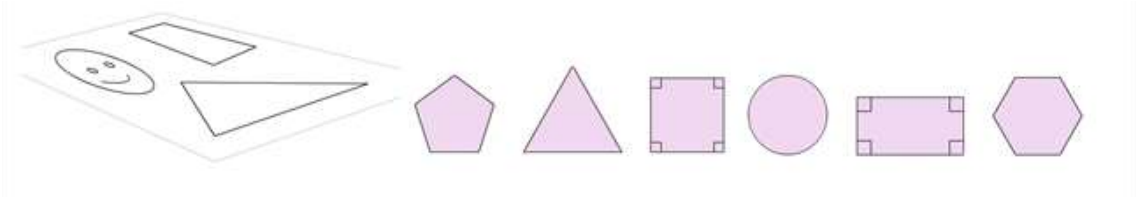
Mathematics

KNOWLEDGE

2D shapes

Shapes that you can draw on a piece of paper are 2D shapes.

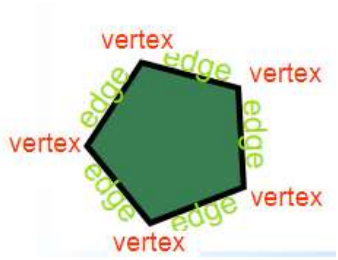


Vertex and Edge

A **vertex** (plural: **vertices**) is a point where two or more lines meet.

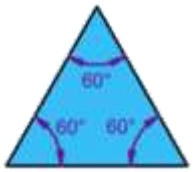
An **edge** is a line segment that joins two vertices.

And this pentagon has 5 vertices and 5 edges.



Types of triangles

There are three special names given to triangles that tell how many sides (or angles) are equal. There can be **3**, **2** or **no** equal sides/angles:



Equilateral Triangle

Three equal sides
Three equal angles, always 60°

Isosceles Triangle

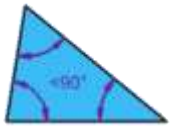
Two equal sides
Two equal angles

Scalene Triangle

No equal sides
No equal angles

Triangles can also have names that tell you what **type of angle** is inside:

Acute Triangle



All angles are less than 90°

Right Triangle

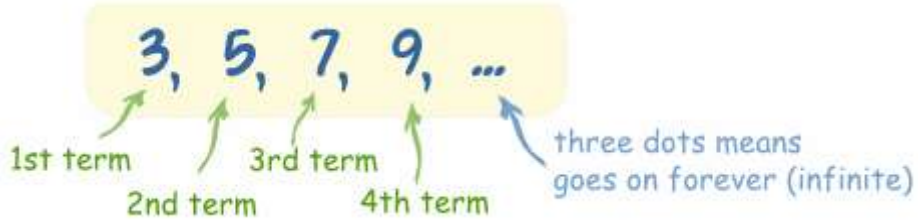
Has a right angle 90°

Obtuse Triangle

Has an angle more than 90°

Sequence

A sequence is a list of things (usually numbers) that are in order.



("term" , "element" or "member" mean the same thing)

A **sequence**, in mathematics, is a string of objects, like numbers, that follow a particular pattern.

The individual elements in a sequence are called **terms**. Some of the simplest sequences can be found in multiplication tables:

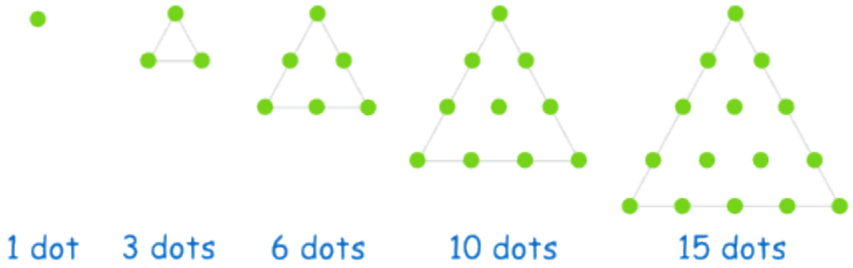
- 3, 6, 9, 12, 15, 18, 21, …
  Pattern: "add 3 to the previous number to get the next number"
- 0, 12, 24, 36, 48, 60, 72, …
  Pattern: "add 12 to the previous number to get the next number"
- 1, 6, 11, 16, 21, …

  Pattern: "add 5 to the previous number to get the next number"
- 25, 21, 17, 13, 9, …

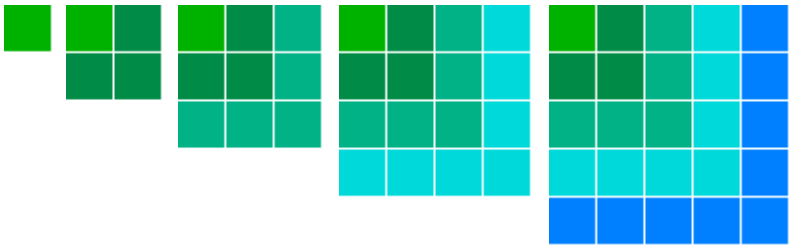
  Pattern: "subtract 4 from the previous number to get the next number"

  We can also create sequences based on geometric objects:

Triangle Numbers Pattern: "add increasing integers to get the next number"



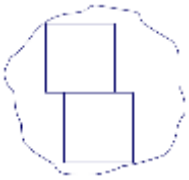
Square Numbers Pattern: "add increasing odd numbers to get the next number"



1 4 9 16 25

The sequences of triangle and square numbers also have numerical patterns like the ones we saw at the beginning. To find the following triangle numbers we have to add increasing integers to the last term of the sequence (+2, +3, +4, …). To find the following square numbers we have to add increasing odd numbers (+3, +5, +7, …).

Area



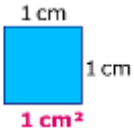
What is area and how do we measure it?

Area is a measure of space on a flat surface.

We measure area by **counting** the number of squares that fit inside the shape.

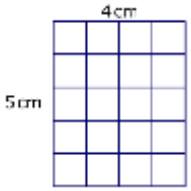
The squares can be of any size. We usually use squares with sides 1 cm long.

We call them **square centimetres** or cm^2.

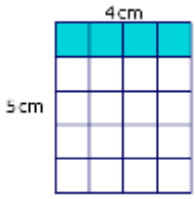


We can also use **square metres** or m^2 which are squares with sides 1 metre long. They are used for measuring larger areas.

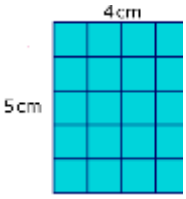
Quicker way to count the number of squares inside the rectangle



Count the number of squares in one row.



There are four squares in one row.



There are 5 rows of 4.

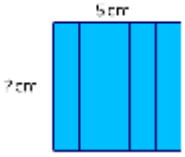
$5 \times 4 = 20\ squares$

$5 \times 4 = 20\ cm^2$

The formula for finding the area of a rectangle is: $\boldsymbol{Area = length \times width}$

This rectangle covers 25 squares ($25\ cm^2$).

It has a width of 5 cm.



What is its length?

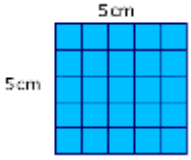
$$\boldsymbol{Area = length \times width}$$

So something times 5 equals 25:

$$? \times \mathbf{5} = \mathbf{25}$$

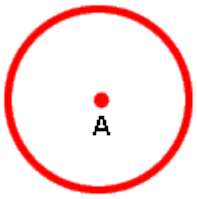
$$? = \mathbf{25} \div \mathbf{5}$$

$$? = \mathbf{5}$$

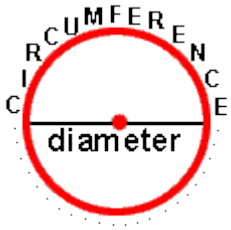


Circle

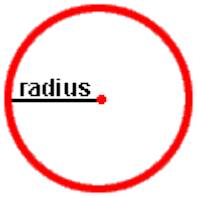
A **circle** is a shape with all points the same distance from its center.
A circle is named by its center.
Thus, the circle to the right is called circle A since its center is at point A.
Some real world examples of a circle are a wheel,
a dinner plate and (the surface of) a coin.



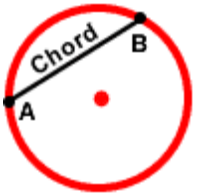
These set of points form the **perimeter** of the circle.
The **circumference** of a circle is the perimeter of the circle.
The distance across a circle through the center is called the **diameter**.
A real-world example of diameter is a 9-inch plate.



The **radius** is the distance from the centre of the circle to any point
on its perimeter (circumference).
If you place two radii (The plural of radius is **radii**) end-to-end in a circle,
you would have the same length as one diameter.
Thus, the diameter of a circle is twice as long as the radius.

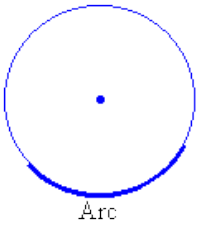


A **chord** is a line that joins two points on the circumference of a circle.

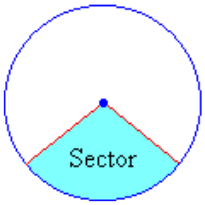


Parts of a Circle

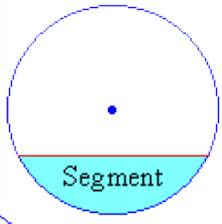
An **arc** is a part of the circumference.



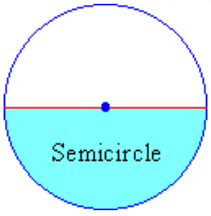
A **sector** is the part of a circle between two radii.



A **segment** is the part of a circle
that is between a chord and the circumference.



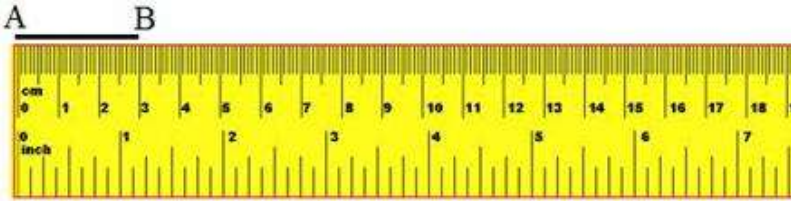
A **semicircle** is a half of a circle.



SKILLS

Measure line segment using ruler

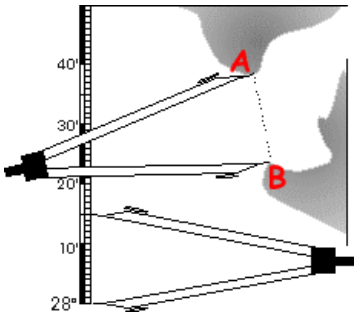
Let there be a line-segment AB.
We have to measure its length.



The scale is placed along the line-segment putting its zero (0) mark at A. We see the end B is at the 3 cm mark of the scale. So the length of the line-segment AB = 3 cm.

Measure line segment using Dividers

It is used in measuring the length of a line segment.
It can also be used in map reading, it measures the distance between two points on a map and that distance can be used to know the actual distance using a scale.
It can be used to divide a segment into several divisions of same length.

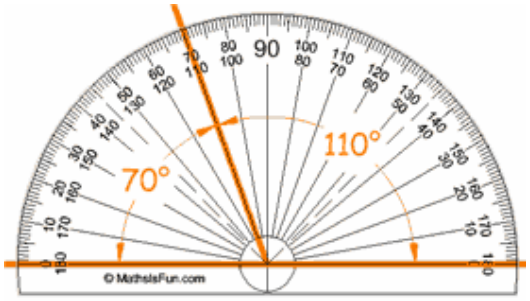


Measure angle using protractor

Protractors usually have two sets of numbers going in opposite directions.

Be careful which one you use!

When in doubt think "should this angle be bigger or smaller than 90° ?"

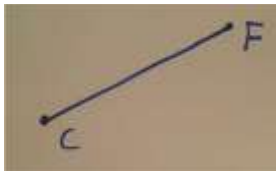


Draw line segment using ruler or straight edge

A line-segment has two end points.

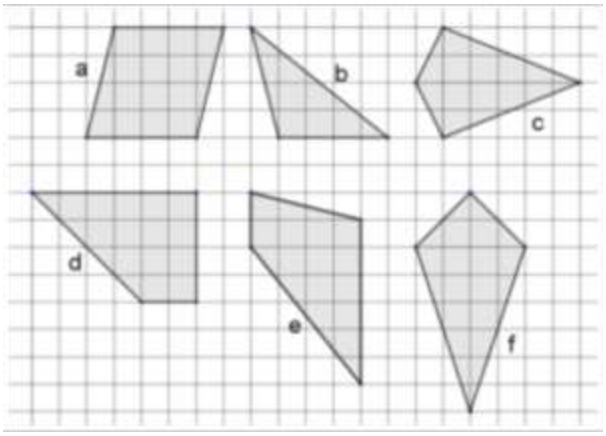
Mark two points and label them.

Use the ruler or straight edge to join the points.

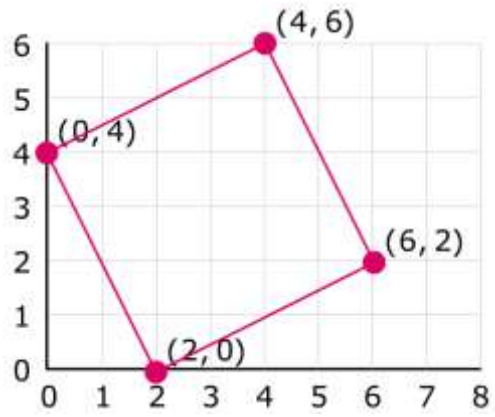


This is how you draw a line segment.

Drawing 2D shapes on a grid



Drawing 2D shapes on a coordinate grid



Draw a circle or an arc using compass

A **compass** is an instrument used to draw circles or the parts of circles called arcs.
It consists of two movable arms hinged together where one arm has a pointed end and the other arm holds a pencil.

Note that a compass is also called a pair of compasses.

To draw a circle (or arc) with a compass:

Make sure that the hinge at the top of the compass is tightened so that it does not slip.
Tighten the hold for the pencil so it also does not slip.
Secure a sharp pencil in the clamp of a compass so the point of the compass and the point of the pencil are level when the compass is closed.

Adjust the angle of the arms so that they span the full desired radius.

Put the sharp end of a compass down firmly wherever you want the middle of your circle to be.
Put the pencil point gently down on the paper.
Keep the compass upright and hold the compass at the top.
Turn the compass so that the pencil draws a circle.

To draw a circle of radius 4 cm

Step 1: Use a ruler to set the distance from the point of the compass to the pencil's lead at 4 cm.
Step 2: Place the point of the compass at the centre of the circle.
Step 3: Draw the circle by turning the compass through 360°.