

# Class 6

Mathematics Prerequisite



22

# Mathematics

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## KNOWLEDGE

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### Line

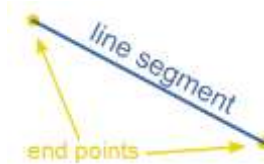
A line is straight (no curves), has no thickness, and extends in both directions without end (infinitely).



A line has **no ends** !

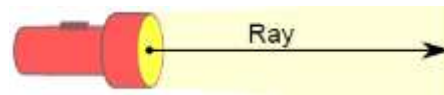
### Line Segment

When it **does** have ends, it is called a "Line Segment".



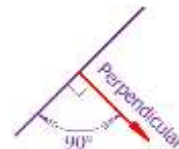
### Ray

When it has just **one end**, it is called a "Ray".



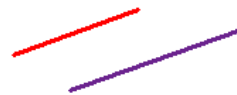
### Perpendicular Lines

Lines that are at right angles ( $90^\circ$ ) to each other are perpendicular.



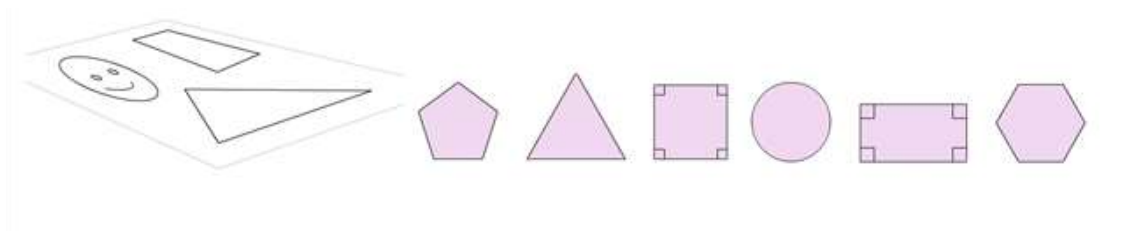
### Parallel Lines

Two lines on a plane that **never** meet. They are always the **same** distance apart. Here the **red** and **purple** line segments are parallel.



### 2D shapes

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

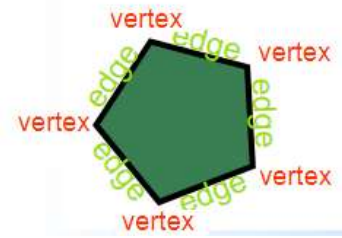


## Vertex and Edge

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**.



## Polygons

Polygons are 2D shapes. They are made of straight lines, and the shape is "closed" (all the lines connect up).



**Polygon**  
(straight sides)



**Not a Polygon**  
(has a curve)



**Not a Polygon**  
(open, not closed)

## Regular or Irregular

A **regular** polygon has all angles equal and all sides equal, otherwise it is **irregular**



equilateral  
triangle



square



regular  
pentagon



regular  
hexagon



regular  
heptagon



regular  
octagon



irregular

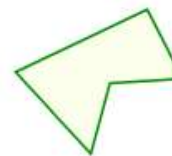
## Concave or Convex

A **convex** polygon has no angles pointing inwards. More precisely, no internal angle can be more than  $180^\circ$ . If any internal angle is greater than  $180^\circ$  then the polygon is **concave**.

(Think: *concave* has a "cave" in it)



Convex

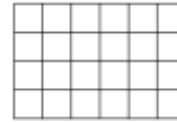


Concave

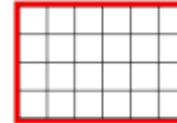
## Perimeter

The perimeter is the total length around the edge of a shape.

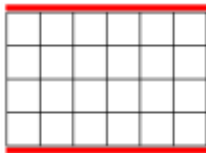
**Add up** all the edges.



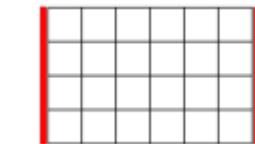
$$\begin{aligned} \text{Perimeter} &= 6 \text{ cm} + 4 \text{ cm} + 6 \text{ cm} + 4 \text{ cm} \\ &= 20 \text{ cm} \end{aligned}$$



A quicker way is to do this



$$2 \times 6 \text{ cm}$$



$$+ 2 \times 4 \text{ cm}$$

=

$$12 \text{ cm} + 8 \text{ cm}$$

=

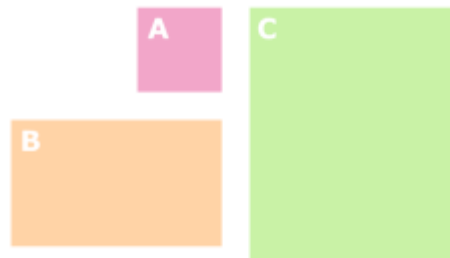
$$20 \text{ cm}$$

## Area

Area is a measure of how much space the surface of a shape or object covers.

Which of the 3 shapes has the largest area?

It looks like shape C has the largest area,  
but how can we be sure?

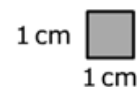


Like all measures, we need something to measure with!

To measure area, we count the number of squares that fit inside a shape.

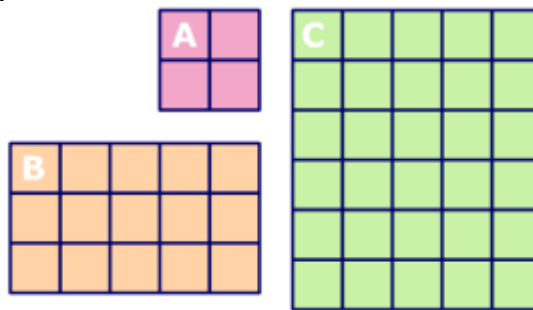
The size of these squares is based on units of length.

Where shapes are small, like the shapes above,  
we use squares with sides 1 cm long.

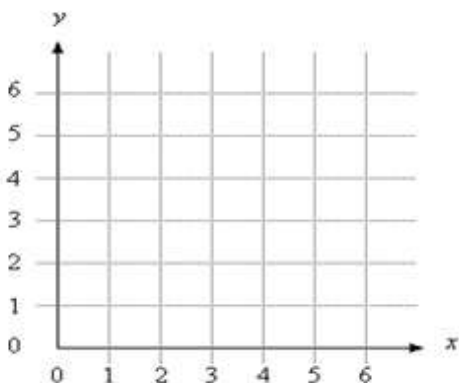


We call these **centimeter squares** or  $\text{cm}^2$ .

Shape C is the biggest because it has more squares than Shape A and Shape B.



## Co-ordinate Grid



A **coordinate grid** has two perpendicular lines, or axes, labeled like number lines.

The **x-axis** and the **y-axis**.

The point where the x-axis and the y-axis intersect is called the **origin**.

## Position of a point

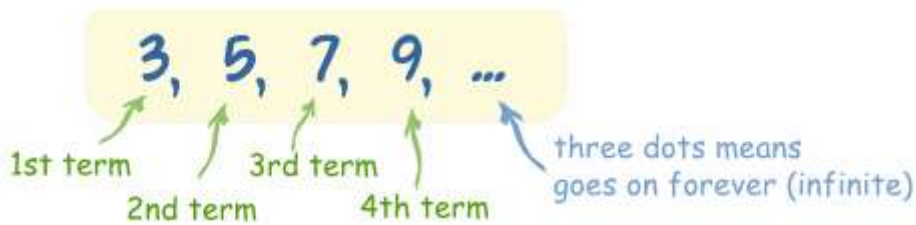
The coordinates of a **point** are a pair of numbers that define its exact location on a coordinate grid. The coordinates of a given point represent how far along each **axis** the point is located.



Here we see the point (12, 5)

## Sequence

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



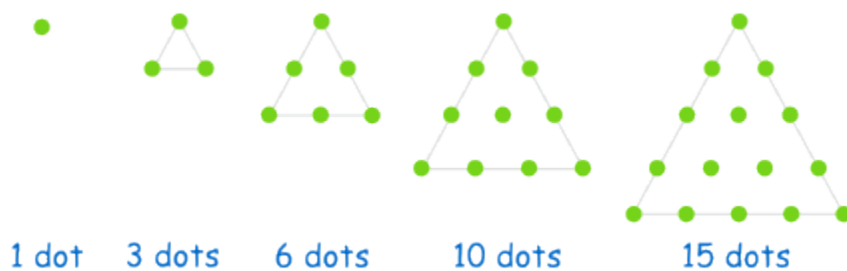
("term" , "element" or "member" mean the same thing)

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:

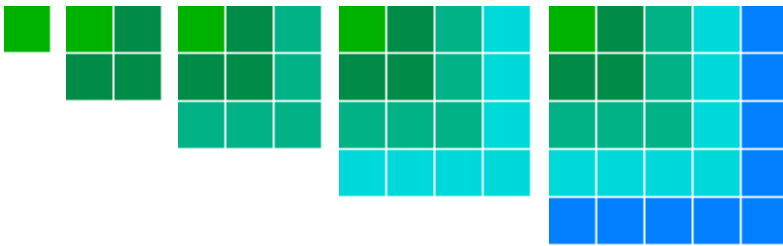
- 3, 6, 9, 12, 15, 18, 21, ...  
Pattern: "add 3 to the previous number to get the next number"
- 0, 12, 24, 36, 48, 60, 72, ...  
Pattern: "add 12 to the previous number to get the next number"
- 1, 6, 11, 16, 21, ...  
Pattern: "add 5 to the previous number to get the next number"
- 25, 21, 17, 13, 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"



1      4      9      16      25

## Square Numbers

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

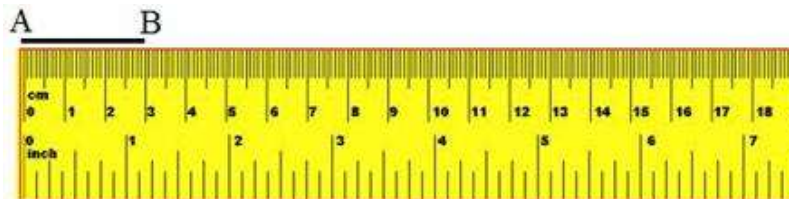
The sequences of triangle and square numbers also have numerical patterns like the ones we saw at the beginning. To find the following triangle numbers we have to add increasing integers to the last term of the sequence (+2, +3, +4, ...). To find the following square numbers we have to add increasing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

## SKILLS

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### 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.

### Draw line segment using ruler or straight edge

A line-segment has two end points.



Mark two points and label them.

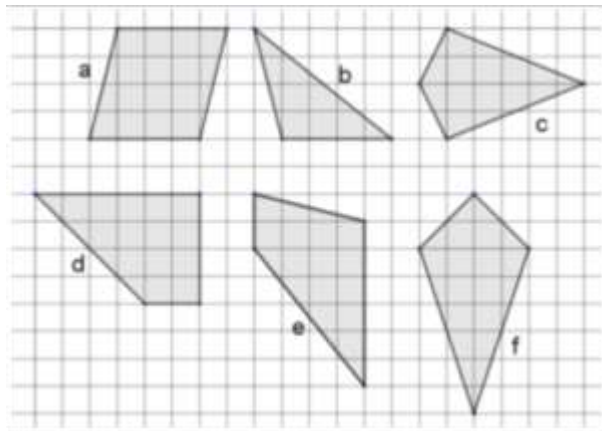


Use the ruler or straight edge to join the points.



This is how you draw a line segment.

## Drawing 2D shapes on a grid



## Drawing 2D shapes on a coordinate grid

