COORDINATES, CONSTRUCTIONS AND NETS

Finding the midpoint of a line between two coordinates, drawing and constructing triangles, and working with nets of 3D shapes.

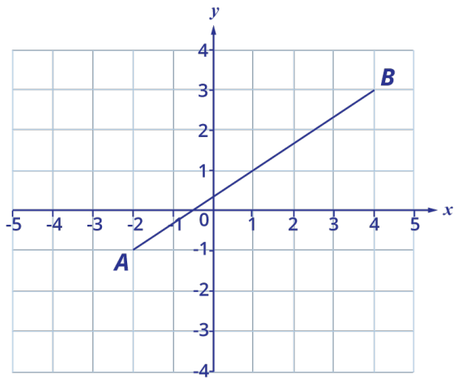
Check that you:

- *can recognise positive and negative x and y coordinates of different points*
- *can recognise and name simple 3D shapes*
- *have access to a ruler, protractor, pair of compasses, and a pencil.*

Finding the midpoint of a line between two coordinates

You need to know how to find the mid-point of a line drawn on a coordinate grid.

For example, the midpoint of the line *AB* is $(1, 1)$. This is the point on the line that is exactly halfway between the endpoints of the line, *A* and *B*.



We can also calculate the coordinates of the mid-point without a drawn graph, provided we know the coordinates of the ends of the line.

To calculate the coordinates of the mid-point of a line, calculate the means of both the x-coordinates and the y-coordinates of the end points.

Example
The line *CD* has end points $C(2, 5)$ and $D(10, 2)$.

Calculate the coordinates of the mid-point of *CD*.

Answer
The coordinates of *CD* are $(2, 5)$ and $(10, 2)$.

Mean of the x-coordinates $= \frac{2+10}{2} = 6$

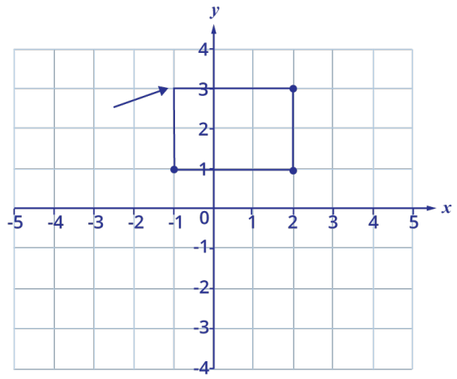
Mean of the y-coordinates $= \frac{5+2}{2} = 3{\cdot}5$

So, the mid-point of *CD* is $(6, 3{\cdot}5)$.

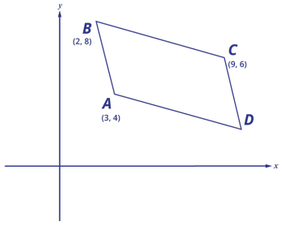
Another type of problem that can be presented in relation to coordinates is finding the missing coordinate for a vertex of a shape when the coordinates of the other three vertices have been given.

To do this, we use the properties of the shape to help us find the missing coordinate.

Example
When given three coordinates of a rectangle, we can plot these on a coordinate grid and use this diagram to find the missing coordinate. By connecting these points up using two pairs of equal and parallel sides, with four angles of 90°, we can see that the missing coordinate is $(-1, 3)$.



Example
ABCD is a parallelogram. Calculate the coordinates of *D*.



Answer
C is 7 to the right of *B* (+7) and 2 down from *B* (−2). So, from *A* we need to add 7 to the x-coordinate and −2 from the y-coordinate. The coordinates of *D* are $(10, 2)$.

REMEMBER! To calculate the mean average of a set of values, find the total of these values, and then divide this total by the number of values in the set. For example, the mean of 2 and $6 = \frac{2+6}{2} = 4$.

Drawing and constructing triangles

You will need to know how to draw triangles accurately, either with a ruler and a protractor, or construct them using of a pair of compasses.

There are two sets of instructions that can be given for drawing a triangle using a ruler and a protractor. These vary depending on the information we are given about the triangle. If two sides and one angle are given, or one side and two angles are given, the technique to draw the complete triangle will vary.

If three sides and no angles are given, you can construct the triangle using a ruler and a pair of compasses (a protractor would not be used in this case).

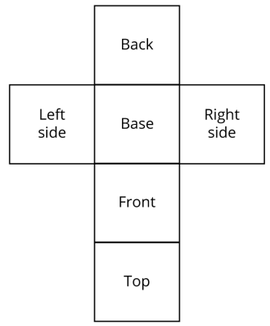
For detailed guidance on how to draw and construct triangles, have a look at this WJEC Blended Learning resource.

Nets of 3D shapes

A net is a flat shape that folds to make a 3D shape. It consists of all the faces of the 3D shape, with each face connected to another face along one edge only.

You will need to know how to:

- choose the correct net of a shape from a selection
- name the 3D shape that a net would fold to make
- complete the drawing of a net.



The diagram on the right shows one example of the net of a cube. We have to visualise folding up the faces about the common edges, to make a cube. One possibility for the names of each of the faces is shown on the diagram.

Drawing 3D shapes on isometric paper

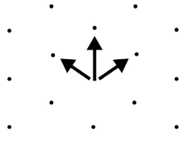
Isometric paper is also known as triangular paper, or sometimes triangular dotty paper.

It is used to show a 2D view of a 3D shape, allowing you to visualise the top, front and side views.

Example
On 1 cm isometric paper, draw an isometric representation of a cuboid measuring 5 cm by 3 cm by 2 cm.

Answer
Always start by turning the paper so that you have vertical columns of dots, with the dots in the columns 1 cm apart.

We then need to draw lines in these three directions which represent heights, lengths and widths.



Here is one possible representation of the cuboid.