Shape and Space

## Constructions

Constructions

What are Constructions?

- Constructions are what maths used to be all about before computers came in and made life just a bit too easy!

- The Ancient Greeks and the Egyptians were fascinated by constructions, and their discoveries form the basis of many of the important concepts in the shape and space branch of mathematics.

- Constructions rely on the use of just a compass and a ruler to do some pretty tricky and pretty impressive things
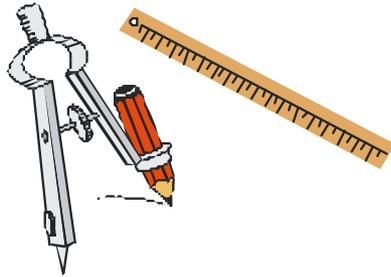
- I will cover some basic skills in this section, but you should also have a good read through 4. Loci, as that shows you some practical uses for these skills

- Note: If you are the type of person who just hates algebra, wishes fractions were never invented, and would not care if they did not see another percentage for the rest of their lives, then this type of maths might be just for you!
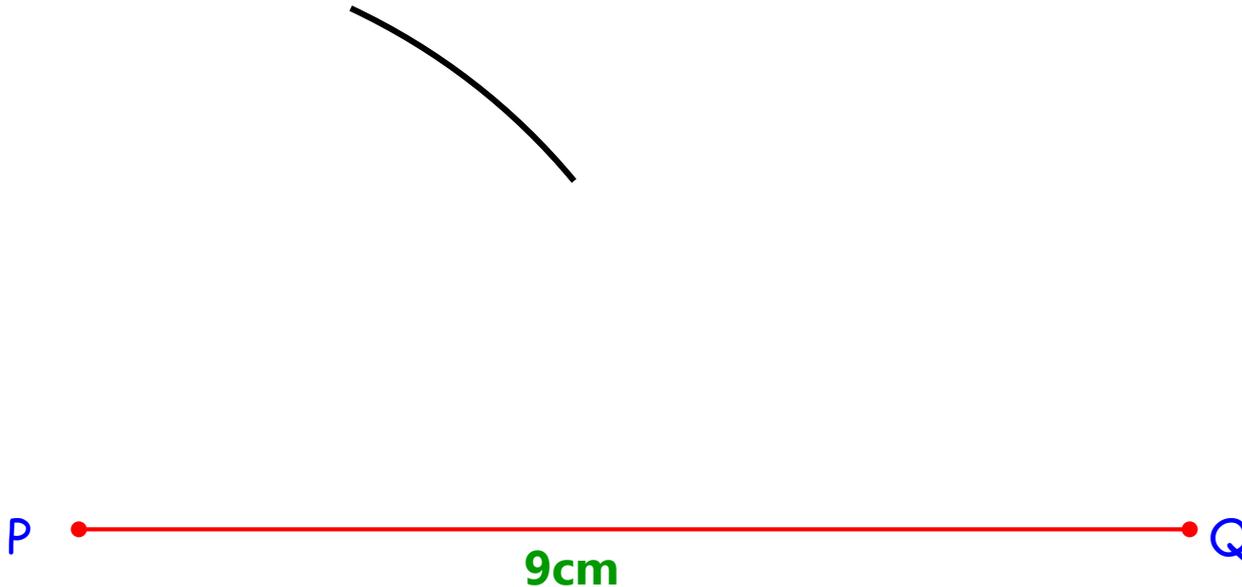
1. Drawing a Triangle Given 3 Sides

Construct the triangle PQR with sides: PQ = 18cm, PR = 10cm and QR = 14cm
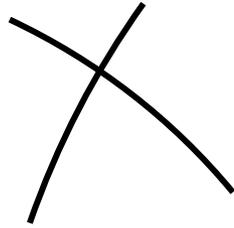
1. Select the longest side as your base, and carefully draw a horizontal line 18cm long, labelling the ends **P** and **Q**
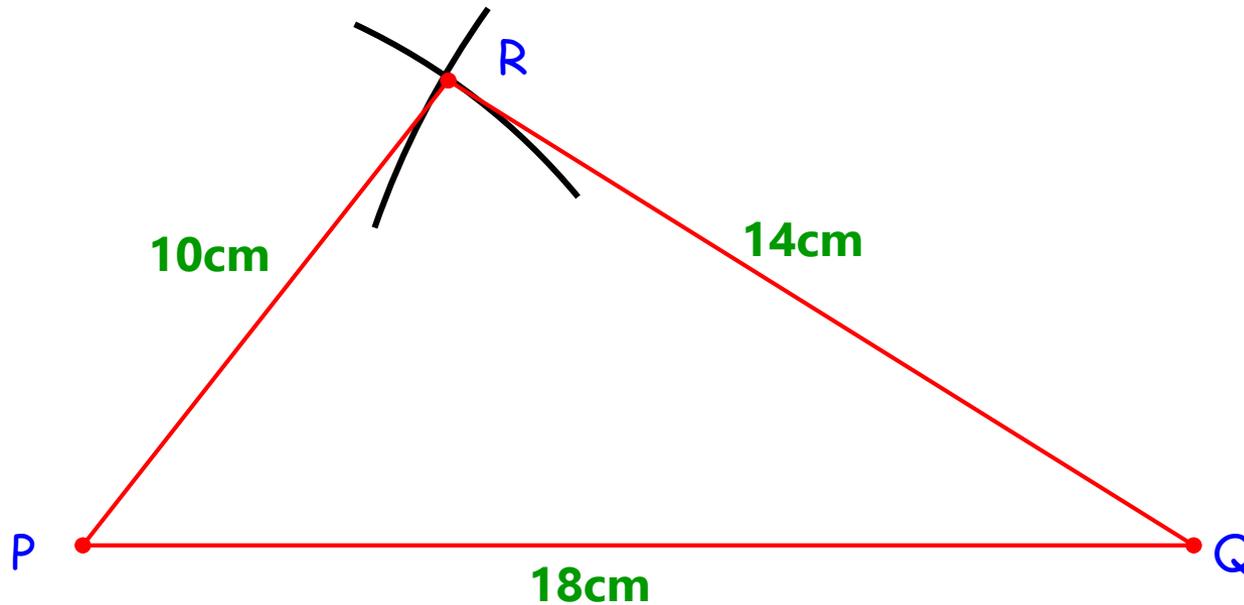
P ●————————————————————————● Q

18cm

2. Set your compass to 10cm, place the pointy bit at **P**, and draw an arc:

P ●————————————————————————● Q

9cm

3. Now set your compass to 14cm, place the pointy bit at **Q** and draw and arc:

P ●————————————————————————● Q
18cm

4. Label the point where these two arcs meet **R**, join up your lines, and check with a ruler that you have got your measurements correct!

R

10cm

14cm

P

18cm

Q

NOTE: If you wanted to construct an Equilateral Triangle, then whatever length you choose for your base, just make sure you set your compass to the exact same length for both of your arcs!
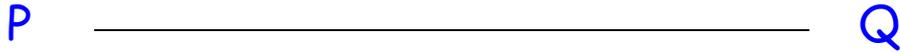
2. Drawing a Perpendicular Bisector

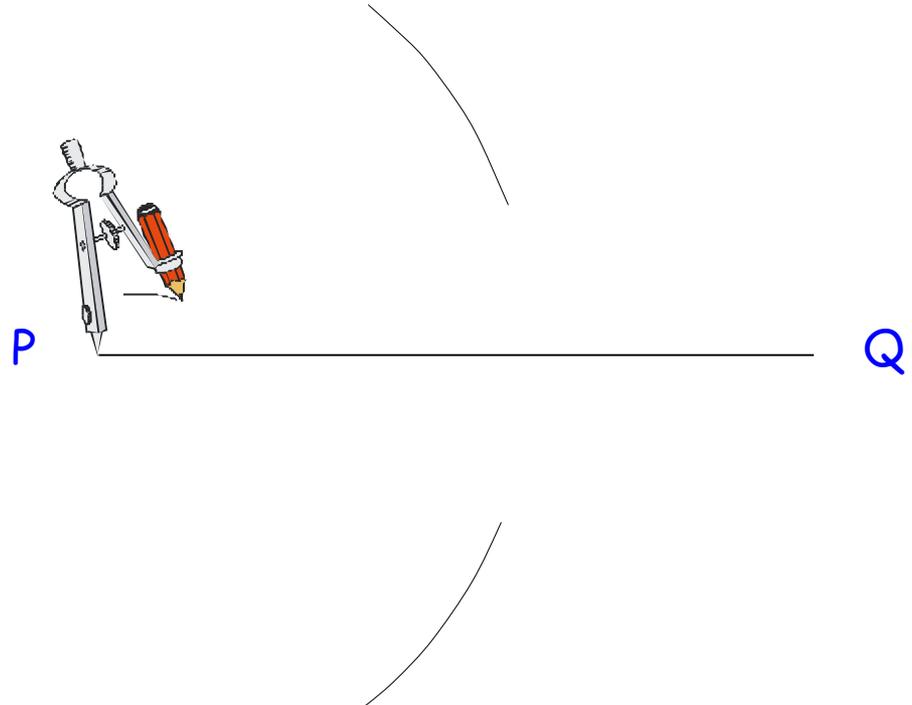What does that mean?

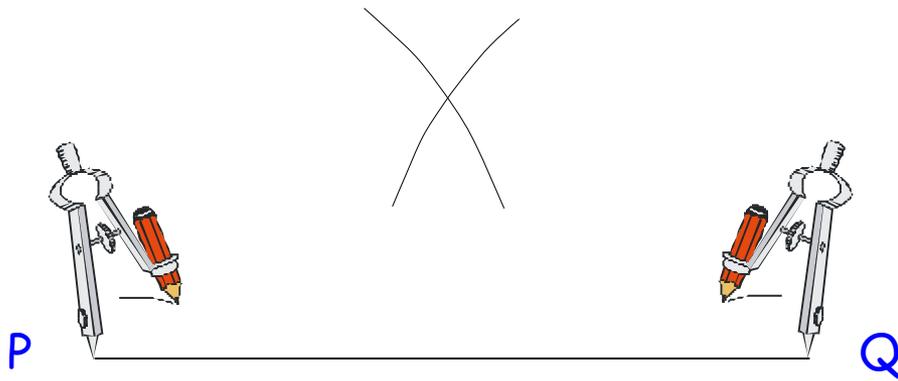Perpendicular: At right angles (90^0)

Bisector: Chop in half

So… if we are given a line to start with, we want a line that chops it in half at right
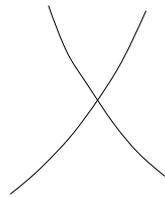
Construct a perpendicular bisector to the line PQ

P ──────────────── Q

1. Set your compass to over half the length of the line. Place the pointy bit of the compass at **P** and draw an arc above and below the line:
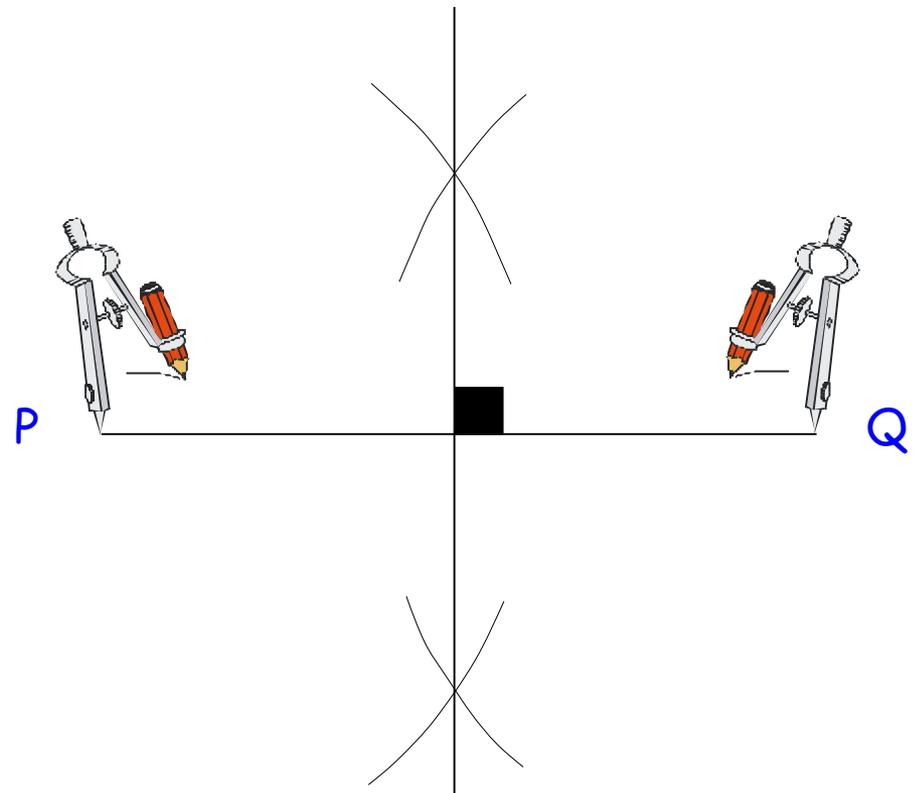
P ──────────────── Q

P

Q

2. Making sure you keep your compass at the exact same setting, place the pointy bit at **Q** and draw two more arcs.

3. With your ruler, draw a straight line through the two points where the arcs cross, and that is your perpendicular bisector!

Note: Every point on this new line is the exact same distance from point P as it is from point Q!
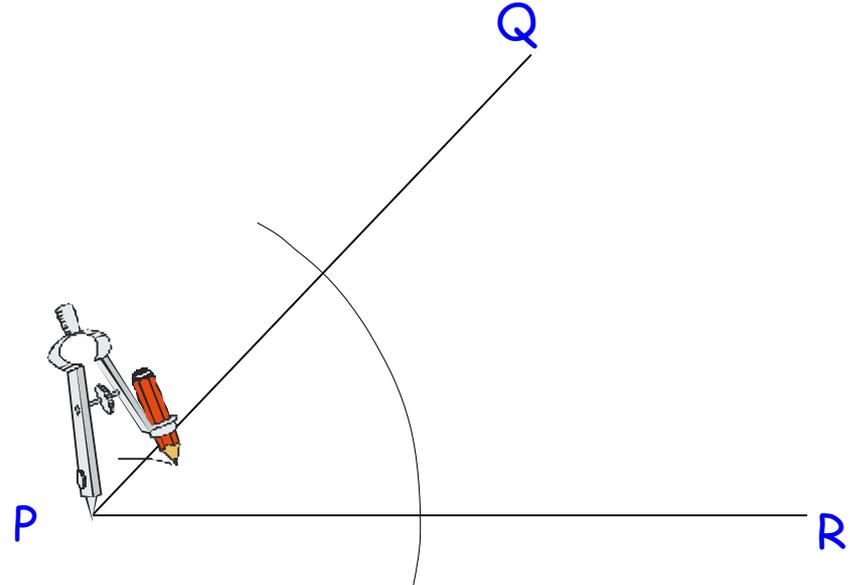
P

Q

3. Drawing an Angle Bisector
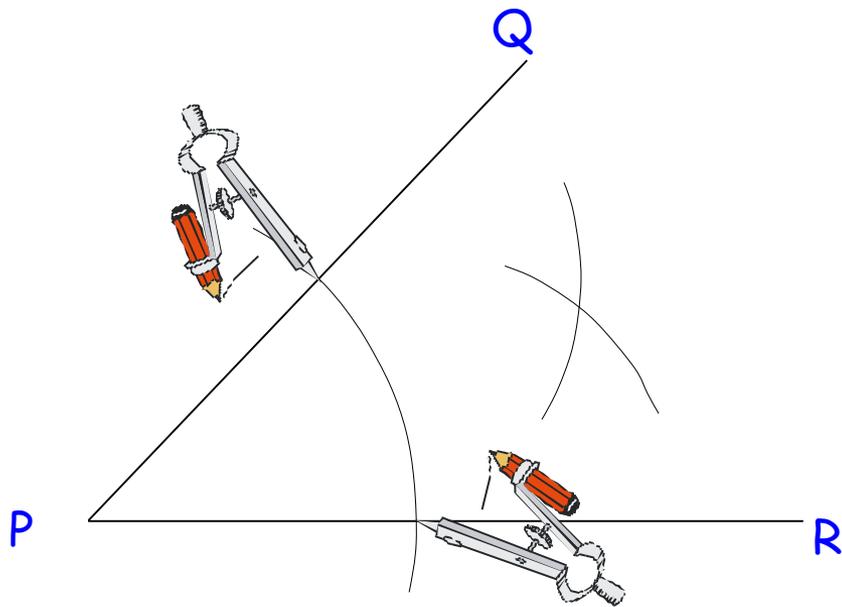
What does that mean?

Bisector: Chop in half

So... if we are given an angle, we need to chop it in half... without using an angle measurer!

Construct an angle bisector for the angle made by lines PQ and PR

1. Place the pointy bit of your compass at **P** and draw an arc which crosses lines **PQ** and **PR**
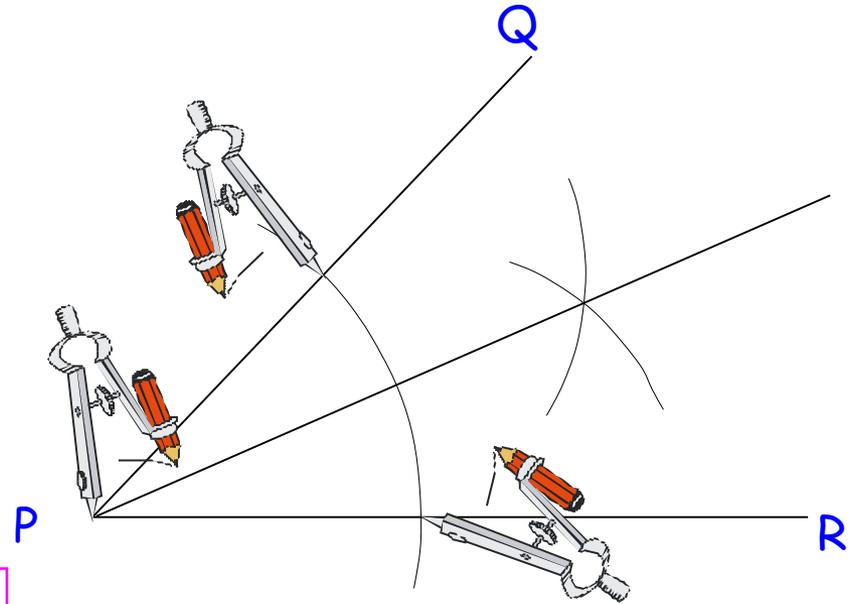
Q

P   R

Q

2. Place the pointy bit of the compass at both of the places where the arc hits the lines and draw two arcs

Crucial: You must not change the setting of the compass at this stage!

P   R

3. With your ruler, draw a straight line from **P** through the intersection of the arcs.

This is your angle bisector!

Q

P   R

Note: Every point on this new line is the exact same distance from line PQ as it is from line PR!