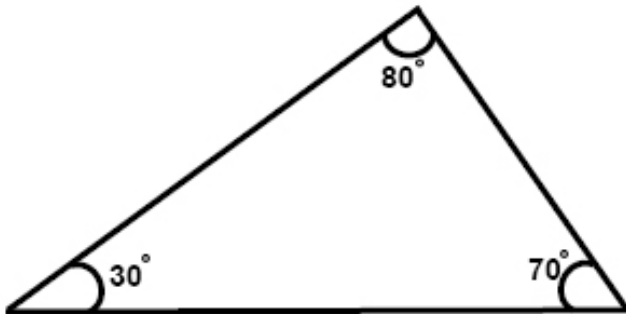


**SHQ: How can I calculate a missing angle in a triangle without a protractor?**

Look at the picture of the triangle. What facts can you list about this triangle? Have a go before looking at the ideas below:



Here are some facts you may have considered:

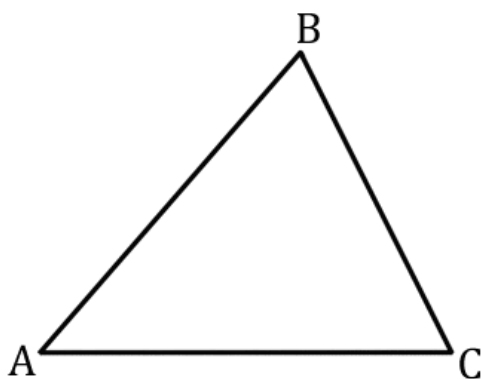
- All the angles in the triangle are acute (less than  $90^\circ$ )
- All the angles are different
- Because all the angles are different, all the sides will be different lengths
- Because all angles and side lengths are different, it is a **SCALED** triangle
- When added together, the three angles in the triangle total  $180^\circ$

The key fact to remember about angles in a triangle is that when added together, they total  $180^\circ$ .

Therefore, if you know two of the angles, you can work out the third without using a protractor to measure it.

**For example:**

- In this triangle, angle A measures  $45^\circ$
- Angle B measures  $60^\circ$
- What is angle C?



Firstly, add together the measurements for angle A and angle B:  
 $45 + 60 = 105$

We know that angles in a triangle add up to  $180^\circ$ , so if we subtract the total of the angles that we know from  $180^\circ$ , we will be left with the missing measurement:  
 $180 - 105 = 75$   
So angle C must measure  $75^\circ$

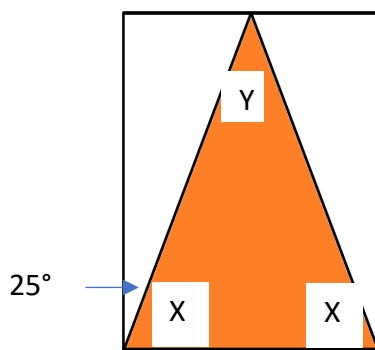
**ALWAYS check your answer by adding the three measurements together to make sure they make  $180^\circ$**

Sometimes, triangles might be drawn inside another shape, so you will need to use other facts to help work out the angles.

**For example:**

This is an isosceles triangle inside a rectangle. Remember, in an isosceles triangle, two of the sides are the same length, and the two angles at the base are the same size.

Using the information given, you can work out the angles X (they are the same) and Y in the triangle. Have a go before looking at the solution below.



Angle X makes up part of a right angle (at the corner of the rectangle). A right angle measures  $90^\circ$

We know that angle X plus the  $25^\circ$  angle will make  $90^\circ$

Angle X is therefore  $90 - 25 = 65^\circ$

Because this is an isosceles triangle, we know that both angles at the base (labelled 'X') are the same.

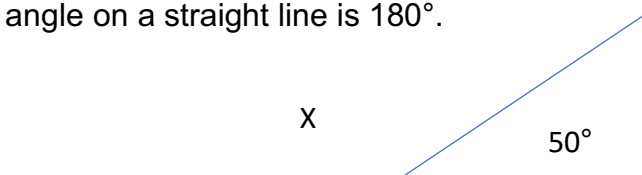
If we add together the two angles at the base,  $65 + 65$ , this makes  $130^\circ$

We know that the angles in a triangle add up to  $180^\circ$  so to find the size of angle Y, if we subtract what we know ( $130^\circ$ ) from 180, we will find our missing angle.

$180 - 130 = 50$  so angle Y measures  $50^\circ$

**To check**, we add our three angles together :  $65 + 65 + 50 = 180^\circ$

Another useful fact you will need to remember before tackling the Power Maths questions for this worksheet (see Worksheet 6a Power Maths activity) is that the angle on a straight line is  $180^\circ$ .



For example, on this diagram, we know that the total angle on the line is  $180^\circ$  so to calculate angle X, we subtract  $50^\circ$  from  $180^\circ$  giving us  $130^\circ$

**Now it's your turn:** Using these tips, work through the questions on the Power Maths resource for Worksheet 6b. Answers are included in 'Week 6 Maths Answers'.