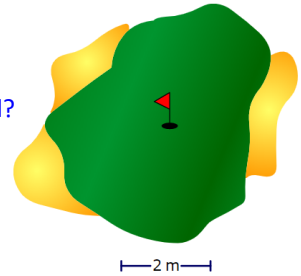
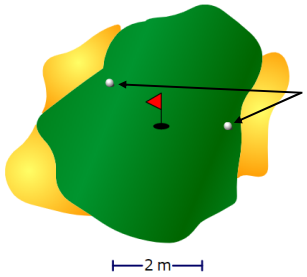
Maths, Y8 - Loci

1. Points equidistant from a point

A golfer hits a drive to a distance of 2 metres from the hole.

Where might the ball have landed?

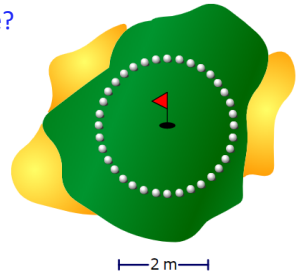




Here are two possible positions.

If you carry on plotting possible positions, what shape will they make?

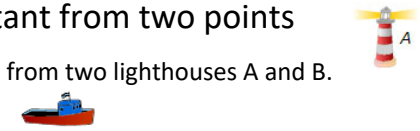
These balls are all 2m away from the hole. They form a circle.



The locus of points equidistant from a fixed point is a circle.

2. Points equidistant from two points

A ship sails equidistant from two lighthouses A and B.

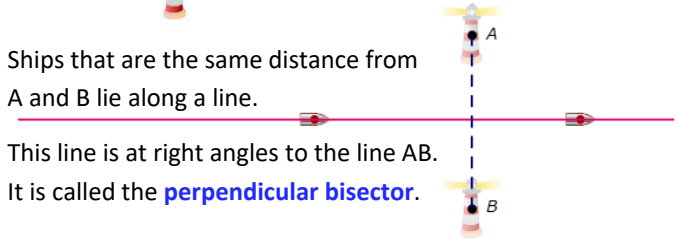


What is the locus of the ship going to be?

Here are two possible positions.

If you carry on plotting possible positions, what shape will they make?

Ships that are the same distance from A and B lie along a line.



This line is at right angles to the line AB.

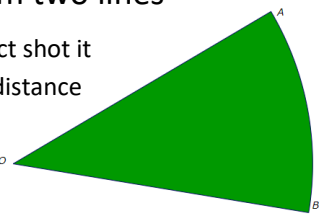
It is called the **perpendicular bisector**.

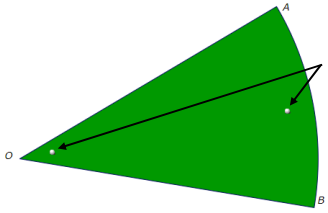
The locus of points equidistant from two fixed points is a line.

3. Points equidistant from two lines

A golfer hits a ball. To be a perfect shot it must land so that it is the same distance from the two lines, OA and OB.

Where might the ball land?



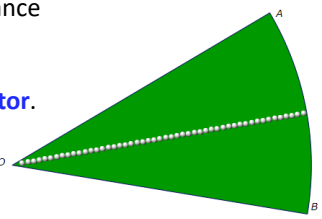


Here are two possible positions.

If you carry on plotting possible positions, what shape will they make?

Golf balls that are the same distance from OA and OB lie along a line.

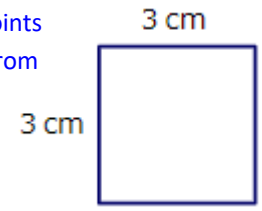
This line is called the **angle bisector**.



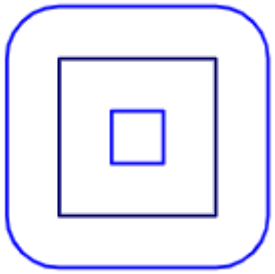
The locus of points equidistant from two lines is a line.

4. Points equidistant from a square

Draw the locus of points that are 1cm away from the perimeter.



Here is the answer.



Notice that the locus is rounded at the corners and also that the locus is also inside the square.

5. Shading regions using circles and lines

A and B are two towns 8 miles apart.

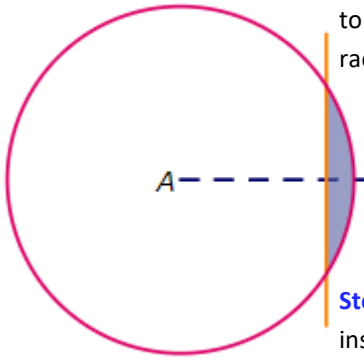
A - - - - - - - - - B

A mobile phone mast is to be installed.

It must be less than 5miles from A and nearer to B than to A.

The scale of the map is 1cm to 1mile.

Shade the region in which the mast can be installed.



Step 1: The locus of points 5miles from A is a circle. The scale of the map is 1cm to 1mile, so the circle must have a radius of 5cm.

Step 2: The locus of points from A and B is a line.

We need to construct the perpendicular bisector of the line AB.

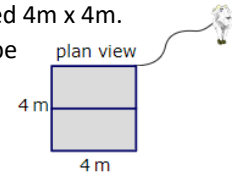
Step 3: Shade the region which is both inside the circle and nearer to B than A.

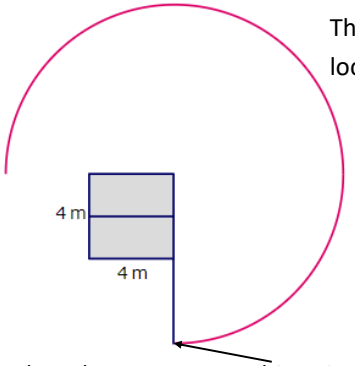
6. Goat problem

The diagram shows a plan view of a garden shed 4m x 4m.

A goat is tied to the corner of the shed on a rope 8m long.

Draw the locus of points that would be the goat's boundary line.

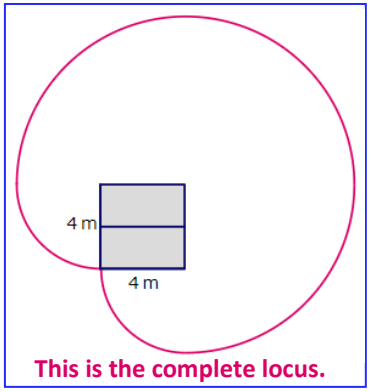




When the rope gets to this point it must bend around the shed.

And likewise for the other corner.

The goat will have free rein on the locus of points 8m from the corner.



This is the complete locus.