

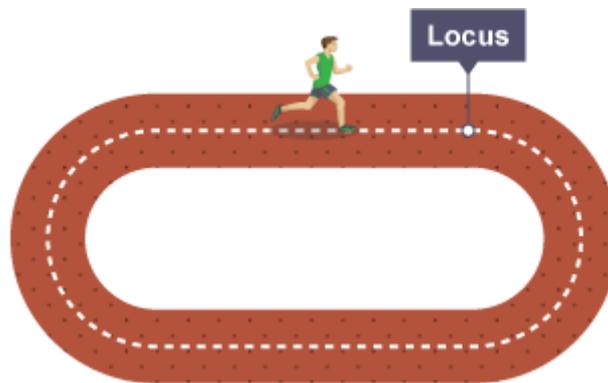
## Loci and construction – The four rules

In maths, there are 4 ruler and compass constructions you should know.

1. Locus of all points around a point or line
2. Perpendicular bisector
3. Perpendicular line from a point.
4. Bisecting an angle.

## Loci

A **locus** is a path formed by a point which moves according to a rule. The plural is **loci**.



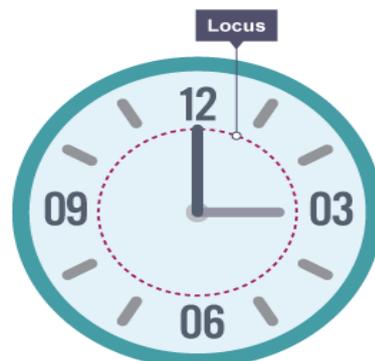
The runner is following a path. This path is a locus.

## Locus around a point

The hands of a clock move around the clock and create a locus.

The tip of each hand is always the same distance - **equidistant** - from the centre of the clock.

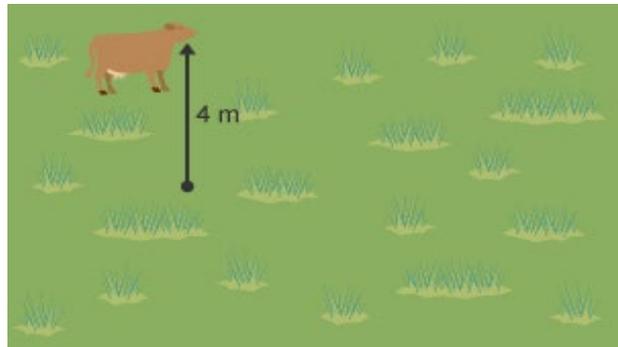
The locus the hands create is a circle.



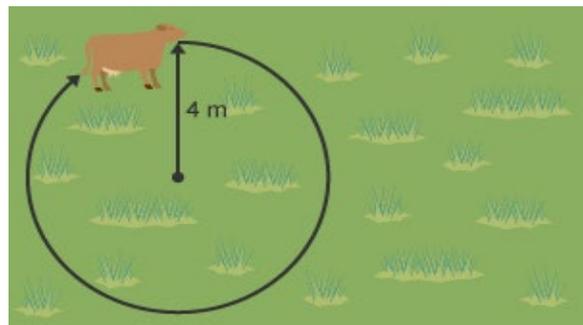
**A locus of points at equal distance around a point is a circle.**

## Question

Farmer Smith has tied a cow to a post on a rope 4 m long. What is the locus of the cow as it moves around the post?



The locus is a circle 4 m from the post.



## Locus from a line

A locus does not have to be a line - it can also be an area.

### Example

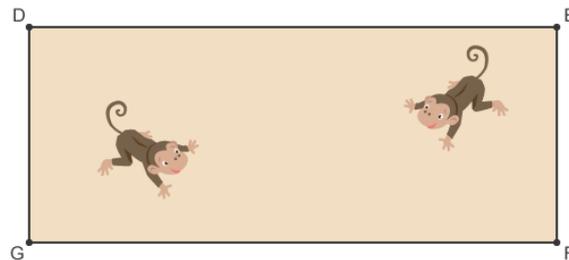
A flowerbed runs along the grass between A and B. The edge of the flowerbed is 1 m from the grass. How would you draw an accurate diagram showing the flowerbed, using a scale of 1 cm:1 m?



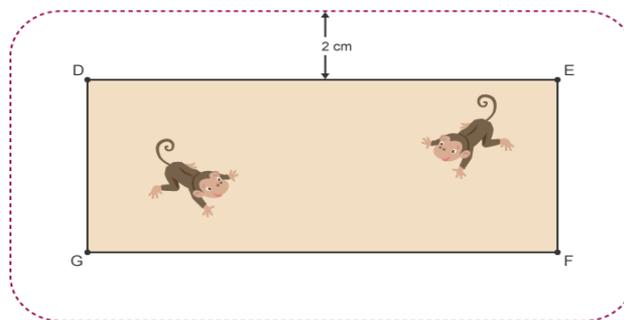
Draw a line parallel to AB 1 cm from AB. Shade in the area between this line and the line AB

### Question

Visitors must stand at least 2 m away from the walls of the monkey enclosure at the zoo. How would you draw an accurate diagram to show where the visitors must not stand, using a scale of 1 cm:1 m?

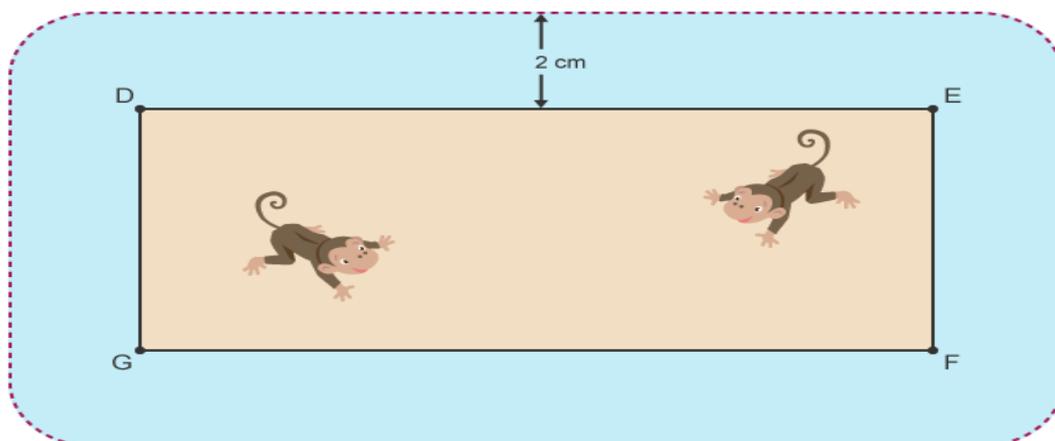


Draw four lines parallel to each side of the rectangle, 2 cm away. Use a compass to draw rounded corners at D, E, F and G.



The straight line of the locus is parallel to the edges of the rectangle, because they are at a set distance from the edges. At each corner the locus is a quarter circle drawn from the fixed points D, E, F and G.

Visitors must not stand in the area between the rectangles. Shade this in.



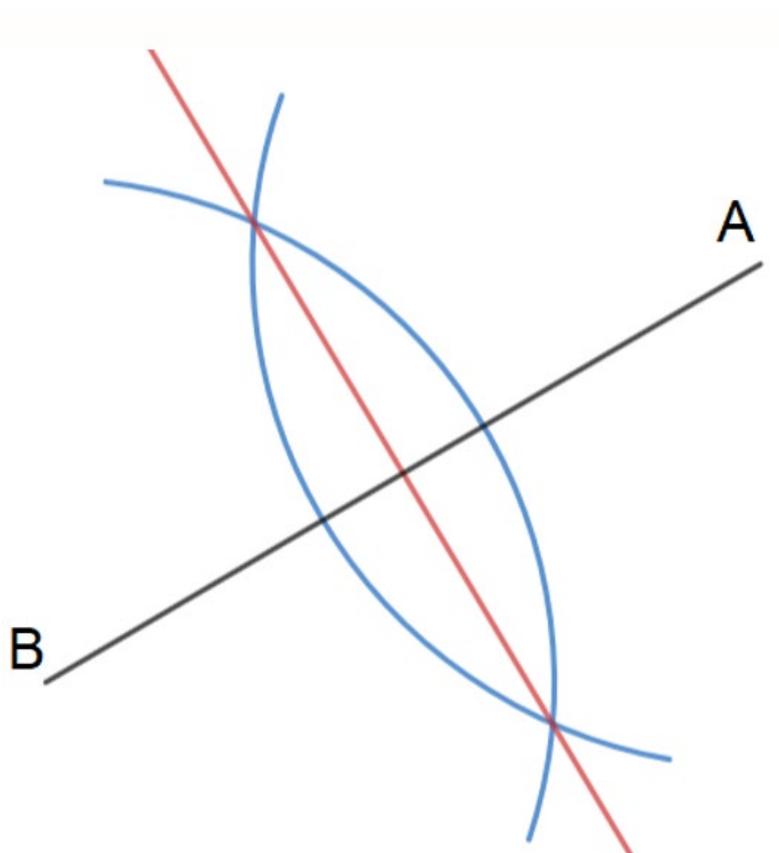
### Perpendicular bisector

The first construction is a **perpendicular bisector** of a line.

**Example:** Bisect line AB, or you could be asked to *draw a line equidistant from points A and B*, the method will be exactly the same

To do this you must do the following:

- Set your compasses to a fixed length apart (**Must be greater than half the line**)
- Put your compass on point A and draw an arc (blue).
- With your compasses at the **same length**, repeat step 2 for the other end of the line (also blue).
- Then, draw a line which passes through the two crossing points. This line (red) is the perpendicular bisector.



### Perpendicular line from a point.

The second construction is a **perpendicular from a line to a point**.

In the diagram, we have been given a line segment and a point (both black).

**Example:** Construct a perpendicular line from point C to line AB

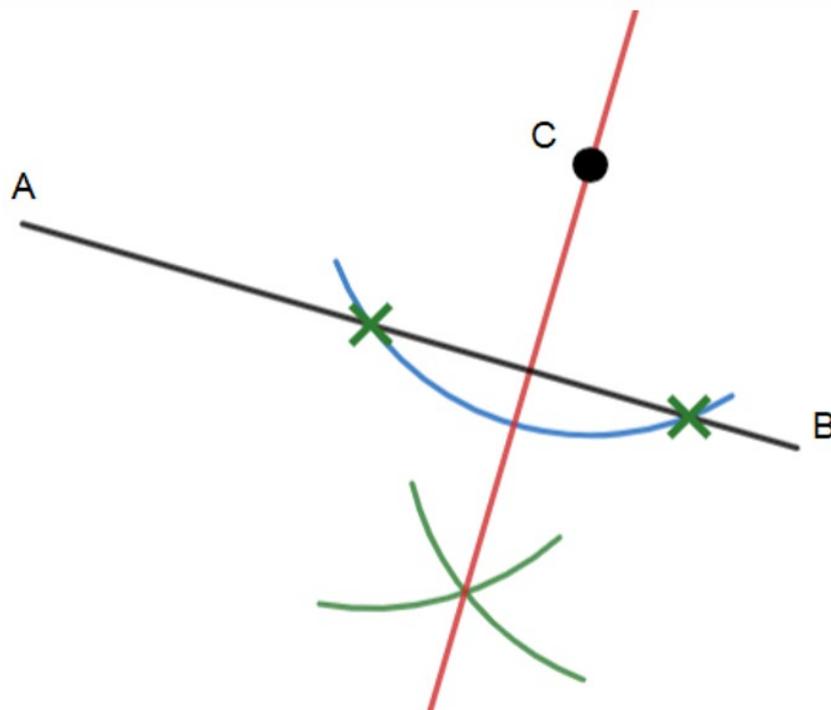
– Place your compass on the point C and draw an arc of a circle that passes through the line twice (**blue**).

– Place your compass on the crossing point (**green cross**) and draw a small arc on the opposite side of the line to where the point is (green).

– With your compasses at the **same length**, repeat step 2 for the other crossing point (other green cross).

– Draw a line that passes through the original point and the point where the last two arcs cross.

This line (red) is the perpendicular from the line to the point.



### Bisecting an angle

The third construction is an **angle bisector**. This allows us to split a given angle perfectly in half.

**Example:** Construct a line, equidistant from line AB and BC

In the diagram, we have been given two lines (black) and an angle between them. To bisect it, we do the following:

– Place your compass on the corner where the two lines meet and draw an arc (**blue**) that passes through both lines.

Place your compass on the crossing point and draw a small arc between the lines.

– With your compasses at the **same length**, repeat step 2 from the other crossing point.

– Draw a line (red) passing through the corner where the lines meet and the point where the two green arcs cross. This is the angle bisector.

