

Constructing bisectors and perpendiculars

Notes

Constructions are produced using a maths compass, a straight edge (i.e. a ruler with no scale on it) and a pencil.

There are 4 constructions you need to know:

- **Perpendicular bisector** (also known as a **line bisector**)
- **Angle bisector**
- **Perpendicular from a point to a line**
- **Perpendicular to a line at a point**



Bisectors

Perpendicular bisector (or line bisector)

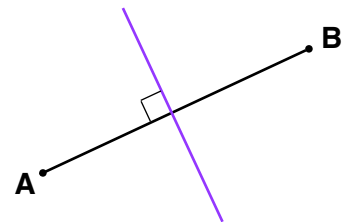
What does perpendicular mean?

At right angles

What does bisector mean?

Cut into two equal parts

In the diagram the **perpendicular bisector** cuts the line AB in half and is at right angles



Success criteria for **constructing** a perpendicular bisector:

1. Draw a line about 7 cm long on your page.
2. Open your maths compass to just over half the length of your line.
3. Put the compass point on one end of the line and draw an arc (see **Diagram 1**)
4. **Important:** do not change how wide your maths compass is opened
5. Put the compass point on the other end of the line and draw an arc which intersects the first arc above and below the line (see **Diagram 2**)
6. Draw a straight line through the points where the arcs intersect — this is the **perpendicular bisector** (your final diagram will look like **Diagram 3**).

N.B. Make sure you leave your construction lines (i.e. the arcs) on your diagram

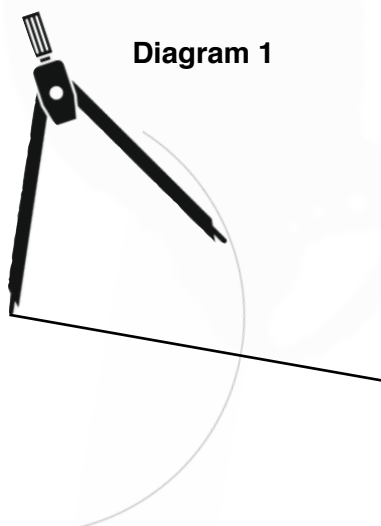


Diagram 1



Diagram 2

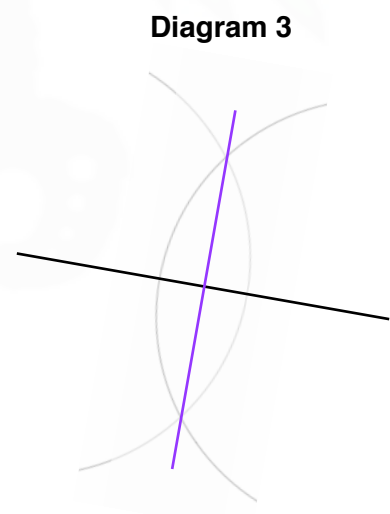


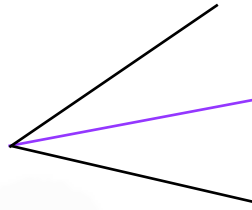
Diagram 3

[Video \(until 2m 20s\):](#)

[Perpendicular bisector](#)

Angle bisector

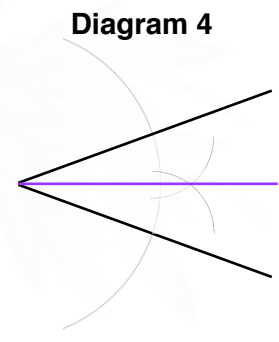
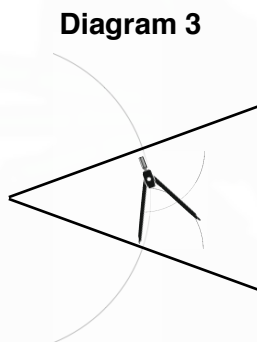
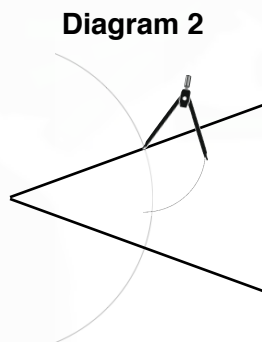
An angle bisector cuts an angle in half.



Success criteria for **constructing** an angle bisector:

1. Draw two intersecting lines about 7 cm long on your page.
2. Put the compass point on the intersection point of the 2 lines
3. Draw an arc that intersects the two lines (see **Diagram 1**)
4. Put the compass point on one of the new intersection points and draw an arc between the two lines — you will probably need to change how wide your compass is open (see **Diagram 2**)
5. **Important:** do not change how wide your maths compass is opened
6. Repeat step 3 from the other new intersection point, making sure the arcs intersect (see **Diagram 3**)
7. Draw a line through the point where the lines intersect and where the arcs intersect — this is the **angle bisector** (your final diagram will look like **Diagram 4**).

N.B. Make sure you leave your construction lines (i.e. the arcs) on your diagram



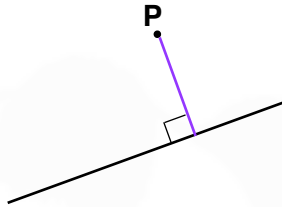
Video:

[Angle bisector](#)

Perpendiculars

Perpendicular from a point to a line

Here a point, **P**, is above (or below) a line and we want to draw line down to it that meets it at a right angle.



Success criteria for **constructing** a perpendicular from a point to a line

1. Draw a line 7 cm long and a point 2 cm above the line but not above the centre of the line
2. Put the compass point on one end of the line
3. Open the compass to the point and draw an arc above and below the line (see **Diagram 1**)
4. Put the compass point on the other end of the line
5. Open the compass to the point and draw an arc above and below the line, making sure construction arcs intersect (see **Diagram 1**)
6. Draw the line through the points of intersection of the arcs — this is the **perpendicular from a point to a line** (your final diagram will look like **Diagram 3**)

N.B. Make sure you leave your construction lines (i.e. the arcs) on your diagram

Diagram 1

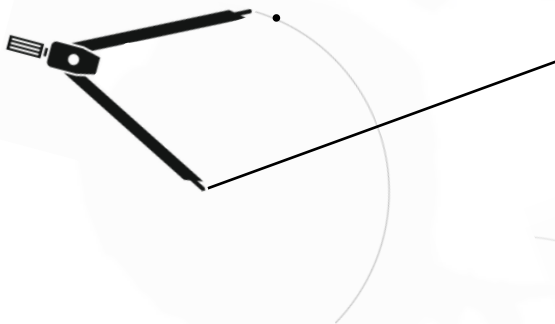


Diagram 2

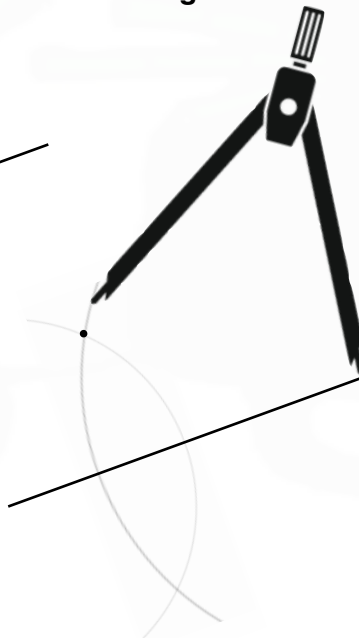
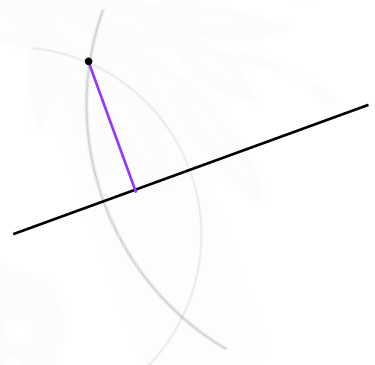


Diagram 3



Video:

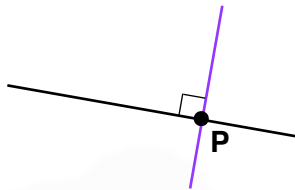
[Perpendicular from a line to a point](#)

Success Criteria B

1. Put the compass point on the point
2. Draw 2 arcs which intersect the line
3. Draw the perpendicular bisector of these two points

Perpendicular to a line at a point

The difference between this construction and the last one is that the point is on the line.



Success criteria for **constructing** a perpendicular to a line at a point

1. Draw a line 7 cm long and a point about 3 cm from one end of the line
2. Put the compass point on the point and draw two arcs that intersect the line on either side of the point (see **Diagram 1**)
3. Now draw the perpendicular bisector of these two points (see **Diagrams 2 and 3**)
4. The perpendicular bisector is the **perpendicular to a line at a point** (your final diagram will look like **Diagram 4**)

N.B. Make sure you leave your construction lines (i.e. the arcs) on your diagram

Diagram 1



Diagram 2

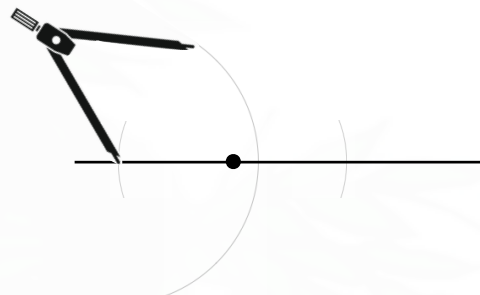


Diagram 3

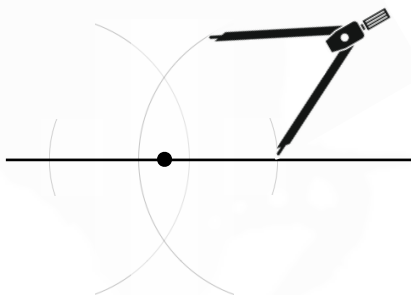
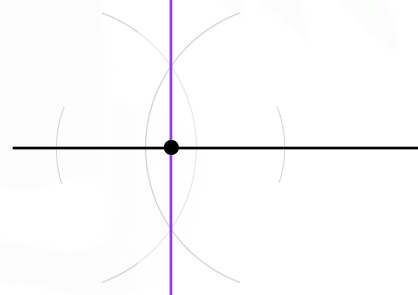


Diagram 4



Video: [Perpendicular through a point on a line](#)

Notation for angles

$$\widehat{PQR} \equiv \hat{Q} \equiv \angle PQR$$

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:

p536 M17.2 Qu 1-7 (Qu 4 — reminder about constructing triangles)
p538 M17.3 Qu 1-2, 6b, 10, 12

A*-G class textbook:

p494 M17.2 Qu 1-7 (Qu 4 — reminder about constructing triangles)

p496 M17.3 Qu 1-2, 6b, 11, 12

9-1 homework book: p180 M17.2 Qu 1-4, 6; p181 M17.3 Qu 3, 4, 7

A*-G homework book: p136 M17.2 Qu 1-4, 6; p181 M17.3 Qu 3, 4, 7

Summary

Constructing a perpendicular bisector:

1. Draw a line about 7 cm long on your page.
2. Open your maths compass to just over half the length of your line.
3. Put the compass point on one end of the line and draw an arc (see **Diagram 1**)
4. **Important:** do not change how wide your maths compass is opened
5. Put the compass point on the other end of the line and draw an arc which intersects the first arc above and below the line (see **Diagram 2**)
6. Draw a straight line through the points where the arcs intersect — this is the **perpendicular bisector** (your final diagram will look like **Diagram 3**).

Constructing an angle bisector:

1. Draw two intersecting lines about 7 cm long on your page.
2. Put the compass point on the intersection point of the 2 lines
3. Draw an arc that intersects the two lines (see **Diagram 1**)
4. Put the compass point on one of the new intersection points and draw an arc between the two lines — you will probably need to change how wide your compass is open (see **Diagram 2**)
5. **Important:** do not change how wide your maths compass is opened
6. Repeat step 3 from the other new intersection point, making sure the arcs intersect (see **Diagram 3**)
7. Draw a line through the point where the lines intersect and where the arcs intersect — this is the **angle bisector** (your final diagram will look like **Diagram 4**).

Constructing a perpendicular from a point to a line:

1. Draw a line 7 cm long and a point 2 cm above the line but not above the centre of the line
2. Put the compass point on one end of the line
3. Open the compass to the point and draw an arc above and below the line (see **Diagram 1**)
4. Put the compass point on the other end of the line
5. Open the compass to the point and draw an arc above and below the line, making sure construction arcs intersect (see **Diagram 1**)
6. Draw the line through the points of intersection of the arcs — this is the **perpendicular from a point to a line** (your final diagram will look like **Diagram 3**)

Constructing a perpendicular to a line at a point:

1. Draw a line 7 cm long and a point about 3 cm from one end of the line
2. Put the compass point on the point and draw two arcs that intersect the line on either side of the point (see **Diagram 1**)
3. Now draw the perpendicular bisector of these two points (see **Diagrams 2 and 3**)
4. The perpendicular bisector is the **perpendicular to a line at a point** (your final diagram will look like **Diagram 4**)

Notation for angles: $\widehat{PQR} \equiv \hat{Q} \equiv \angle PQR$

[Homework book answers \(only available during a lockdown\)](#)