

# Constructions and loci

Pearson Edexcel GCSE Mathematics 1MA1 • L028  
Foundation and Higher • 60 minutes • Lesson resources

REACH FOR THE STAR | GCSE MATHEMATICS

Use ruler and compass constructions and interpret loci as sets of points satisfying distance conditions.

No calculator needed. Practical construction quality is teacher reviewed. Use a ruler to check distances and a protractor to check right angles after constructing; they do not replace compass evidence.

Follow the task-specific calculator guidance below. Write on the lines or replace them with typed answers. Attempt before reading intentional practice feedback.

## Connect & Check

Locus: set of all points satisfying a condition. Bisect: divide into two equal parts. Perpendicular bisector: line at  $90^\circ$  through a segment midpoint. Construction arcs: retained compass evidence.

### R1

How many degrees is a perpendicular angle?

---



---

### R2

What is half of 8 cm?

---



---

### R3

Explain equidistant from A and B.

---



---

**Share | In pairs, predict the first step for this problem: Equal-radius arcs from endpoints intersect at points equally distant from both endpoints; their joining line is the perpendicular bisector. To bisect an angle, mark equal distances Compare your reasons before using the worked model.**

## **Present through worked examples**

Equal-radius arcs from endpoints intersect at points equally distant from both endpoints; their joining line is the perpendicular bisector. To bisect an angle, mark equal distances along its rays, then intersect equal-radius arcs from those marks. Congruent triangles explain the equal angles. Distance from a point to a line is measured along a perpendicular.

### **D1**

Model: draw  $AB=6$  cm; equal arcs of radius greater than 3 cm intersect above and below. Join intersections. Now construct the perpendicular bisector of  $AB=8$  cm.

---

### **D2**

Model: equal marks on both rays and equal arcs bisect a  $60^\circ$  angle into  $30^\circ$ . Now draw a  $70^\circ$  angle with a protractor, then bisect it using compass arcs.

---

### **D3**

Model: points exactly 2 cm from O lie on a radius-2 circle. Draw the locus exactly 3 cm from P.

---

### **D4**

Model: points 2 cm from a straight line form two parallel lines. Draw points no more than 1 cm from a line.

---

## Apply with less support

Use a sharp pencil, straightedge and compass; leave arcs visible. For a perpendicular from a point, an arc centred there cuts the line twice; bisect that segment and join to the point. At a point on a line, mark equal distances either side, then use equal arcs. For loci, draw each condition separately and retain their intersection.

### A1

Use the practical sheet: construct a perpendicular from an off-line point P to line l. Keep arcs and label the foot.

---

---

---

---

### A2

Draw A and B 6 cm apart. Construct points exactly 4 cm from each. How many are there?

---

---

---

---

### A3

A sensor must be no more than 3 cm from O and equidistant from A and B. Describe how to construct the permitted set.

---

---

---

---

Optional support: Choose a radius reaching across l.

No calculator needed. Practical construction quality is teacher reviewed. Use a ruler to check distances and a protractor to check right angles after constructing; they do not replace compass evidence.

## Apply and extend reasoning

### C1

A learner draws one arc intersection and joins it to A to bisect AB. Explain the error.

---

---

---

---

### C2

A and B are 8 cm apart. How many points are exactly 3 cm from each? Explain.

---

---

---

---

### Intentional practice feedback — read after attempting

A1: Arc from P cuts  $l$  at X,Y; bisect XY and draw through P to  $l$ .

A2: Two intersections of radius-4 circles centred A and B.

A3: Intersect the closed radius-3 disc with the perpendicular bisector of AB.

C1: One equidistant point is insufficient to locate the bisector line; use two intersections, or one and the known midpoint. Joining A is generally wrong.

C2: None; the two circles are separated since  $3+3<8$ .

Correct one response and explain your change. Stretch is available to either tier; temporary support needs do not determine entry tier.

## Recall & Review through retrieval

Work without notes. Six retrieval points; this attempt does not establish mastery. Equivalent exact numeric forms are accepted. Where accuracy is requested, also state the requested form in your written work.

**Q1 Midpoint distance for segment 10 cm**

---

**Q2 Bisect  $80^\circ$ : each angle in degrees**

---

**Q3 Radius 3 cm: diameter in cm**

---

**Q4 Perpendicular angle in degrees**

---

**Q5 A,B 6 cm apart; radius-4 circles: intersections**

---

**Q6 A,B 8 cm apart; radius-3 circles: intersections**

---

### Intentional retrieval feedback

Q1 5; Q2 40; Q3 6; Q4 90; Q5 2; Q6 0. Correct and retry tomorrow, then in one week.

## Prove independently and improve

P1–P2: five minutes without notes; 4 marks. Your teacher reviews explanations and method marks.  
P3 has no mark.

### P1

Describe the locus equidistant from two fixed points A and B, with both defining properties. [2]

---

---

---

---

### P2

A and B are 6 cm apart. How many points are exactly 3 cm from each? Explain. [2]

---

---

---

---

### P3

Explain one corrected error. Record a fresh question and a date to check it without support.

---

---

---

---

Teacher feedback: \_\_\_\_\_

Fresh question and retry date: \_\_\_\_\_

Delayed independent evidence: \_\_\_\_\_

## Prepare for the next lesson

L029: Coordinates and transformations

### F1

Tomorrow reconstruct an angle bisector and explain why the arcs match.

---

---

---

### F2

Before L029, plot  $(2,3)$  and  $(-2,3)$  on a coordinate grid. What line lies halfway between them?

---

---

---

## Read and prepare

Coordinates record horizontal then vertical displacement. A translation moves every point by the same vector. Reflection preserves perpendicular distance to its mirror line.

Digital workbook: save locally where available; export a JSON backup before closing or moving the file. Restore only this lesson/version. Printing records answers, not mastery. Live browser checks remain pending; use Word/PDF if required.

## Optional extension activities

Allow 10–15 minutes for learners who have secured the main practice. Show a method, explain a check and justify your conclusion.

### Stretch

Construct the perpendicular bisector of an 8 cm segment. How far is its midpoint from either endpoint?

---

---

---

---

### Deep challenge

A point is 3 cm from A and 4 cm from B. Describe the intersection of its loci.

---

---

---

---

# Recall & Review: feedback and extension integration

---

## Lesson L028: Constructions and loci

Objective: Use ruler and compass constructions and interpret loci as sets of points satisfying distance conditions.

### Timing for a 60-minute lesson

0-7 Connect & Check; 7-14 Share; 14-25 Present/model; 25-44 Apply route choice/practice; 44-52 independent exam-style check; 52-60 Recall & Review, WWW/EBI and next step.

### Recall & Review evidence

At the end of the lesson, solve a fresh question without prompts, explain one check, correct one error and record the next practice step.

### What Went Well (WWW)

I selected the correct geometric fact, theorem, formula or transformation and used a clear diagram with appropriate labels and units.

### Even Better If (EBI)

I will name the fact or theorem, show the substitution or construction step and check whether the size, direction and units of the result are reasonable.

### Integrated stretch and deep challenge

Stretch: Construct the perpendicular bisector of an 8 cm segment. How far is its midpoint from either endpoint?

Deep challenge: A point is 3 cm from A and 4 cm from B. Describe the intersection of its loci.

### My next-step response

---