4.3 Constructions and scale drawings

Name: _____ Class: _____ Date: _____ **Total: 22 marks**

KEY WORDS locus

Constructions and scale drawings

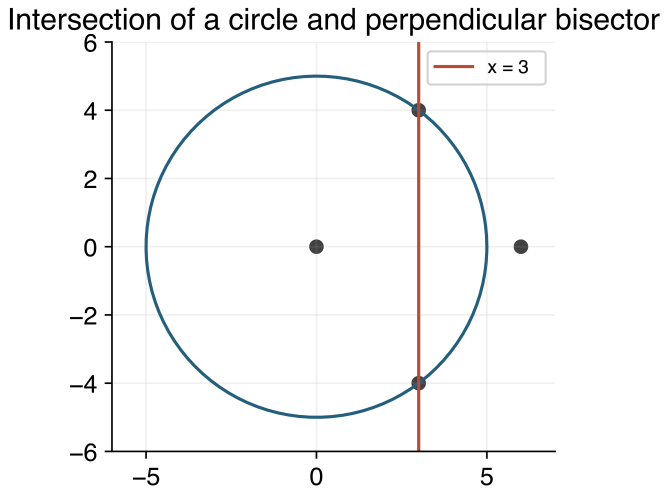
Objective

Measure and draw to accuracy, construct triangles and the two classic bisectors, answer locus questions, and use map scales (objectives Foundation 4.5 A–D and 4.11 B).

1 Key knowledge and worked examples

Constructions. Ruler + protractor builds SAS, ASA and SSS triangles; straight edge + compasses build the perpendicular bisector of a segment and the bisector of an angle. Leave all construction arcs visible – the arcs carry the marks. These constructions also give 60° (equilateral arcs), 90° (perpendicular) and 45° (bisected).

Loci and scales. The locus of points a fixed distance d from a point is a circle; from a line, two parallel lines (with semicircular ends around the endpoints); equidistant from two points, the perpendicular bisector; equidistant from two lines, the angle bisector. Scale 1 : 50 000 means 1 cm on the map is 50 000 cm = 0.5 km.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 Describe the locus of points exactly 3 cm from a given straight line segment of length 8 cm. [2]

2.2 Describe the locus of points equidistant from two fixed points P and Q. [1]

2.3 On a 1 : 50 000 map, two towns are 4.8 cm apart. Find the real distance in km. [3]

2.4 List the compass-and-ruler steps to bisect an angle. [3]

3 Exam-style questions

3.1 *(Original.)* A treasure lies within 4 cm of a fence AB (a straight segment) and closer to A than to B. Describe, or sketch with construction lines, the region in which the treasure can lie. [3]

3.2 *(Original.)* Construct triangle PQR with $PQ = 8$ cm, $QR = 6$ cm and $\angle PQR = 55°$. (a) Which congruence condition does the construction use? (b) Without measuring, use the cosine rule to calculate PR to 1 decimal place. [5]

3.3 *(Original.)* A map scale is $1 : 25\,000$. A rectangular field measures 6 cm by 4 cm on the map. (a) Find its real dimensions in km. (b) Find its real area in km^2. [5]

Solutions

2.1 Two lines parallel to the segment, 3 cm either side, joined by semicircles of radius 3 cm centred on the endpoints (a "stadium" shape).

2.2 The perpendicular bisector of PQ.

2.3 $4.8 \times 50\,000 = 240\,000$ cm $= 2.4$ km.

2.4 Arc of any radius centred on the vertex crossing both arms; from the two crossing points, equal arcs that intersect; join the vertex to that intersection.

3.1 The region within 4 cm of segment AB (the stadium shape around AB) intersected with the half-plane on A's side of the perpendicular bisector of AB – shade the overlap.

3.2 (a) SAS (two sides and the included angle). (b) $PR^2 = 8^2 + 6^2 - 2 \times 8 \times 6 \cos 55^\circ = 100 - 96 \times 0.5736 = 100 - 55.07 = 44.93$, so $PR = 6.7$ cm (1 d.p.).

3.3 (a) $6 \times 25\,000 = 150\,000$ cm $= 1.5$ km; $4 \times 25\,000 = 100\,000$ cm $= 1.0$ km. (b) $1.5 \times 1.0 = 1.5$ km^2.

Local review guidance: construction steps in order with radii stated; exact scale conversions with units; locus answers name the boundary shape, not just "near the line". This is authored classroom guidance.