



Bisectors, loci and plans

About 50 minutes Calculator allowed 39 marks

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** From chapter 7 [2 marks]
- The point $(4, 1)$ is reflected in the line $y = 1$, then translated by the vector $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$. Find the coordinates of the final image.
- Triangles ABC and PQR are congruent, with A matching P , B matching Q and C matching R . Angle $A = (2x + 6)^\circ$, angle $P = (3x - 9)^\circ$ and angle $B = 38^\circ$. Find angle R .

Answer

Answer

- A3** Key Stage 3 [2 marks] **A4** Key Stage 3 [2 marks]
- Work out $1.1^2 - 0.4 \times 0.7$.
- Given that $32 \times 29 = 928$, work out 32×31 .

Answer

Answer

B Example, then your turn

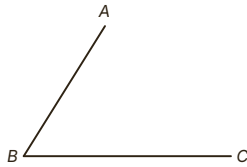
Your teacher works through each example. Then try the one beside it. Leave every arc showing.

EXAMPLE 1

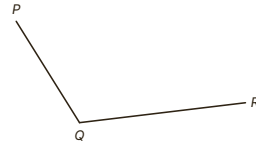
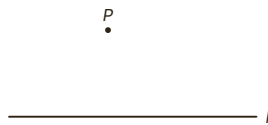
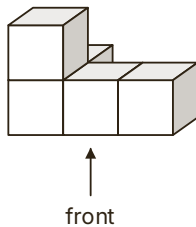
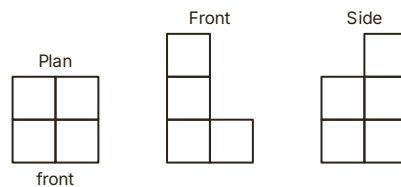
Construct the perpendicular bisector of AB .**Hint** Open the compasses wider than half of AB .

- B1** Construct the perpendicular bisector of PQ . [2 marks]

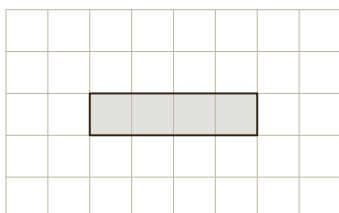


EXAMPLE 2Construct the bisector of angle ABC .**Hint** Start with an arc centred on B .**B2** Construct the bisector of angle PQR .

[2 marks]

**c Practice****C1** Use a ruler and compasses to construct the perpendicular from P to the line l . [2 marks]**C2** Use a ruler and compasses to construct an angle of 45° at A . [3 marks]**C3** The solid is made from 5 cubes. Sketch its plan and its front elevation. [2 marks]**C4** The plan, front and side (from the right) elevations of a solid made of cubes are shown. How many cubes are there? [2 marks]

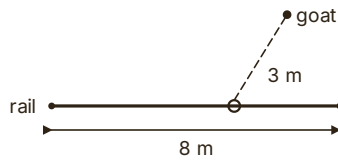
Answer

C5 The rectangle is drawn on a grid of squares. Draw the locus of the points outside it that are exactly one square width from it. [2 marks]

D Exam-style questions

D1

A goat is tied by a rope 3 m long to a ring. The ring can slide along a straight rail 8 m long in the middle of a field. Ali says, "The goat can reach more than 80 m^2 of the field."

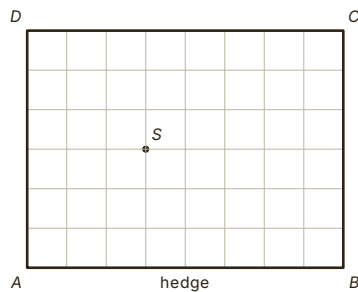


- Describe the shape of the region the goat can reach. [1 mark]
- Show that Ali is wrong. You must show your working. [3 marks]
- Work out the perimeter of the region, correct to 3 significant figures. [2 marks]

Answer

Total for D1: 6 marks

- D2 The plan shows a garden $ABCD$ on a grid of 1 m squares. A sprinkler at S waters every point within 3 m of S . A tree is to be planted where it is watered, at least 2 m from the hedge AB , and no further from B than from A .



- Shade the region where the tree can be planted. [4 marks]
- Work out the greatest possible distance of the tree from the hedge AB . Give your answer correct to 1 decimal place. [2 marks]

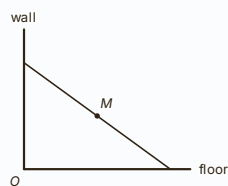
Answer

Total for D2: 6 marks

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** A ladder 6 m long leans against a vertical wall. Its foot slides away from the wall until the ladder lies flat on the floor. Describe the locus of the midpoint M of the ladder, and work out how far M moves, correct to 3 significant figures. [4 marks]



Not drawn accurately

Answer ; m

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Draw the ladder in three or four positions and mark M each time. What shape do the points make?
- Hint 2** In a right-angled triangle, the midpoint of the longest side is the same distance from all three corners.
- Hint 3** So $OM = 3$ m always. M moves on a quarter circle of radius 3 m, centre O : its length is $\frac{1}{4} \times 2\pi \times 3$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can construct bisectors, perpendiculars and angles of 90° and 45° with a ruler and compasses. ☐ ☐ ☐

I can draw a locus and shade a region that meets several conditions. ☐ ☐ ☐

I can draw plans and elevations, and count the cubes in a solid from them. ☐ ☐ ☐