

GCSE Maths Loci, Bearings and Vectors (Higher): check-up and exam-style questions: answers

GCSE Maths - Loci, Bearings and Vectors - Higher - Test yourself

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch22-constructions-loci-bearings-vectors/higher/check-up-and-exam-style-questions/

Exercise 22Z Check-up (non-calculator) Non-calculator

- 1 The scale of a map is 1 : 50 000. Two towns are 6 cm apart on the map. How far apart are they in real life? Give your answer in km.

Answer: 3 km

- 2 A map has a scale of 1 cm to 2 km. Write the scale as a ratio in the form 1 : n .

Answer: 1 : 200 000

- 3 The bearing of B from A is 065° . Work out the bearing of A from B.

Answer: 245°

- 4 Describe the locus of points that are the same distance from two points A and B.

Answer: The perpendicular bisector of AB

- 5 Describe the locus of points that are exactly 4 cm from a fixed point P.

Answer: A circle with centre P and radius 4 cm

- 6 $\mathbf{a} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -4 \\ 5 \end{pmatrix}$. Work out $\mathbf{a} + \mathbf{b}$.

Answer: $\begin{pmatrix} -2 \\ 2 \end{pmatrix}$

- 7 $\mathbf{a} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$. Work out $3\mathbf{a}$.

Answer: $\begin{pmatrix} 6 \\ -9 \end{pmatrix}$

- 8 A is the point (1, 2) and B is the point (5, 5). Write down the column vector from A to B.

Answer: $\begin{pmatrix} 4 \\ 3 \end{pmatrix}$

- 9 The bearing of A from B is 300° . Work out the bearing of B from A.

Answer: 120°

- 10 OAB is a triangle with $OA = \mathbf{a}$ and $OB = \mathbf{b}$. M is the midpoint of AB. Find OM in terms of $\mathbf{a}$ and $\mathbf{b}$.

Answer: $\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$

Exercise 22X Exam-style questions Non-calculator

- 1 The scale of a map is 1 : 25 000. The distance between a school and a park on the map is 8.4 cm. Work out the real distance. Give your answer in kilometres. [2 marks]

Answer: 2.100000000000000088817841970012523233890533447265625 km

- 2 Draw a line AB of length 7 cm. Use ruler and compasses to construct the perpendicular bisector of AB. You must show all your construction lines. [2 marks]

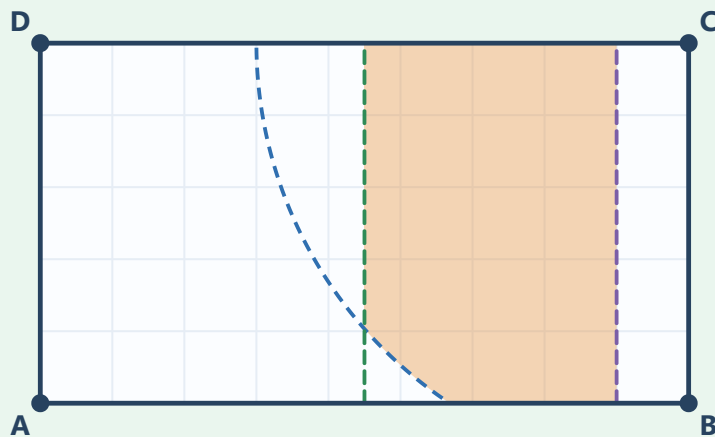
Answer: Perpendicular bisector drawn, meeting AB at 3.5 cm from A

- 3 ABCD is a rectangular garden, 9 m by 5 m, drawn on a grid with each square 1 m. A seat is to be placed **within 6 m of C, nearer to C than to D** and **at least 1 m from side BC**. Shade the region where the seat can be placed.

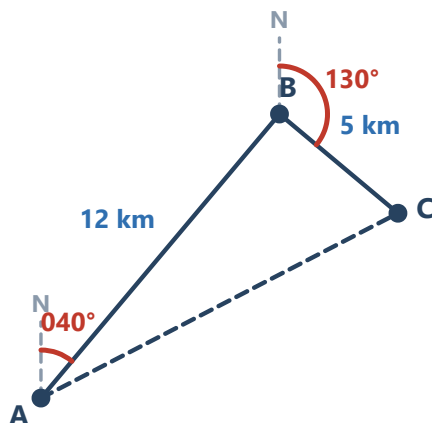


Answer: The shaded region in the solution diagram (about 17 m²)

[4 marks]



- 4 A boat sails 12 km from A to B on a bearing of 040°. It then sails 5 km from B to C on a bearing of 130°. Work out (a) the distance AC, (b) the bearing of C from A, to the nearest degree. [5 marks]



Answer: 13.0 km, 063°

- 5 The bearing of B from A is 125°. Work out the bearing of A from B. [2 marks]

Answer: 305°

- 6 Construct triangle ABC with AB = 6 cm, BC = 4 cm and AC = 5 cm. Use a ruler and compasses. Measure the largest angle of the triangle. [3 marks]

Answer: 83° (accept 82° to 84°)

- 7 $\mathbf{a} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$. Work out $2\mathbf{a} - \mathbf{b}$. [2 marks]

Answer: $\begin{pmatrix} 8 \\ -6 \end{pmatrix}$

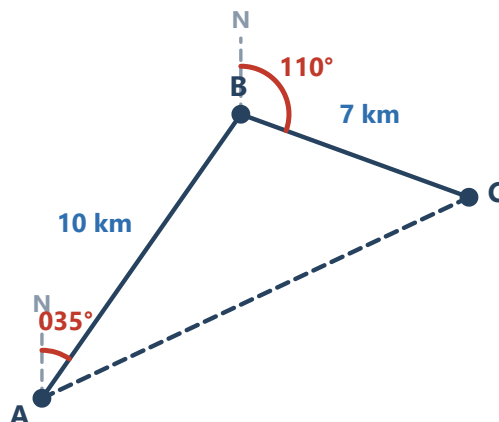
- 8 Triangle ABC has vertices A(1, 1), B(4, 1) and C(4, 3). It is translated by the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$. (a) Write the coordinates of A', B' and C'. (b) Work out the exact distance that A moves. Give your answer as a surd.

Answer: A' (-2, 3), B' (1, 3), C' (1, 5); $\sqrt{13}$ [4 marks]

- 9 A plan of a school field has a scale of 1 : 200. The field is a rectangle that measures 5 cm by 3 cm on the plan. Work out the real area of the field in m². [4 marks]

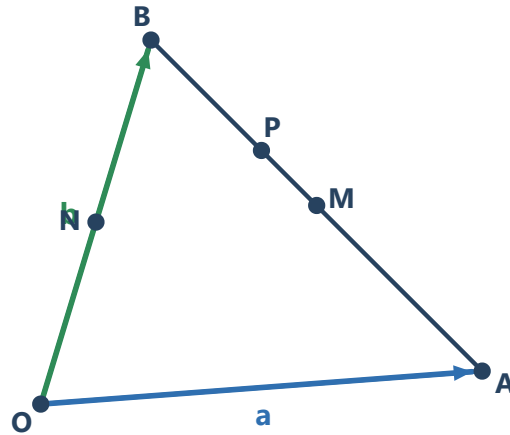
Answer: 60 m²

- 10 A boat sails 10 km from A to B on a bearing of 035°, then 7 km from B to C on a bearing of 110°. Work out (a) the distance AC, (b) the bearing of C from A. [6 marks]



Answer: 13.6 km, 065°

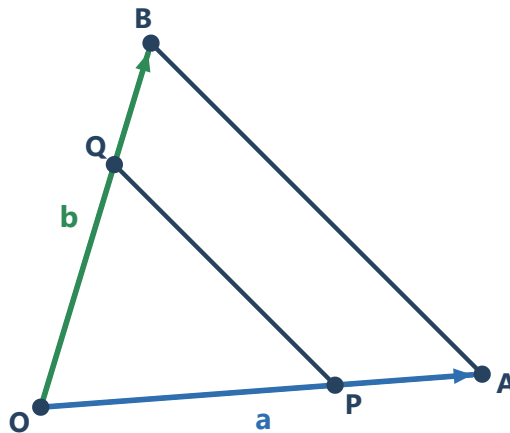
- 11** OAB is a triangle. $OA = \mathbf{a}$ and $OB = \mathbf{b}$. P is the point on AB such that $AP : PB = 2 : 1$. (a) Write AB in terms of $\mathbf{a}$ and $\mathbf{b}$. (b) Find OP in terms of $\mathbf{a}$ and $\mathbf{b}$. Give your answer in its simplest form.



Answer: (a) $\mathbf{b} - \mathbf{a}$; (b) $\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$

[4 marks]

- 12** OAB is a triangle with $OA = \mathbf{a}$ and $OB = \mathbf{b}$. P is the point on OA such that $OP = \frac{2}{3}\mathbf{a}$. Q is the point on OB such that $OQ = \frac{1}{3}\mathbf{b}$. **Prove** that PQ is parallel to AB.



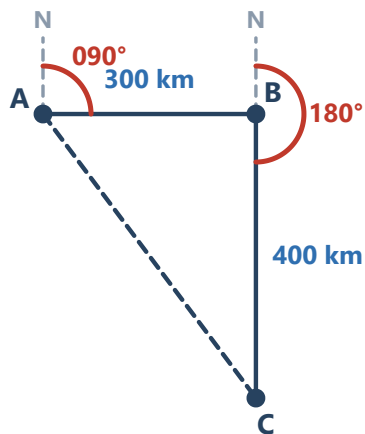
Answer: $PQ = \frac{2}{3}AB$, so parallel

[4 marks]

- 13** OAB is a triangle with $OA = \mathbf{a}$ and $OB = \mathbf{b}$. M is the midpoint of OA and N is the point on OB with $ON = \frac{1}{3}\mathbf{b}$. The lines AN and BM meet at X. Find OX in terms of $\mathbf{a}$ and $\mathbf{b}$. [6 marks]

Answer: $\frac{2}{5}\mathbf{a} + \frac{1}{5}\mathbf{b}$

- 14** A plane flies 300 km from A due east to B, then 400 km due south to C. Work out (a) the distance AC, (b) the bearing of A from C. [5 marks]



Answer: 500 km, 323°

- 15** Explain why the shortest distance from a point P to a straight line is the perpendicular distance. Use the fact that any other line from P to the line is the hypotenuse of a right-angled triangle. [2 marks]

Answer: A slanted line is a hypotenuse, which is longer than the perpendicular (a shorter side).