IB MATHS AI HL · UNIT 3

Three-Figure Bearings and Navigation: exam practice

10 questions · 34 marks · worked solutions and markschemes

Name _____ Date _____ Score / 34

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/hlai/three-figure-bearings-and-navigation-exam-practice

1. **3 marks · Paper 1 style · calculator allowed**

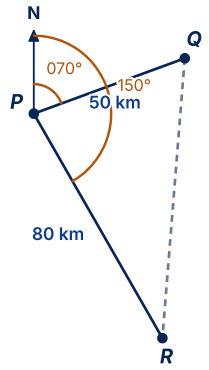
A hiker walks 6 km due east and then 4 km due south.

Find the distance from the start and the bearing of the hiker from the start. **[3]**

2. **3 marks · Paper 2 style · calculator allowed**

Port Q is 50 km from port P on a bearing of $070°$. Port R is 80 km from P on a bearing of $150°$.

Find the distance QR. **[3]**



PQ = 50 km on 070°, PR = 80 km on 150°

3. **3 marks · Paper 1 style · calculator allowed**

A boat sails 10 km on a bearing of $200°$.

Find how far south and how far west it has travelled. **[3]**

4. **3 marks · Paper 2 style · calculator allowed**

A runner goes 3 km on a bearing of $310°$, then 5 km on a bearing of $020°$.

Find the distance from the start. **[3]**

5. **3 marks · Paper 2 style · calculator allowed**

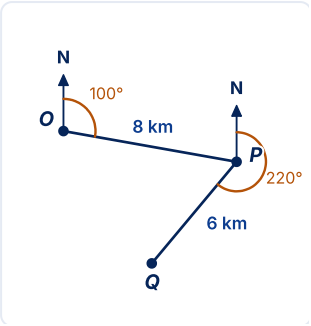
Town B is 35 km north and 22 km west of town A.

Find the distance and the bearing of B from A. **[3]**

6. **3 marks · Paper 2 style · calculator allowed**

A yacht sails from O to P, 8 km on a bearing of $100°$, then to Q, 6 km on a bearing of $220°$.

Find the distance OQ. **[3]**



8 km on 100°, then 6 km on 220°

7. **4 marks · Paper 2 style · calculator allowed**

A plane flies 300 km on a bearing of $040°$ and then 200 km on a bearing of $130°$.

Find its distance from the start and its bearing from the start. **[4]**

8. **4 marks · Paper 1 style · calculator allowed**

B is 8 km from A on a bearing of $243°$.

Find how far west and how far south B is from A, and the bearing of A from B. **[4]**

9. **4 marks · Paper 2 style · calculator allowed**

Two coastguard stations A and B are 25 km apart, with B due east of A. A ship is on a bearing of $062°$ from A and $318°$ from B.

Find the distance of the ship from A. **[4]**

10. **4 marks · Paper 2 style · calculator allowed**

From a lighthouse L, ship A is 12 km away on a bearing of $030°$, and ship B is on a bearing of $095°$. The bearing of B from A is $140°$.

Find the distance LB. **[4]**

Answers and worked solutions

Question 1 — 3 marks

Answer: 7.21 km on $124°$

$\sqrt{52} = 7.21$ km **A1**

$\tan\theta = \frac{4}{6}$, $33.7°$ below east **M1**

bearing $124°$ **A1**

Question 2 — 3 marks

Answer: 86.7 km

$Q\hat{P}R = 80°$ **A1**

$QR^2 = 50^2 + 80^2 - 2(50)(80)\cos 80°$ **M1**

86.7 km **A1**

Question 3 — 3 marks

Answer: 9.40 km south, 3.42 km west

south $10\cos 20° = 9.40$ km $M1$**A1**

west $10\sin 20° = 3.42$ km **A1**

Question 4 — 3 marks

Answer: 6.65 km

angle at the turn $110°$ **A1**

$d^2 = 9 + 25 - 30\cos 110°$ **M1**

6.65 km **A1**

Question 5 — 3 marks

Answer: 41.3 km on $328°$

$\sqrt{35^2 + 22^2} = 41.3$ km **A1**

$\tan^{-1}\frac{22}{35} = 32.2°$ **M1**

$328°$ **A1**

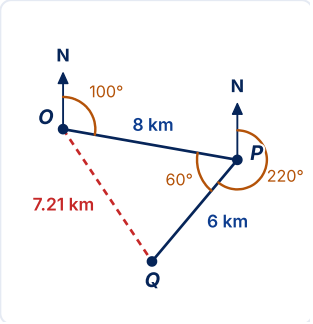
Question 6 — 3 marks

Answer: 7.21 km

angle $O\hat{P}Q = 60°$ **A1**

$OQ^2 = 64 + 36 - 96\cos 60°$ **M1**

7.21 km **A1**



Angle $OPQ = 60°$, $OQ = 7.21$ km

Question 7 — 4 marks

Answer: 361 km on $073.7°$

angle at turn $90°$ **A1**

$\sqrt{300^2 + 200^2} = 361$ km **A1**

angle $\tan^{-1}\frac{200}{300} = 33.7°$ **M1**

bearing $073.7°$ **A1**

Question 8 — 4 marks

Answer: 7.13 km west, 3.63 km south; $063°$

angle below west $27°$ **M1**

west $8\sin 63° = 7.13$ km **A1**

south $8\cos 63° = 3.63$ km **A1**

$063°$ **A1**

Question 9 — 4 marks

Answer: 19.1 km

angle at A: $28°$ **A1**

angle at B: $48°$ **A1**

angle at the ship $104°$; sine rule **M1**

19.1 km **A1**

Question 10 — 4 marks

Answer: 15.9 km

$A\hat{L}B = 65°$ **A1**

$L\hat{A}B = 70°$, so $L\hat{B}A = 45°$ **A1**

$\frac{LB}{\sin 70°} = \frac{12}{\sin 45°}$ **M1**

15.9 km **A1**

Every solution is also on ibmathrevision.com/hlai/three-figure-bearings-and-navigation-exam-practice Our own original questions, written and checked by IB Math Revision. IB Math Revision is independent and is not affiliated with, endorsed by or connected to the International Baccalaureate Organization. This work/product/service has been developed independently from and is not endorsed by the International Baccalaureate Organization. International Baccalaureate, Baccalauréat International, Bachillerato Internacional and IB are registered trademarks owned by the International Baccalaureate Organization.