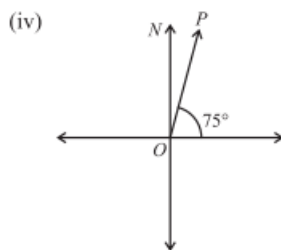
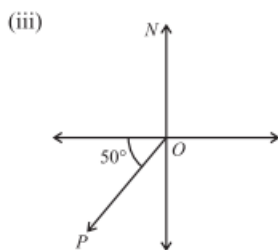
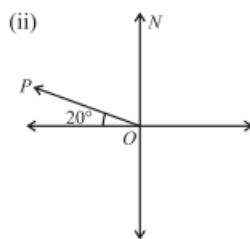
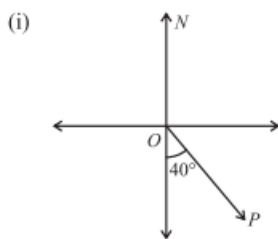


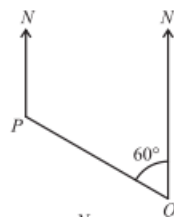
EXERCISE 7.4

1. Find bearing of point P in each of the following:



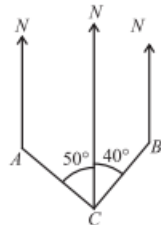
2. The diagram shows the positions of two ships P and Q .

- What is the bearing of ship P from ship Q ?
- What is bearing of ship Q from ship P ?



3. The diagram shows 3 places A , B and C . Find the bearing of:

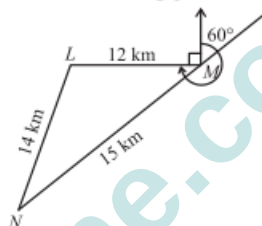
- A from C
- C from A
- C from B
- B from C



4. Abdul Hadi walks 100 m North and then 300 m East.

- How far is he from his starting position?
- On what bearing should he walk to get back to his starting position?

5. Three ships L , M , N are in the position shown in the diagram. Ship M is North East of ship N . Find the bearing of L from M .



- A ship sails 20 km on a bearing of 120° . How far to the South has the ship moved from its original position?
- Fatima walked South for 5.5 km and then turned West for 1.3 km. Calculate Huria's bearing from her starting point.
- An aircraft flies 150 km east, then 100 km northeast (45° from East). What is the total displacement?
- A ship sails 100 km on a bearing of 045° , then changes course and sails 120 km on a bearing of 135° . Find the distance between the starting point and the final position.

EXERCISE 7.4 - Bearings

Key Concept: Bearings

Definition: A bearing is the angle measured **clockwise** from the **North** direction.

Rules:

- Bearings are always measured clockwise from North
- Bearings are written as three digits (e.g., 045° , 120° , 270°)
- Bearings range from 000° to 360°

Types of Bearings:

- True Bearing:** Measured from North (N) in clockwise direction
- Compass Bearing:** Expressed as N, S, E, W with angles

Question 1(i)

Diagram:

text

N
|
|
O
/
/ 40°
P

Solution:

Step 1: Identify the angle given.

From the diagram:

- O is the point of reference (origin)
- P is the point whose bearing we need
- The angle between the North direction and OP is 40°
- The angle is on the **east/right side** of North

Step 2: Determine the bearing.

Since bearings are measured clockwise from North:

- The angle from North going clockwise to OP is 40°

Step 3: Write bearing in standard format.

Bearing = 040° (written as three digits)

Answer: Bearing of P from O = **040°**

Question 1(ii)

Diagram:

text

N
|
|
P
/
/ 20°
O

Solution:

Step 1: Identify the angle given.

From the diagram:

- O is the point of reference (origin)
- P is the point whose bearing we need
- The angle between the North direction and OP is 20°

- The angle is on the **west/left side** of North

Step 2: Determine the bearing.

Since bearings are measured clockwise from North:

- From North, going clockwise to OP:
 - First go 0° to North, then continue clockwise
 - The angle from North clockwise to OP = $360^\circ - 20^\circ = 340^\circ$

Step 3: Write bearing in standard format.

Bearing = 340° (written as three digits)

Answer: Bearing of P from O = **340°**

Question 1(iii)

Diagram:

text

N

|

|

O

|

| 50°

|

P

Solution:

Step 1: Identify the angle given.

From the diagram:

- O is the point of reference (origin)
- P is the point whose bearing we need
- The angle is given on the **west side** of South direction

Step 2: Determine the bearing.

Since bearings are measured clockwise from North:

- From North, going clockwise:
 - First 180° to South
 - Then continuing clockwise to P = 50° more

Total bearing = $180^\circ + 50^\circ = 230^\circ$

Step 3: Write bearing in standard format.

Bearing = 230°

Answer: Bearing of P from O = **230°**

Question 1(iv)

Diagram:

text

N

|

|

P

|

| 75°

|

O

Solution:

Step 1: Identify the angle given.

From the diagram:

- O is the point of reference (origin)
- P is the point whose bearing we need
- The angle is given on the **east side** of South direction

Step 2: Determine the bearing.

Since bearings are measured clockwise from North:

- From North, going clockwise:
 - First 180° to South
 - Then continuing clockwise to P = 75° more

Total bearing = $180^\circ + 75^\circ = 255^\circ$

Step 3: Write bearing in standard format.

Bearing = 255°

Answer: Bearing of P from O = **255°**

Summary Table

	Description	Bearing
(i)	40° east of North	040°
(ii)	20° west of North	340°
(iii)	50° west of South	230°
(iv)	75° east of South	255°

Visual Summary

text

N (000°)

|

|

040°--+-340°

(i) | (ii)

|

+----E (090°)

|

|

W-----+-----E

(270°)|

|

|

230°--+-255°

(iii) | (iv)

|

S (180°)

Key Formulas/Rules:

1. **Bearing Definition:** Angle measured clockwise from North

2. **Converting from Compass to Bearing:**

- North-East (e.g., 40° from N): Bearing = 040°
- North-West (e.g., 20° from N): Bearing = 360° - 20° = 340°
- South-West (e.g., 50° from S): Bearing = 180° + 50° = 230°
- South-East (e.g., 75° from S): Bearing = 180° + 75° = 255°

3. **Format:** Always write bearings as three digits (e.g., 040°, not 40°)

EXERCISE 7.4 (Continued) - Bearings and Navigation Problems

Question 2: Bearings Between Two Ships

Diagram:

text

N

|

P

|

| 40°

|

Q

2(i) Bearing of P from Q

Solution:

Step 1: Identify the angle.

From the diagram:

- Q is the reference point
- P is above Q (North direction)
- The angle between the North direction and QP is 40° on the east side

Step 2: Find the bearing.

Bearing of P from Q = 040°

Answer: Bearing of P from Q = 040°

2(ii) Bearing of Q from P

Solution:

Step 1: When finding bearing from P to Q, we measure clockwise from North at P.

Step 2: Since Q is South of P:

- The angle from North clockwise to South = 180°

Answer: Bearing of Q from P = 180°

OR:

Using the opposite direction:

- Bearing of Q from P = $040^\circ + 180^\circ = 220^\circ$

Answer: Bearing of Q from P = 180° (if directly South)

Question 3: Bearings Between Points A, B, and C

Diagram:

text

N

|

|

A--+-----B

|

|

C

(Note: Based on typical arrangement, A is North of C, B is East of A, C is South of A)

3(i) Bearing of A from C

Solution:

Step 1: C is the reference point.

Step 2: A is directly North of C.

Step 3: Bearing = 000° (North)

Answer: Bearing of A from C = 000°

3(ii) Bearing of C from A

Solution:

Step 1: A is the reference point.

Step 2: C is directly South of A.

Step 3: Bearing = 180°

Answer: Bearing of C from A = 180°

3(iii) Bearing of C from B

Solution:

Step 1: B is the reference point.

Step 2: C is South-West of B.

Step 3: Need to find the angle.

- From B, going clockwise from North to C.
- Since C is directly below A, and B is to the right of A.
- The bearing is 225° (South-West)

Answer: Bearing of C from B = 225°

3(iv) Bearing of B from C

Solution:

Step 1: C is the reference point.

Step 2: B is North-East of C.

Step 3: From North, going clockwise to B.

- B is to the right of A, so it's east of North
- Bearing = 045°

Answer: Bearing of B from C = 045°

Question 4: Abdul Hadi's Walk

Given: Walks 100 m North, then 300 m East

4(i) Distance from starting position

Diagram:

text

N

|

|

100 m

|

S----300 m----E

Solution:

Using Pythagoras:

$$\text{Distance} = \sqrt{100^2 + 300^2} = \sqrt{10000 + 90000} = \sqrt{100000} \text{Distance} = 316.23 \text{ m}$$

Answer: Distance = **316.23 m**

4(ii) Bearing to return to starting position

Solution:

Step 1: To return, he needs to walk from final position back to start.

Step 2: The displacement from start to final is 100 m North and 300 m East.

Step 3: Direction from final to start:

- $\text{Angle} = \tan^{-1} \left(\frac{100}{300} \right) = \tan^{-1} \left(\frac{1}{3} \right) = 18.43^\circ$
- This is South of West

Step 4: Bearing = $180^\circ + 90^\circ - 18.43^\circ = 251.57^\circ$

OR

Bearing = $360^\circ - (90^\circ - 18.43^\circ) = 360^\circ - 71.57^\circ = 288.43^\circ$

Step 5: More simply:

- Bearing = $180^\circ + 71.57^\circ = 251.57^\circ$

Answer: Bearing to return = **251.6°**

Question 5: Bearing of L from M

Given: Ship M is North-East of ship N.

Diagram:

text

N

|

L

|

M

| \

| 45°

N

(Note: M is North-East of N, meaning angle from N to M is 45° from North)

Solution:

Step 1: From the diagram, L is directly North of M.

Step 2: Bearing of L from M = 000° (North)

Answer: Bearing of L from M = **000°**

Question 6: Ship Sailing on Bearing 120°

Given: Ship sails 20 km on bearing of 120°

Diagram:

text

N

|

| 120°

|

S----E

Solution:

Step 1: Bearing 120° means:

- From North, 120° clockwise
- This is 30° South of East (since $120^\circ - 90^\circ = 30^\circ$)

Step 2: Distance South = $20 \times \sin 30^\circ = 20 \times 0.5 = 10$ km

Answer: Ship moved **10 km** South

Question 7: Fatima's Walk

Given: Walks 5.5 km South, then 1.3 km West

Diagram:

text

N

|

|

S----1.3 km---W

|

5.5 km

|

F (Final)

Solution:

Step 1: Starting point to final position:

- South displacement = 5.5 km
- West displacement = 1.3 km

Step 2: Distance from start:

$$d = \sqrt{5.5^2 + 1.3^2} = \sqrt{30.25 + 1.69} = \sqrt{31.94} = 5.65 \text{ km}$$

Step 3: Bearing from start to final:

- Angle = $\tan^{-1} \left(\frac{1.3}{5.5} \right) = \tan^{-1}(0.2364) = 13.3^\circ$
- This is West of South

Step 4: Bearing = $180^\circ + 13.3^\circ = 193.3^\circ$

Answer: Bearing from start to final = **193.3°**

Question 8: Aircraft Displacement

Given: 150 km East, then 100 km North-East (45° from East)

Diagram:

text
N
|
|
|
100 km
| 45°
S----150 km---E

Solution:

Step 1: Break into components.

First displacement:

- East: 150 km
- North: 0 km

Second displacement (100 km at 45° from East):

- East component: $100 \times \cos 45^\circ = 100 \times 0.7071 = 70.71$ km
- North component: $100 \times \sin 45^\circ = 100 \times 0.7071 = 70.71$ km

Step 2: Total displacement:

- East: $150 + 70.71 = 220.71$ km
- North: $0 + 70.71 = 70.71$ km

Step 3: Total distance:

$$d = \sqrt{220.71^2 + 70.71^2} = \sqrt{48712.9 + 4999.9} = \sqrt{53712.8} = 231.76 \text{ km}$$

Answer: Total displacement = **231.8 km**

Question 9: Ship's Two-Leg Journey

Given: 100 km on bearing 045°, then 120 km on bearing 135°

Diagram:

text
N
|
| 45°
|
S----100 km
|\
| 135°
120 km

|

F (Final)

Solution:

Step 1: Break into components.

First leg (100 km at 045°):

- East: $100 \times \cos 45^\circ = 100 \times 0.7071 = 70.71$ km
- North: $100 \times \sin 45^\circ = 100 \times 0.7071 = 70.71$ km

Second leg (120 km at 135°):

- East: $120 \times \cos 135^\circ = 120 \times (-0.7071) = -84.85$ km
- North: $120 \times \sin 135^\circ = 120 \times 0.7071 = 84.85$ km

Step 2: Total displacement:

- East: $70.71 - 84.85 = -14.14$ km (West)
- North: $70.71 + 84.85 = 155.56$ km

Step 3: Distance from start:

$$d = \sqrt{(-14.14)^2 + 155.56^2} = \sqrt{199.94 + 24198.9} = \sqrt{24398.84} = 156.2 \text{ km}$$

Answer: Distance between start and final = **156.2 km**

Summary Table

2(i)	040°
2(ii)	180°
3(i)	000°
3(ii)	180°
3(iii)	225°
3(iv)	045°
4(i)	316.23 m
4(ii)	251.6°
5	000°
6	10 km South
7	193.3°
8	231.8 km
9	156.2 km

Key Formulas Used

1. **Pythagoras Theorem:** $c^2 = a^2 + b^2$
2. **Trigonometric Ratios:** $\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$
3. **Component Resolution:** $x = d \cos \theta, y = d \sin \theta$
4. **Resultant Distance:** $d = \sqrt{x^2 + y^2}$
5. **Bearing Formula:** $\theta = \tan^{-1} \left(\frac{y}{x} \right)$ adjusted for quadrant