education equals

Topic: Mixed Applications including Bearings

Time: 45 mins Marks: /45 marks

Question One: [2, 3, 5: 10 marks]

Two hikers set out on a trek. They began their hike and were walking at a pace of 5km/hr on a bearing of 105°. They walked for 2.5 hours before a huge fallen tree caused them to go off their path. At this junction they began walking on a bearing of 10° until they were due east of their starting position.

a) Draw a diagram of this situation.

b) If they continued at the same pace how long did they walk for before they were due east of their starting position?

When they reached the point due east of their starting point, they saw a sign directing them to a look out over a waterfall. The position of this lookout is exactly 9km due north of the huge fallen tree.

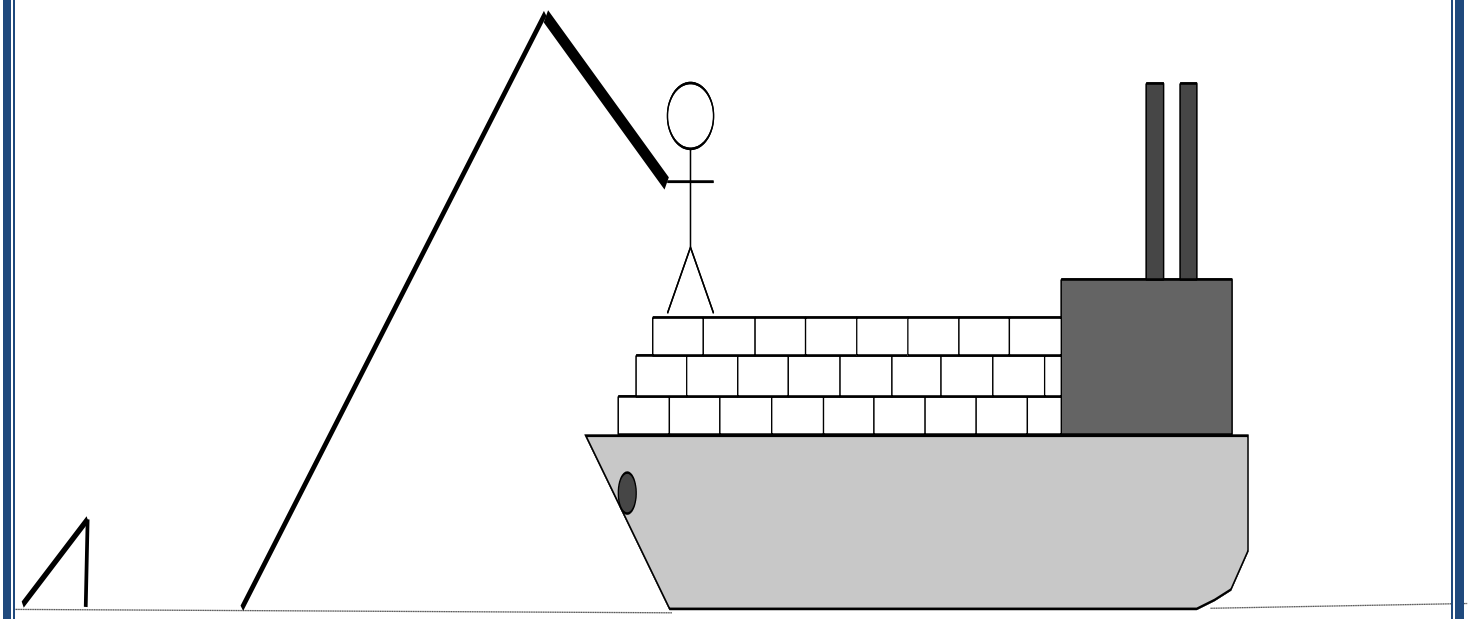
c) If they take a path directly to the lookout from their current position (due east of their starting point), what is the bearing and distance of this path?

Question Two: [2, 5, 5: 12 marks]

A fisherman is standing on his boat fishing. His hand which is holding his 0.4m long fishing rod is 1.3 metres above the water

The angle of elevation from the fishing line to the fisherman's hand holding the rod is 51°.

a) Add this information to the diagram below.



The fisherman spots a shark in the water at an angle of depression of 38° from the fisherman's hand which holds the fishing rod.

b) Calculate the distance between the fishing line in the water and the shark.

c) If the angle of elevation of the fishing line to the top of the fishing rod is 63.88°, calculate how much fishing line there is between the rod and the water.

Question Three: [7 marks]

A city planner is planning to build some roads around what will be a triangular shaped parkland space with an area of 6.2 square kilometres.

The city planner is designing a grand entrance to the parkland at one of the vertices. One road from the entrance, running alongside the parkland, is to be 2.5km and at a bearing of 23°. The other road from the entrance, also running alongside the parkland, runs at a bearing of 109°.

Calculate the total distance around the parkland.

Question Four: [6, 2: 8 marks]

Jack and Jill live in apartment buildings opposite each other. They are looking out of their windows opposite each other and see a vintage car on the street between their buildings. Jack is 8m above the street and sees the car at an angle of depression of 51°. Jill is 6.5m higher than Jack and the angle of elevation from the car to Jill is 47°.

a) What is the distance between Jack and Jill's buildings?

b) Jack and Jill want to make an old fashion cup telephone which is two cups connected by a long piece of string. If this is to pass between the windows of their two buildings how much string in required to go between the two apartments.

Question Five: [2, 3, 3: 8 marks]

Aimee and Claire are playing hide and seek with Sam in the park. Sam will be seeking. Aimee leaves Sam on a bearing of 116 degrees and goes 23m to hide. Claire leaves Sam and goes 35m to hide. Claire and Aimee's hiding spots are 19m apart.

a) Draw a diagram of this situation.

b) On what bearing is Claire's hiding spot from Sam?

c) What is the bearing of Claire from Aimee?

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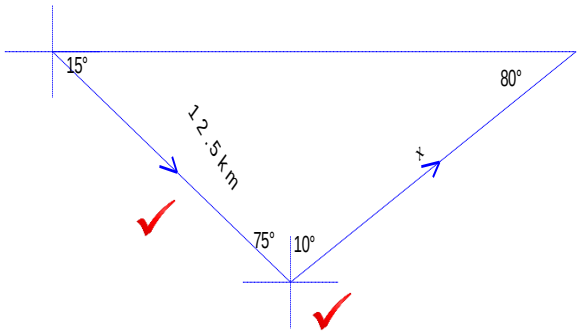
Topic: Mixed Applications including Bearings SOLUTIONS

Time: 45 mins Marks: /45 marks

Question One: [2, 3, 5: 10 marks]

Two hikers set out on a trek. They began their hike and were walking at a pace of 5km/hr on a bearing of 105°. They walked for 2.5hours before a huge fallen tree caused them to go off their path. At this junction they began walking on a bearing of 10° until they were due east of their starting position.

a) Draw a diagram of this situation.



b) If they continued at the same pace how long did they walk for before they were due east of their starting position?

$$\frac{x}{sin15°} = \frac{12.5}{sin80°}$$ ✓

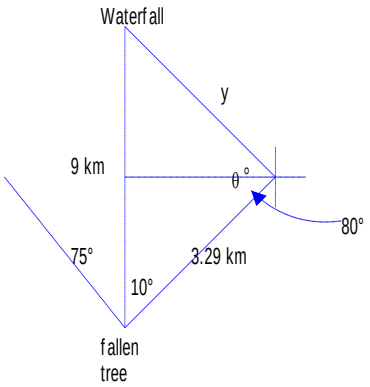
$$x = 3.29km$$ ✓

$$t = \frac{3.29}{5} = 0.66 \text{ hours}$$

$$= 39\ mins$$ ✓

When they reached the point due east of their starting point, they saw a sign directing them to a look out over a waterfall. The position of this lookout is exactly 9km due north of the huge fallen tree.

c) If they take a path directly to the lookout from their current position (due east of their starting point), what is the bearing and distance of this path?



$$y^2 = 9^2 + 3.29^2 - 9 \times 3.29 \times cos10°$$ ✓

$$y = 5.788\ m$$ ✓

$$\frac{sin\theta}{9} = \frac{sin10°}{y}$$

$$\theta = 164.34°$$ ✓

$$Bearing = 270 + 84.34$$ ✓

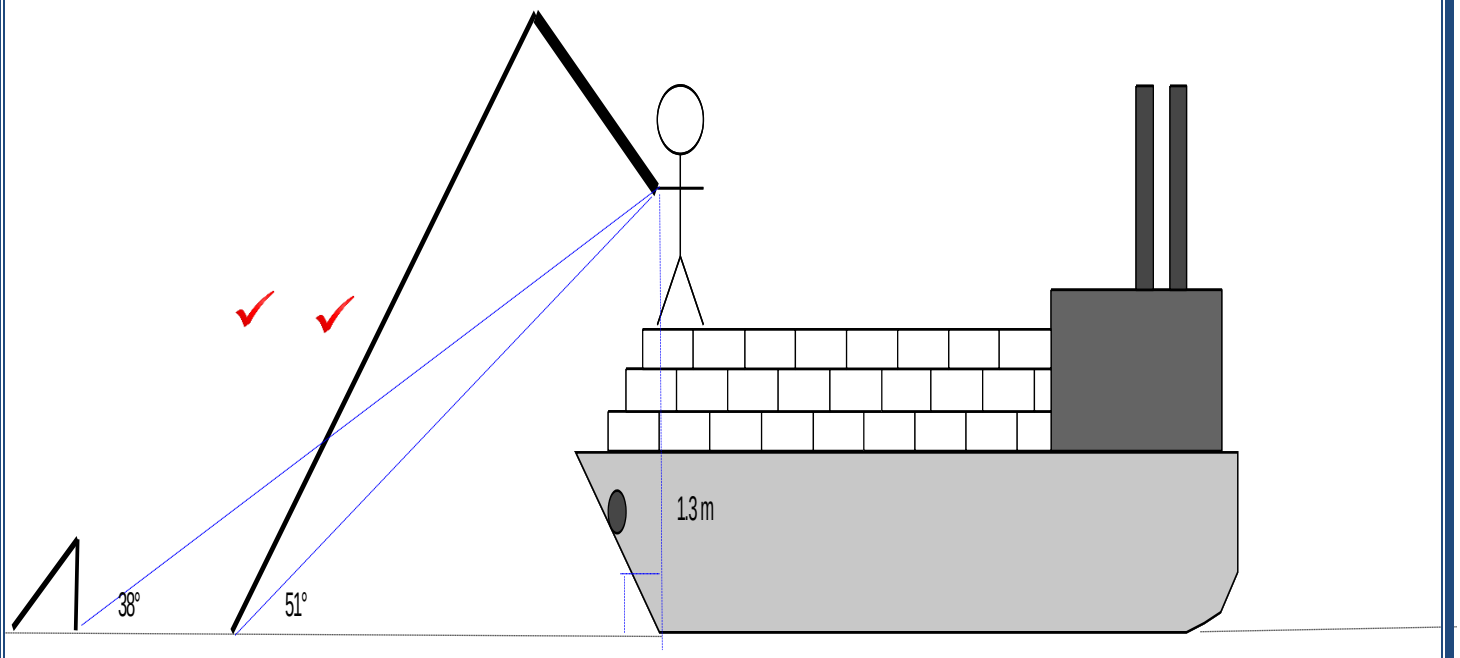
$$= 354.34°$$ ✓

Question Two: [2, 5, 5: 12 marks]

A fisherman is standing on his boat fishing. His hand which is holding his 0.4m long fishing rod is 1.3 metres above the water

The angle of elevation from the fishing line to the fisherman's hand holding the rod is 51°.

a) Add this information to the diagram below.



The fisherman spots a shark in the water at an angle of depression of 38° from the fisherman's hand which holds the fishing rod.

b) Calculate the distance between the fishing line in the water and the shark.

$tan51° = \frac{1.3}{x}$ ✓

$x = 1.0529m$ ✓

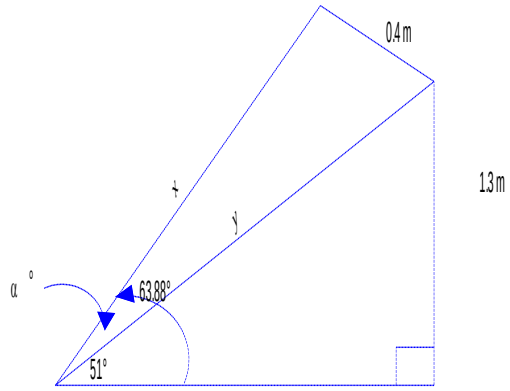
$tan38° = \frac{1.3}{y}$ ✓

$y = 1.664m$ ✓

$Distance\ between\ fishing\ line\ and\ shark = y - x$

$= 0.6113m$ ✓

c) If the angle of elevation of the fishing line to the top of the fishing rod is 63.88°, calculate how much fishing line there is between the rod and the water.



$cos51° = \frac{1.3}{y}$ ✓

$y = 1.67m$ ✓

$\alpha = 63.88° - 51°$

$= 12.88°$ ✓

$0.4^2 = x^2 + y^2 - 2x \times y \times cos\alpha$ ✓

$x = 1.77m$ ✓

Question Three: [7 marks]

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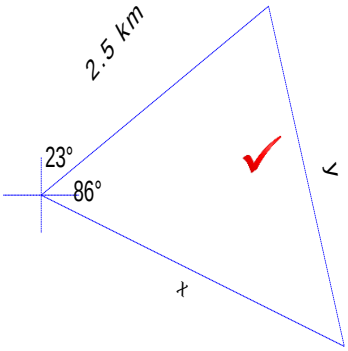
Calculate the total distance around the parkland.



$109° - 23° = 86$ ✓

$6.2 = 0.5 \times 2.5 \times x \times sin86°$ ✓

$x = 4.97\ km$ ✓

$y = \sqrt{2.5^2 + x^2 - 2 \times 2.5 \times x \times cos86°}$ ✓

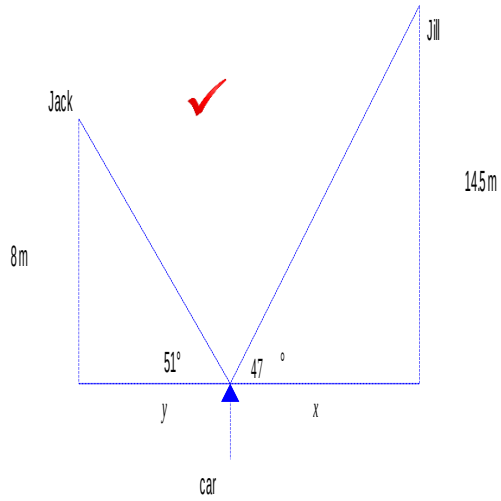
$y = 5.41\ km$ ✓

$Distance = 5.41 + 4.97 + 2.5 = 12.88\ km$ ✓

Question Four: [6, 2: 8 marks]

Jack and Jill live in apartment buildings opposite each other. They are looking out of their windows opposite each other and see a vintage car on the street between their buildings. Jack is 8m above the street and sees the car at an angle of depression of 51°. Jill is 6.5m higher than Jack and the angle of elevation from the car to Jill is 47°.

a) What is the distance between Jack and Jill's buildings?

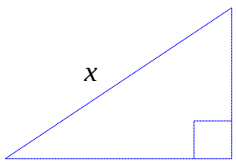


$x = 13.52m$ ✓ ✓

$y = 6.48m$ ✓ ✓

$x + y = 20m$ ✓

b) Jack and Jill want to make an old fashion cup telephone which is two cups connected by a long piece of string. If this is to pass between the windows of their two buildings how much string in required to go between the two apartments.



✓ 6.5 m

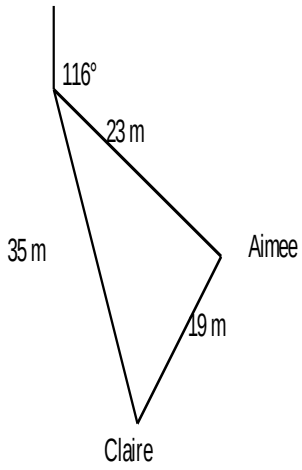
20 m

✓ $x = 21.03m$

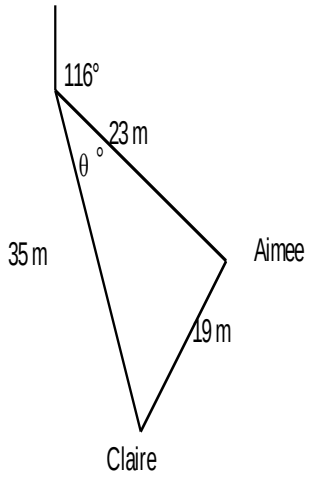
Question Five: [2, 3, 3: 8 marks]

Aimee and Claire are playing hide and seek with Sam in the park. Sam will be seeking. Aimee leaves Sam on a bearing of 116 degrees and goes 23m to hide. Claire leaves Sam and goes 35m to hide. Claire and Aimee's hiding spots are 19m apart.

a) Draw a diagram of this situation.



b) On what bearing is Claire's hiding spot from Sam?

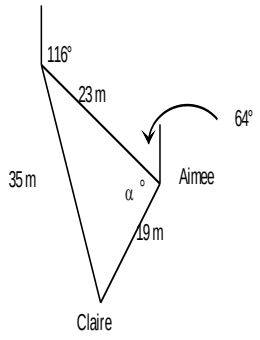


$\theta = 30°$

$bearing = 146°$

c) What is the bearing of Claire from Aimee?

$\propto = 112.75°$



$bearing = 360 - \alpha - 64$

$= 183.25°$