868

Math

868 TUTORS

TUTORS

Preparation for

High School

Mathematics

Bearings

Solutions

Instructions and Tips:

- ✓ **You have 60 minutes to complete this worksheet**
- ✓ **This worksheet consists of 4 questions**
- ✓ **Write answers in the spaces provided**
- ✓ **Show all working**

Student Name: _____

Student ID: _____

Date: _ _ / _ _ / _ _ _ _

**Total Score:**

Highest Score:

Tutor's Comments:

Question 1

A ship leaves a port A and sails to an offshore oil platform 80km away on a bearing of 070˚. At port B, the ship changes course and sails to another port C, 50 km away on a bearing of 300˚.

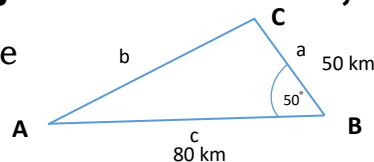**(a) Sketch the ship's journey and clearly indicate the following:**

(i)   The direction of North

(ii)   The points A, B and C

(iii)   The bearings 070˚ and 300˚

(iv)   The distances 80 km and 50 km
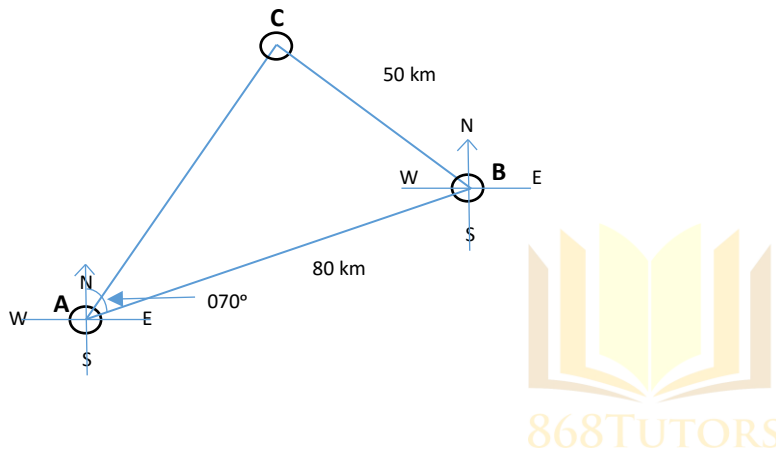
(4 marks)

(b) Calculate the straight line distance AC, in km, to 2 decimal places.

Using a simplified triangle

Applying cosine rule

$b^2 = a^2 + c^2 - 2ac \times \cos B$

$b^2 = (50)^2 + (80)^2 - 2(50)(80) \times \cos 50°$

$b^2 = 2500 + 6400 - 8000 \times \cos 50°$

$b^2 = 8900 - 5142.300877$

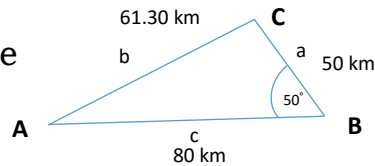$b^2 = 3757.699123$ $b = 61.30$ km

| AC = 61.30 km |

(3 marks)

(c) Calculate the bearing of C from A, to the nearest degree.

Using a simplified triangle

61.30 km   C

b   a   50 km

50°

A   B
c
80 km

Applying Sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} \qquad \frac{50\ km}{\sin A} = \frac{61.30}{\sin 50°} \qquad \text{(cross -multiplying)}$$

$50 \sin 50° = 61.30 \sin A$

$61.30 \sin A = 50 \sin 50°$
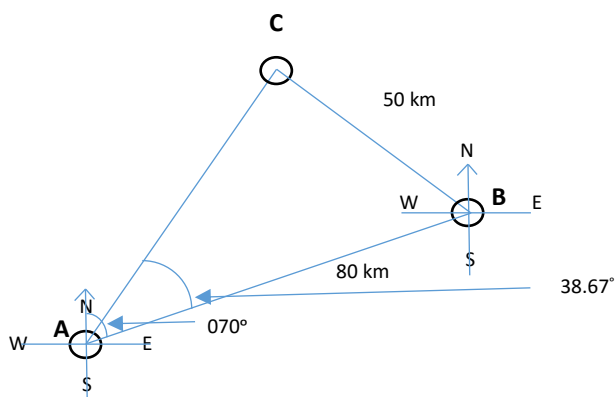
$$\sin A = \frac{50 \sin 50°}{61.30}$$

$$\sin A = \frac{50 \sin 50°}{61.30}$$

$\sin A = 0.624832335$

$A = \sin^{-1}(0.624832335)$

A = 38.67°

C

50 km

N

W   B   E

80 km
S

38.67°

N

W   A   E

070°
S

Bearing of C from A = 70° - 38.67°

Bearing of C from A = 31.33°

Bearing of C from A = 031°

(3 marks)

Question 2

A speedboat leaves a harbor J and heads to an islet, K, 30 km away on a bearing of 050˚. At the islet K, the speedboat changes direction and heads to a port L, 40 km away on a bearing of 100˚.

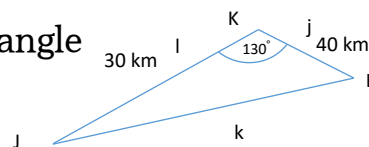(a) Sketch the speedboat's journey and clearly indicate the following:

(i)   The direction of North

(ii)   The points J,K and L

(iii)   The bearings 050˚ and 100˚

(iv)   The distances 30 km and 40 km
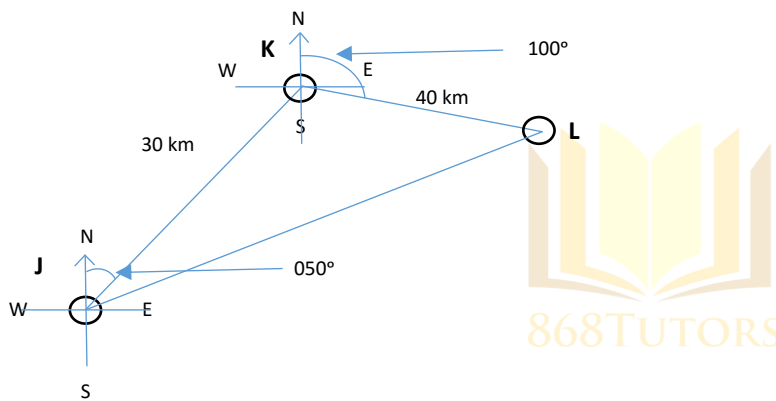
(4 marks)

(b) Calculate the straight line distance JL, in km, to 2 decimal places.

Using a simplified triangle

Applying cosine rule

$k^2 = j^2 + l^2 - 2jl \times \cos K$

$k^2 = (40)^2 + (30)^2 - 2(40)(30) \times \cos 130°$

$k^2 = 1600 + 900 - 2400 \times \cos 130°$

$k^2 = 2500 - -1542.690263$

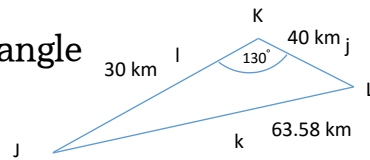$k^2 = 4042.690263$ $k = 63.58$ km   **JL = 63.58 km**   (3 marks)

(c) Calculate the bearing of L from J, to the nearest degree.

Using a simplified triangle

First we need to solve for J

Applying Sine rule $\dfrac{j}{\sin J} = \dfrac{k}{\sin K} = \dfrac{l}{\sin L}$

$\dfrac{j}{\sin J} = \dfrac{k}{\sin K}$

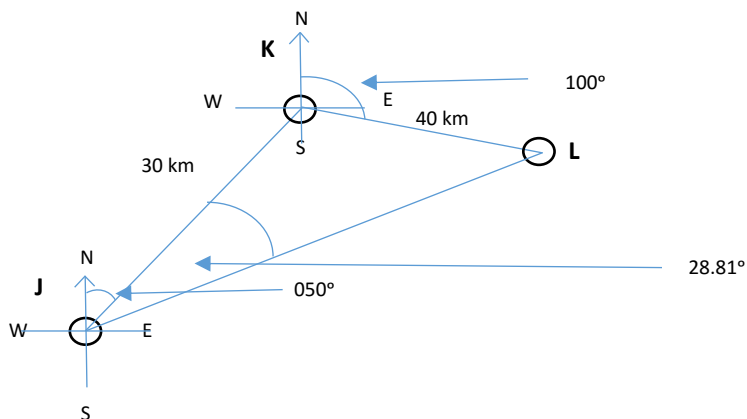$\dfrac{40}{\sin J} = \dfrac{63.58}{\sin 130°}$ (Cross-multiplying)

$40 \sin 130° = 63.58 \sin J$

$63.58 \sin J = 40 \sin 130°$

$\sin J = \dfrac{40 \sin 130°}{63.58}$

$\sin J = 0.481940511$

$J = \sin^{-1}(0.481940511)$ $J = 28.81°$

Bearing of L from J = $050° + 28.81°$

Bearing of L from J = 079° (to nearest degree)

(3 marks)

Question 3

Three hunters are positioned strategically in the Moruga forest. Hunter B is 50 meters north of Hunter A. Hunter C is on a bearing of 030° from Hunter A. The straight line distance between Hunter A and Hunter C is 38 m.
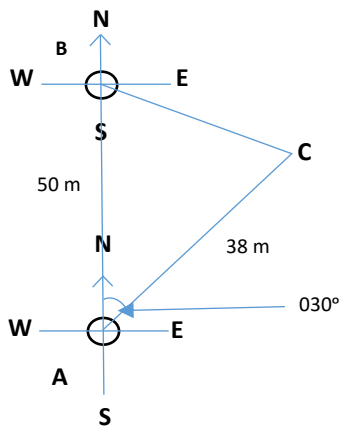
(a) Sketch the positions of the Hunters A, B and C

(i)   The direction of North

(ii)   The points A, B and C

(iii)   The bearing 030°

(iv)   The distances 50 m and 38 m

(4 marks)

(b) Calculate the straight line distance BC, in m, to 2 decimal places.

Using a simplified triangle

Applying cosine rule

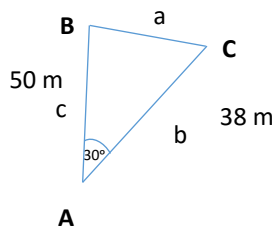$a^2 = b^2 + c^2 - 2bc \times \cos A$

$a^2 = (38)^2 + (50)^2 - 2(38)(50) \times \cos 30°$

$a^2 = 1444 + 2500 - 3800 \times \cos 30°$ $a^2 = 3944 - 3290.896534$ $a^2 = 3944 - 3290.896534$

$a^2 = 653.1034656$
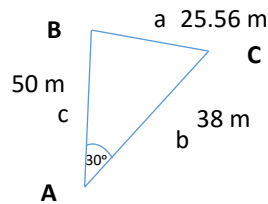
$a = 25.56$ m

BC = 25.56 m (to 2 decimal places)

(3 marks)

(c) Calculate the bearing of C from B, to the nearest degree.

Using a simplified triangle

We need to solve for B

Applying sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{25.56}{\sin 30^\circ} = \frac{38}{\sin B}$$

$$38 \sin 30^\circ = 25.56 \sin B$$
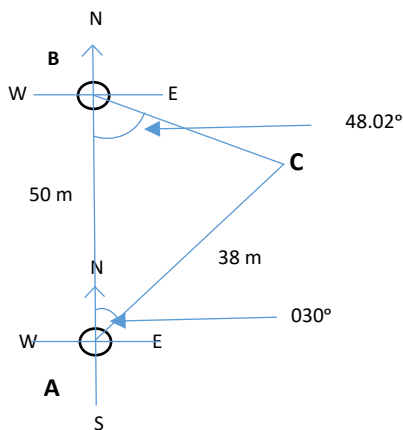
$$25.56 \sin B = 38 \sin 30^\circ$$

$$\sin B = \frac{38 \sin 30^\circ}{25.56}$$

$$\sin B = \frac{19}{25.56}$$

$$\sin B = 0.743348982$$

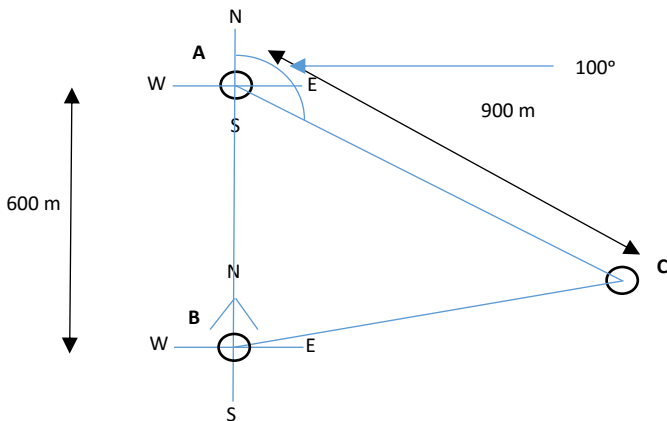$$B = \sin^{-1}(0.743348982)$$

$$B = 48.02^\circ$$

Bearing of C from B = 180° - 48.02°

Bearing of C from B = 132°

(3 marks)

Question 4

The diagram below illustrates the position of three sea vessels in the Columbus Channel in the Southern Caribbean.
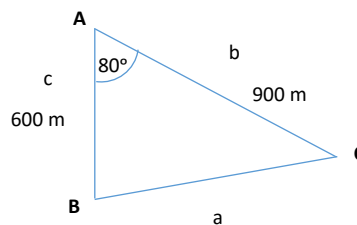

(Diagram not drawn to scale)

(a) Indicate the following on the diagram above:

(i)   The bearing of vessel C from vessel A is 100°

(ii)   The distance AC is 900 m

(iii)   The distance BA is 600 m

(b) Calculate the straight line distance between B and C, to 2 decimal places.

Using a simplified triangle

Applying cosine rule

$a^2 = b^2 + c^2 - 2bc \times \cos A$

$a^2 = (900)^2 + (600)^2 - 2(900)(600) \times \cos 80°$

$a^2 = 810{,}000 + 360{,}000 - 1{,}080{,}000 \times \cos 80°$

$a^2 = 1{,}170{,}000 - 187{,}540.0319$

$a^2 = 982{,}459.9681$

$a = 991.19$ m   **BC = 991.19 m (to 2 decimal places)**   **(4 marks)**

END OF WORKSHEET