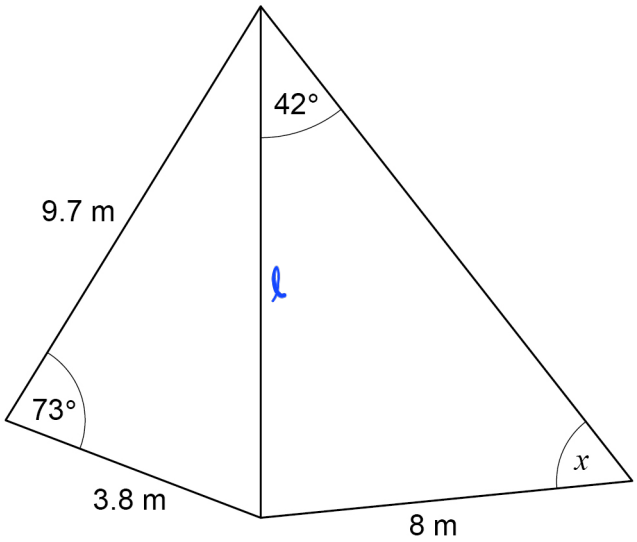
1 (a) Another sail is joined to the first sail as shown.



Not drawn accurately

x is an acute angle.

Work out the size of angle x.

[5 marks]

$l^2 = 9.7^2 + 3.8^2 - 2 \times 9.7 \times 3.8 \times \cos 73°$

$= 94.09 + 14.44 - 73.72 \cos 73°$

$= 86.976\ldots$ (1)

$l = \sqrt{86.976\ldots}$ (1)

$= 9.32\ldots$ (1)

$\frac{\sin x}{9.32\ldots} = \frac{\sin 42}{8}$ (1)

$\sin x = 0.0836\ldots \times 9.32\ldots$

$= 0.779\ldots$

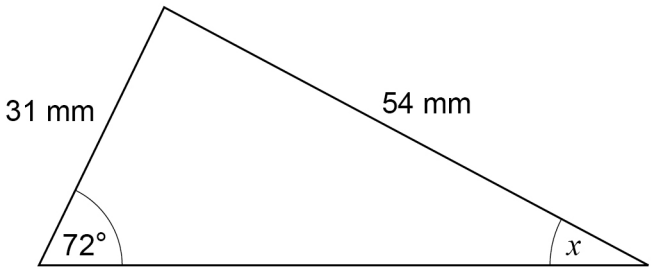
$x = \sin^{-1} 0.779\ldots$

$= 51.2°$

Answer 51.2 (1) degrees

2 (a) Here is a different triangle.

Not drawn accurately



Leah tries to use the sine rule to work out the size of angle x.

Here are the first two lines of her working.

$$\frac{x}{\sin 31} = \frac{54}{\sin 72}$$

$$x = \frac{54 \sin 31}{\sin 72}$$

What error has she made in this working?

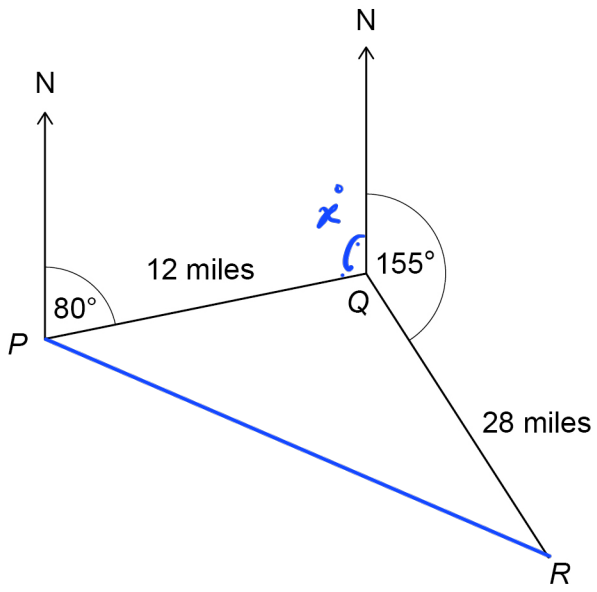
[1 mark]

it should be $\frac{31}{\sin x}$ instead. (1)

3 A ship sails from *P* to *Q* and then from *Q* to *R*.

Q is 12 miles from *P*, on a bearing of 080°

R is 28 miles from *Q*, on a bearing of 155°



Not drawn accurately

Work out the direct distance from *P* to *R*.

[4 marks]

$x^\circ = 180^\circ - 80^\circ = 100^\circ$

$PQR = 360^\circ - 155^\circ - 100^\circ$

$= 105^\circ$ (1)

$PR^2 = 12^2 + 28^2 - 2(12)(28)\cos 105^\circ$

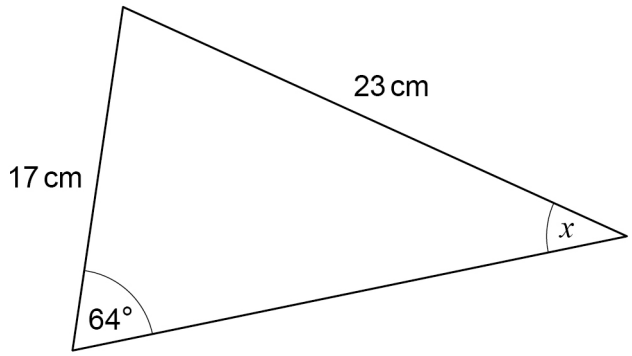
$= 1101$ (1)

$PR = \sqrt{1101}$ (1)

$= 33.19$ (1)

Answer 33.19 miles

4



Not drawn accurately

Use the sine rule to work out the size of angle x.

[3 marks]

$\frac{\sin x^\circ}{17} = \frac{\sin 64^\circ}{23}$

$\sin x^\circ = \frac{\sin 64^\circ}{23} \times 17$ (1)

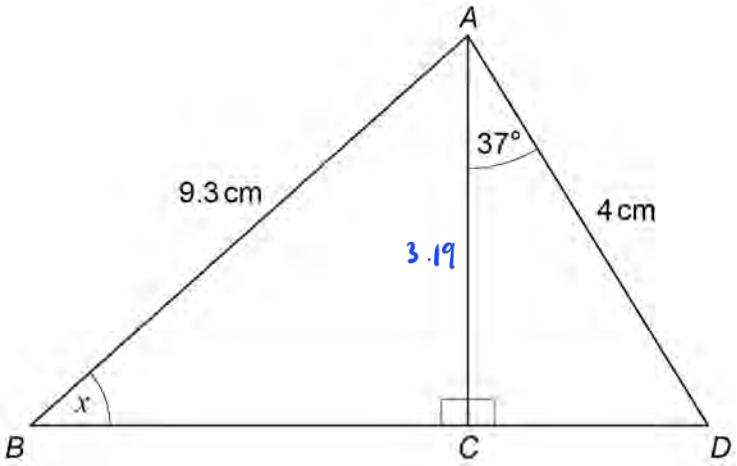
$x^\circ = \sin^{-1} \frac{17 \sin 64^\circ}{23}$ (1)

$= \sin^{-1} 0.664... = 41.3$

(1)

$x =$ 41.3 °

5



Not drawn accurately

Work out the size of angle x.

[4 marks]

$\cos 37^\circ = \frac{AC}{4}$ (1)

$AC = 4 \cos 37^\circ$

$= 3.19$ cm (1)

$\frac{\sin x}{3.19} = \frac{\sin 90^\circ}{9.3}$

$\sin x = \frac{1}{9.3} \times 3.19$

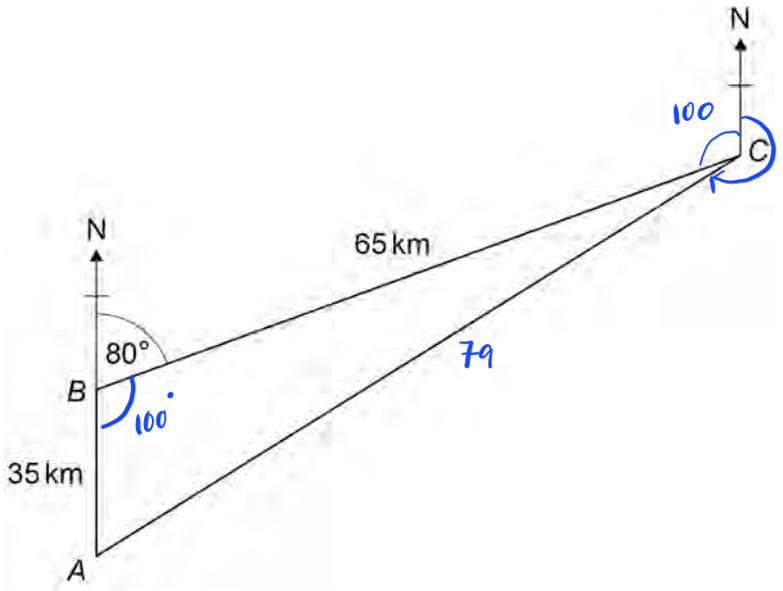
$x = \sin^{-1} 0.34$ (1)

$= 19.87$

(1)

$x =$ 19.87 °

6



Not drawn accurately

A boat sails 35 km North from *A* to *B*.

From *B* the boat sails to *C* and then back to *A*.

6 (a) Show that the distance the boat sails from *C* to *A* is 79 km to the nearest km

You **must** show your working.

[2 marks]

$AC^2 = 65^2 + 35^2 - 2(65)(35)\cos 100°$ (1)

$= 4225 + 1225 - 4550\cos 100°$

$= 5450 + 790$

$= 6240$

$AC = \sqrt{6240}$

$= 78.9\ldots$ (1)

≈ 79 (nearest km)

6 (b) Work out the bearing of *A* from *C*.

[4 marks]

$\frac{\sin ACB}{35} = \frac{\sin 100}{79}$ (1)

$\sin ACB = \frac{35 \sin 100}{79}$

$\sin ACB = 0.436\ldots$ (1)

$ACB = \sin^{-1} 0.436\ldots$

$= 25.8\ldots$ (1)

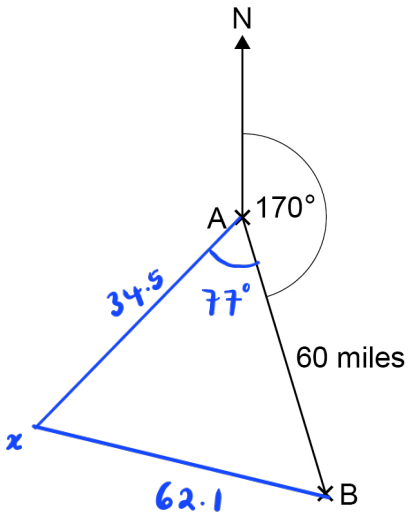
Bearing of A from C : $360^\circ - 100^\circ - 25.8^\circ$

$= 234.2^\circ$ (1)

Answer 234.2 °

7 B is 60 miles from A on a bearing of 170°

Not drawn accurately



A ship sails from A on a bearing of 247°

It travels at a constant speed of 23 mph for $1\frac{1}{2}$ hours.

Is the ship now closer to B than it was when it left A?

You **must** show your working.

[5 marks]

$247° - 170° = 77°$ (1)

distance $= 23 \times 1.5 = 34.5$ (1)

$xB^2 = 34.5^2 + 60^2 - 2(34.5)(60)\cos 77°$ (1)

$= 3858$

$xB = \sqrt{3858}$ (1)

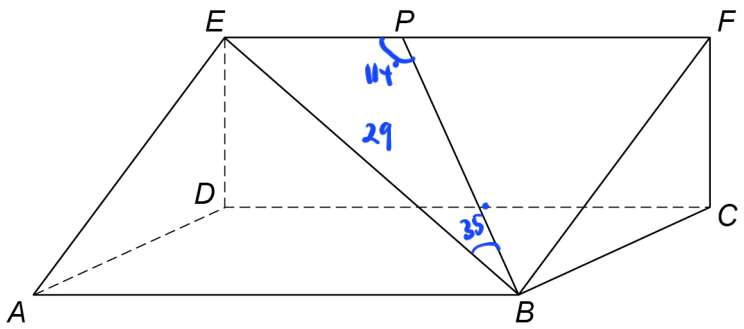
$= 62.1$

(1)

No. The ship is further away.

8 *ABCDEF* is a triangular prism.

P is a point on *EF*.



EB = 29 cm

Angle *EBP* = 35°

Angle *EPB* = 114°

Work out the length of *EP*.

[2 marks]

$\frac{EP}{\sin 35^\circ} = \frac{29}{\sin 114^\circ}$ (1)

$EP = \frac{29}{\sin 114^\circ} \times \sin 35^\circ$

$= 18.2$ (1)

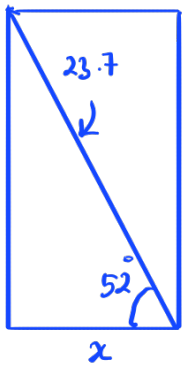
Answer 18.2 cm

9 A diagonal of a rectangle is 23.7 cm long.

The diagonal makes an angle of 52° with a side of length x cm

Work out the value of x.

[3 marks]



$\cos 52^\circ = \frac{x}{23.7}$ ✓ (1)

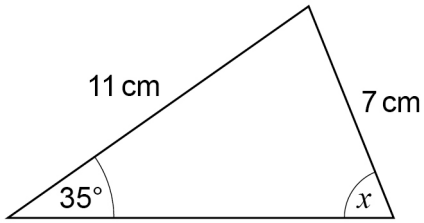
$x = 23.7 \cos 52^\circ$ ✓ (1)

$= 14.6$ cm

$x =$ 14.6 cm ✓ (1)

10 Here is triangle A.

Not drawn accurately



10 (a) Use the sine rule to show that $x = 64°$ to the nearest degree.

[3 marks]

$\frac{\sin x}{11} = \frac{\sin 35^\circ}{7}$ ✓ (1)

$\sin x = \sin 35^\circ \times \frac{11}{7}$ ✓ (1)

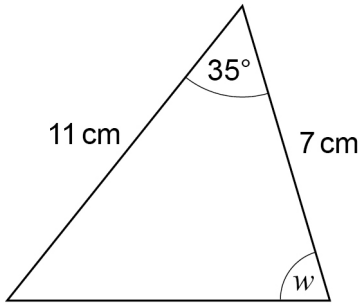
$= 0.901$

$x = \sin^{-1} 0.901$

$= 64.33$ ✓ (1)

$= 64^\circ$ (nearest degree)

10 (b) Here is triangle B.



Not drawn accurately

Anna thinks that w must be 64° to the nearest degree.

She says,

"This is because triangle B has two sides and one angle the same as triangle A."

Without further calculation, is she correct?

Tick a box.

Yes ☐ No ☑

Give a reason for your answer.

[1 mark]

the '7 cm side' is a different side