

Name:

## Exam Style Questions

Sine Rule

Cosine Rule

Area of a Triangle (Sine)



Corbettmaths

Equipment needed: Ruler, Pencil, Calculator and Pen

### Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

### Video Tutorial

[www.corbettmaths.com/contents](http://www.corbettmaths.com/contents)

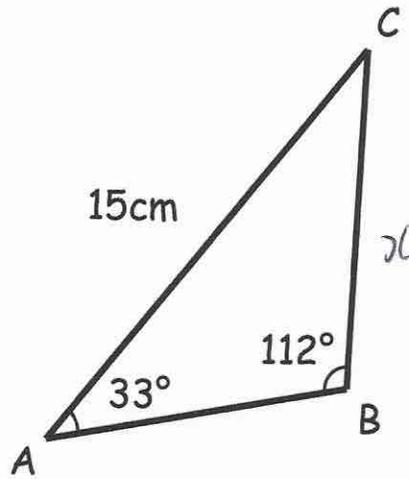
Videos 333 to 337



### Answers and Video Solutions



1.



In triangle ABC the length of AC is 15cm  
Angle ABC =  $112^\circ$   
Angle BAC =  $33^\circ$

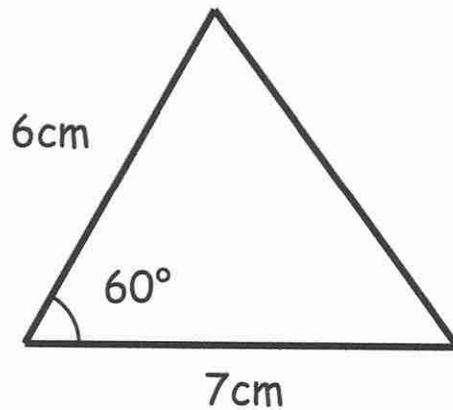
Work out the length of BC.

$$\frac{x}{\sin 33} = \frac{15}{\sin 112}$$

$$x = 8.811181822$$

8.81  
.....cm  
(3)

2.



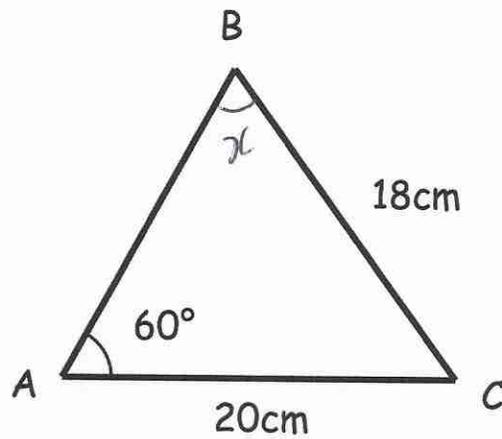
Calculate the area of the triangle.

$$\frac{1}{2} \times 6 \times 7 \times \sin 60$$

$$= 18.18653348 \text{ cm}^2$$

18.19  
.....cm<sup>2</sup>  
(2)

3.



Calculate the size of angle ABC.

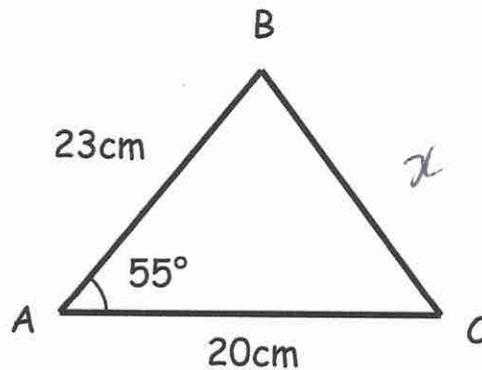
$$\frac{\sin x}{20} = \frac{\sin 60}{18}$$

$$\sin x = 0.9622504\dots$$

$$\underline{\underline{74.2}}^\circ$$

(3)

4.



Calculate the length of BC.

$$x^2 = 23^2 + 20^2 - 2 \times 20 \times 23 \times \cos 55$$

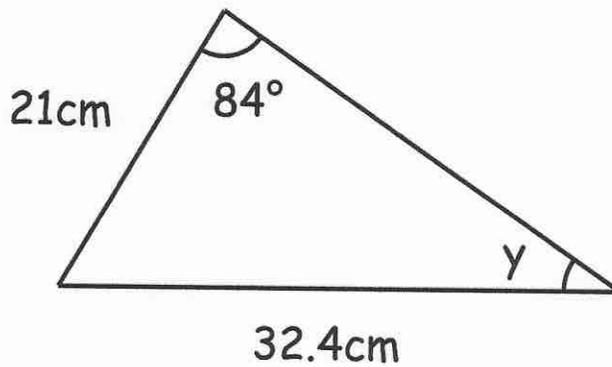
$$x^2 = 401.3\dots$$

$$x = 20.03271521$$

$$\underline{\underline{20.03}}\text{cm}$$

(3)

5.



Calculate the size of the angle labelled y.

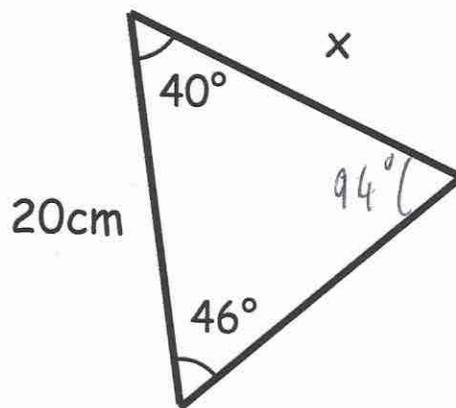
$$\frac{\sin y}{21} = \frac{\sin 84}{32.4}$$

$$\sin y = 0.6445975248$$

$$\underline{\underline{40.1355^\circ}}$$

(3)

6.



$$180 - 40 - 46 = 94^\circ$$

Find the size of x.

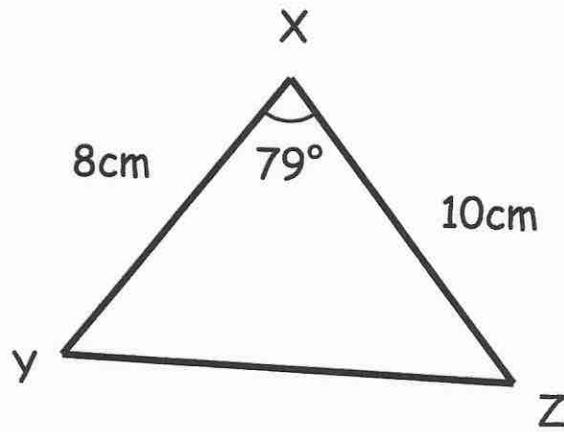
$$\frac{x}{\sin 46} = \frac{20}{\sin 94}$$

$$x = 14.4219271$$

$$\underline{\underline{14.422}} \text{ cm}$$

(3)

7.



XY = 8cm

XZ = 10cm

angle YXZ = 79°

(a) Calculate the area of the triangle XYZ.

$$\frac{1}{2} \times 8 \times 10 \times \sin 79$$

$$= 39.26508734$$

$$\begin{array}{r} 39.265 \\ \hline \text{.....cm}^2 \\ (3) \end{array}$$

(b) Calculate the length of YZ.

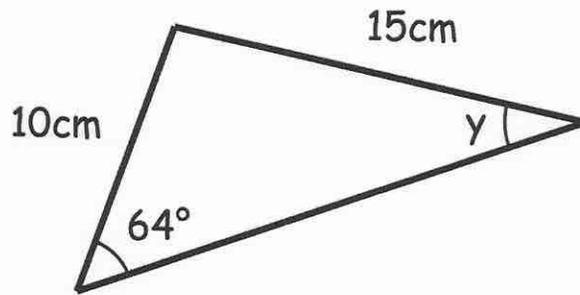
$$y z^2 = 8^2 + 10^2 - 2 \times 8 \times 10 \times \cos 79$$

$$y z^2 = 133.4705607$$

$$y z = 11.55294598$$

$$\begin{array}{r} 11.553 \\ \hline \text{.....cm} \\ (3) \end{array}$$

8.

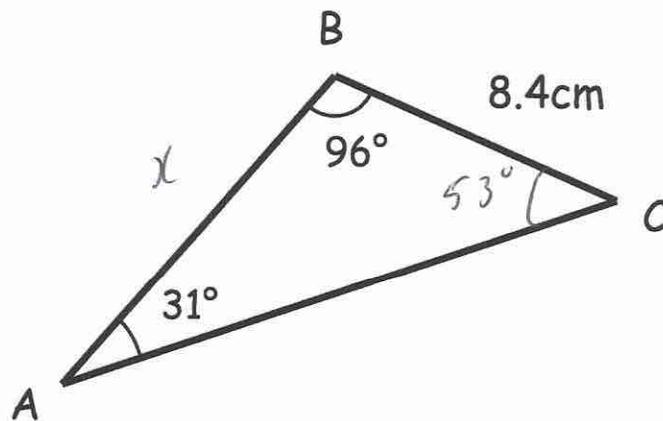
Find the size of  $y$ .

$$\frac{\sin y}{10} = \frac{\sin 64}{15}$$

$$\sin y = 0.599196\dots$$

$$\underline{\underline{36.8123^\circ}}$$
  
(3)

9.



$$180 - 31 - 96$$

$$= 53$$

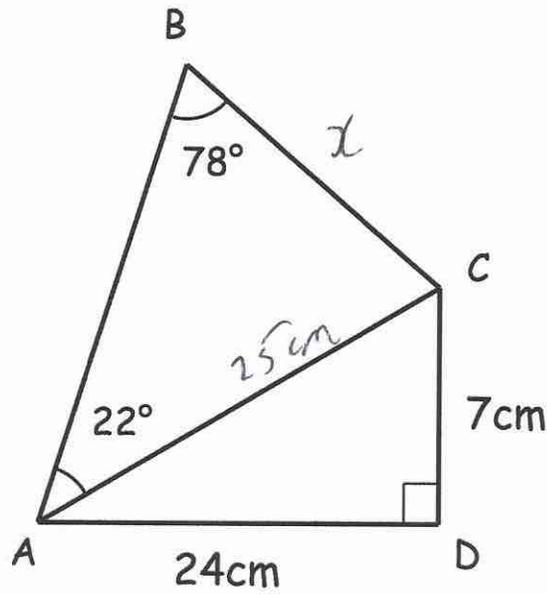
Calculate the length of AB.

$$\frac{x}{\sin 53} = \frac{8.4}{\sin 31}$$

$$x = 13.02532494$$

$$\underline{\underline{13.0253\text{cm}}}$$
  
(3)

10. ABC and ACD are triangles



Calculate the length of BC.

$$AC^2 = 7^2 + 24^2$$

$$AC^2 = 625$$

$$AC = 25$$

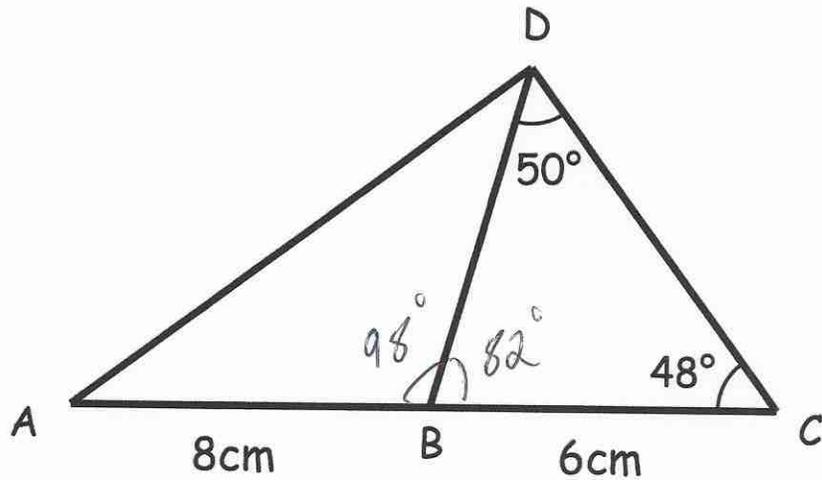
$$\frac{x}{\sin 22} = \frac{25}{\sin 78}$$

$$x = 9.574388189$$

$$9.57439$$

.....cm  
(4)

11.



ACD is a triangle and B is a point on AC.  
 AB = 8cm and BC is 6cm.  
 Angle BCD = 48° and angle BDC = 50°.

(a) Find the length of BD.

$$\frac{BD}{\sin 48} = \frac{6}{\sin 50}$$

$$BD = 5.820640033$$

$$\begin{array}{r} 5.82 \\ \text{.....cm} \\ (3) \end{array}$$

(b) Find the length of AD.

$$AD^2 = 8^2 + 5.82064...^2 - 2 \times 8 \times 5.82... \times \cos 98$$

$$AD^2 = 110.8410748$$

$$AD = 10.52810879$$

$$\begin{array}{r} 10.528 \\ \text{.....cm} \\ (3) \end{array}$$

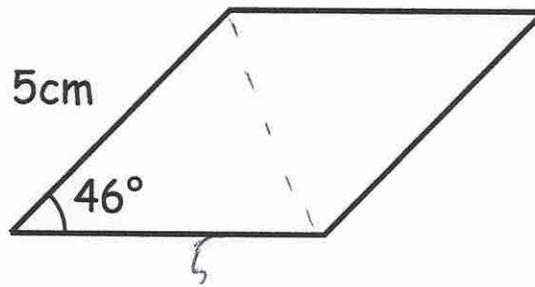
(c) Find the area of triangle ABD.

$$\frac{1}{2} \times 8 \times 5.82... \times \sin 98$$

$$= 23.05597586$$

$$\begin{array}{r} 23.056 \\ \text{.....cm}^2 \\ (3) \end{array}$$

12. Shown below is a rhombus.



Find the area of the rhombus.

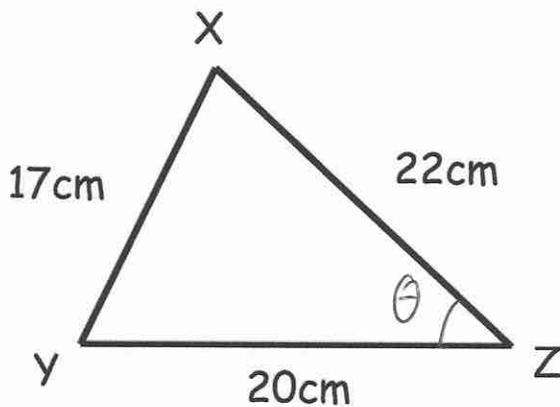
$$\frac{1}{2} \times 5 \times 5 \times \sin 46 = 8.991747\dots \text{ cm}^2$$

$$8.9917\dots \times 2 = 17.98349\dots$$

$$\underline{\underline{17.9835}} \text{ cm}^2$$

(3)

- 13.



Find the size of angle XZY.

$$\cos \theta = \frac{20^2 + 22^2 - 17^2}{2 \times 20 \times 22}$$

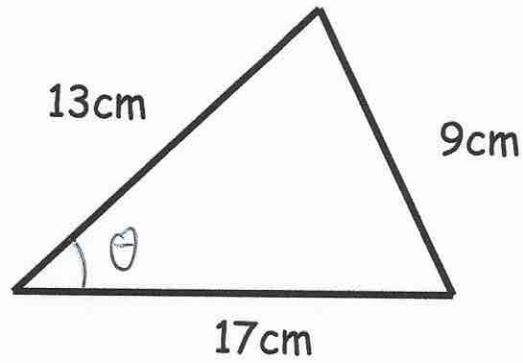
$$\cos \theta = 0.6761363636\dots$$

$$\theta = 47.45754\dots$$

$$\underline{\underline{47.458}}^\circ$$

(3)

14.



Calculate the size of the smallest angle in the triangle.

$$\cos \theta = \frac{13^2 + 17^2 - 9^2}{2 \times 13 \times 17}$$

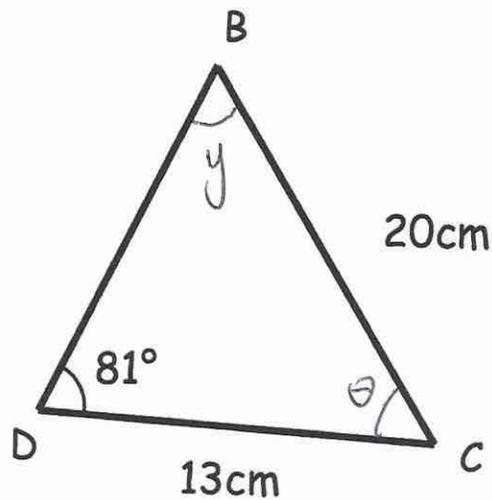
$$\cos \theta = \frac{29}{34}$$

$$\theta = 31.46697\dots$$

$$\underline{\underline{31.467}} \text{ } ^\circ$$

(4)

15. Shown below is triangle BCD.



Calculate the size of angle BCD.  
Give your answer correct to 2 decimal places.

$$\frac{\sin 81}{20} = \frac{\sin y}{13}$$

$$\sin y = 0.641997\dots$$

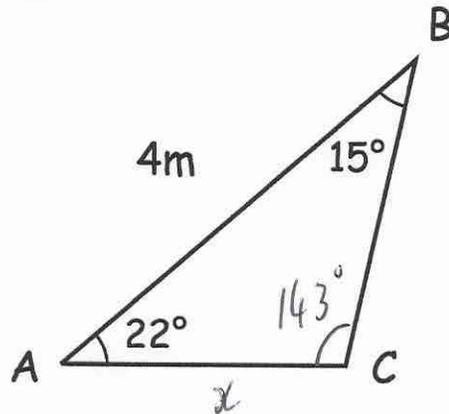
$$y = 39.94\dots$$

$$180 - 81 - 39.94\dots = 59.059\dots$$

$$\underline{\underline{59.06}}^\circ$$

(4)

16. Shown below is triangle ABC.



$$180 - 22 - 15 = 143$$

Calculate the length of AC.

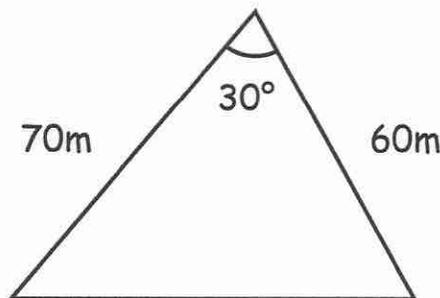
$$\frac{4}{\sin 143} = \frac{x}{\sin 15}$$

$$x = 1.720256459$$

1.72

.....m  
(3)

17. Shown below is a sketch of a field.



$$\begin{array}{r} 70 \\ \times 15 \\ \hline 350 \\ + 700 \\ \hline 1050 \end{array}$$

Work out the area of the field.

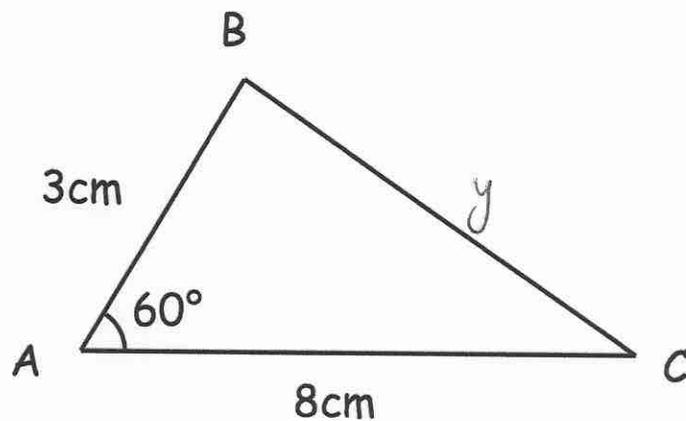
$$\frac{1}{2} \times 70 \times 60 \times \sin 30$$

$$\frac{1}{2} \times 70 \times 60 \times \frac{1}{2}$$

$$70 \times 15$$

1050  
.....m<sup>2</sup>  
(2)

18. Shown below is triangle ABC.



Work out the length of BC.

$$y^2 = 3^2 + 8^2 - 2 \times 3 \times 8 \times \cos 60$$

$$y^2 = 9 + 64 - 48 \times \frac{1}{2}$$

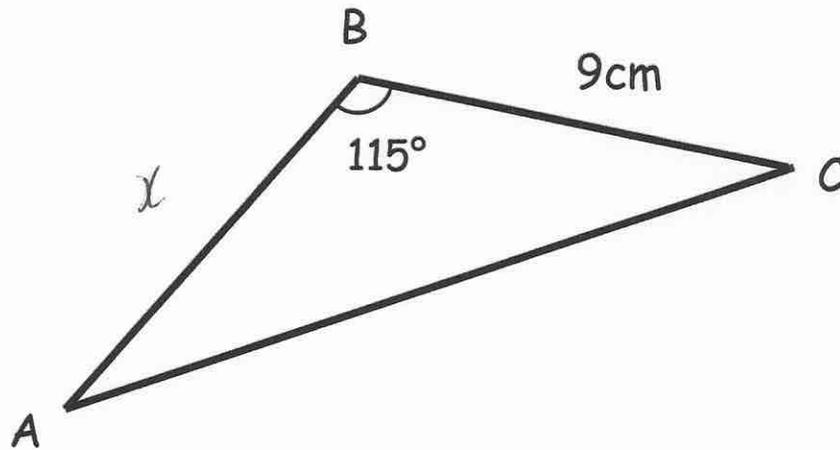
$$y^2 = 73 - 24$$

$$y^2 = 49$$

$$y = 7$$

.....7.....cm  
(3)

19. Shown below is triangle ABC.



The area of triangle ABC is  $72\text{cm}^2$

Calculate the length of AB.

Give your answer to 2 decimal places.

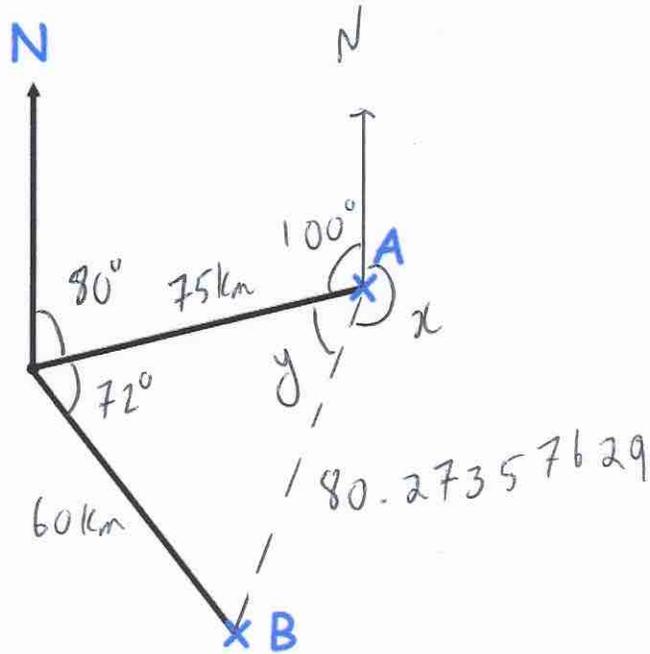
$$72 = \frac{1}{2} \times x \times 9 \times \sin 115$$

$$72 = 4.078385042 x$$

$$x = 17.6540467$$

17.654  
.....cm  
(3)

20.



Two ships, A and B, leave a port at 11:00  
 A travels on a bearing of  $080^\circ$  at a speed of  $25\text{ km/h}$   
 B travels on a bearing of  $152^\circ$  at a speed of  $20\text{ km/h}$

(a) Work out the distance between A and B at 14:00

3 hours

$$AB^2 = 60^2 + 75^2 - 2 \times 60 \times 75 \times \cos 72$$

$$AB^2 = 6443.847\dots$$

$$AB = 80.27357\dots$$

$$\underline{\underline{80.27}} \text{ km} \quad (3)$$

(b) Work out the bearing of B from A at 14:00

$$\frac{\sin y}{60} = \frac{\sin 72}{80.2735\dots}$$

$$z = 360 - 100 - 45.305\dots$$

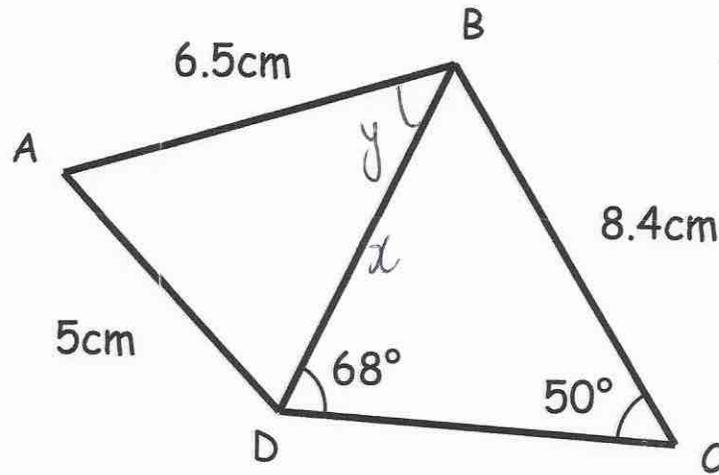
$$z = 214.694\dots$$

$$\sin y = 0.7108\dots$$

$$y = 45.30504\dots$$

$$\underline{\underline{214.7^\circ}} \quad (3)$$

21.



Calculate the size of angle ABD.

$$\frac{x}{\sin 50} = \frac{8.4}{\sin 68}$$

$$x = 6.940126589$$

$$\cos y = \frac{6.5^2 + 6.94\dots^2 - 5^2}{2 \times 6.5 \times 6.94\dots}$$

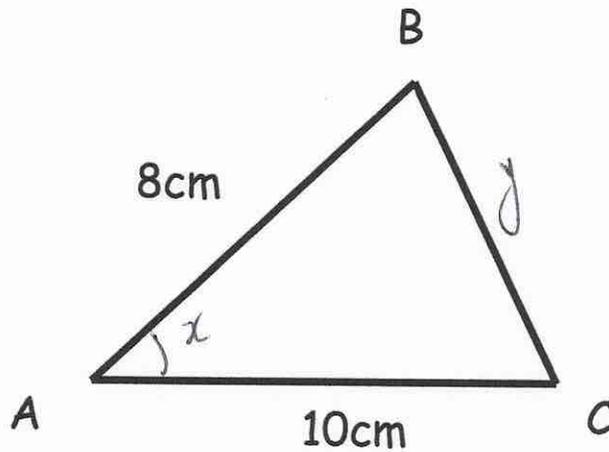
$$\cos y = 0.7250516\dots$$

$$y = 43.5268\dots$$

$$\underline{\underline{43.527}}.$$

(4)

22.



AB = 8cm

AC = 10cm

Angle BAC is acute.

The area of the triangle shown is 25cm<sup>2</sup>

Calculate the perimeter of the triangle

$$A = \frac{1}{2} \times a \times b \times \sin C$$

$$25 = \frac{1}{2} \times 8 \times 10 \times \sin x$$

$$\sin x = 0.625$$

$$x = 38.682 \dots$$

$$y^2 = 8^2 + 10^2 - 2 \times 8 \times 10 \times \cos 38.68218745$$

$$y^2 = 39.10004003$$

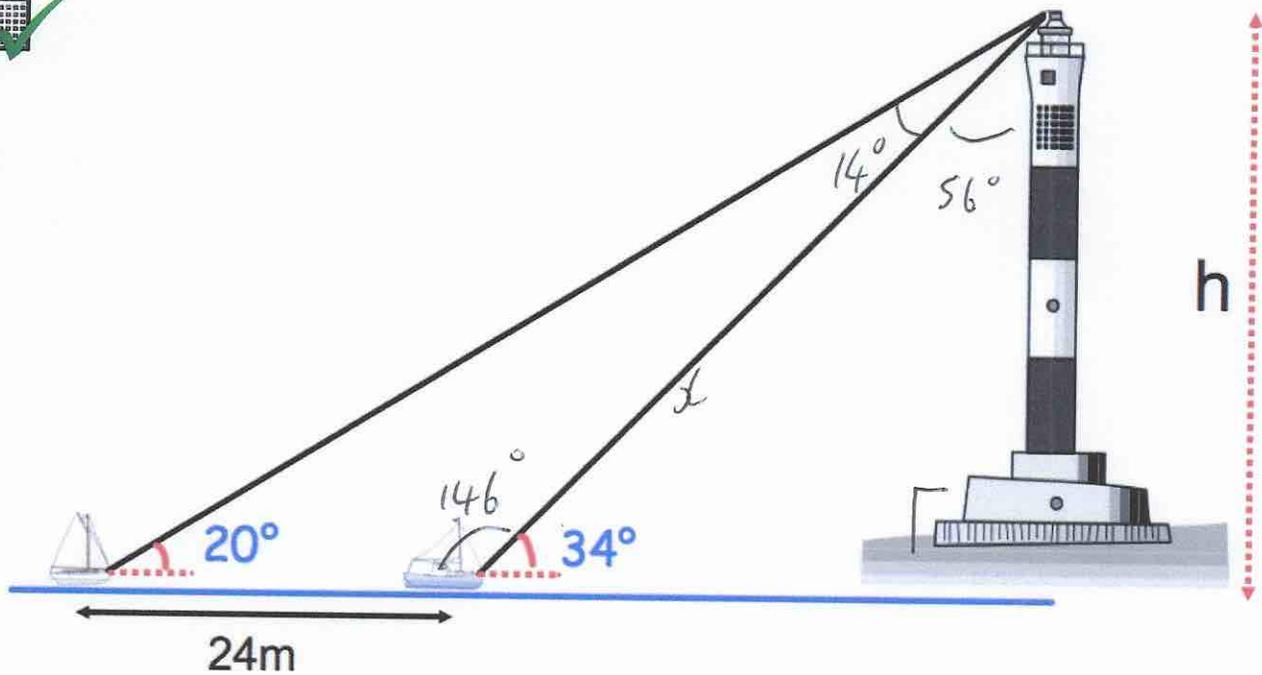
$$y = 6.253 \dots$$

$$\underline{\underline{24.253}} \text{ cm}$$

(4)

$$6.253 \dots + 8 + 10 = 24.253 \dots \text{ cm}$$

23.



Two small boats are 24m apart.

The angle of elevation of the boats to the top of a lighthouse are  $20^\circ$  and  $34^\circ$  respectively.

Calculate the height of the lighthouse.

$$\frac{x}{\sin 20} = \frac{24}{\sin 14}$$

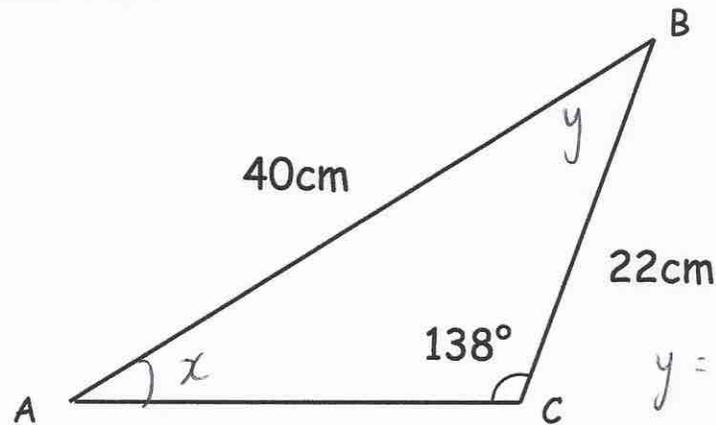
$$x = 33.93030391$$

$$h = 33.9303... \times \sin 34$$

$$h = 18.9735...$$

$$\begin{array}{r} 18.974 \\ \hline \end{array} \text{m} \\ (6)$$

24. Shown below is triangle ABC.



$$y = 180 - 138 - 21.59\dots$$

$$y = 20.406\dots$$

Calculate the length of AC.  
Give your answer to 2 decimal places.

$$\frac{\sin x}{22} = \frac{\sin 138}{40}$$

$$\sin x = 0.368021\dots$$

$$x = 21.593\dots^\circ$$

$$AC^2 = 40^2 + 22^2 - 2 \times 22 \times 40 \times \cos 20.406\dots$$

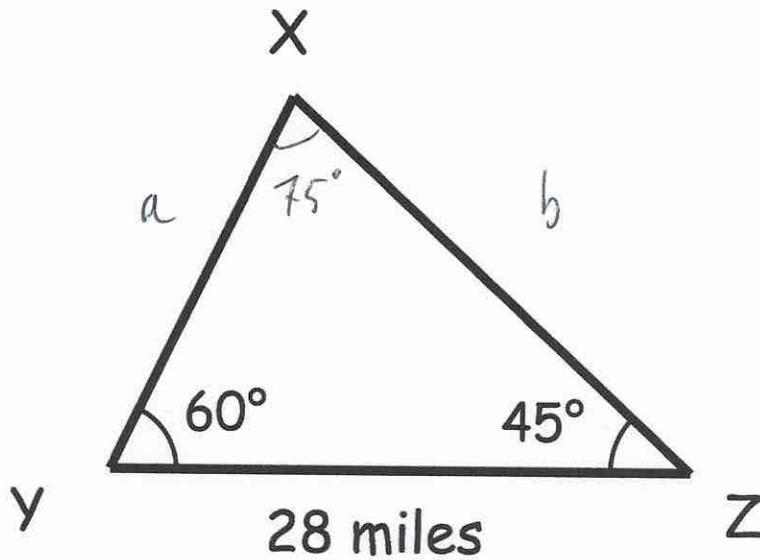
$$AC^2 = 434.451\dots$$

$$\underline{20.84}\text{ cm}$$

$$AC = 20.843\dots$$

(5)

25.  A boat, located at position X is running out of fuel. There are two ports located at Y and Z. The boat must refuel as soon as possible.



How much closer is the boat to the port at Y than the port at Z?

$$\frac{a}{\sin 45} = \frac{28}{\sin 75}$$

$$\frac{b}{\sin 60} = \frac{28}{\sin 75}$$

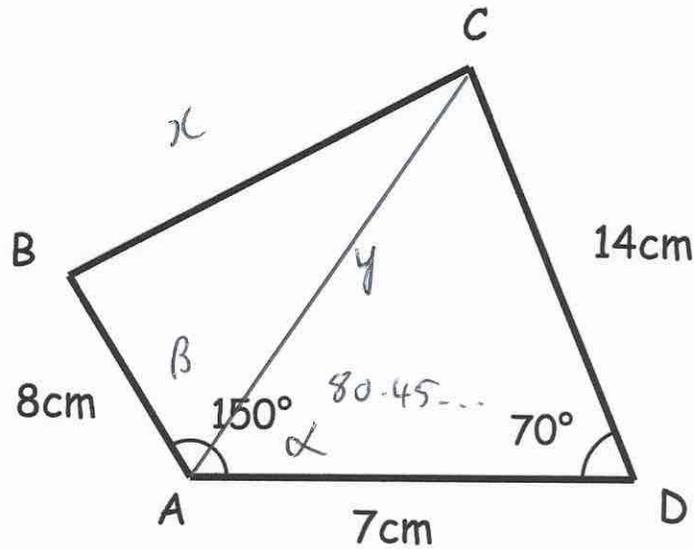
$$a = 20.4974\dots$$

$$b = 25.10411\dots$$

$$b - a = 4.60669\dots$$

$$\begin{array}{r} 4.607 \text{ miles} \\ \hline \text{to 3dp} \end{array} \quad (4)$$

26. In a quadrilateral ABCD, AD = 7cm, AB = 8cm and CD = 14cm.  
Angle BAD = 150° and Angle ADC = 70°



Calculate the length BC.

$$y^2 = 7^2 + 14^2 - 2 \times 7 \times 14 \times \cos 70$$

$$y^2 = 177.96...$$

$$y = 13.3403...$$

$$\frac{\sin \alpha}{14} = \frac{\sin 70}{13.34...}$$

$$\sin \alpha = 0.9861...$$

$$\alpha = 80.4567...$$

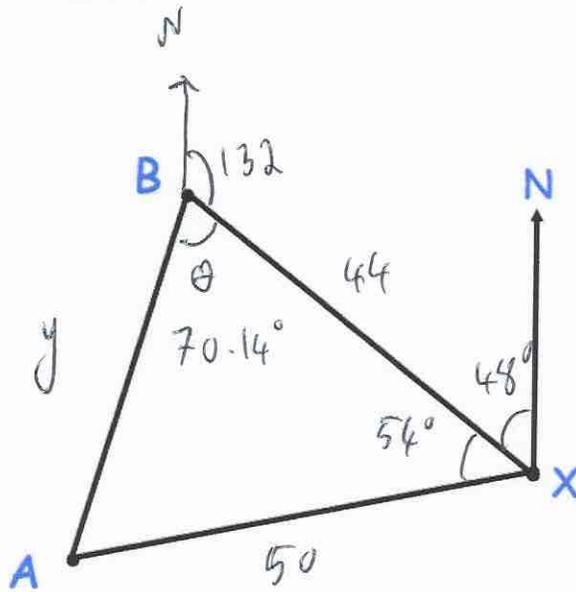
$$\beta = 150 - 80.456... = 69.54... \quad 12.937 \text{ cm}$$

$$x^2 = 8^2 + 13.34...^2 - 2 \times 8 \times 13.34... \times \cos 69.54... \quad (6)$$

$$x^2 = 167.36...$$

$$x = 12.93696...$$

27.



$$312 - 258 = 54$$

Ship A is 50km from X on a bearing of 258°  
 Ship B is 44km from X on a bearing of 312°

(a) Calculate the distance between A and B.

$$y^2 = 44^2 + 50^2 - 2 \times 44 \times 50 \times \cos 54$$

$$y^2 = 1849.74489$$

$$y = 43.00866\dots$$

$$\begin{array}{r} 43.01 \\ \dots\dots\dots \text{km} \\ (3) \end{array}$$

(b) Calculate the bearing of A from B.

$$\frac{\sin \theta}{50} = \frac{\sin 54}{43.008\dots}$$

$$\sin \theta = 0.9405\dots$$

$$\theta = 70.14\dots$$

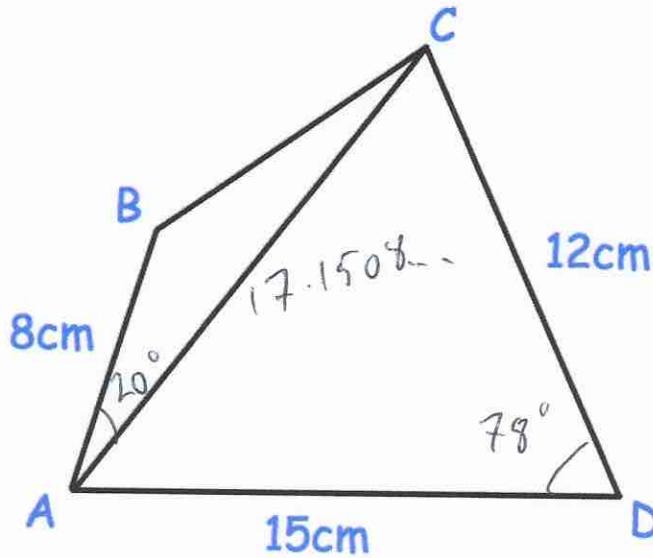
$$132 + 70.14 = 202.14^\circ$$

$$\begin{array}{r} 202.14^\circ \\ \dots\dots\dots \\ (3) \end{array}$$

28. ABCD is a quadrilateral.



AB = 8cm, AD = 15cm and CD = 12cm.  
 Angle ADC = 78° and angle BAC = 20°



(a) Calculate the length of AC.

$$AC^2 = 12^2 + 15^2 - 2 \times 15 \times 12 \times \cos 78$$

$$AC^2 = 294.1517 \dots$$

$$AC = 17.15 \dots$$

$$\begin{array}{r} 17.151 \\ \dots\dots\dots \text{cm} \\ (3) \end{array}$$

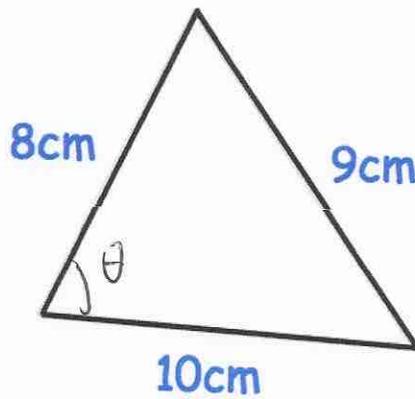
(b) Calculate the area of triangle ABC.

$$\text{Area} = \frac{1}{2} \times 8 \times 17.15085395 \times \sin 20$$

$$= 23.46375 \dots$$

$$\begin{array}{r} 23.464 \\ \dots\dots\dots \text{cm}^2 \\ (2) \end{array}$$

29.



Find the area of the triangle.

$$\cos \theta = \frac{8^2 + 10^2 - 9^2}{2 \times 8 \times 10}$$

$$\cos \theta = 0.51875$$

$$\theta = 58.75155\dots$$

$$\text{Area} = \frac{1}{2} \times 8 \times 10 \times \sin 58.75\dots$$

$$= 34.19703935$$

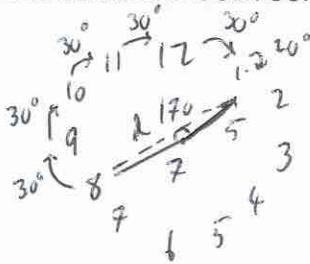
$$\begin{array}{r} 34.2 \\ \text{.....cm}^2 \\ (5) \end{array}$$

30. A clock has two hands.



A minute hand that is 7cm long and an hour hand that is 5cm long.

Find the distance between the tips of the two hands at 13:40



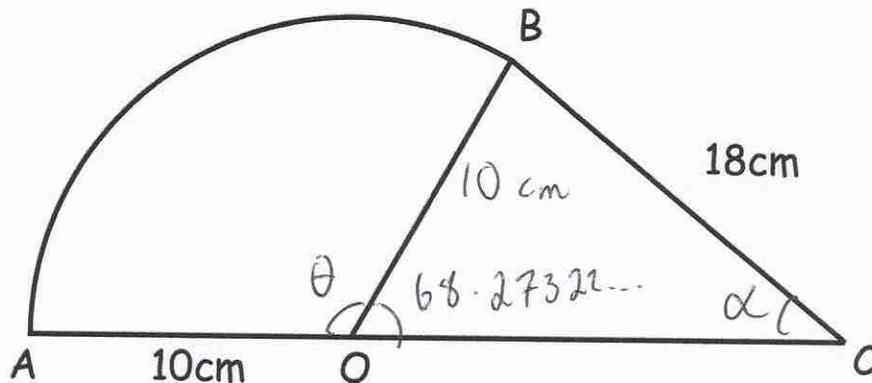
$$d^2 = 5^2 + 7^2 - 2 \times 5 \times 7 \times \cos 170$$

$$d^2 = 142.936\dots$$

$$d = 11.955607\dots$$

$$\begin{array}{r} 11.956 \\ \text{.....cm} \\ \text{to 3 dp.} \\ (4) \end{array}$$

31. OAB is a sector of a circle, centre O.  
AOC is a straight line.



$$AO = 10\text{cm} \quad BC = 18\text{cm}$$

Arc AB has a length of 19.5cm

Calculate the size of angle OCB.

$$\text{arc length} = \frac{\theta}{360} \times \pi \times d$$

$$19.5 = \frac{\theta}{360} \times \pi \times 20$$

$$\theta = 111.7267701$$

$$180 - 111.72\dots = 68.273\dots$$

$$\frac{\sin \alpha}{10} = \frac{\sin 68.27\dots}{18}$$

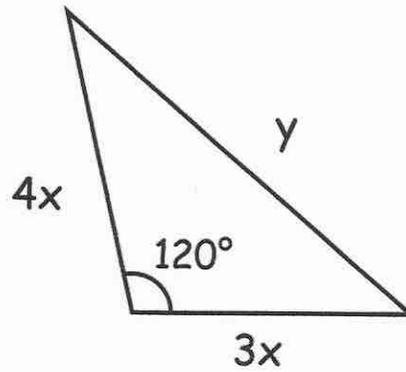
$$\sin \alpha = 0.516\dots$$

$$\alpha = 31.0702\dots$$

$$\underline{\underline{31.07}} \text{ } ^{\circ}$$

(6)

32.



Work out the ratio  $y : x$

$$y^2 = (4x)^2 + (3x)^2 - 2 \times (4x) \times (3x) \times \cos 120$$

$$y^2 = 16x^2 + 9x^2 - 24x^2 (\cos 120) \quad \leftarrow -\frac{1}{2}$$

$$y^2 = 16x^2 + 9x^2 + 12x^2$$

$$y^2 = 37x^2$$

$$y = \sqrt{37} x$$

$$\frac{\sqrt{37} : 1}{\dots\dots\dots}$$

(4)