Name:

Level 2 Further Maths

Sine Rule
Cosine Rule
Area of any Triangle

Corbettmaths

Ensure you have: Pencil or pen

Guidance

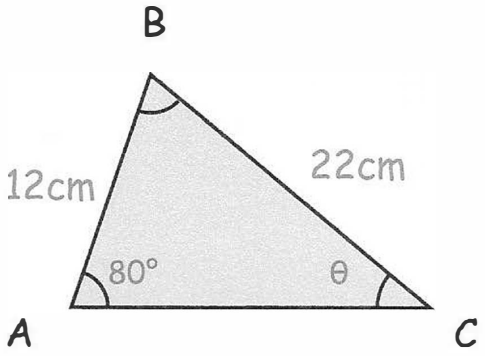
1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Revision for this topic

www.corbettmaths.com/more/further-maths/

1. In triangle ABC,

AB = 12cm, angle BAC = 80° and BC = 22cm



Work out the size of angle ABC

$\frac{\sin\theta}{12} = \frac{\sin 80}{22}$

$\sin\theta = 0.5371...$

$\theta = 32.49$

180 - 80 - 32.49.. = 67.509...

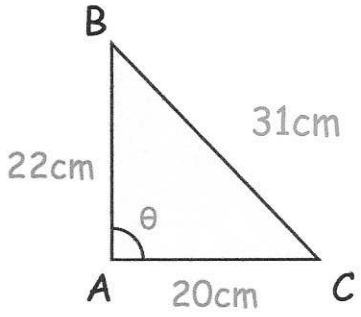
67.509...

.....°

(3)

2. In triangle ABC,

AB = 22cm AC = 20cm AC = 31cm



Find the size of angle BAC

$\cos\theta = \frac{22^2 + 20^2 - 31^2}{2 \times 20 \times 22}$

$\cos\theta = -\frac{7}{80}$

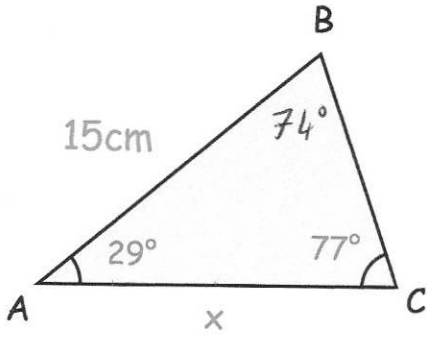
$\theta = 95.02$

95.02 .....°

(3)

3. In triangle ABC,

AB = 15cm, angle BAC = 29° and angle ACB = 77°



Find the length of the side AC.

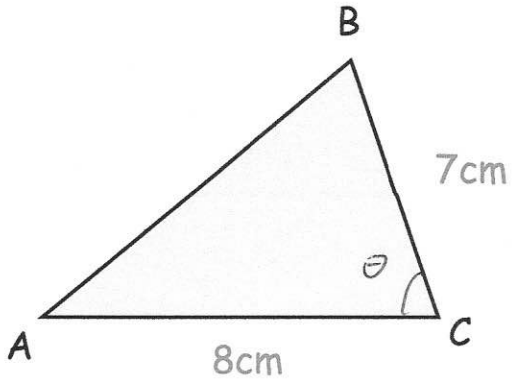
$$\frac{15}{\sin 77} = \frac{x}{\sin 74}$$

$$x = 14.798$$

.....cm

(3)

4. Shown below is triangle ABC.



The area of the triangle $14\sqrt{3}$ cm²

Find the size of angle ACB

$\frac{1}{2} \times 8 \times 7 \times \sin\theta = 14\sqrt{3}$

$28 \sin\theta = 14\sqrt{3}$

$\sin\theta = \frac{1}{2}\sqrt{3}$

$\sin\theta = \frac{\sqrt{3}}{2}$

$\theta = 60$

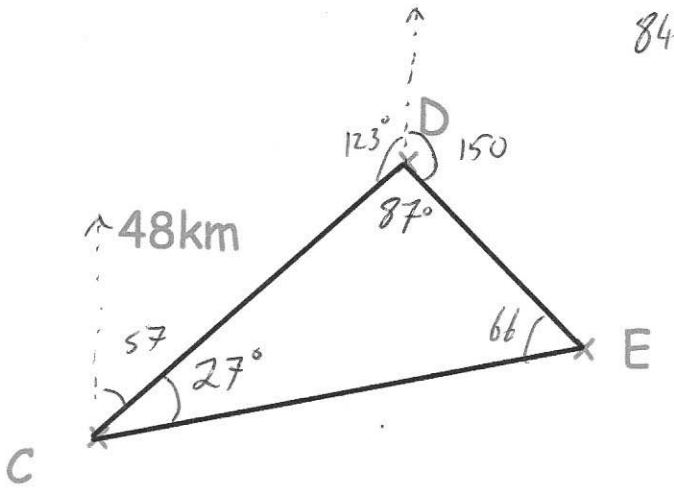
60 .....°

(3)

5. Donhampton is 48km from Castletown on a bearing of 057°.

Eastville is on a bearing of 084° from Castletown and on a bearing of 150° from Donhampton.

84 − 57 = 27



Calculate the distance of Eastville from Castletown.

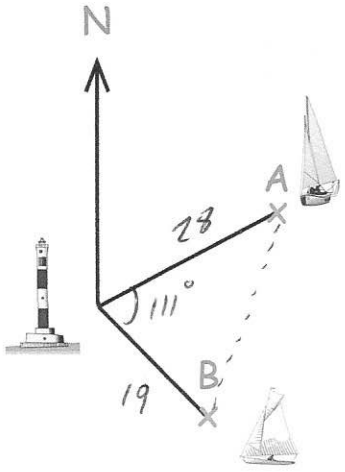
$\frac{48}{\sin 66} = \frac{x}{\sin 87}$

$x = 52.47$

52.47 .....km

(4)

6. Boat A is 28km from a lighthouse on a bearing of 053°
Boat B is 19km from the same lighthouse on a bearing of 164°



Calculate the distance between the two boats.

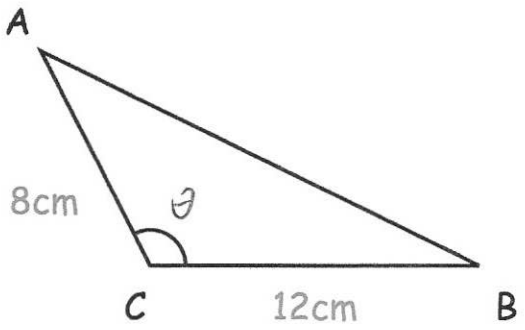
$AB^2 = 28^2 + 19^2 - 2 \times 19 \times 28 \times \cos 111$

$AB^2 = 1526.303498$

$AB = 39.068$

39.068 .....km
(4)

7. The area of triangle ABC is 30cm²
Angle ACB is obtuse.



Work out the size of angle ACB.

$\frac{1}{2} \times 8 \times 12 \times \sin\theta = 30$

$48 \sin\theta = 30$

$\sin\theta = \frac{5}{8}$

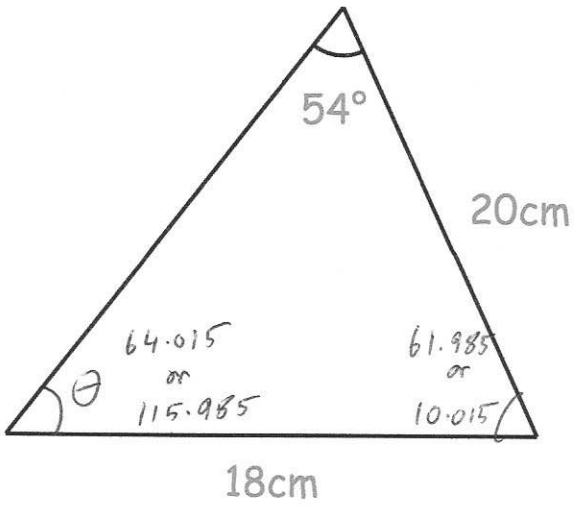
$\theta = 38.68°$

.....°

(4)

8. Shown below is a triangle.

Not drawn accurately



Work out the difference in size between the smallest and largest angles in the triangle.

$\frac{\sin\theta}{20} = \frac{\sin 54}{18}$

$\sin\theta = 0.8989...$

$\theta = 64.015°$

or

$\theta = 115.985°$

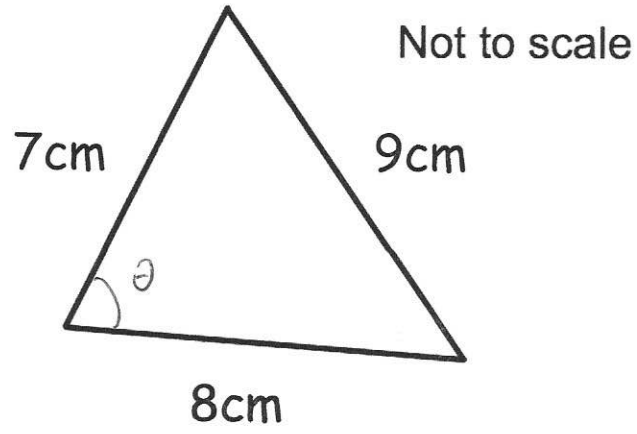
Option (1) $115.985 - 10.015 = 105.97$

Option (2) $64.015 - 54 = 10.015$

.....°

(4)

9. Shown below is a triangle.



Calculate the area of the triangle

$\cos\theta = \frac{7^2 + 8^2 - 9^2}{2 \times 7 \times 8}$

$\cos\theta = \frac{1}{7}$

$\theta = 73.3985^\circ$

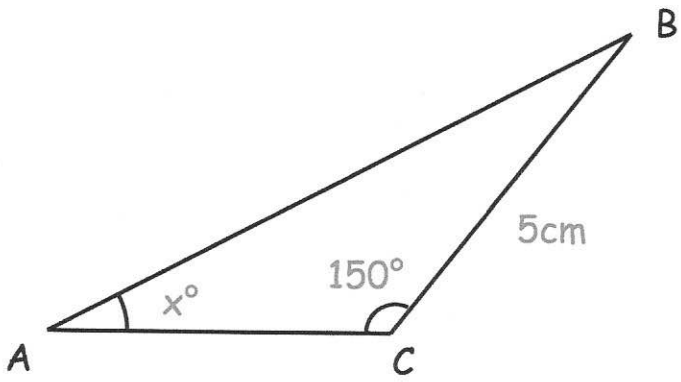
$A = \frac{1}{2} \times 7 \times 8 \times \sin 73.3985$

$= 26.83 \text{ cm}^2$

26.83 .....cm²

(4)

10. Here is a triangle



BC = 5cm Angle ACB = 150° $sin x^\circ = \frac{1}{\sqrt{10}}$

Work out the length of AB

$\frac{AB}{\sin 150} = \frac{5}{\sin x}$ ↙ $\frac{1}{\sqrt{10}}$

$\frac{AB}{\sin 150} = 5\sqrt{10}$ $\sin 150 = \frac{1}{2}$

$2AB = 5\sqrt{10}$

$AB = \frac{5\sqrt{10}}{2}$

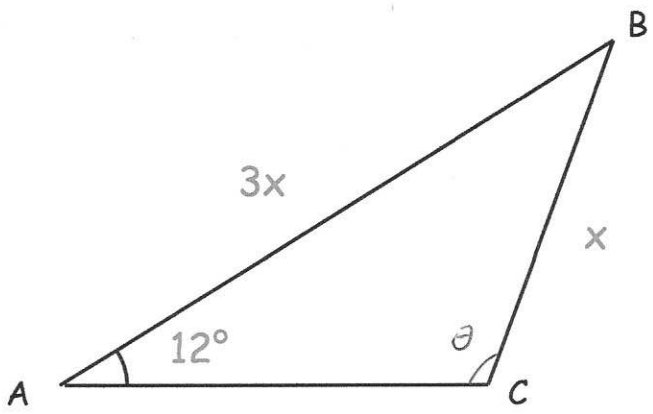
$\frac{5\sqrt{10}}{2}$ .....cm

(4)

(7.906 cm)

11. Shown below is triangle ABC.

AB = 3x BC = x $\angle BAC = 12°$



$\angle ACB$ is an obtuse angle.

Find the size of angle $\angle ACB$

$\frac{\sin\theta}{3x} = \frac{\sin 12}{x}$

$\sin\theta = \frac{3x \sin 12}{x}$

$\sin\theta = 3\sin 12$

$\sin\theta = 0.6237...$

$\theta = 38.589...$

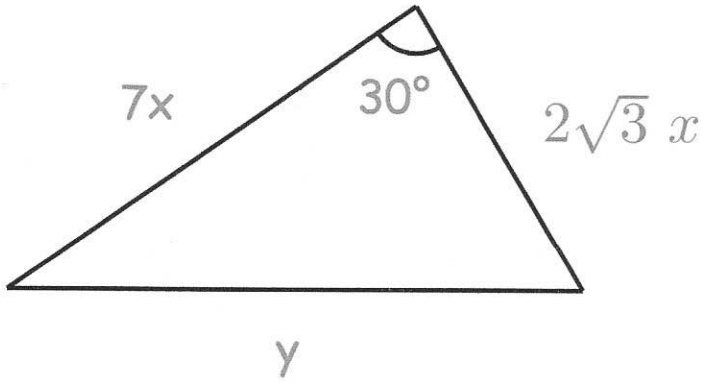
$90 - 38.589... = 51.41...$

$90 + 51.41... = 141.4$

141.4 .....°

(3)

12.



Express y in terms of x.

$y^2 = (7x)^2 + (2\sqrt{3}x)^2 - 2(7x)(2\sqrt{3}x)\cos 30$

$y^2 = 49x^2 + 12x^2 - 42x^2$

$y^2 = 19x^2$

$y = \sqrt{19}\,x$

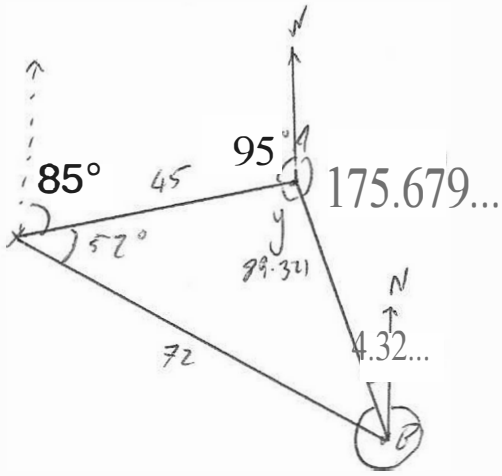
.....

(4)

13. Two ships, A and B, leave a port at midday.

Ship A travelled on a bearing of 085° at a speed of 15km/h 45
Ship B travelled on a bearing of 137° at a speed of 24km/h 72

(a) How far apart are ships A and B at 15:00?



$AB^2 = 45^2 + 72^2 - 2 \times 45 \times 72 \times \cos 52$

$AB^2 = 7209 - 6480 \cos 52$

$AB^2 = 3219.51364...$

$AB = 56.74...$

56.74 km

(4)

(b) What is the bearing of ship A from ship B at 15:00?

$\frac{\sin y}{72} = \frac{\sin 52}{56.74...}$

$y = 89.321...$

$360 - 89.321... - 95 = 175.679...$

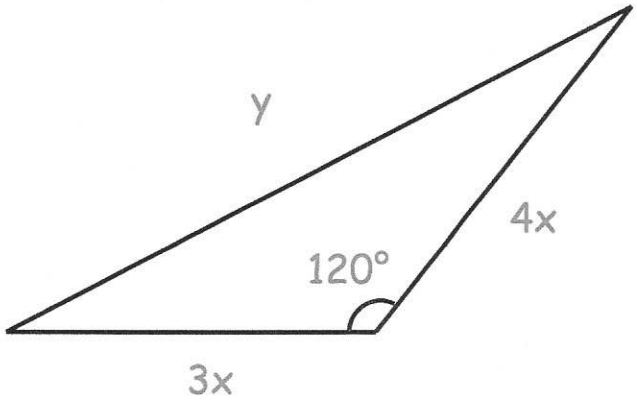
$180 - 175.679... = 4.32...$

355.7° to 1 dp

(3)

355.679..°

14.



Work out the ratio $y : x$

$-\frac{1}{2}$ ✓

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

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

$y^2 = 37x^2$

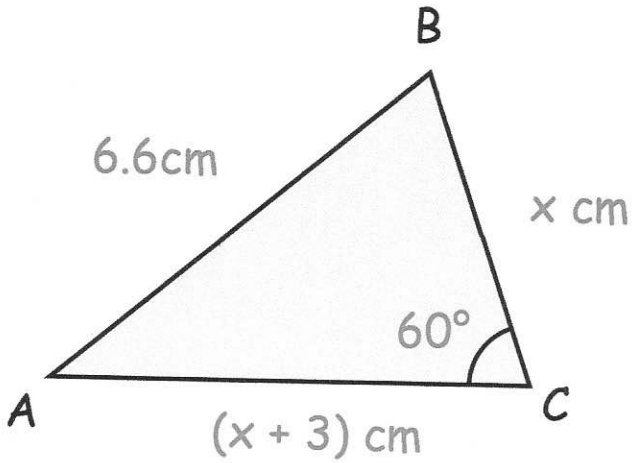
$y = \sqrt{37}x$

$\sqrt{37} : 1$

.....

(4)

15.



AB = 6.6cm BC = x cm AC = (x + 3) cm

Angle ACB = 60°

$\cos 60 = \frac{1}{2}$

Calculate the perimeter of ABC.
Give your answer to 1 decimal place.

$6.6^2 = x^2 + (x+3)^2 - x(x+3)(x)\cos 60$

$6.6^2 = x^2 + x^2 + 6x + 9 - (x^2 + 3x)$

$6.6^2 = 2x^2 + 6x + 9 - x^2 - 3x$

$6.6^2 = x^2 + 3x + 9$

$0 = x^2 + 3x - 34.56$

$a = 1 \quad b = 3 \quad c = -34.56$

$x = 4.567$ ✓ or $x = -7.567$ ✗

$4.567 + 7.567 + 6.6$

18.734

(7)