Topic: Non-right angled triangles

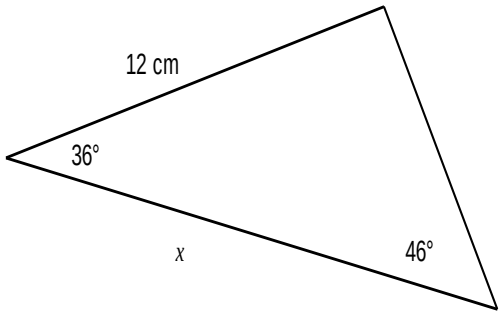
Time: 45 mins Marks: /45 marks

Calculator Assumed

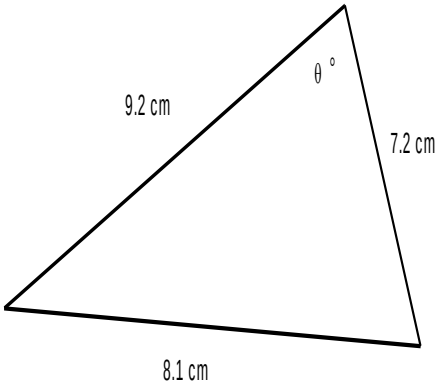
Question One: [3, 2, 3, 5: 13 marks]

Calculate the value of the unknown side or angle in each of the following triangles.

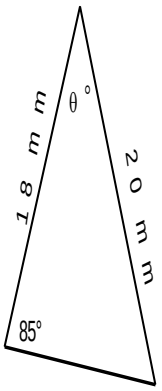
a)



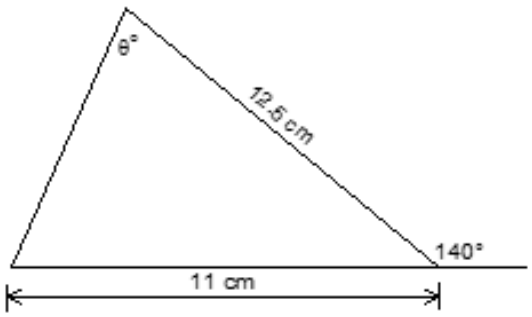
b)



c)

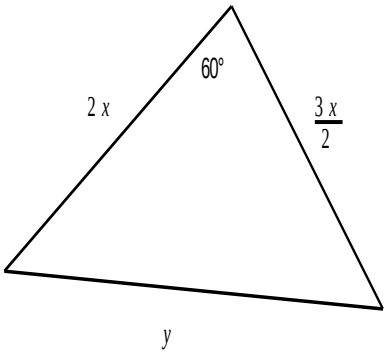


d)



Question Two: [5, 3: 8 marks]

Consider the following triangle.

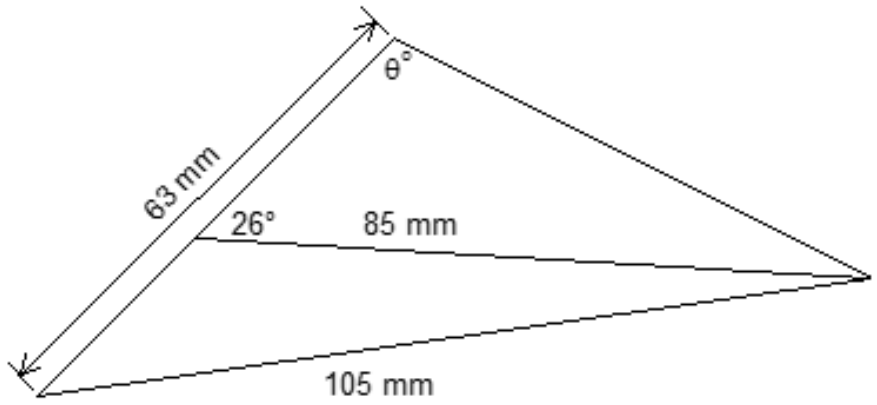


a) Use the cosine rule to show that $y = \sqrt{\frac{13x^2}{4}}$

b) If $x = 3cm$, calculate the length of each side of the triangle.

Question Three: [6 marks]

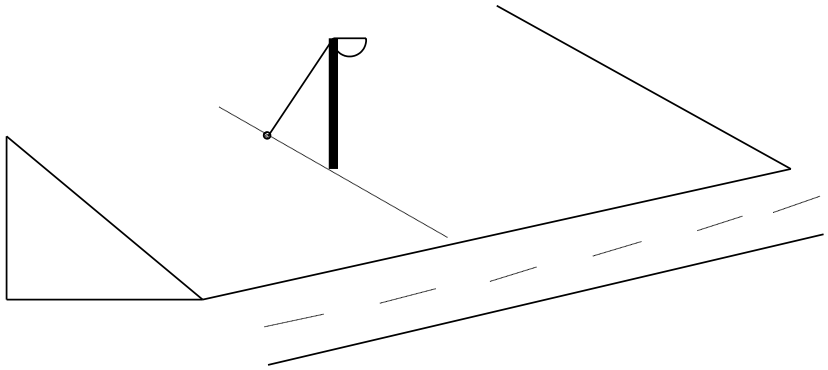
Calculate the value of the unknown angle. Show working to support your answer.



Question Four: [2, 4: 6 marks]

A road through a valley is lit by light from lamp posts which are erected 2m up the slope of the embankment on either side of the road. The lamp posts are anchored to the embankment by a 1.2m wire which is welded to the embankment. The welding point is 2.7m from the road. The angle between the front of the lamp post and the embankment is 150 degrees.

a) Put all of the relevant information on the diagram below.



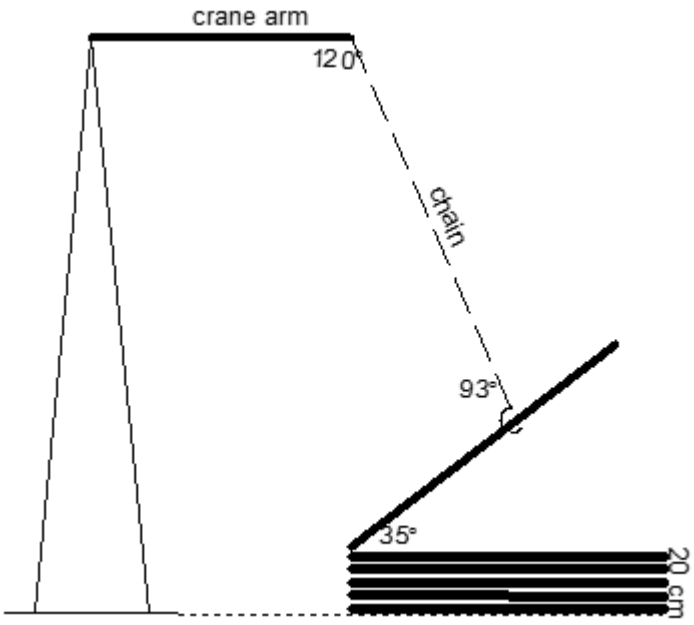
b) Calculate the height of the lamp post.

Question Five: [3, 3: 6 marks]

A 5m high crane is moving 2m long posts. The posts are in a 20cm high pile. A chain is extracted from the crane and attached to the post $\frac{2}{3}$ from the base and is pulling the post up. Use the diagram below to calculate:

a) the length of chain being extracted from the crane at this moment.

b) the length of the crane arm if an extra 5.6m support rope is attached from the point where the crane arm meets the crane tower to the point where the chain is attached to the pole.



Question Six: [3, 3: 6 marks]

Heidy, the golden retriever dog, escaped from the backyard and ran 4.5km on a bearing of 45 degrees. Her owners did not see her leave and when they discovered she was gone they went out looking for her. The owners went 3.5km on a bearing of 108 degrees.

a) How far from Heidy are the owners now?

b) What is the bearing of Heidy from home?

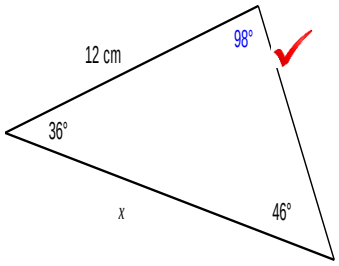
Topic: Non-right angled triangles
SOLUTIONS
Time: 45 mins Marks: /45 marks

Calculator Assumed

Question One: [3, 2, 3, 5: 13 marks]

Calculate the value of the unknown side or angle in each of the following triangles.

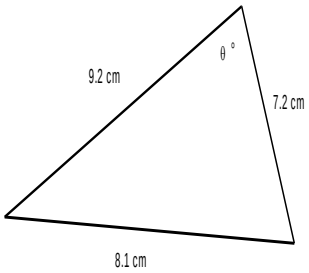
a)



$$\frac{x}{\sin 98} = \frac{12}{\sin 46}$$ ✓

$$x = 16.52cm$$ ✓

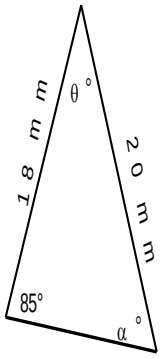
b)



$$\cos\theta = \frac{9.2^2 + 7.2^2 - 8.1^2}{2 \times 9.2 \times 7.2}$$ ✓

$$\theta = 57.66°$$ ✓

c)

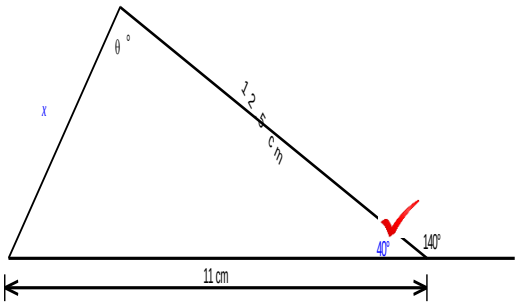


$$\frac{\sin \propto}{18} = \frac{\sin 85}{20}$$ ✓

$$\propto = 63.71°$$ ✓

$$\theta = 31.29°$$ ✓

d)



$$x = \sqrt{11^2 + 12.5^2 - (2 \times 11 \times 12.5 \times \cos 40°)}$$ ✓

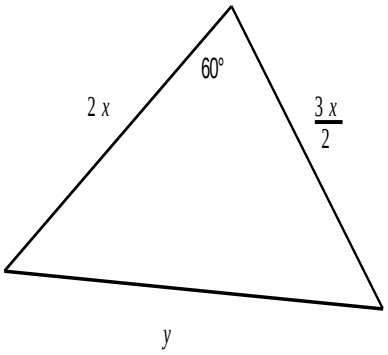
$$x = 8.1601$$ ✓

$$\frac{\sin\theta}{11} = \frac{\sin 40}{x}$$ ✓

$$\theta = 60.05°(2dp)$$ ✓

Question Two: [5, 3: 8 marks]

Consider the following triangle.



a) Use the cosine rule to show that $y = \sqrt{\frac{13x^2}{4}}$

$$y^2 = (2x)^2 + \left(\frac{3x}{2}\right)^2 - 2(2x)\left(\frac{3x}{2}\right)cos60°$$

$$= 4x^2 + \frac{9x^2}{4} - 6x^2\left(\frac{1}{2}\right)$$

$$= x^2 + \frac{9x^2}{4}$$

$$y^2 = \frac{13x^2}{4}$$

$$y = \sqrt{\frac{13x^2}{4}}$$

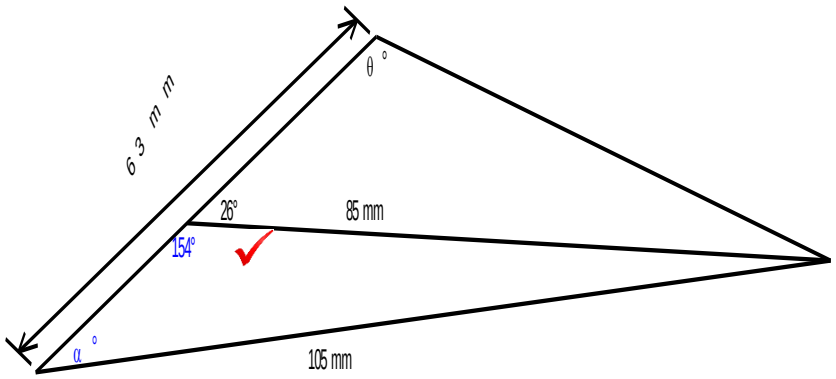
b) If $x = 3cm$, calculate the length of each side of the triangle.

$$6\,cm, \quad 4.5\,cm$$

$$y = \sqrt{\frac{13 \times 9}{4}} = 5.41cm$$

Question Three: [6 marks]

Calculate the value of the unknown angle. Show working to support your answer.



$\frac{sin\alpha}{85} = \frac{sin154}{105}$ ✓

$\alpha = 20.79°$ ✓

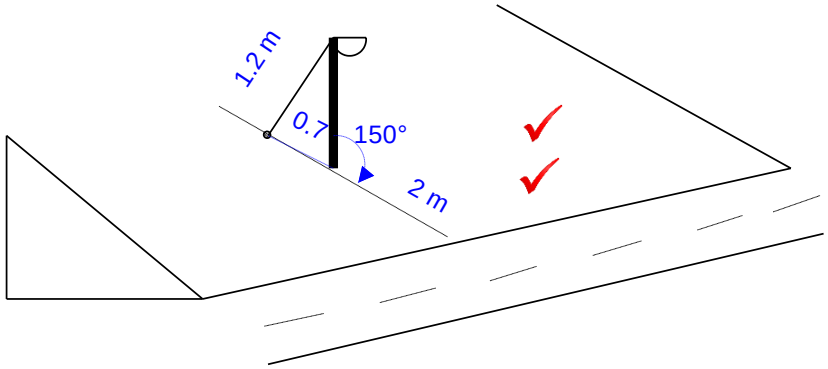
$\frac{\sin(159.21 - \theta)}{63} = \frac{sin\theta}{105}$ ✓ ✓

$\theta = 133.33°$ ✓

Question Four: [2, 4: 6 marks]

A road through a valley is lit by light from lamp posts which are erected 2 m up the slope of the embankment on either side of the road. The lamp posts are anchored to the embankment by a 1.2 m wire which is welded to the embankment. The welding point is 2.7 m from the road. The angle between the front of the lamp post and the embankment is 150 degrees.

a) Put all of the relevant information on the diagram below.



b) Calculate the height of the lamp post.

$180° - 150° = 30°$ ✓

$1.2^2 = h^2 + 0.7^2 - (2 \times h \times 0.7 \times cos30°)$ ✓✓

$h = 1.75cm$ ✓

Question Five: [3, 3: 6 marks]

A 5m high crane is moving 2m long posts. The end of the crane arm is perfectly in line with the start of the 20cm high pile of posts. A chain is extracted from the crane and attached to the post $\frac{2}{3}$ from the base and is pulling the post up. Use the diagram below to calculate:

a) the length of chain being extracted from the crane at this moment.

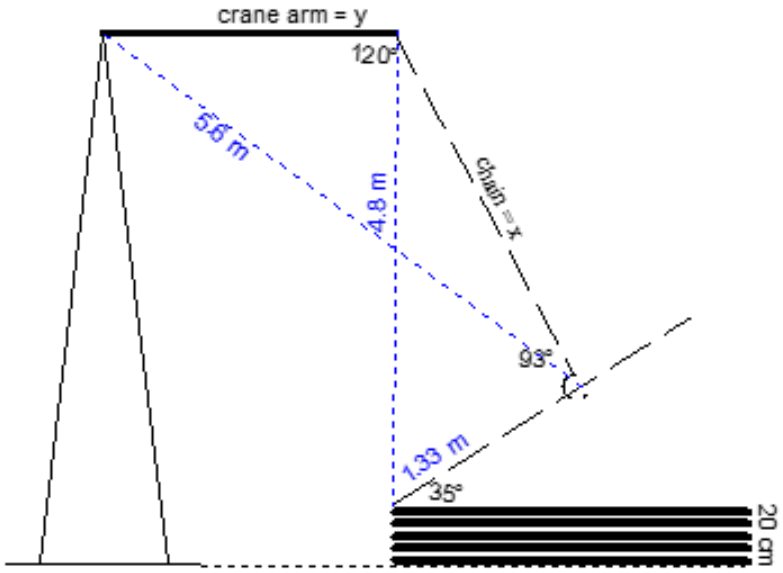
$4.8^2 = 1.33^2 + x^2 - 2 \times 1.33 \times x \times cos93$

$x = 4.55m$

b) the length of the crane arm if an extra 5.6m support rope is attached from the point where the crane arm meets the crane tower to the point where the chain is attached to the pole.

$5.6^2 = y^2 + x^2 - 2 \times y \times x \times cos120$

$x = 1.7\ m$



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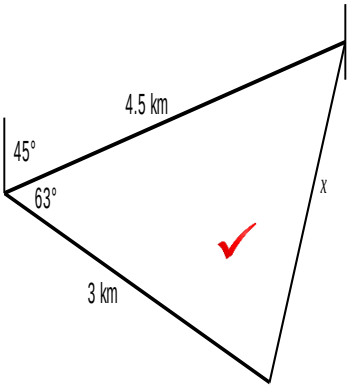
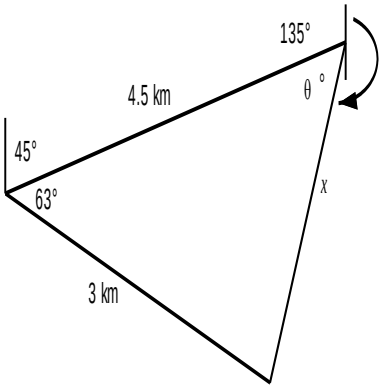


✓ ✓

$x = 4.266\ km\ (3\ dp)$

b) What is the bearing of the owners from Heidy?



✓ ✓

$\theta = 46.97°$

$bearing = 360 - 135 - \theta = 178.03°$ ✓