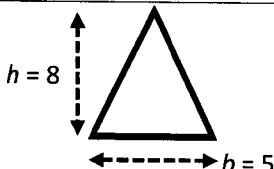
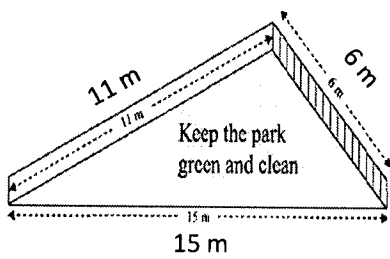
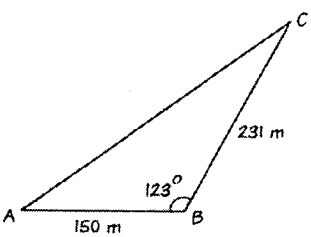


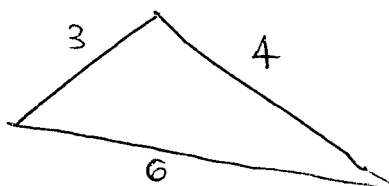
## AREA FORMULAS for TRIANGLES

Choose the most appropriate formula based on the information that you are given.

Information		
Base and height (altitude)		<b>BASIC FORMULA</b> $A = \frac{bh}{2}$
Three sidelengths		<b>HERON'S FORMULA</b> $A = \sqrt{s(s-a)(s-b)(s-c)}$
Two sidelengths and an enclosed angle		<b>SINE FORMULA</b> $A = \frac{1}{2} ac \sin(B)$

### Question

Marcia is planning a garden in her yard. She is using three pieces of wood as a border. The lengths of the pieces of wood are: 4m, 6m and 3m. She wishes to initially cover the garden with a layer of composted soil of height 12 cm. Calculate, correct to the nearest cubic cm, the volume of soil that she will require.



$$V = Ah, \quad h = 12 \text{ cm} = 0.12 \text{ m}$$

$$s = \frac{3+4+6}{2} = 6.5$$

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{6.5(6.5-3)(6.5-4)(6.5-6)}$$

$$= \sqrt{6.5 \times 3.5 \times 2.5 \times 0.5}$$

$$= 5.3327 \text{ m}^2$$

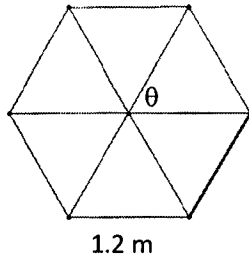
$$\therefore V = 5.3327 \times 0.12 \text{ m}^3 = 0.63992187 \text{ m}^3$$

$$= 0.63992187 \times 100^3 \text{ cm}^3$$

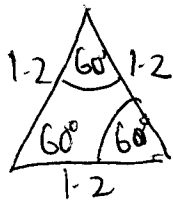
$$\approx 639922 \text{ cm}^3$$

### Question

Marcia's friend Alena is planning a more elaborate garden. It will be in the shape of a regular hexagon. The length of each of the six sides will be 1.2 m.



- a. Show that the angle  $\theta$  is equal to  $60^\circ$   $\theta = \frac{360}{6} = 60^\circ$
- b. Calculate the area of Marcia's garden. Give your answer correct to the nearest square cm.

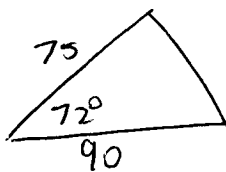


$$A_{\text{triangle}} = \frac{1}{2} \times 1.2 \times 1.2 \sin(60^\circ) = 0.6235 \text{ m}^2$$

$$\begin{aligned} \therefore \text{Total area of hexagon} &= 6 \times 0.6235 \\ &= 3.7412297 \text{ m}^2 \\ &= 3.7412297 \times 100^2 \text{ cm}^2 \\ &= 37,412 \text{ cm}^2 \end{aligned}$$

### Question

Matthew is planning to fertilize his lawn. Each bag of fertilizer claims that it can cover 200 square metres of grass. His property is approximately in the shape of a triangle with two sides of length 75 m and 90 m, with an angle in between them of  $72^\circ$ . How many bags of fertilizer will he need to buy?



$$A = \frac{1}{2} \times 75 \times 90 \sin(72^\circ) = 3209.8157 \text{ m}^2$$

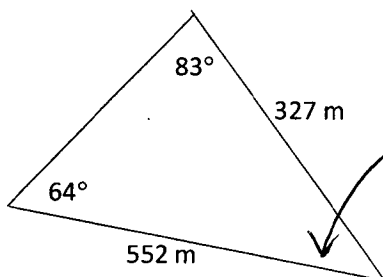
$$\frac{3209.8157}{200} \approx 16.049$$

Will require 17 bags, as 16 won't be quite enough.

### Question

Matthew's friend Jarod has a property with the following shape:

Calculate its area, correct to the nearest square metre.

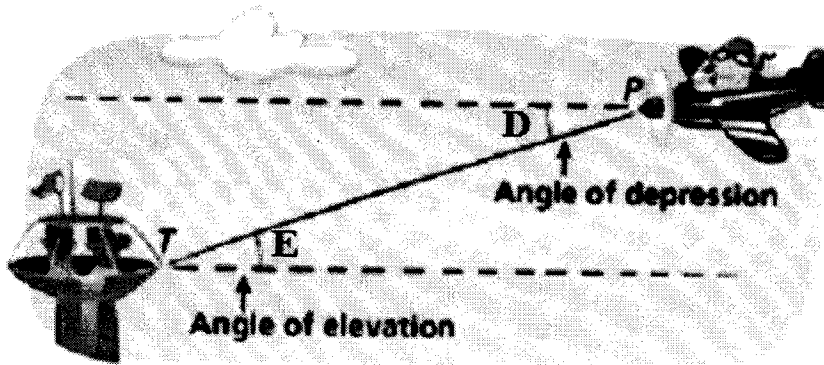


$$\theta = 180^\circ - 83^\circ - 64^\circ = 33^\circ$$

$$\begin{aligned} A &= \frac{1}{2} \times 552 \times 327 \sin(33^\circ) \\ &= 49154.76 \text{ m}^2 \\ &\approx 49155 \text{ m}^2 \end{aligned}$$

## ANGLES of ELEVATION and DEPRESSION

Are ALWAYS measured relative to the **horizontal**. The angle of elevation from T to P is equal to the angle of depression from P to T (*alternate angles*)

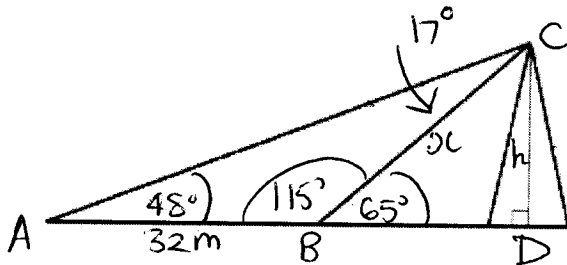


$Angle\ E = Angle\ D$

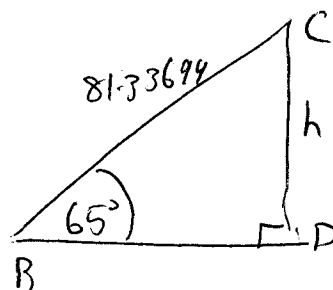
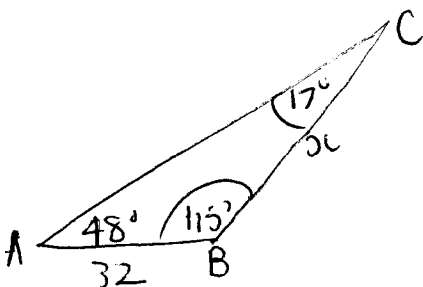
### Question

Caroline wants to measure the height of a vertical radio tower. From some distance away, the angle of elevation from her spot on horizontal ground is  $65^\circ$ . She walks 32 m further away from the tower and then measures the angle of elevation to be  $48^\circ$ .

- a. Fill in the relevant information on this diagram.



- b. Calculate the height of the radio tower in metres correct to one decimal place.



$$\frac{32}{\sin(17^\circ)} = \frac{x}{\sin(48^\circ)}$$

$$x = \frac{32 \sin(48^\circ)}{\sin(17^\circ)}$$

$$x = 81.33699$$

$$\sin(65^\circ) = \frac{h}{81.33699}$$

$$h = 81.33699 \sin(65^\circ)$$

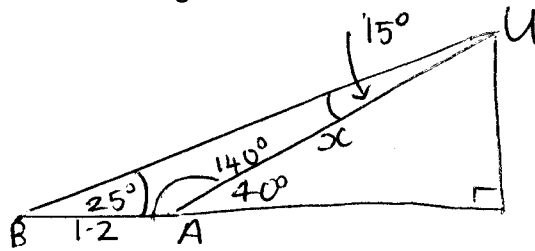
$$h = 73.7 \text{ m}$$

$$\text{Height of antenna} = 73.7 \text{ m}$$

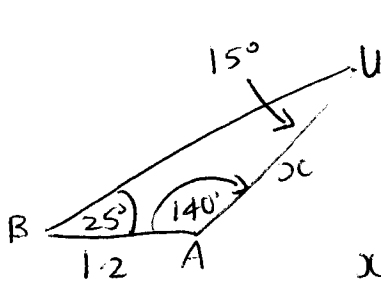
## Questions

1. A person at point A looks due east and spots a UFO with an angle of elevation of  $40^\circ$ . At the same time, another person, 1.2 km due west of A looks due east and sights the same UFO with an angle of elevation of  $25^\circ$

a. Draw a diagram to illustrate.



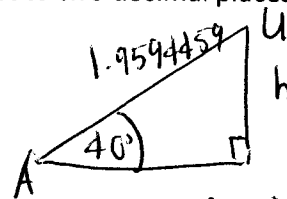
b. Calculate the height of the UFO, in km correct to two decimal places.



$$\frac{1.2}{\sin(15^\circ)} = \frac{x}{\sin(25^\circ)}$$

$$x = \frac{1.2 \sin(25^\circ)}{\sin(15^\circ)}$$

$$x = 1.9594459$$



$$\sin(40^\circ) = \frac{h}{1.9594459}$$

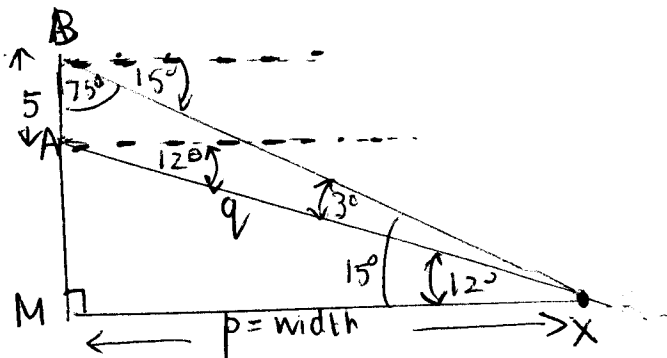
$$h = 1.9594459 \times \sin(40^\circ)$$

$$h = 1.26 \text{ km}$$

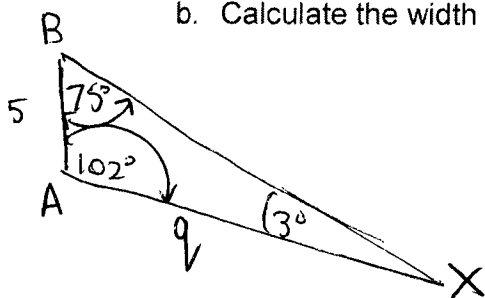
Height  $\approx 1.26 \text{ km}$

2. The angle of depression from point A on the edge of a river bank to the point X directly in line with it on the edge of the opposite bank is  $12^\circ$ . A tree of height 5 m grows at point A, and from the top of this tree, the angle of depression to point X is  $15^\circ$ .

a. Draw a diagram to illustrate

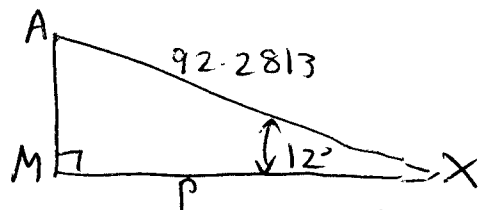


b. Calculate the width of the river, correct to the nearest metre.



$$\frac{5}{\sin(3^\circ)} = \frac{q}{\sin(75^\circ)}$$

$$q = \frac{5 \sin(75^\circ)}{\sin(3^\circ)} = 92.2813 \text{ m}$$



$$\cos(12^\circ) = \frac{p}{92.2813}$$

$$p = 92.2813 \cos(12^\circ)$$

$$p \approx 90.26$$

$\therefore$  Width  $\approx 90 \text{ m}$