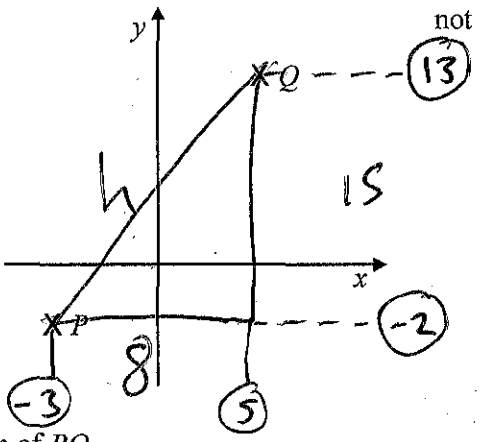
Trigonometry and Pythagoras Revision (Including 3D Pythagoras)

1. The sketch below shows the points $P(-3, -2)$ and $Q(5, 13)$.



Calculate the length of PQ.

$h^2 = 8^2 + 15^2$

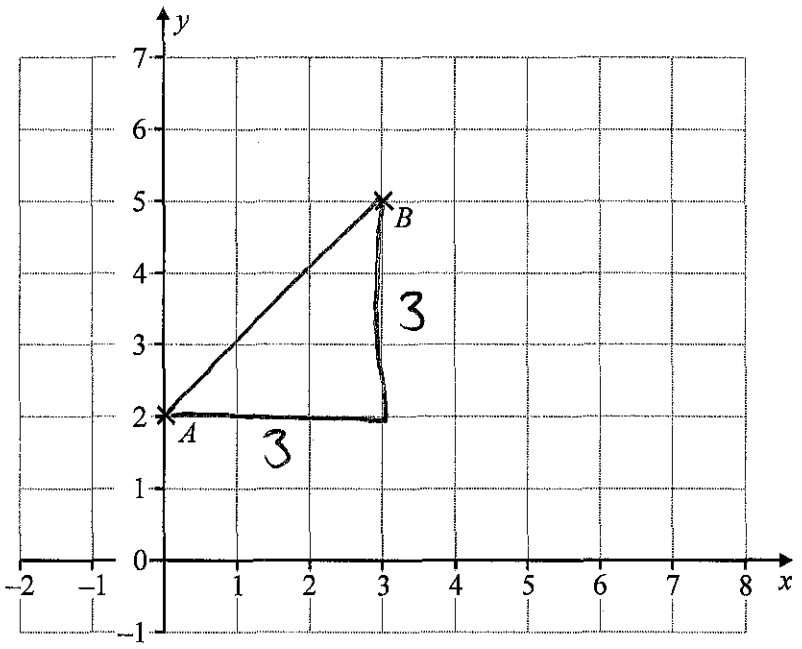
$= 289$

$h = \sqrt{289}$

$= 17$

(Total 3 marks)

2.



A is the point (0,2) and B is the point (3,5).

Find the **exact** length of AB.

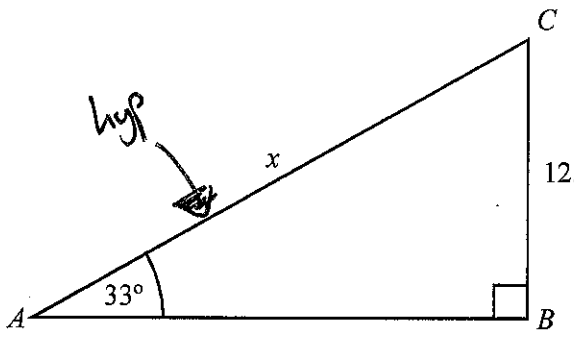
$AB^2 = 3^2 + 3^2$

$= 18$

$AB = \sqrt{18}$

(Total 2 marks)

3. *ABC* is a right-angled triangle.
BC = 125 m.
Angle *CAB* = 33°



Not drawn accurately

← opp

SOH CAH TOA

Find the length of *AC* (marked *x* in the diagram).
Give your answer to an appropriate degree of accuracy.

← 1 decimal place more than given in the question

$\sin\theta = \frac{\text{opp}}{\text{hyp}}$

$\sin 33° = \frac{125}{x}$

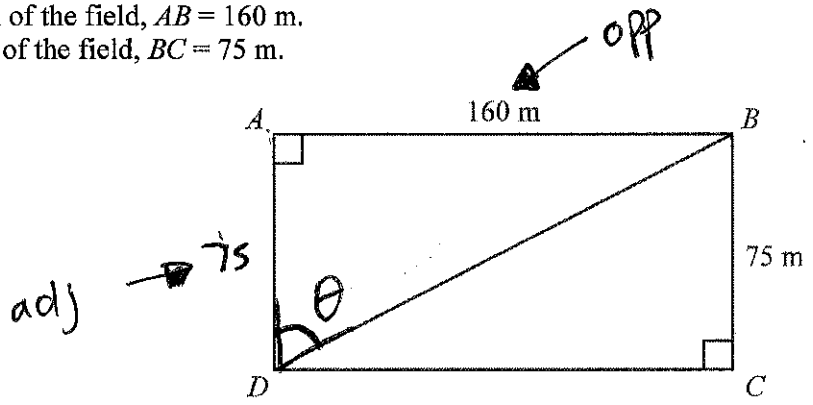
$x \sin 33° = 125$ (× x)

$x = \frac{125}{\sin 33°}$ (÷ sin 33°)

$= 229.5\text{m}$

(Total 4 marks)

4. A rectangular field *ABCD* is shown.
The length of the field, $AB = 160$ m.
The width of the field, $BC = 75$ m.



Not to scale

(a) Calculate the length of the diagonal *BD*.

$$BD^2 = 75^2 + 160^2$$
$$= 31225$$
$$BD = \sqrt{31225}$$
$$= 176.7\text{m}$$

(4)

(b) Calculate the size of angle *ADB*.

SOH CAH TOA

$$\tan\theta = \frac{160}{75}$$

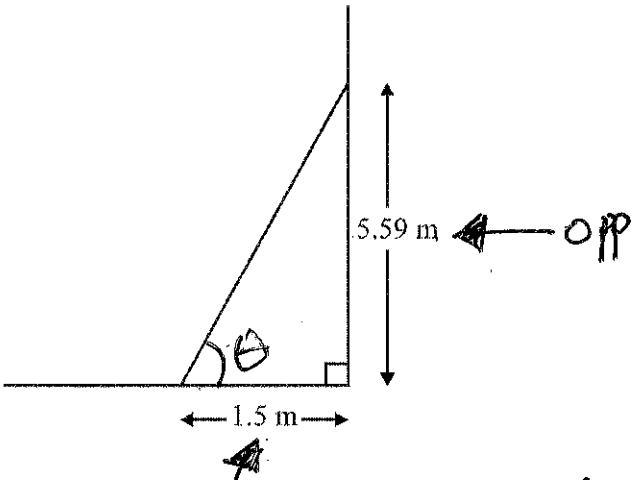
$$\theta = \tan^{-1}\left(\frac{160}{75}\right)$$

$$= 64.9^\circ$$

(3)
(Total 7 marks)

5. For a ladder to be safe it must be inclined at between 70° and 80° to the ground.

(a) The diagram shows a ladder resting against a wall.



Is it safe?
You **must** show your working.

SOHCAHTOA

$\tan\theta = \frac{5.59}{1.5}$

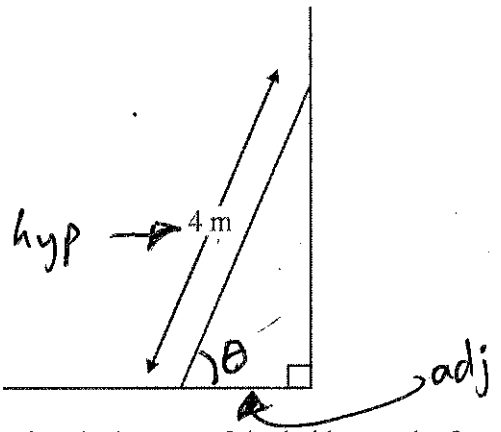
$\theta = \tan^{-1}\left(\frac{5.59}{1.5}\right)$

$= 74.98°$

The ladder is safe.

(3)

(b) Another ladder rests against a wall.



Work out the closest distance that the bottom of the ladder can be from the wall so that it is safe.

Closest distance → biggest angle → 80°

$\cos\theta = \frac{x}{4}$

$x = 4\cos 80°$

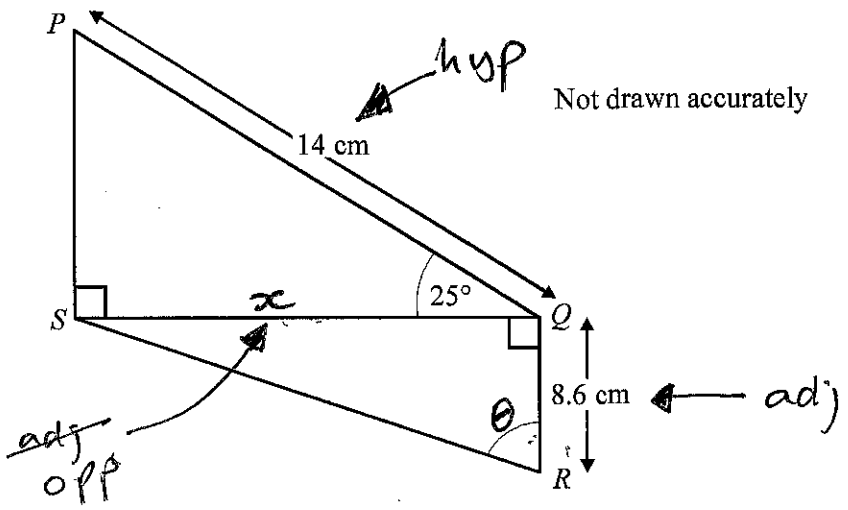
$= 0.69\text{m}$

(3)
(Total 6 marks)

6. In the diagram, $PQ = 14$ cm and $QR = 8.6$ cm.

Angle PSQ = angle $SQR = 90°$

Angle $PQS = 25°$



Calculate angle R. ← Need 2 side lengths to calculate the angle.

SOH CAH TOA

$$\cos\theta = \frac{adj}{hyp}$$

$$\cos 25 = \frac{x}{14}$$

$$x = 14\cos 25$$

$$= 12.69\text{cm}$$

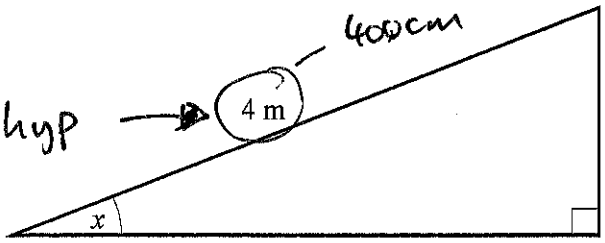
$$\tan\theta = \frac{12.69}{8.6}$$

(Total 5 marks)

$$\theta = \tan^{-1}\left(\frac{12.69}{8.6}\right)$$

$$= 55.9°$$

7. (a) A ramp is 4 metres long and 29 centimetres high.
If the ramp is safe for wheelchair users the angle marked x must be 4° or less.



not drawn accurately

Is this ramp safe for wheelchair users?
You **must** show your working

SOH CAH TOA

$\sin\theta = \frac{opp}{hyp}$

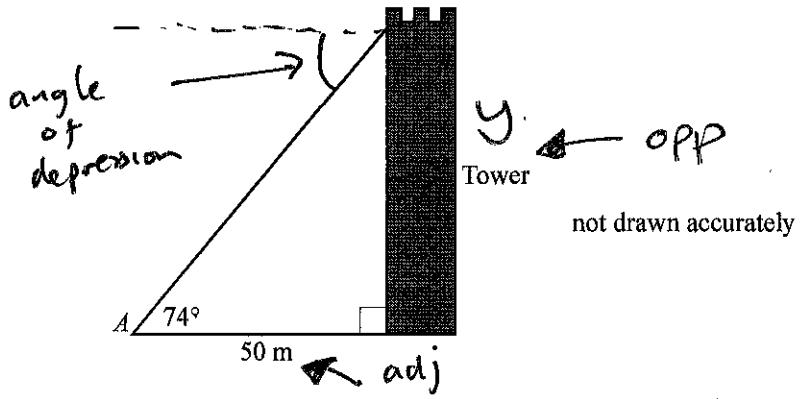
$\sin x = \frac{29}{400}$

$x = \sin^{-1}\left(\frac{29}{400}\right)$

$= 4.16°$ Ramp not safe.

(4)

(b) The point A is 50 metres from the base of a tower.
The angle of elevation of the top of the tower from A is 74°.



not drawn accurately

(i) Calculate the height of the tower.
Give your answer to a suitable degree of accuracy.

$\tan 74 = \frac{y}{50}$

$y = 50\tan 74$

$= 174.4\text{ m}$

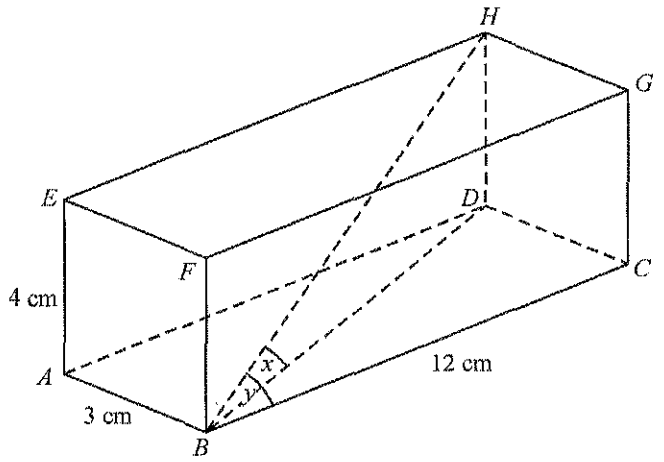
(4)

(ii) What is the angle of depression of the point A from the top of the tower?

angle of depression = 74°
(alternate angles)

(1)
(Total 9 marks)

8. The diagram shows a cuboid.
$AB = 3$ cm, $AE = 4$ cm, $BC = 12$ cm.



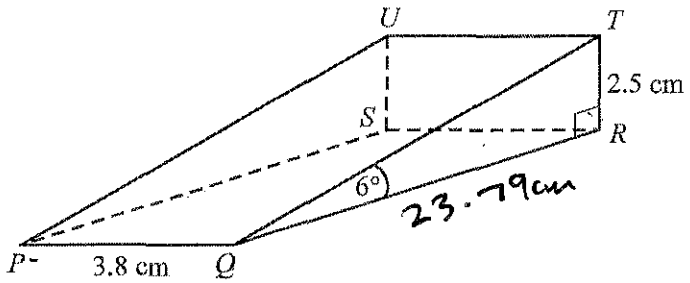
Not drawn accurately

Find the length of *BH*.

$BH^2 = 3^2 + 4^2 + 12^2$
$= 169$
$BH = \sqrt{169}$
$= 13\text{cm}$

(Total 2 marks)

9. The diagram shows a door-wedge with a rectangular horizontal base *PQRS*.
The sloping face *PQTU* is also rectangular.
$PQ = 3.8$ cm and angle $TQR = 6°$
The height *TR* is 2.5 cm.

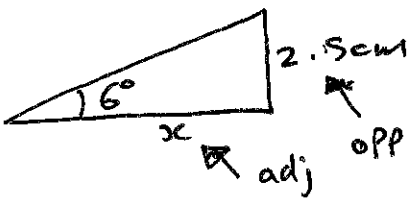


Not drawn accurately

Calculate the length of the diagonal *PT*. ← Same as if it was a cuboid.

$PT^2 = PQ^2 + QR^2 + RT^2$

Need to find RQ



$\tan 6° = \frac{2.5}{x}$

$x = \frac{2.5}{\tan 6°}$
$= 23.79\text{cm}$

$PT^2 = 3.8^2 + 23.79^2 + 2.5^2$
$= 586.46\ldots$
$PT = \sqrt{586.46\ldots}$
$= 24.2\text{cm}$

(Total 5 marks)