

# National 4

## N4 Relationships

### Unit Test

## Preparation Booklet 1

### Exercise 1

1. Copy and complete the table below for  $y = 3x$ . Plot the points and draw the straight line on an  $x - y$  axis.

$x$	1	2	3
$y$			

2. Copy and complete the table below for  $y = 2x + 1$ . Plot the points and draw the straight line on an  $x - y$  axis.

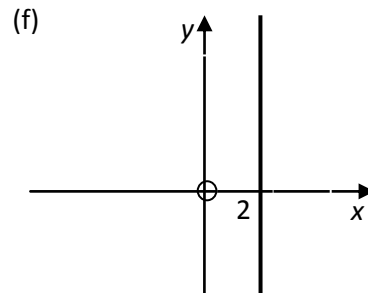
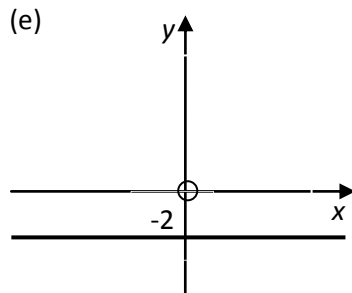
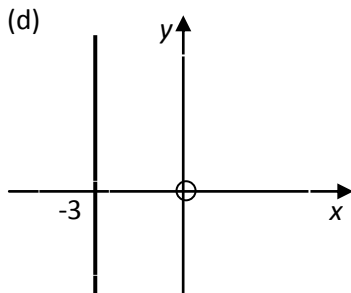
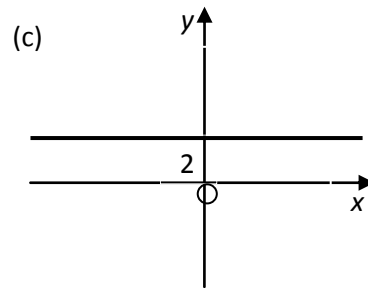
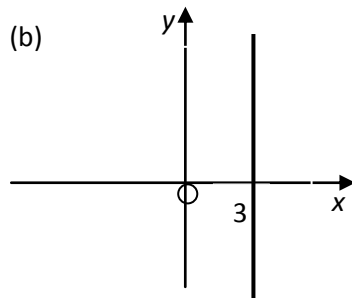
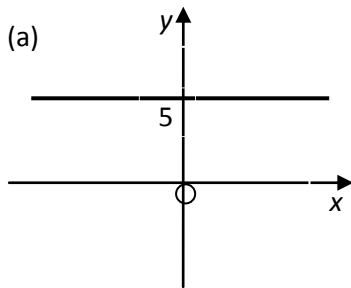
$x$	1	2	3
$y$			

3. Copy and complete the table below for  $y = 3x - 2$ . Plot the points and draw the straight line on an  $x - y$  axis.

$x$	1	2	3
$y$			

### Exercise 2

Write down the equation of each line in the diagrams below.



### Exercise 3

Solve the following equations;

(a)  $3y + 7 = -2$

(b)  $2x + 5 = 9$

(c)  $4z - 3 = 9$

(d)  $6x - 8 = -2$

(e)  $2y + 5 = -1$

(f)  $8x + 7 = 31$

(g)  $5z - 2 = 8$

(h)  $3x - 7 = -1$

### Exercise 4

Change the subject of the formula to the given letter in the bracket

(a)  $c = \frac{d}{x}$  (x)

(b)  $2t + 5 = y$  (t)

(c)  $c = \frac{2}{P}$  (P)

(d)  $x = 4 + yz$  (z)

(e)  $2x + 5 = k$  (x)

(f)  $\frac{R}{t} = x$  (t)

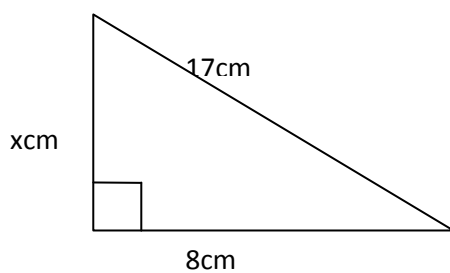
(g)  $5P - 2 = 8q$  (P)

(h)  $a = 1 - 6z$  (z)

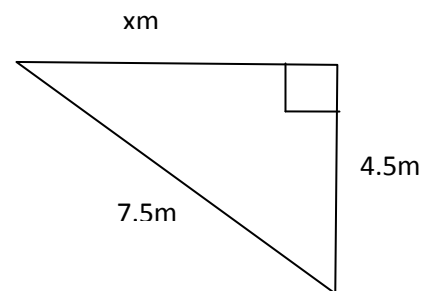
### Exercise 5

1. Calculate the length x in these triangles

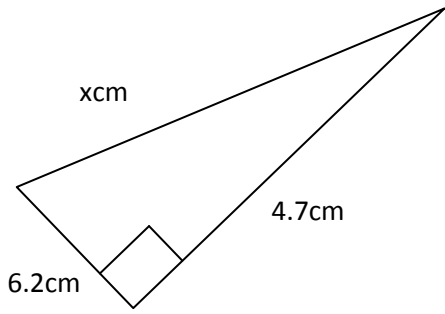
(a)



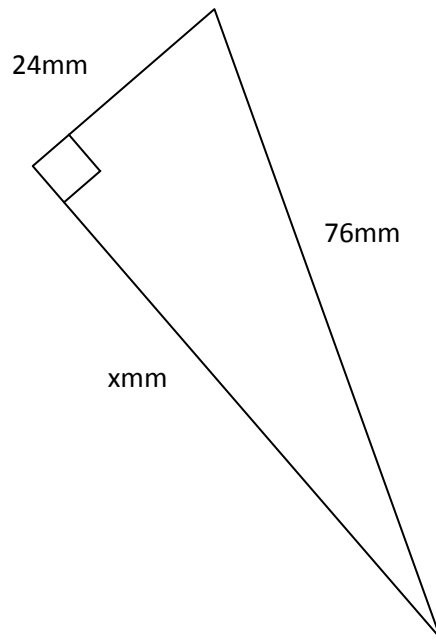
(b)



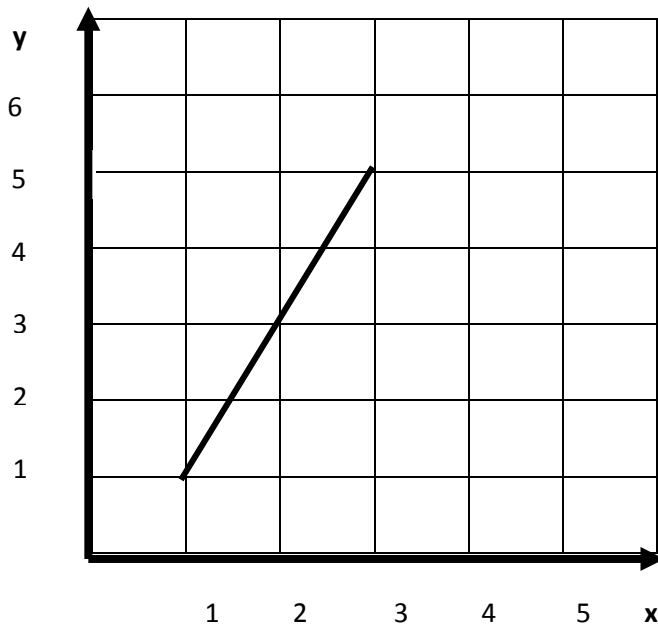
(c)



(d)



2. Calculate the length of the line

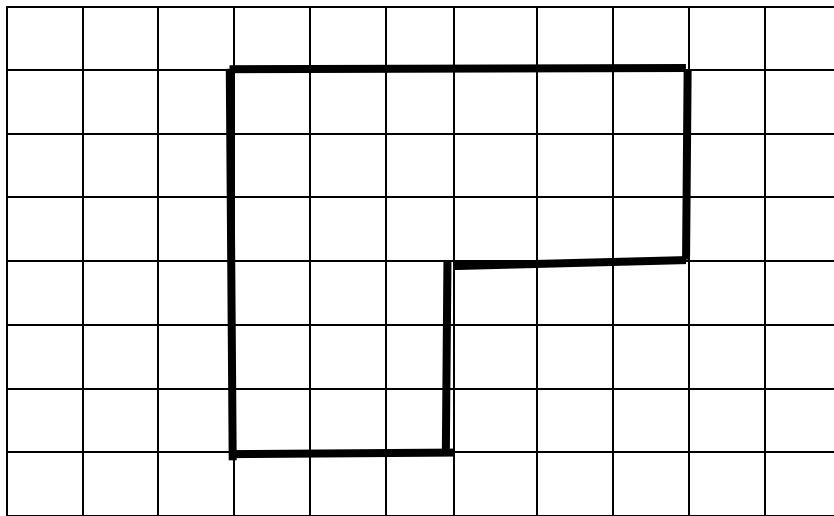


## Exercise 6

1. On squared paper draw

(i) a reduction of the given shape using a scale factor of  $\frac{2}{3}$

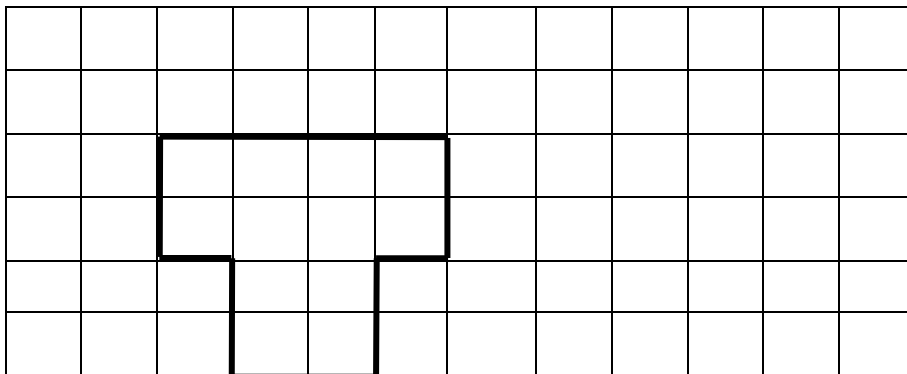
(ii) an enlargement of the given shape using a scale factor of 2



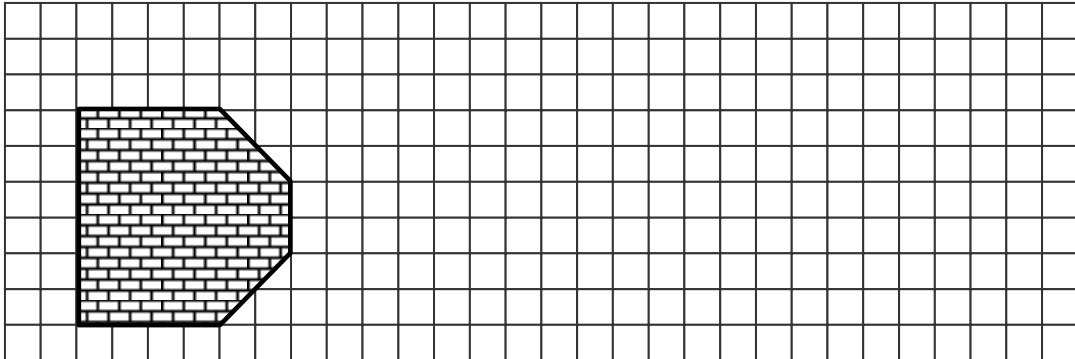
2. On squared paper draw

(i) an enlargement of the given shape using a scale factor of  $\frac{3}{2}$

(ii) a reduction of the given shape using a scale factor of  $\frac{1}{2}$

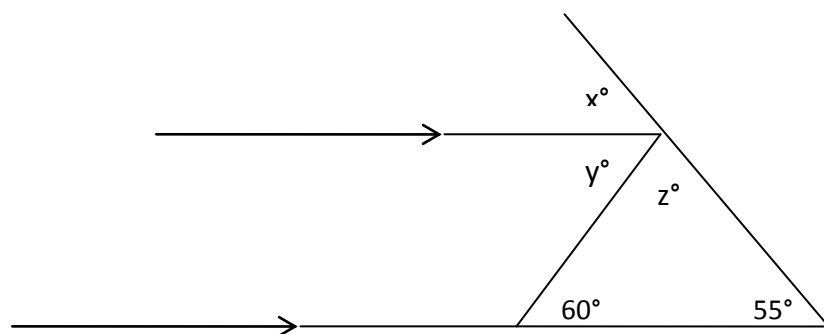
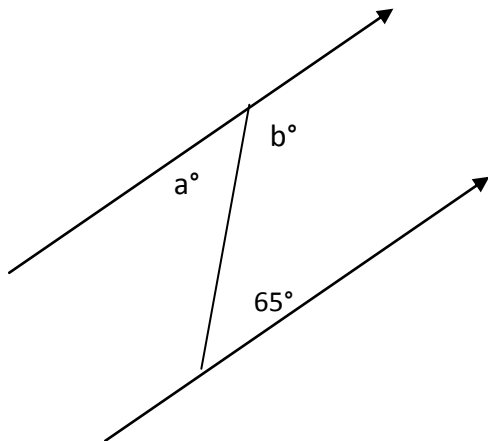


3. On squared paper draw an enlargement of this shape using a Scale Factor of 1.5.



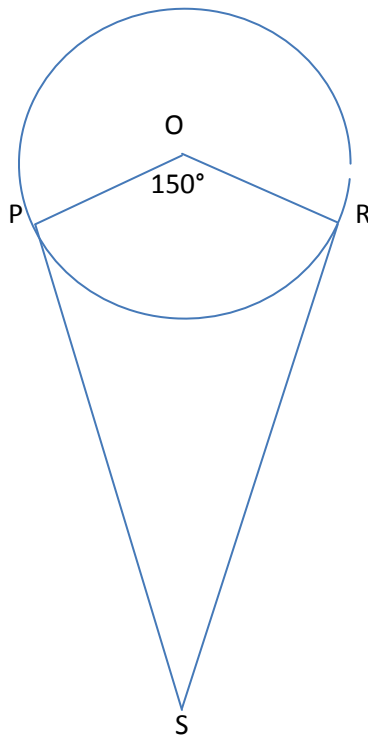
Exercise 7

1 Calculate the missing angles  $a$ ,  $b$ ,  $x$ ,  $y$  and  $z$  in the diagrams



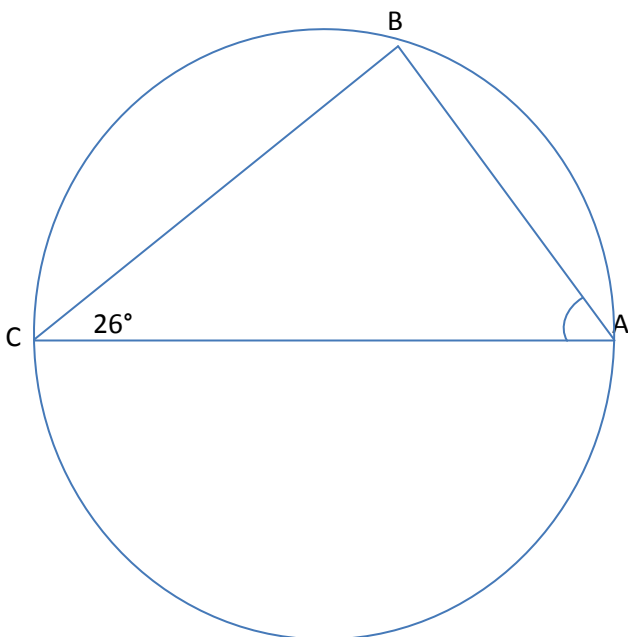
2 The diagram below shows a kite PQRS and a circle with centre O.

PS is the tangent to the circle at P and RS is the tangent to the circle at R.



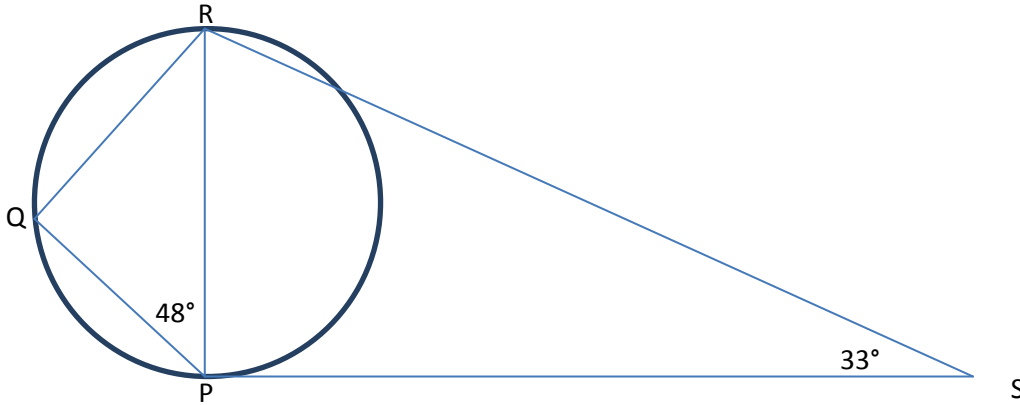
- a) What is the size of angle QRS?      b) Calculate the size of angle PSR

3. AC is the diameter of the circle. Find angle BAC



4. In the diagram below PR is a diameter of the circle.

PS is a tangent to the circle at P. Angle QPR =  $48^\circ$  and angle PSR =  $33^\circ$



a) Write down the size of angle PQR.

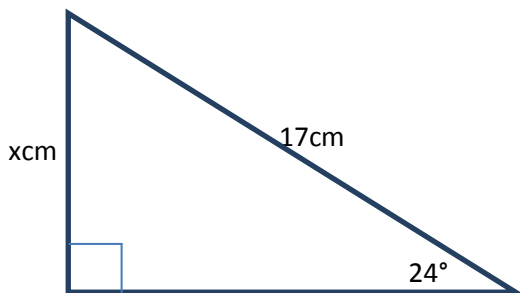
b) Calculate the size of angle QRS

(give a reason for your answer)

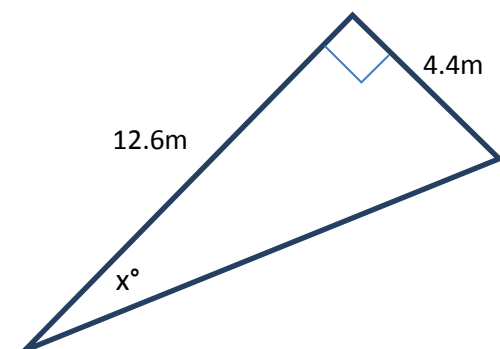
### EXERCISE 8

1. Find  $x$  in the following triangles.

a)

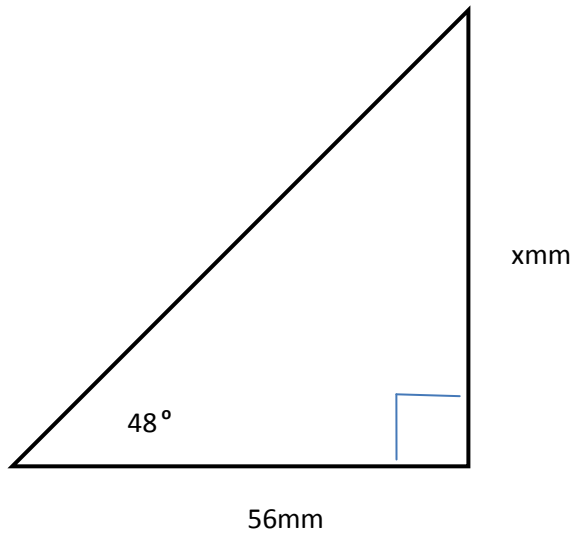


b)

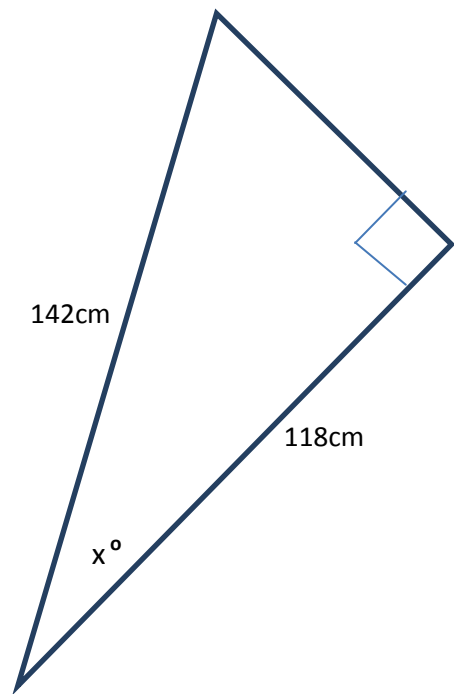




c)

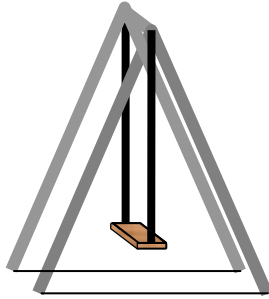


d)

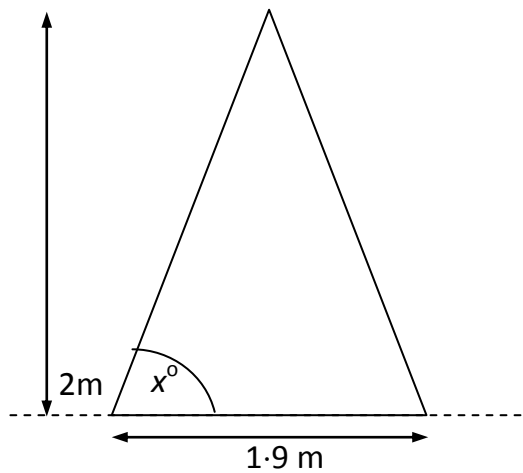


### EXERCISE 9

1. The frame of a child's swing is in the shape of an isosceles triangle.



The base of the triangle is 1.9metres and the height of it is 2m.



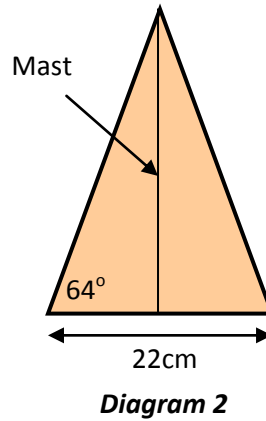
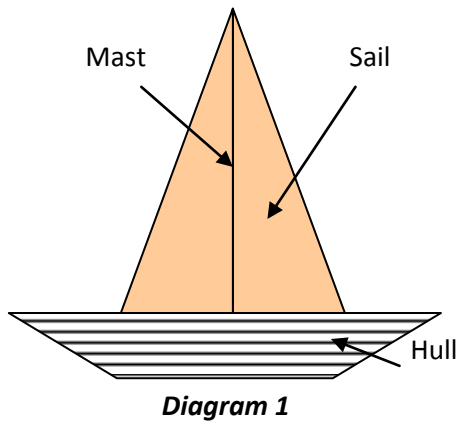
To be safe, the angle,  $x^\circ$ , which the framework makes with the ground should be between  $63^\circ$  and  $65^\circ$ .

Is this swing safe?

You must give a reason for your answer.

2. Max wants to build the toy boat shown in diagram 1.

The sail is made from a piece of cloth in the shape of an isosceles triangle as shown in diagram 2.



Max also has a thin strip of wood measuring 24cm to make the mast.

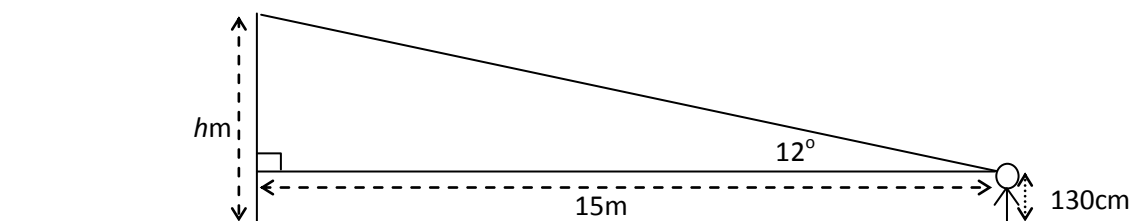
Is this piece of wood long enough? Justify your answer.

3. Alan's dad claims the height of the horse statue on the M8 motorway near Glasgow is more than 3 times his own height of 1m 86cm.



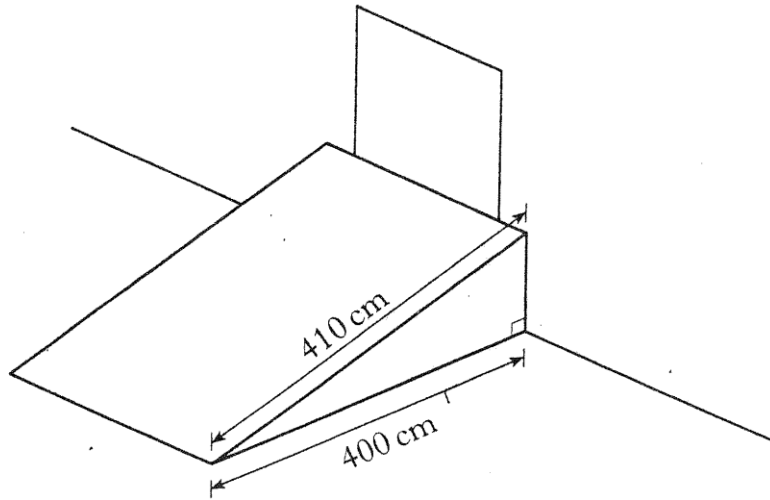
Alan stood a distance of 15 metres from the statue and measured the angle to the top of the statue to be  $12^\circ$  using a clinometer.

If the height to Alan's eye level is 130cm, was Alan's dad right. Justify your answer.



4. A new regulation states that the gradient of all ramps into a building must be less than 0.26.

An existing ramp is 410 cm long and has a horizontal distance of 400 cm.



Does this ramp satisfy the new regulation?

Show all your working and give a reason for your answer.

## Answers

### Exercise 1

1)  $y=3,6,9$

2)  $y=3,5,7$

3)  $y=1,4,7$

### Exercise 2

a)  $y=5$    b)  $x=3$    c)  $y=2$    d)  $x=-3$    e)  $y=-2$    f)  $x=2$

### Exercise 3

a)  $y=-3$    b)  $x=2$    c)  $z=3$    d)  $x=1$    e)  $y=-3$    f)  $x=3$    g)  $z=2$    h)  $x=2$

### Exercise 4

a)  $x = \frac{d}{c}$    b)  $t = \frac{y-5}{2}$    c)  $P = \frac{2}{c}$    d)  $z = \frac{x-4}{y}$    e)  $x = \frac{k-5}{2}$

f)  $t = \frac{R}{x}$    g)  $P = \frac{8q+2}{5}$    h)  $z = \frac{1-a}{6}$

### Exercise 5

1a) 15cm   b) 6cm   c) 7.8cm   d) 72.1

### Exercise 6

Ask teacher to check

### Exercise 7

- 1)  $a=65^\circ$   $b=115^\circ$   $z=65^\circ$   $y=60^\circ$   $x=55^\circ$
- 2) a)  $90^\circ$  b)  $30^\circ$
- 3)  $64^\circ$
- 4) a)  $90^\circ$  (angle in semi circle) b)  $99^\circ$

### Exercise 8

- 1) a)  $x=6.9\text{cm}$  b)  $x=19^\circ$  c)  $x=62\text{mm}$  d)  $x=34^\circ$

### Exercise 9

- 1) yes,  $63 < x=64.5 < 65^\circ$
- 2) yes mast measures  $22.6\text{cm} < 24\text{cm}$
- 3)  $h=3.19+1.30=4.49\text{m} < 3 \times 1.86=5.58\text{m}$ , therefore Alan's dad's claim incorrect.
- 4) Gradient =  $\frac{90}{400} = 0.225 < 0.26$ , ramp satisfies the new regulation.

