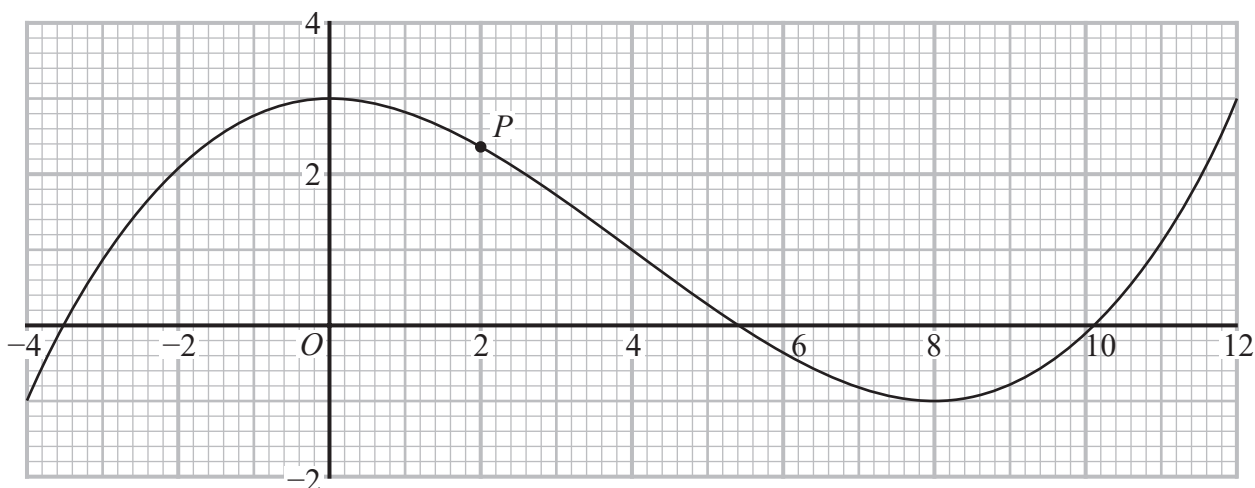


18 The diagram shows the graph of $y = f(x)$ for $-4 \leq x \leq 12$



The point P on the curve has x coordinate 2

(a) (i) Use the graph to find an estimate for the gradient of the curve at P .

.....
(3)

(ii) Hence find an equation of the tangent to the curve at P .
Give your answer in the form $y = mx + c$

.....
(2)

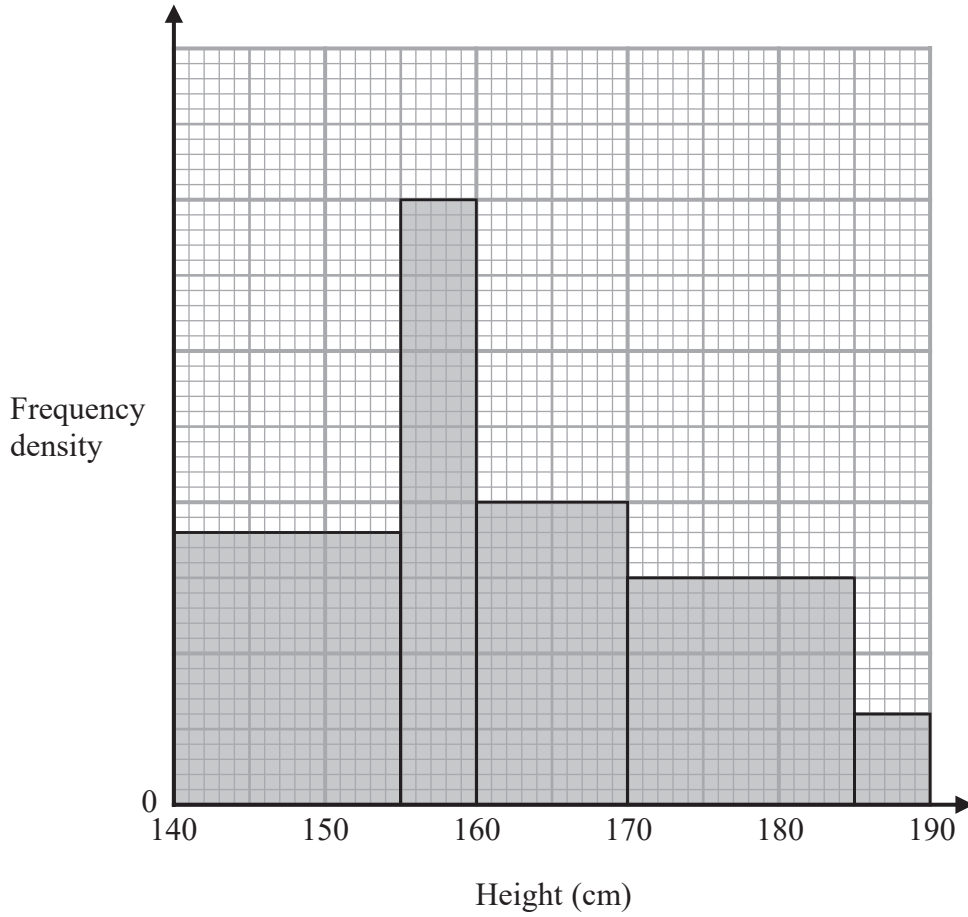
The equation $f(x) = k$ has exactly two different solutions for $-4 \leq x \leq 12$

(b) Use the graph to find the two possible values of k .

.....
(2)

(Total for Question 18 is 7 marks)





The histogram gives information about the heights of all the Year 11 students at a school.

There are 160 students in Year 11 with a height between 155 cm and 170 cm.

Work out the total number of students in Year 11 at the school.

(Total for Question 19 is 4 marks)



20 The diagram shows a frustum of a cone and a sphere.

The frustum is made by removing a small cone from a large cone.
The cones are similar.

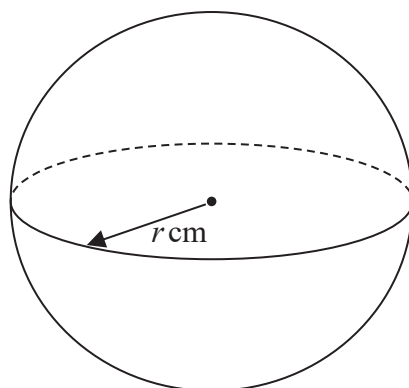
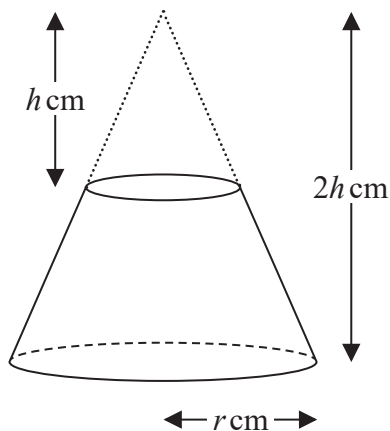


Diagram **NOT**
accurately drawn

The height of the small cone is h cm.
The height of the large cone is $2h$ cm.
The radius of the base of the large cone is r cm.

The radius of the sphere is r cm.

Given that the volume of the frustum is equal to the volume of the sphere,

find an expression for r in terms of h .
Give your expression in its simplest form.

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$r = \dots\dots\dots$

(Total for Question 20 is 5 marks)



P 5 8 4 4 3 A 0 2 1 2 4

21 The diagram shows the prism $ABCDEF$ with cross section triangle ABC .

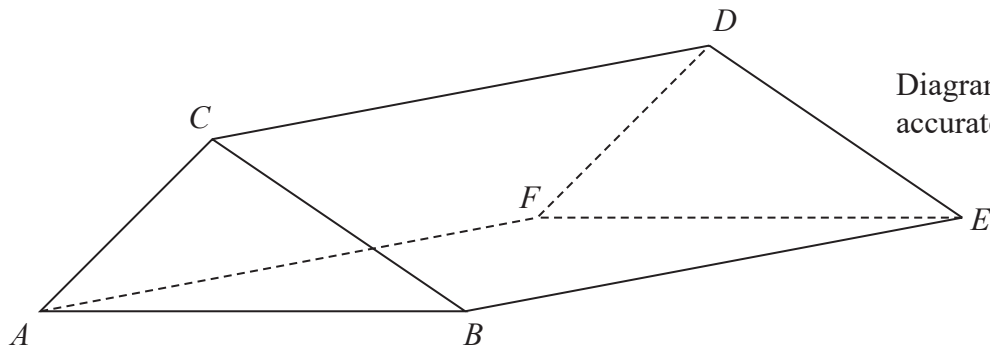


Diagram **NOT** accurately drawn

Angle $BEC = 40^\circ$ and angle ACB is obtuse.
 $AC = 6$ cm and $CE = 13$ cm

The area of triangle ABC is 22 cm²

Calculate the length of AB .

Give your answer correct to one decimal place.

..... cm

(Total for Question 21 is 6 marks)

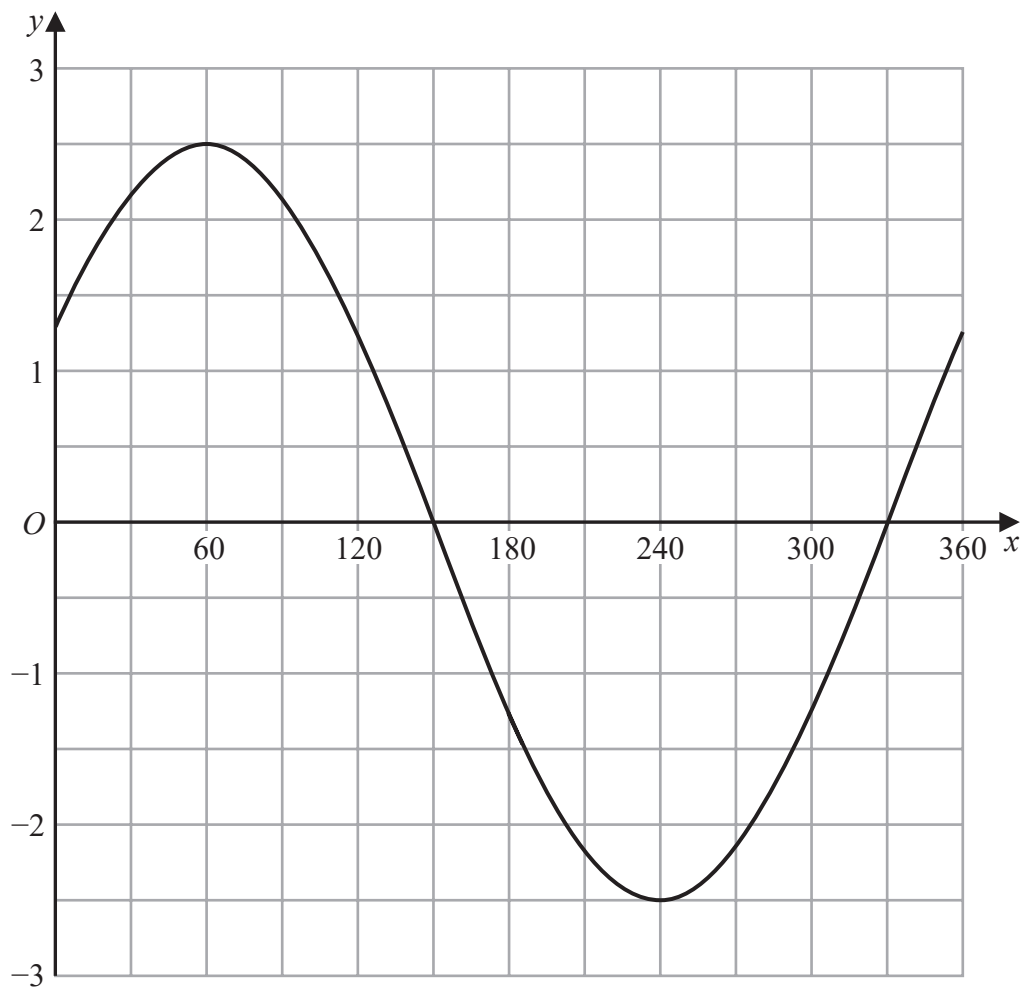
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22 The graph of $y = a \cos(x + b)^\circ$ for $0 \leq x \leq 360$ is drawn on the grid.



(a) Find the value of a and the value of b .

$$a = \dots\dots\dots$$

$$b = \dots\dots\dots$$

(2)

Another curve C has equation $y = f(x)$

The coordinates of the minimum point of C are $(4, 5)$

(b) Write down the coordinates of the minimum point of the curve with equation

(i) $y = f(2x)$

(.....,))

(ii) $y = f(x) - 7$

(.....,))

(2)

(Total for Question 22 is 4 marks)



23 A particle moves along a straight line.

The fixed point O lies on this line.

The displacement of the particle from O at time t seconds, $t \geq 0$, is s metres where

$$s = t^3 + 4t^2 - 5t + 7$$

At time T seconds the velocity of P is V m/s where $V \geq -5$

Find an expression for T in terms of V .

Give your expression in the form $\frac{-4 + \sqrt{k + mV}}{3}$ where k and m are integers to be found.

$T = \dots\dots\dots$

(Total for Question 23 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

