

18 The three solids **A**, **B** and **C** are similar such that

the surface area of **A** : the surface area of **B** = 4 : 9

and

the volume of **B** : the volume of **C** = 125 : 343

Work out the ratio

the height of **A** : the height of **C**

Give your ratio in its simplest form.

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(Total for Question 18 is 4 marks)

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19 Given that  $\left(\sqrt[3]{\frac{1}{x}}\right)^4 = x^m$

(a) find the value of  $m$

$$m = \dots\dots\dots (1)$$

Given that  $a$ ,  $b$  and  $c$  are integers,

(b) express  $3x^2 + 12x + 19$  in the form  $a(x + b)^2 + c$

$$\dots\dots\dots (2)$$

**(Total for Question 19 is 3 marks)**



20 The curve with equation  $y = f(x)$  has one turning point.

The coordinates of this turning point are  $(-6, -4)$

(a) Write down the coordinates of the turning point on the curve with equation

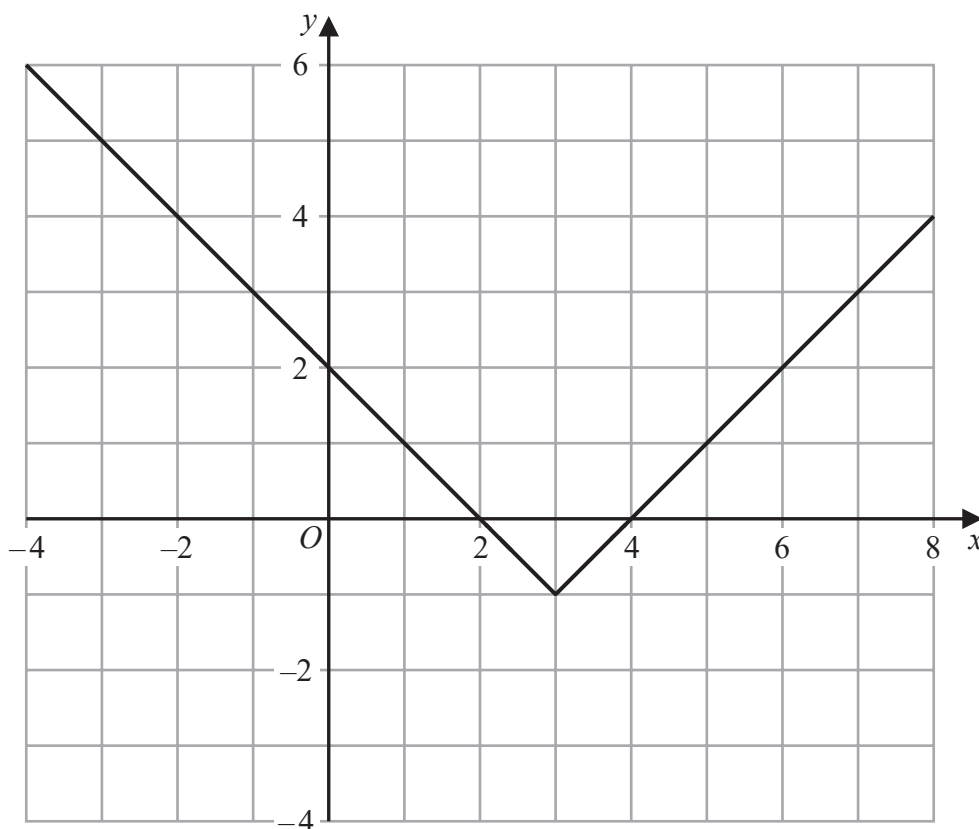
(i)  $y = f(x) + 5$

(....., .....) )

(ii)  $y = f(3x)$

(....., .....) )  
(2)

The graph of  $y = g(x)$  is shown on the grid below.



(b) On the grid, sketch the graph of  $y = 2g(x)$  for  $-1 \leq x \leq 7$

(2)



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The graph of  $y = h(x)$  intersects the  $x$ -axis at two points.  
The coordinates of the two points are  $(-1, 0)$  and  $(6, 0)$

The graph of  $y = h(x + a)$  passes through the point with coordinates  $(2, 0)$ , where  $a$  is a constant.

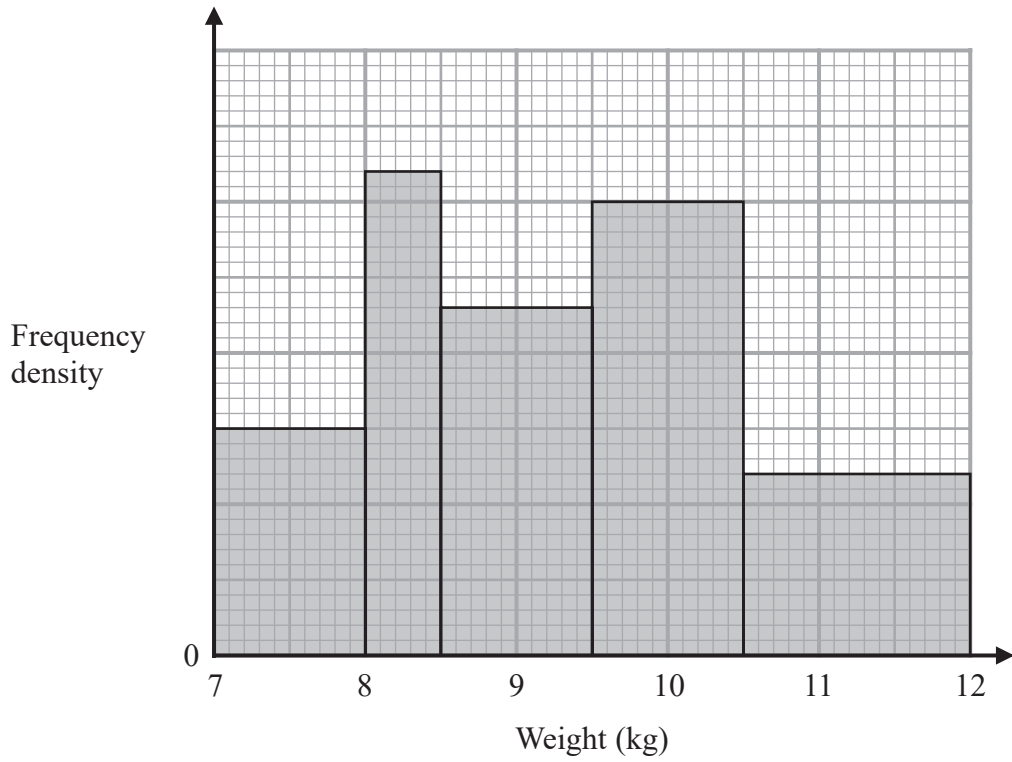
(c) Find the two possible values of  $a$

....., .....

(2)

**(Total for Question 20 is 6 marks)**





The histogram gives information about the weights, in kg, of all the watermelons in a field.

There are 16 watermelons with a weight between 8 kg and 8.5 kg

Work out the total number of watermelons in the field.

(Total for Question 21 is 3 marks)

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22 The diagram shows triangle  $ABC$

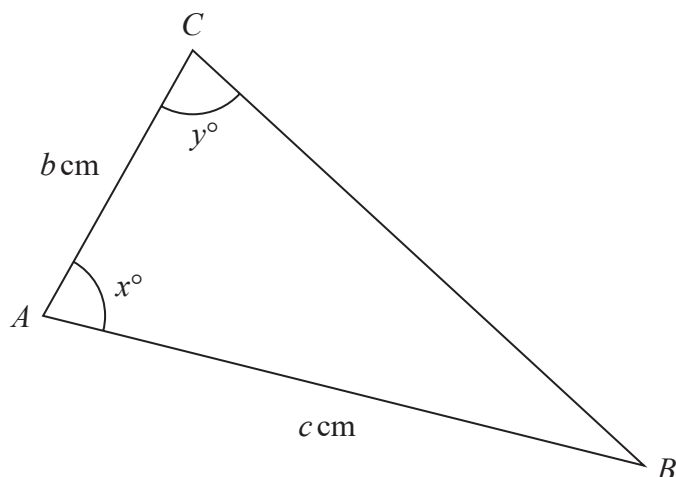


Diagram NOT  
accurately drawn

$$\begin{aligned}c &= 11.5 \quad \text{correct to one decimal place} \\x &= 80 \quad \text{correct to the nearest whole number} \\y &= 75 \quad \text{correct to the nearest whole number}\end{aligned}$$

Calculate the upper bound for the value of  $b$   
Show your working clearly.  
Give your answer correct to 3 significant figures.

(Total for Question 22 is 4 marks)



- 23 Two particles,  $P$  and  $Q$ , move along a straight line.  
The fixed point  $O$  lies on this line.

The displacement of  $P$  from  $O$  at time  $t$  seconds is  $s$  metres, where

$$s = t^3 - 4t^2 + 5t \quad \text{for } t > 1$$

The displacement of  $Q$  from  $O$  at time  $t$  seconds is  $x$  metres, where

$$x = t^2 - 4t + 4 \quad \text{for } t > 1$$

Find the range of values of  $t$  where  $t > 1$  for which both particles are moving in the same direction along the straight line.

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**(Total for Question 23 is 6 marks)**

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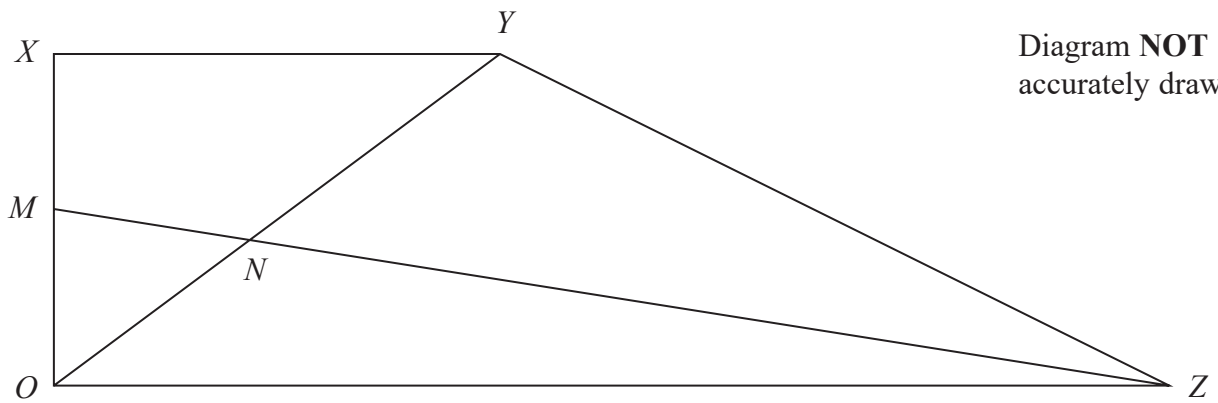
**Turn over for Question 24**



P 6 8 7 2 7 A 0 2 9 3 2



24  $OXYZ$  is a trapezium.



$$\vec{OX} = \mathbf{a}$$

$$\vec{XY} = \mathbf{b}$$

$$\vec{OZ} = 3\mathbf{b}$$

$M$  is the midpoint of  $OX$

$N$  is the point such that  $MNZ$  and  $ONY$  are straight lines.

Given that  $ON : OY = \lambda : 1$

use a vector method to find the value of  $\lambda$

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$$\lambda = \dots\dots\dots$$

(Total for Question 24 is 5 marks)

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**TOTAL FOR PAPER IS 100 MARKS**

