

# GCSE Mathematics

## Practice Tests: Set 6

### Paper 2H (Calculator)

**Time: 1 hour 30 minutes**

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

#### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used.**
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**



#### Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

#### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. The width of a rectangle is a whole number of centimetres.  $x$

The length of the rectangle is 9 cm longer than its width.  $x + 9$   
The perimeter of the rectangle is less than 200 cm.

Find the greatest possible width of the rectangle.

$$\begin{aligned} 2x + 2x + 18 &< 200 \\ \therefore 4x &< 200 - 18 \\ \therefore x &< \frac{182}{4} \\ \therefore x &< 45.5 \end{aligned}$$

..... 45 ..... cm

(Total 4 marks)

- 
2. A rugby team played six games.  
The mean score for the six games is 14.5

The rugby team played one more game.  
The mean score for all seven games is 16

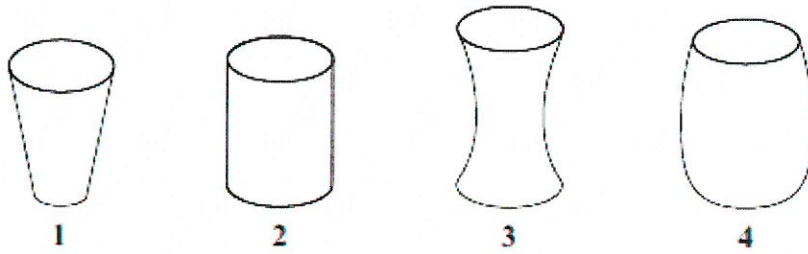
Work out the number of points the team scored in the seventh game.

$$\begin{aligned} 6 \text{ GAMES: } \text{POINTS} &= 6 \times 14.5 = 87 \\ 7 \text{ GAMES: } \text{POINTS} &= 7 \times 16 = 112 \\ \therefore 112 - 87 &= 25 \text{ POINTS IN } 7^{\text{th}} \text{ GAME} \end{aligned}$$

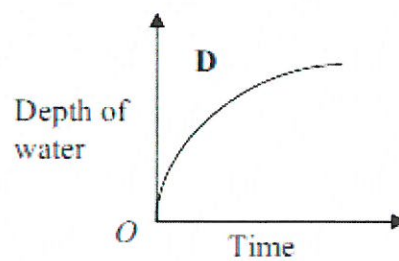
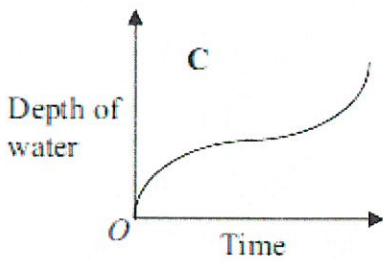
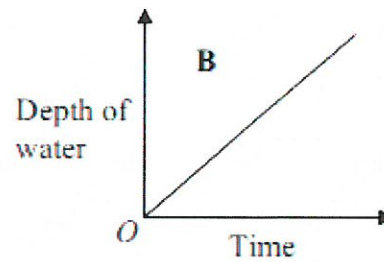
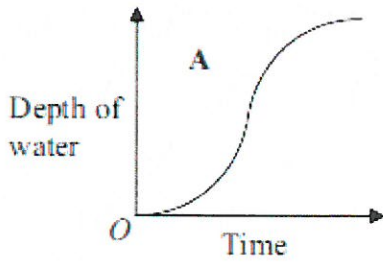
..... 25 ..... points

(Total 2 marks)

3. Here are four containers.  
Water is poured into each container at a constant rate.



Here are four graphs.  
The graphs show how the depth of the water in each container changes with time.



Match each graph with the correct container.

A and ..... **3** .....

B and ..... **2** .....

C and ..... **4** .....

D and ..... **1** .....

(Total 2 marks)

4. The diagram shows the positions of three turbines  $A$ ,  $B$  and  $C$ .

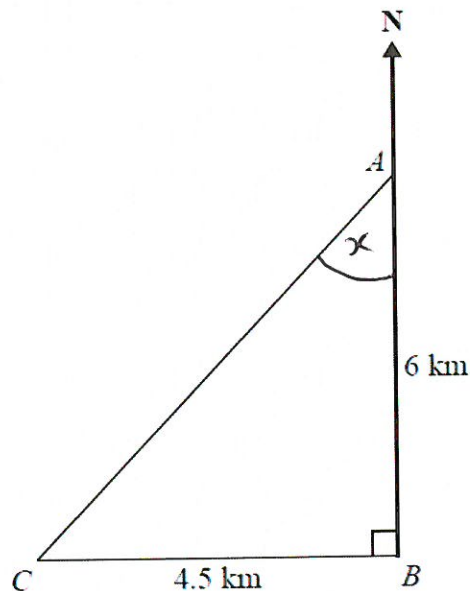


Diagram **NOT**  
accurately drawn

$A$  is 6 km due north of turbine  $B$ .  
 $C$  is 4.5 km due west of turbine  $B$ .

- (a) Calculate the distance  $AC$ .

$$AC^2 = 6^2 + 4.5^2 = 56.25$$

$$\therefore AC = \sqrt{56.25}$$

..... 7.5 ..... km  
(3)

- (b) Calculate the bearing of  $C$  from  $A$ .  
Give your answer correct to the nearest degree.

$$\tan x = \frac{4.5}{6}$$

$$\therefore x = \tan^{-1}\left(\frac{4.5}{6}\right)$$

$$= 37^\circ$$

$$180 + 37 = 217^\circ$$

..... 217 .....  
(4)

(Total 7 marks)

5. The diagram shows a prism.

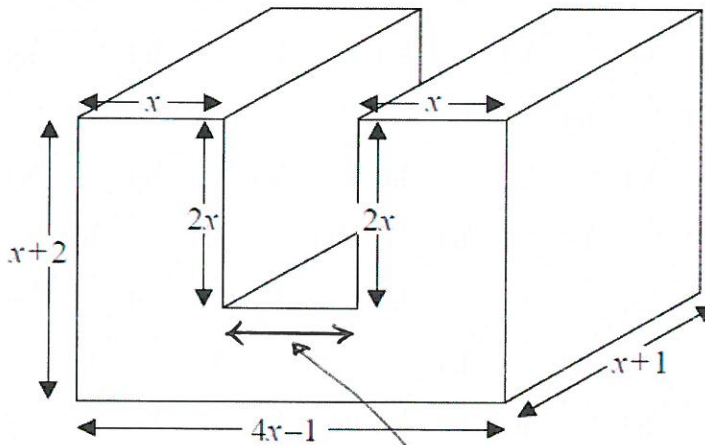


Diagram NOT accurately drawn

All measurements are in centimetres.  
All corners are right angles.

$$4x - 1 - x - x = 2x - 1$$

Find an expression, in terms of  $x$ , for the volume, in  $\text{cm}^3$ , of the prism.  
You must show your working.  
Give your answer in its simplest form.

$$\begin{aligned} \text{AREA OF CROSS-SECTION} &= (4x-1)(x+2) - 2x(2x-1) \\ &= 4x^2 + 8x - x - 2 - 4x^2 + 2x \\ &= 9x - 2 \end{aligned}$$

$$\begin{aligned} \text{VOLUME} &= (9x-2)(x+1) \\ &= 9x^2 + 9x - 2x - 2 \\ &= 9x^2 + 7x - 2 \end{aligned}$$

$$\begin{aligned} &\dots\dots\dots 9x^2 + 7x - 2 \\ &(\text{OR } (9x-2)(x+1)) \quad (\text{Total 4 marks}) \end{aligned}$$

6. The diagram shows a triangle  $DEF$  inside a rectangle  $ABCD$ .

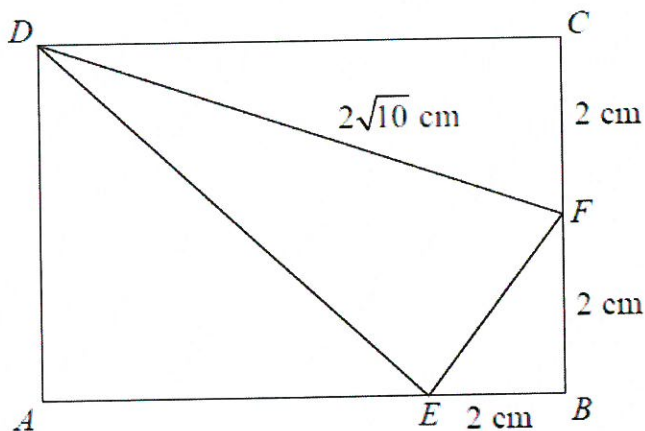


Diagram **NOT** accurately drawn

Show that the area of triangle  $DEF$  is  $8 \text{ cm}^2$ .  
You must show all your working.

$$DC^2 = (2\sqrt{10})^2 - 2^2 = 40 - 4 = 36$$

$$\therefore DC = 6 \quad \therefore AE = 6 - 2 = 4$$

$$\therefore \text{AREA DCF} = \frac{1}{2} \times 6 \times 2 = 6 \text{ cm}^2$$

$$\text{AREA FEB} = \frac{1}{2} \times 2 \times 2 = 2 \text{ cm}^2$$

$$\text{AREA DAE} = \frac{1}{2} \times 4 \times 4 = 8 \text{ cm}^2$$

$$\therefore \text{AREA OF ALL 3 TRIANGLES} = 6 + 2 + 8 = 16 \text{ cm}^2$$

$$\text{AREA OF RECTANGLE} = 6 \times 4 = 24 \text{ cm}^2$$

$$\therefore \text{AREA DEF} = 24 - 16 = 8 \text{ cm}^2$$

(Total 4 marks)

7. Jarek uses the formula

$$\text{Area} = \frac{1}{2} ab \sin C$$

to work out the area of a triangle.

For this triangle,

$a = 7.8$  cm correct to the nearest mm.

$b = 5.2$  cm correct to the nearest mm.

$C = 63^\circ$  correct to the nearest degree.

LOWER BOUND

7.75 cm

5.15 cm

$62.5^\circ$

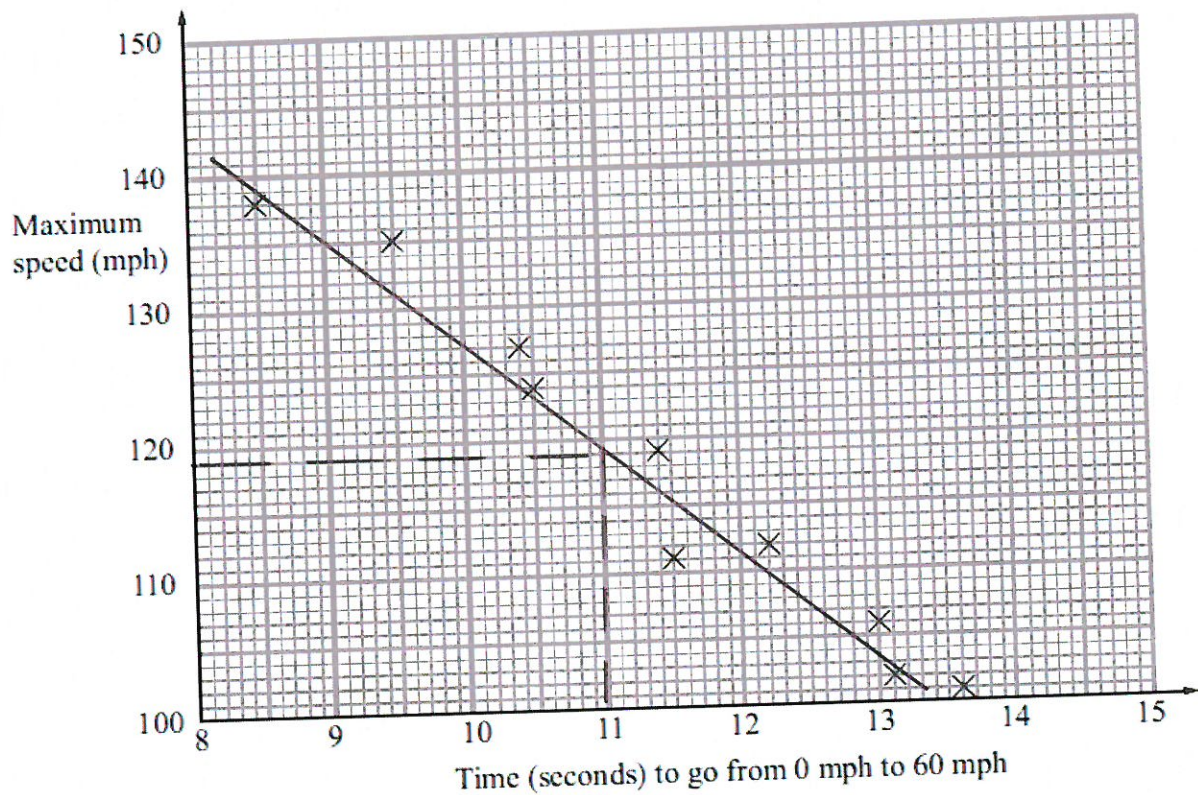
Calculate the lower bound for the area of the triangle.

$$\begin{aligned} \text{LOWER BOUND OF AREA} &= \frac{1}{2} \times 7.75 \times 5.15 \times \sin 62.5^\circ \\ &= 17.7014 \end{aligned}$$

..... 17.7 ..... cm<sup>2</sup>

(Total 3 marks)

8. The scatter graph shows some information about 10 cars. It shows the time, in seconds, it takes each car to go from 0 mph to 60 mph. For each car, it also shows the maximum speed, in mph.



- (a) What type of correlation does this scatter graph show?

..... *NEGATIVE* ..... (1)

The time a car takes to go from 0 mph to 60 mph is 11 seconds.

- (b) Estimate the maximum speed for this car.

..... *119* ..... mph  
 (*117-123*) (2)

(Total 3 marks)



9. Alex and Ben go to a cafe with some friends.

Alex buys 4 cups of coffee and 3 cups of tea.  
He pays a total of £6.95

Ben buys 5 cups of coffee and 2 cups of tea.  
He pays a total of £7.20

Work out the cost of each cup of coffee and the cost of each cup of tea.

$$4C + 3T = 695 \quad \times 2$$

$$5C + 2T = 720 \quad \times 3$$

$$8C + 6T = 1390$$

$$15C + 6T = 2160$$

$$\therefore 7C = 770$$

$$\therefore C = 110$$

$$5 \times 110 + 2T = 720$$

$$550 + 2T = 720$$

$$2T = 170$$

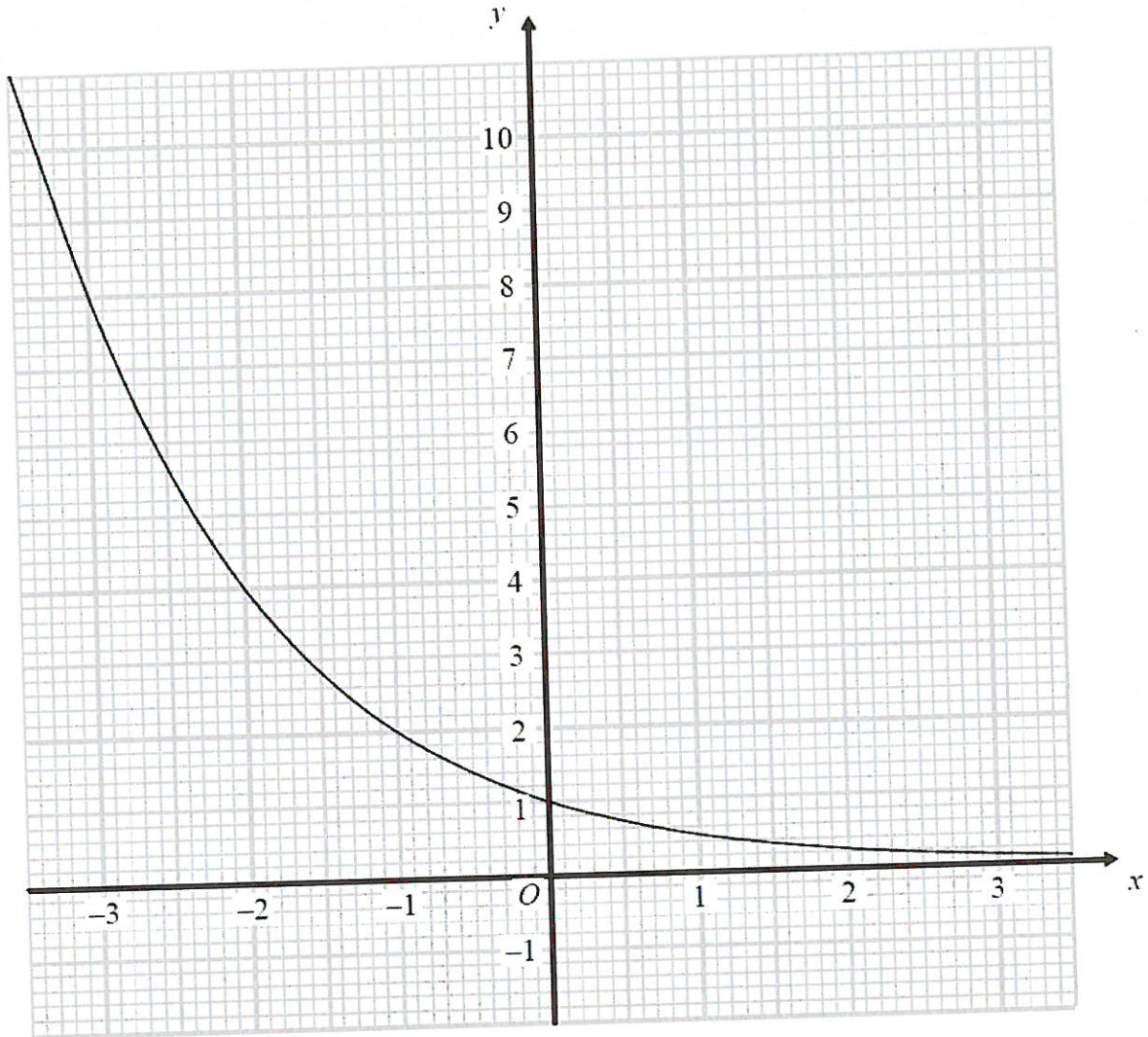
$$T = 85$$

Cup of coffee.....£1.10.....

Cup of tea.....£0.85.....

(Total 5 marks)

10.



The graph of  $y = k^x$ , where  $k$  is a positive constant, is shown above.

Find the value of  $k$ .

$$\text{AT } x = -1, y = 2$$

$$\therefore 2 = k^{-1} = \frac{1}{k}$$

$$\therefore k = \frac{1}{2}$$

$$k = \frac{1}{2}$$

(Total 2 marks)

11. In the USA, Sam pays 20.88 US Dollars for 6 US gallons of petrol.  
In Russia, Leon pays 800 Roubles for 25.58 litres of petrol.

Use the information in the table to compare the prices of petrol in the two countries.

1 US gallon = 3.79 litres  
1 Euro = 40.63 Roubles  
1 US Dollar = 0.77 Euros

(LOTS OF WAYS  
OF DOING THIS)

$$\begin{aligned}
 \text{USA: } & 20.88 \text{ USD FOR } 6 \text{ GALLONS} \\
 \therefore & 1 \text{ USD FOR } \frac{6}{20.88} \text{ GALLONS} \\
 \therefore & \frac{1}{3} \text{ USD FOR } \frac{6}{20.88} \times 3.79 \text{ LITRES} \\
 \therefore & 0.77 \text{ EURO FOR } \frac{6}{20.88} \times 3.79 \text{ LITRES} \\
 \therefore & 1 \text{ EURO FOR } \frac{6}{20.88} \times \frac{3.79}{0.77} \text{ LITRES} \\
 \therefore & 40.63 \text{ ROUBLES FOR } \frac{6}{20.88} \times \frac{3.79}{0.77} \text{ LITRES} \\
 \therefore & 1 \text{ ROUBLE FOR } \frac{6}{20.88} \times \frac{3.79}{0.77} \times \frac{1}{40.63} \text{ LITRES} \\
 \therefore & 800 \text{ ROUBLES FOR } \frac{6}{20.88} \times \frac{3.79}{0.77} \times \frac{800}{40.63} \text{ LITRES} \\
 & = 27.85 \text{ LITRES} \quad \text{(Total 5 marks)}
 \end{aligned}$$

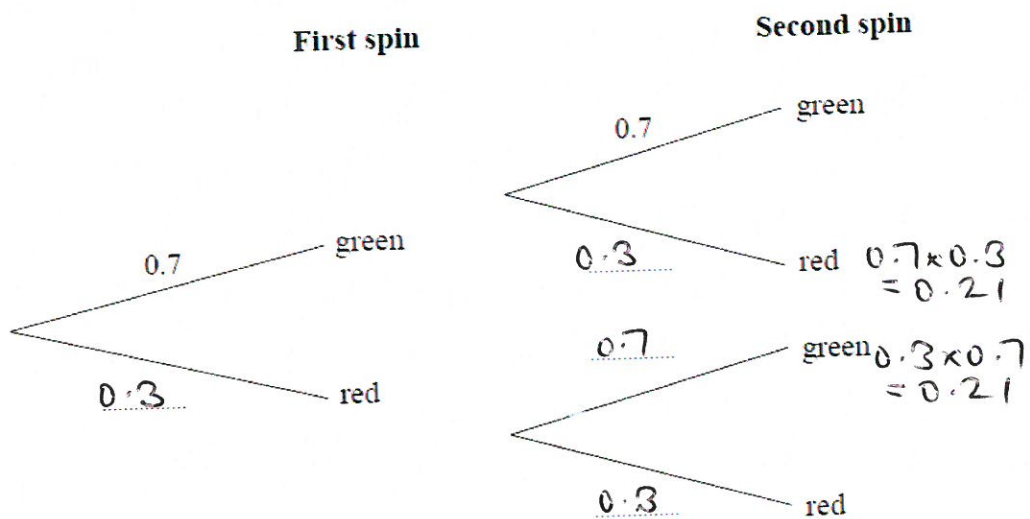
ie IN USA PAY 800 ROUBLES FOR 27.85 LITRES  
IN RUSSIA PAY 800 ROUBLES FOR 25.58 LITRES  
SO IN RUSSIA DON'T GET AS MANY LITRES  
 $\therefore$  PETROL IS MORE EXPENSIVE IN RUSSIA

12. Louise makes a spinner.

The spinner can land on green or on red.  
The probability that the spinner will land on green is 0.7

Louise spins the spinner twice.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that the spinner lands on two different colours.

$$0.21 + 0.21$$

.....  
0.42

(3)

(Total 5 marks)

13. A trapezium  $ABCD$  has an area of  $5\sqrt{6} \text{ cm}^2$ .

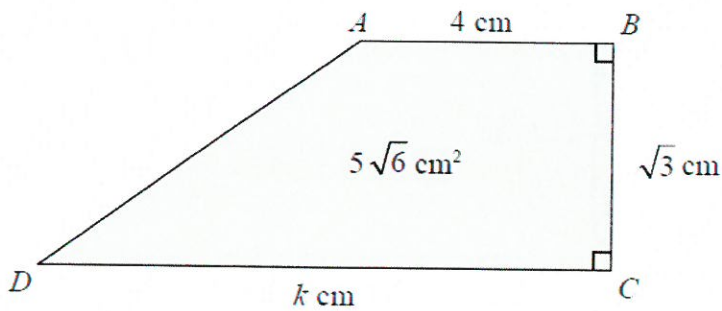


Diagram **NOT**  
accurately drawn

$$\begin{aligned} AB &= 4 \text{ cm.} \\ BC &= \sqrt{3} \text{ cm.} \\ DC &= k \text{ cm.} \end{aligned}$$

Calculate the value of  $k$ , giving your answer in the form  $a\sqrt{b} - c$ , where  $a$ ,  $b$  and  $c$  are positive integers. Show each step in your working.

$$\text{AREA} = \frac{\sqrt{3}}{2} (k + 4) = 5\sqrt{6}$$

$$\therefore k\sqrt{3} + 4\sqrt{3} = 10\sqrt{6}$$

$$\therefore k\sqrt{3} = 10\sqrt{6} - 4\sqrt{3}$$

$$\therefore k = \frac{10\sqrt{6} - 4\sqrt{3}}{\sqrt{3}}$$

$$\therefore k = 10\sqrt{2} - 4$$

$$k = \underline{10\sqrt{2} - 4}$$

(Total 3 marks)

14. The diagram shows a large tin of pet food in the shape of a cylinder.

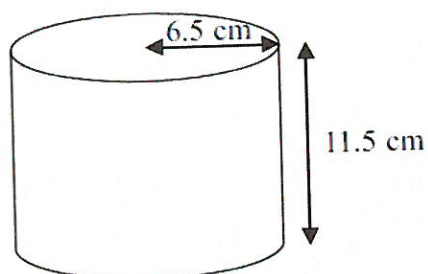


Diagram NOT  
accurately drawn

The large tin has a radius of 6.5 cm and a height of 11.5 cm.

A pet food company wants to make a new size of tin.

The new tin will have a radius of 5.8 cm.  
It will have the same volume as the large tin.

Calculate the height of the new tin.  
Give your answer correct to one decimal place.

$$\text{VOLUME OF LARGE TIN} = \pi \times 6.5^2 \times 11.5$$

$$\text{VOLUME OF } \overset{\text{NEW}}{\text{SMALL}} \text{ TIN} = \pi \times 5.8^2 \times h$$

$$\therefore \pi \times 6.5^2 \times 11.5 = \pi \times 5.8^2 \times h$$

$$\therefore h = \frac{6.5^2 \times 11.5}{5.8^2}$$

$$= 14.4$$

..... 14.4 ..... cm

(Total 3 marks)

15. Prove that, for all positive values of  $n$ ,

$$\frac{(n+2)^2 - (n+1)^2}{2n^2 + 3n} = \frac{1}{n}$$

$$(n+2)^2 = (n+2)(n+2) = n^2 + 4n + 4$$

$$(n+1)^2 = (n+1)(n+1) = n^2 + 2n + 1$$

$$\begin{aligned}\therefore (n+2)^2 - (n+1)^2 &= (n^2 + 4n + 4) - (n^2 + 2n + 1) \\ &= n^2 + 4n + 4 - n^2 - 2n - 1 \\ &= 2n + 3\end{aligned}$$

$$2n^2 + 3n = n(2n + 3)$$

$$\therefore \frac{(n+2)^2 - (n+1)^2}{2n^2 + 3n} = \frac{2n+3}{n(2n+3)} = \frac{1}{n}$$

(Total 4 marks)

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16. Make  $r$  the subject of the formula  $p = \frac{2r+5}{r-3}$

$$p(r-3) = 2r+5$$

$$\therefore pr - 3p = 2r + 5$$

$$\therefore pr - 2r = 3p + 5$$

$$\therefore r(p-2) = 3p+5$$

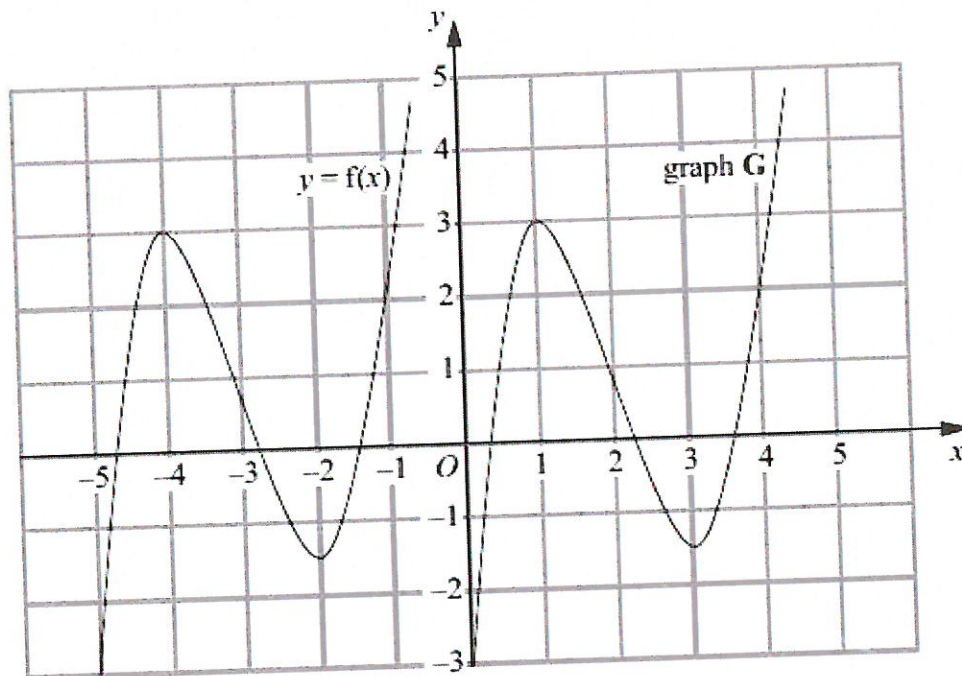
$$\therefore r = \frac{3p+5}{p-2}$$

$$r = \frac{3p+5}{p-2}$$

(Total 4 marks)

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17. The graph of  $y = f(x)$  is shown on the grid.



The graph **G** is a translation of the graph of  $y = f(x)$ .

(a) Write down, in terms of  $f$ , the equation of graph **G**.

$$y = \dots f(x-5) \dots \quad (1)$$

The graph of  $y = f(x)$  has a maximum point at  $(-4, 3)$ .

(b) Write down the coordinates of the maximum point of the graph of  $y = f(-x)$ .

$$(\dots 4 \dots, \dots 3 \dots) \quad (2)$$

**(Total 3 marks)**



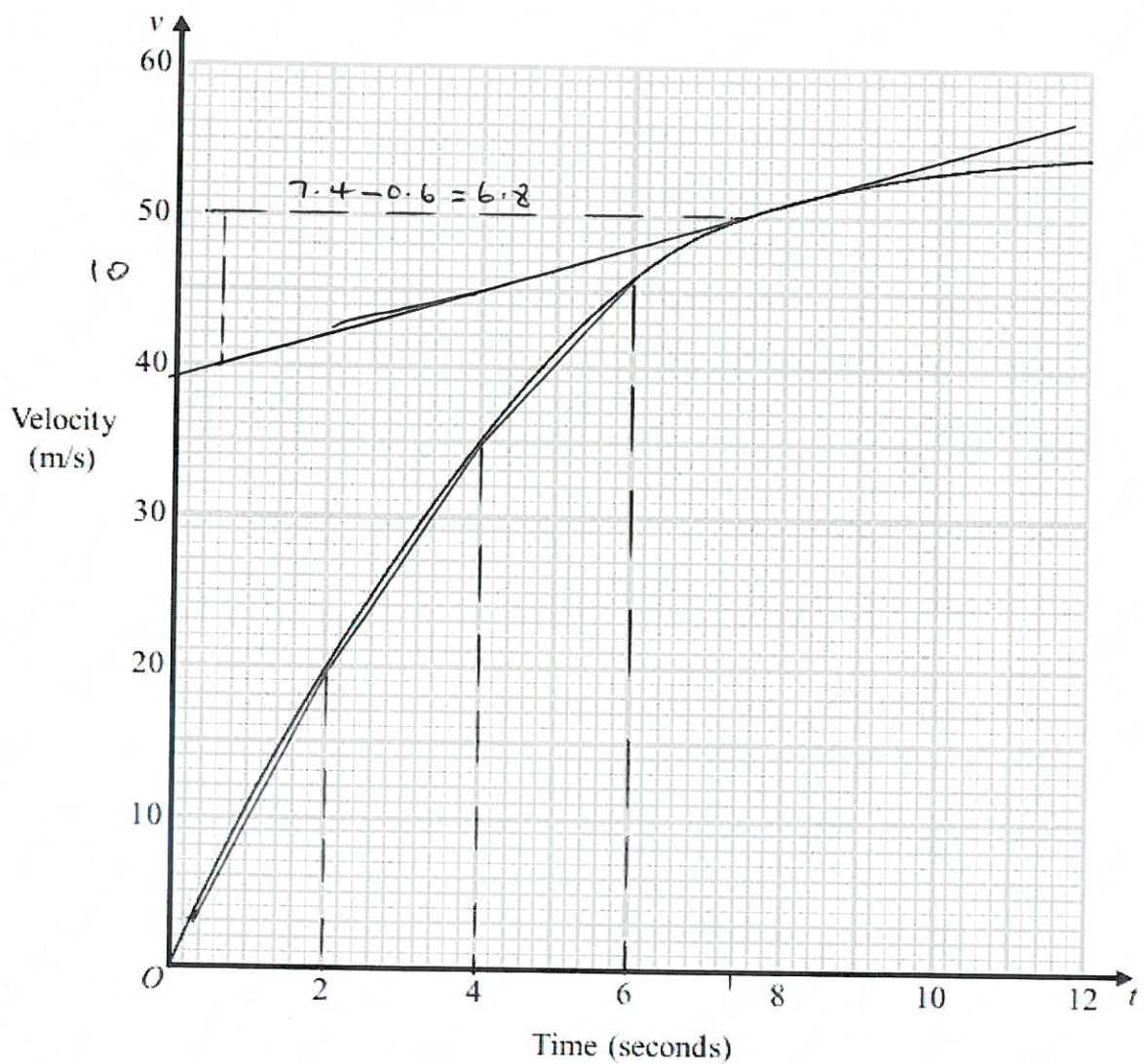
18. A parachutist jumps out of a plane.

This graph shows information about the velocity,  $v$  m/s, of the parachutist  $t$  seconds after he jumped.

- (a) Work out an estimate for the acceleration of the parachutist when  $t = 8$

$$\frac{10}{6.8}$$

$$\frac{1.47}{(1.25 - 1.75)} \text{ m/s}^2 \quad (3)$$



(b) Work out an estimate for the distance the parachutist falls in the first 6 seconds.

$$\frac{2}{2}(19.5) + \frac{2}{2}(19.5 + 35) + \frac{2}{2}(35 + 45.5)$$

$$= 19.5 + 54.5 + 80.5$$

$$= 154.5$$

(NB. HAVE TO HAVE AT LEAST 3 AREAS)

$$\frac{154.5}{(150 - 160)} \text{ m} \quad (3)$$

(Total 6 marks)

19.  $S$  is inversely proportional to the cube of  $t$ .

$$\text{When } t = 4, S = \frac{1}{2}$$

Find the value of  $S$  when  $t = 8$

$$S \propto \frac{1}{t^3}$$

$$\therefore S = \frac{k}{t^3}$$

$$\therefore \frac{1}{2} = \frac{k}{4^3}$$

$$\therefore k = \frac{1}{2} \times 64 = 32$$

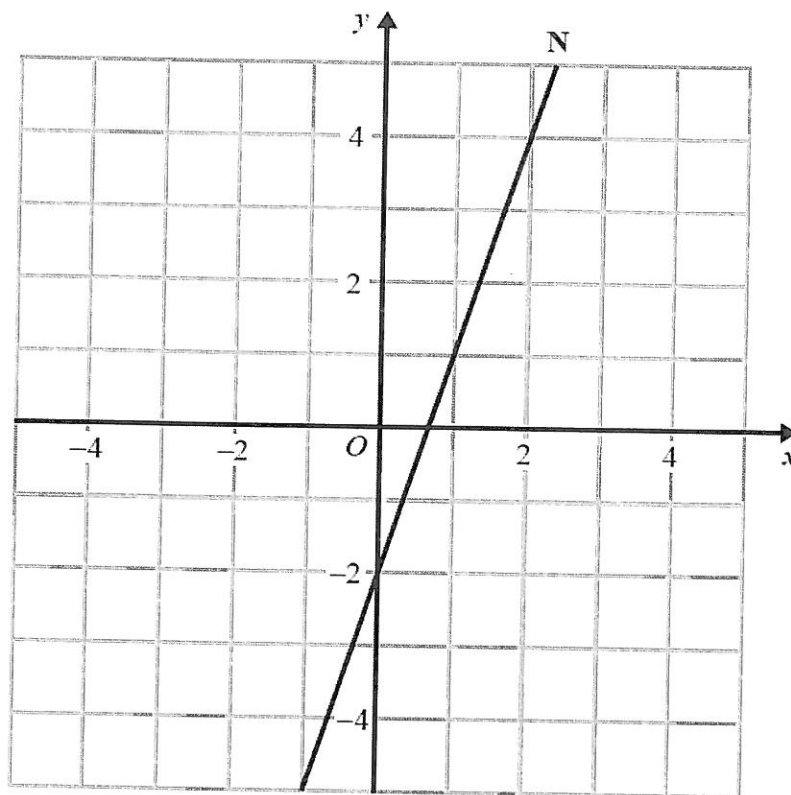
$$\therefore S = \frac{32}{t^3}$$

$$S = \frac{32}{8^3} = \frac{32}{512} = \frac{1}{16}$$

$$\frac{1}{16}$$

(Total 4 marks)

20. The line N is drawn below.



Find an equation of the line perpendicular to line N that passes through the point (0, 1).

$$\text{GRADIENT OF } N = \frac{6}{2} = 3$$

$$\therefore \text{GRADIENT OF PERPENDICULAR TO } N = -\frac{1}{3}$$

$$y = -\frac{1}{3}x + 1$$

(Total 3 marks)

21. The points  $A$ ,  $B$  and  $C$  lie in order on a straight line.

The coordinates of  $A$  are  $(2, 5)$

The coordinates of  $B$  are  $(4, p)$

The coordinates of  $C$  are  $(q, 17)$

Given that  $AC = 4AB$ , find the values of  $p$  and  $q$ .

$$AD = 4 - 2 = 2$$

$$\therefore AE = 4 \times 2 = 8$$

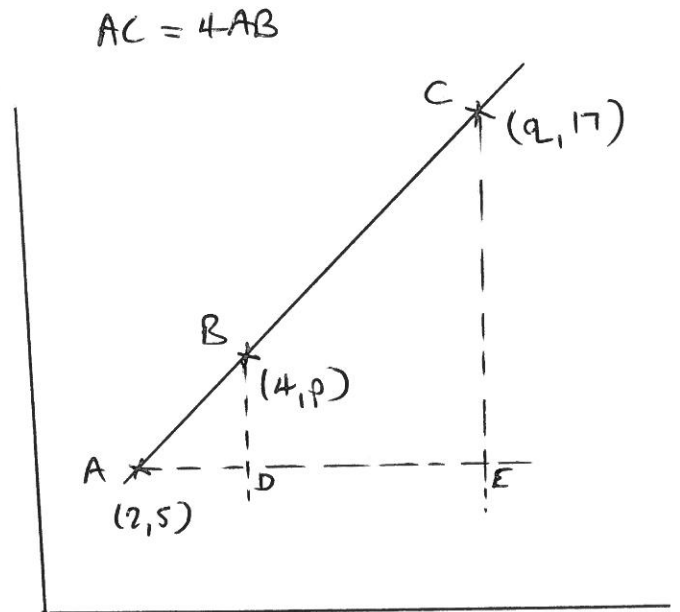
$$\therefore q = 8 + 2 = 10$$

$$CE = 17 - 5 = 12$$

$$\therefore BD = \frac{1}{4} \times 12 = 3$$

$$\therefore p - 5 = 3$$

$$\therefore p = 8$$



$$p = \dots 8 \dots$$

$$q = \dots 10 \dots$$

(Total 3 marks)

**TOTAL FOR PAPER IS 80 MARKS**