

# 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.

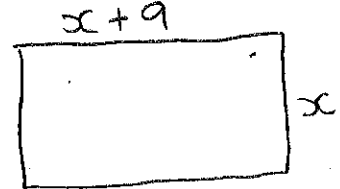
Answer ALL questions.

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.

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



Find the greatest possible width of the rectangle.

$$\begin{aligned}\text{Perimeter} &= x + x + x + 9 + x + 9 \\ &= 4x + 18\end{aligned}$$

$$4x + 18 < 200$$

$$4x < 182$$

$$x < 45.5$$

$x$  is a whole number

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.

$$\text{Scored } 14.5 \times 6 = 87 \text{ in } 6 \text{ games}$$

$$\text{Scored } 16 \times 7 = 112 \text{ in } 7 \text{ games}$$

Must have scored

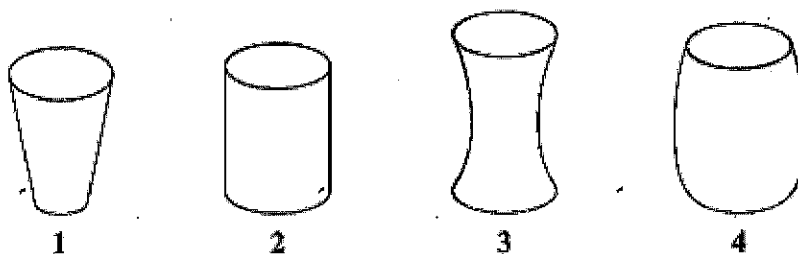
$$112 - 87 = 25 \text{ in } 7^{\text{th}}$$

25

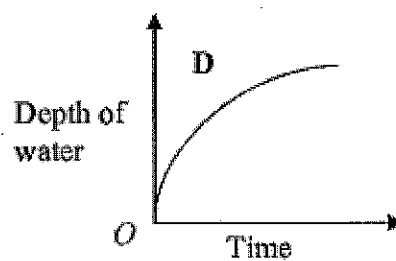
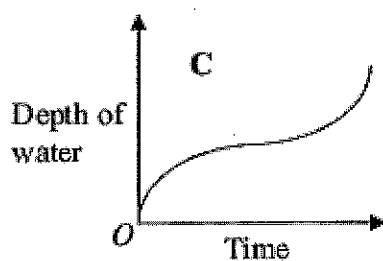
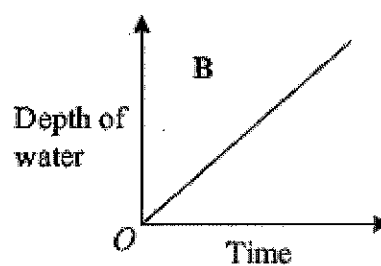
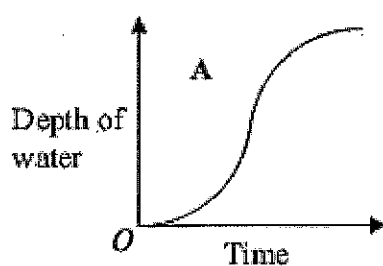
..... points

(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.

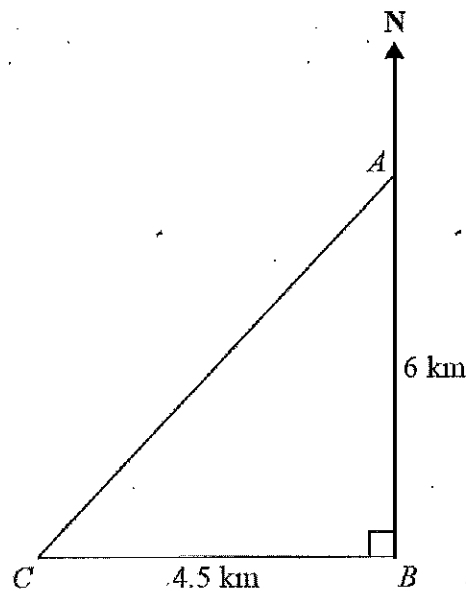


Diagram **NOT**  
accurately drawn

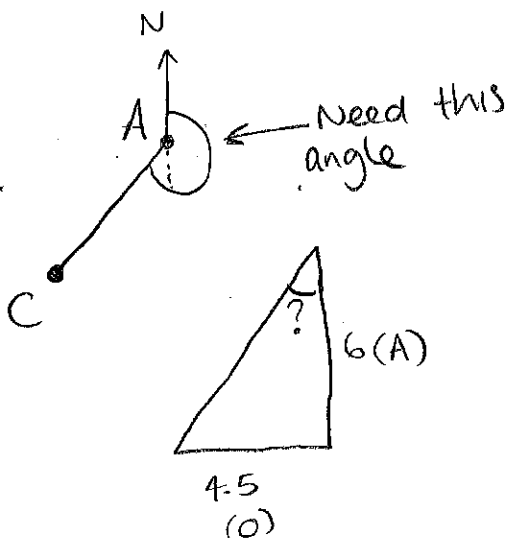
A is 6 km due north of turbine B.  
C is 4.5 km due west of turbine B.

- (a) Calculate the distance AC.

$$\begin{aligned} AC^2 &= 4.5^2 + 6^2 \\ AC^2 &= 56.25 \\ AC &= \sqrt{56.25} = 7.5 \end{aligned}$$

..... 7.5 km  
(3)

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



$$\begin{aligned} \tan(?) &= \frac{O}{A} = \frac{4.5}{6} \\ ? &= \tan^{-1}\left(\frac{4.5}{6}\right) = 36.9 \\ 180 + 36.9 &= 217 \quad (\text{nearest degree}) \end{aligned}$$

..... 217 °  
(4)

(Total 7 marks)

5. The diagram shows a prism.

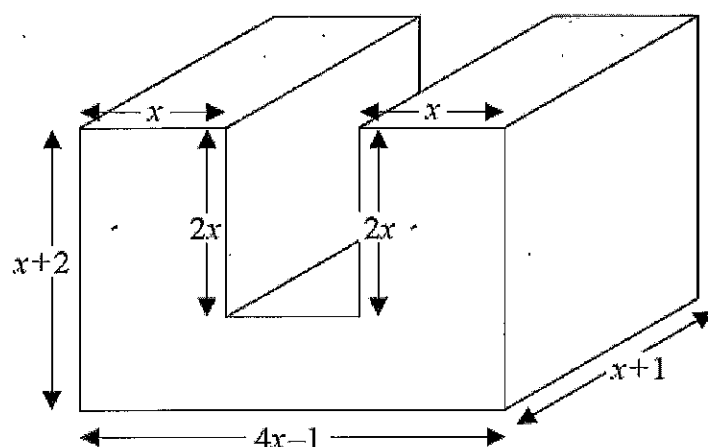
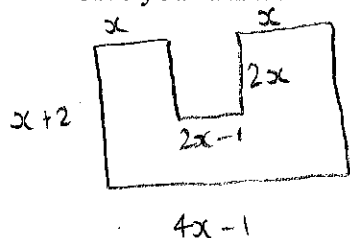


Diagram NOT  
accurately drawn

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

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.



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

$$\begin{aligned} \text{Area of cross section} &= (4x-1)(x+2) - 2x(2x-1) \\ &= 4x^2 - x + 8x - 2 - 4x^2 + 2x \\ &= 9x - 2 \end{aligned}$$

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

$$\underline{9x^2 + 7x - 2}$$

(Total 4 marks)

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

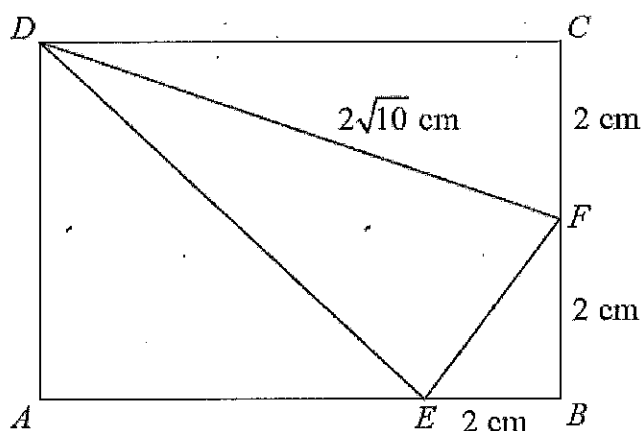


Diagram **NOT**  
accurately drawn

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

$$DC^2 + 2^2 = (2\sqrt{10})^2$$

$$DC^2 + 4 = 40$$

$$DC^2 = 36$$

$$\underline{DC = 6}$$

so  $AE = 4$

$$\text{Area rectangle} = 6 \times 4 = 24$$

$$\text{Area Triangle CDF} = \frac{6 \times 2}{2} = 6$$

$$\text{Area triangle EBF} = \frac{2 \times 2}{2} = 2$$

$$\text{Area triangle ADE} = \frac{4 \times 4}{2} = 8$$

$$\begin{aligned} \text{Area triangle DEF} &= 24 - 6 - 2 - 8 \\ &= 24 - 16 \\ &= 8 \text{ cm}^2 \end{aligned}$$

(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.

Calculate the lower bound for the area of the triangle.

$$a = 7.8 \text{ mm} \quad \text{LB} = 77.5 \text{ mm} = 7.75 \text{ cm}$$

$$b = 5.2 \text{ mm} \quad \text{LB} = 51.5 \text{ mm} = 5.15 \text{ cm}$$

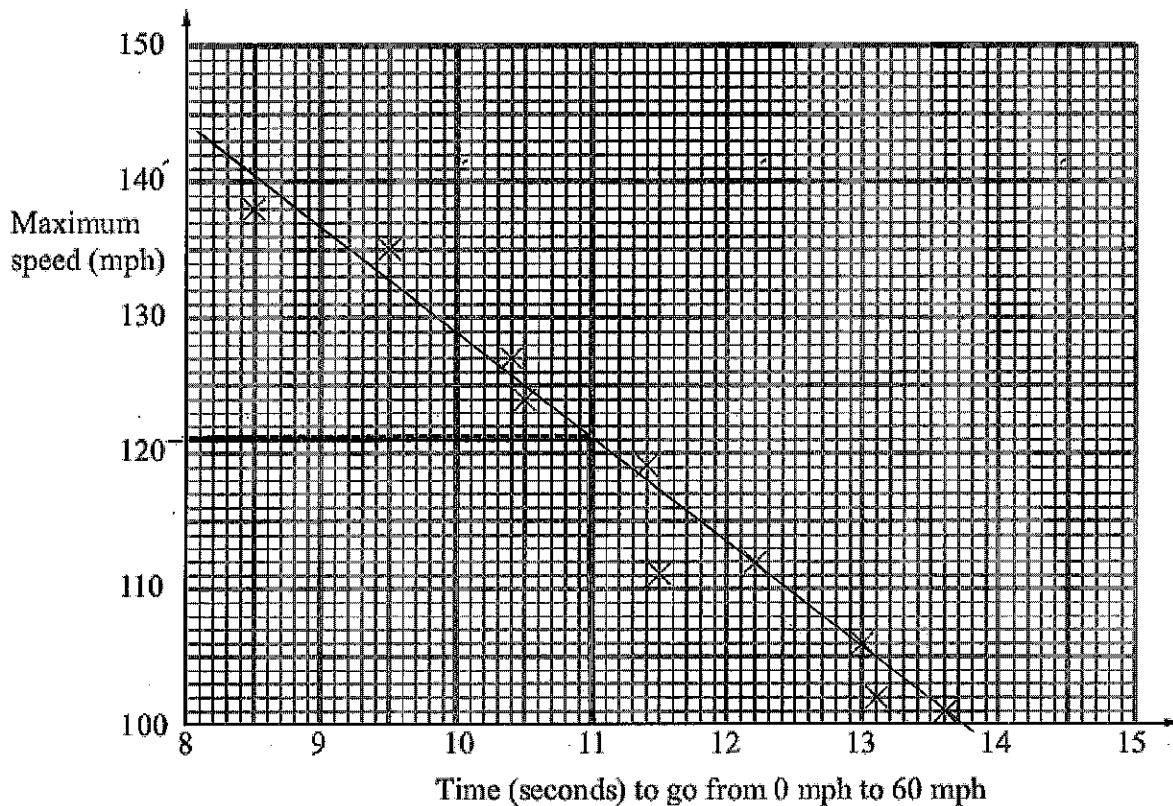
$$C = 63^\circ \quad \text{LB} = 62.5^\circ$$

$$\begin{aligned} \text{Area LB} &= \frac{1}{2} \times 7.75 \times 5.15 \times \sin(62.5) \\ &= 17.70 \dots \text{ cm}^2 \end{aligned}$$

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.

121..... mph  
(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.

$$\textcircled{1} \quad 4c + 3t = 6.95$$

$$\textcircled{2} \quad 5c + 2t = 7.2$$

$$\textcircled{1} \times 2 \quad 8c + 6t = 13.9 \quad \textcircled{3}$$

$$\textcircled{2} \times 3 \quad 15c + 6t = 21.6 \quad \textcircled{4}$$

$$\textcircled{4} - \textcircled{3} : 7c = 21.6 - 13.9 = 7.7$$

$$c = 1.1$$

sub in to  $\textcircled{2}$

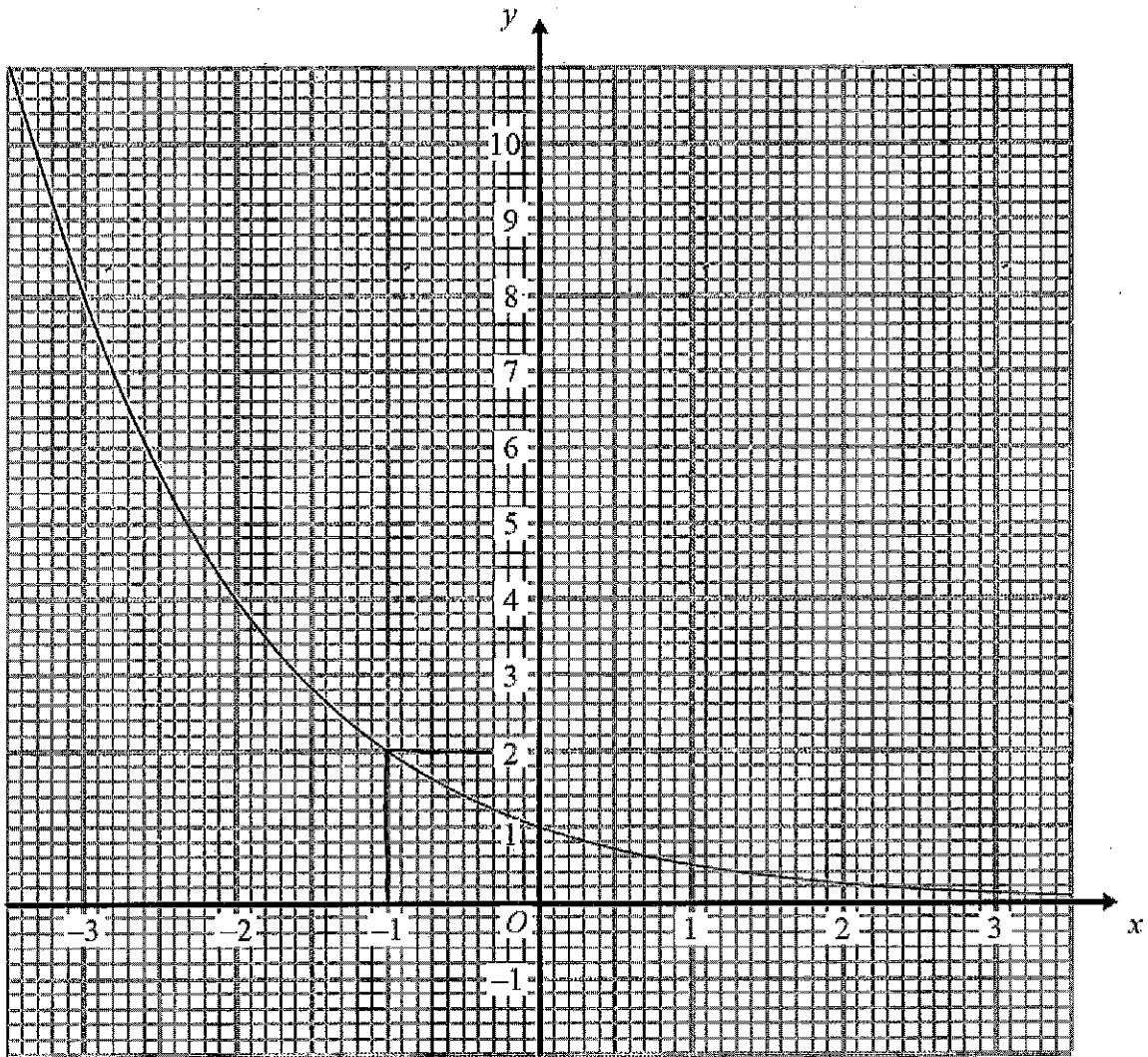
$$\begin{array}{r} -5.5 \quad \left( \begin{array}{l} 5.5 + 2t = 7.2 \\ 2t = 1.7 \\ t = 0.85 \end{array} \right) -5.5 \end{array}$$

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  $k$ .

$$k^{-1} = 2$$

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

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

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

(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

Sam pays \$20.88 for 6 gallons

$$6 \times 3.79 = 22.74 \text{ litres}$$

$$20.88 \times 0.77 = 16.0776$$

Sam pays 16.0776 € for 22.74 L

$$16.0776 \times 40.63 = 653.232888$$

Sam pays 653.232888 roubles for 22.74 L

$$\frac{653.232888}{22.74} = 28.726 \text{ roubles per litre (Sam)}$$

$$\frac{800}{25.58} = 31.27 \text{ roubles per litre (Leon)}$$

Petrol is cheaper in USA

(Total 5 marks)

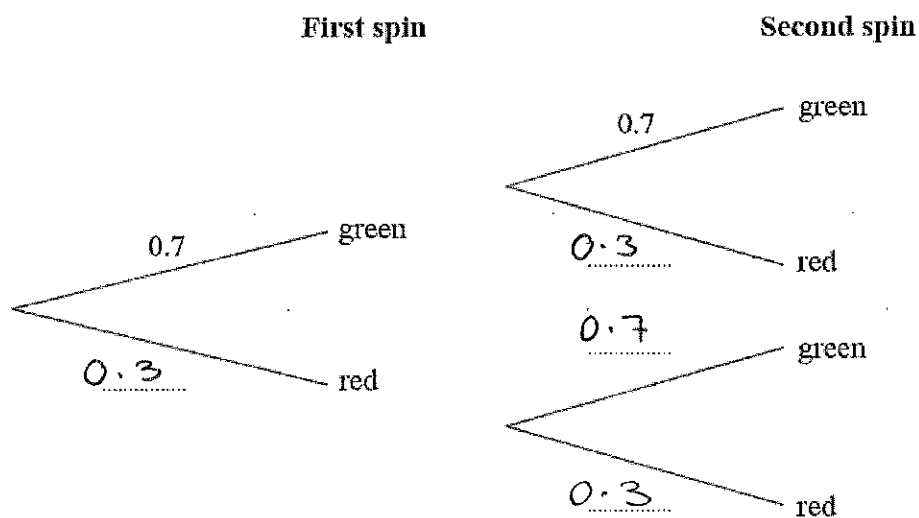
**12.** Louise makes a spinner.

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.

$$P(G, R) = 0.7 \times 0.3 = 0.21$$

$$P(R, G) = 0.3 \times 0.7 = 0.21$$

$$P(G, R) + P(R, G) = 0.21 + 0.21 = 0.42$$

0.42

(3)

**(Total 5 marks)**

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

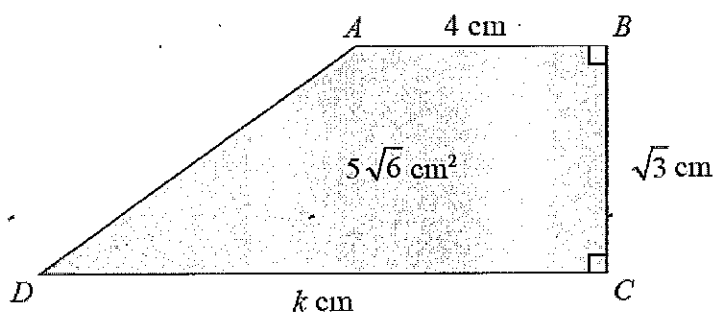
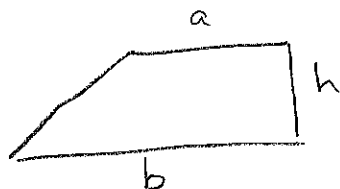


Diagram NOT  
accurately drawn

$AB = 4 \text{ cm.}$   
 $BC = \sqrt{3} \text{ cm.}$   
 $DC = k \text{ cm.}$

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.



$$\text{Area trapezium} = \frac{1}{2} (a+b) h$$

$$5\sqrt{6} = \frac{1}{2} (k+4) \sqrt{3}$$

$\times 2$

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

$\div \sqrt{3}$

$$10\sqrt{2} = k+4$$

$- 4$

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

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

(Total 3 marks)

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

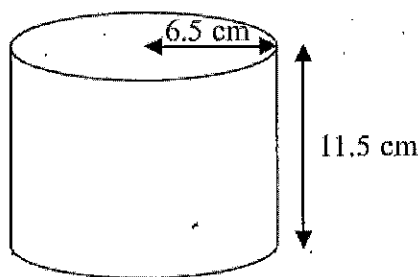


Diagram NOT  
accurately drawn

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.

$$\text{Volume cylinder} = \pi r^2 h = \pi \times 6.5^2 \times 11.5 = \frac{3887}{8} \pi$$

New tin

$$\text{Volume} = \pi \times 5.8^2 \times h = \frac{841}{25} \pi h$$

$$\frac{3887}{8} \pi = \frac{841}{25} \pi h$$

$$\frac{3887}{8} \div \frac{841}{25} = h = 14.4 \text{ (1dp)}$$

14.4

..... cm

(Total 3 marks)

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

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

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

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

$$(n+2)^2 - (n+1)^2 = 2n + 3$$

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

(Total 4 marks)

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

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

$$\times(r-3)$$

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

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

$$+3p \rightarrow pr = 2r + 5 + 3p$$

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

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

$$\div p-2$$

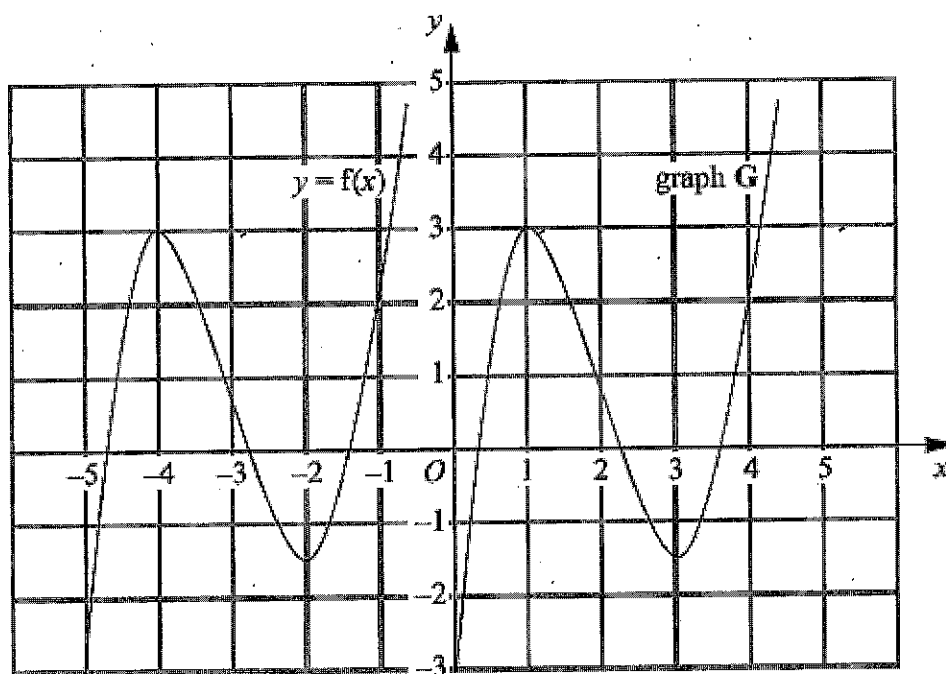
$$r = \frac{5+3p}{p-2}$$

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

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

(Total 4 marks)

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**.

moved 5 squares right

$$f(x-5)$$

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

(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  $y = f(-x)$ .

$f(-x)$  reflection in y axis

y coordinate stays same

x coordinate becomes +ve

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

(2)

(Total 3 marks)



18. A parachutist jumps out of a plane.

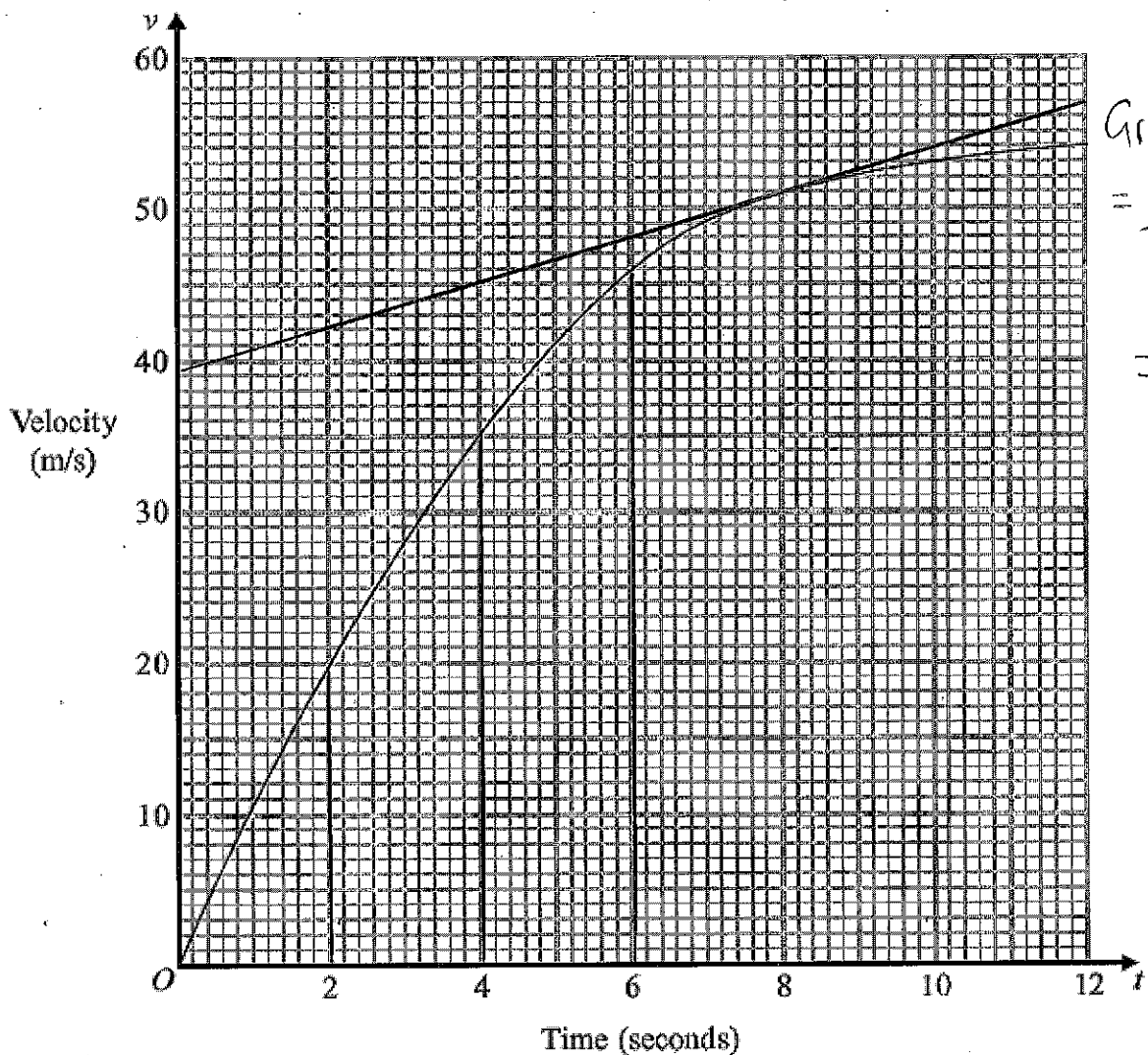
This graph shows information about the velocity,  $v$  m/s, of the parachutist  $t$  seconds after he jumped.

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

gradient of  
velocity graph

..... 1.5 ..... m/s<sup>2</sup>  
(3)

= acceleration. Tangent goes through  
(6, 48) and (8, 51)

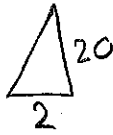


Gradient  
 $= \frac{dy}{dx}$   
 $= \frac{3}{2}$


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

Distance = area under velocity graph

Area triangle  
 $= \frac{20 \times 2}{2} = 20$

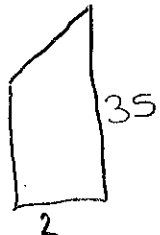


Area trapezium 2



$$= \frac{(35+46) \times 2}{2} = 81$$

Area trapezium 1



$$= \frac{(20+35) \times 2}{2} = 55$$

Total area =  $20 + 55 + 81$   
 $= 156$

..... m

(3)

(Total 6 marks)

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

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

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

$$S = K \times \frac{1}{t^3}$$

$$\frac{1}{2} = K \times \frac{1}{4^3}$$

$$\frac{1}{2} = K \times \frac{1}{64}$$

$$K = \frac{1}{2} \div \frac{1}{64} = 32$$

$$S = 32 \times \frac{1}{t^3}$$

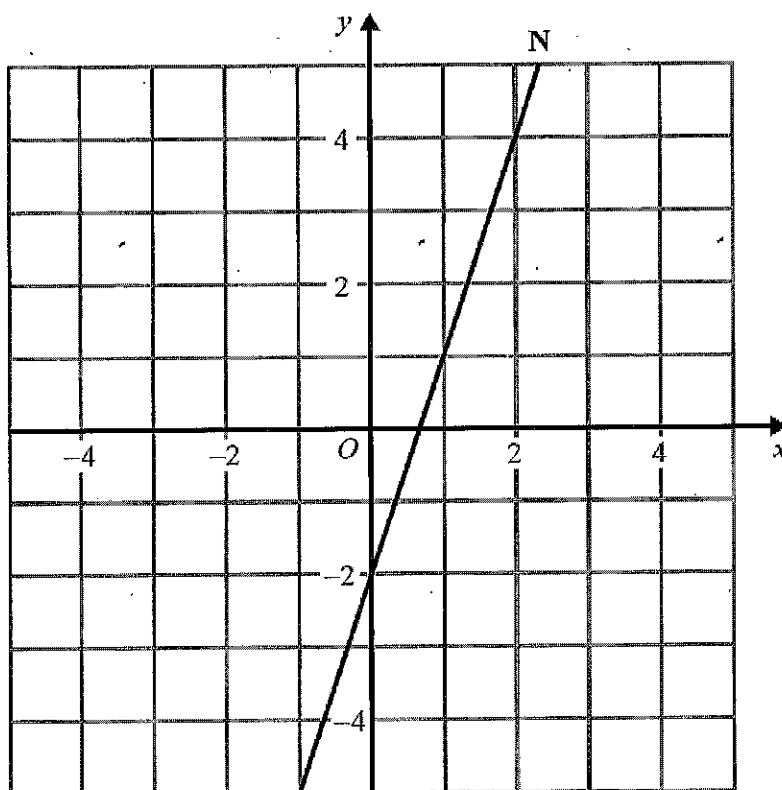
$$S = 32 \times \frac{1}{8^3}$$

$$S = \frac{1}{16}$$

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

(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).

line goes through (0, -2) & (1, 1)

$$\text{gradient} = \frac{3}{1} = 3$$

Perpendicular line has gradient  $-\frac{1}{3}$

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

Goes through (0, 1)

$$1 = -\frac{1}{3} \times 0 + C$$

$$C = 1$$

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

(Total 3 marks)

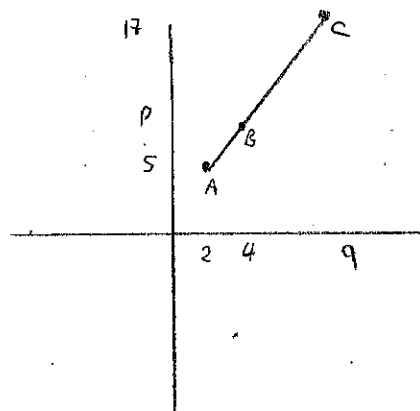
21. The points  $A$ ,  $B$  and  $C$  lie in order on a straight line.

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  $q$ .



$$AC = 4AB$$

$$\text{so } AB \times 3 = BC$$

$$\text{x axis } A \rightarrow B = 2 \text{ squares}$$

$$\text{so } B \rightarrow C = 2 \times 3 = 6 \text{ squares}$$

$$q = 4 + 6 = 10$$

y axis

$$A \rightarrow C = 12 \text{ squares}$$

$$A \rightarrow B = \frac{12}{4} = 3 \text{ squares}$$

$$p = 5 + 3 = 8$$

$$p = \dots 8 \dots$$

$$q = \dots 10 \dots$$

(Total 3 marks)

**TOTAL FOR PAPER IS 80 MARKS**