

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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**Pearson Edexcel Level 1/Level 2 GCSE (9–1)**

**Monday 3 June 2024**

Morning (Time: 1 hour 30 minutes)

Paper  
reference

**1MA1/2H**

**Mathematics**  
**PAPER 2 (Calculator)**  
**Higher Tier**



**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB or B pencil, eraser, calculator, Formulae Sheet (enclosed). Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **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.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a  $\pi$  button, take the value of  $\pi$  to be 3.142 unless the question instructs otherwise.

### 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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P 7 6 9 2 5 A 0 1 2 4

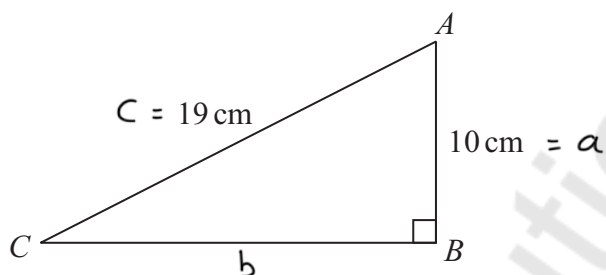
  
Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1  $ABC$  is a right-angled triangle.



Work out the length of  $CB$ .

Give your answer correct to 3 significant figures.

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 10^2 + b^2 &= 19^2 \\ 100 + b^2 &= 361 \\ -100 & \quad -100 \\ b^2 &= 261 \\ b &= \sqrt{261} \end{aligned}$$

16.2 ..... cm

(Total for Question 1 is 2 marks)

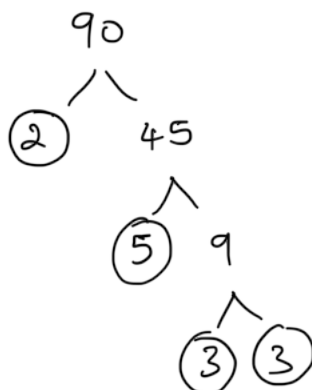
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2 (a) Write 90 as a product of its prime factors.



$$2 \times 3 \times 3 \times 5 \quad \text{OR} \quad \frac{2 \times 3^2 \times 5}{(2)}$$

$$A = 2^2 \times 3$$

$$B = 2 \times 3^2$$

(b) Write down the lowest common multiple (LCM) of  $A$  and  $B$ .

$$A = \boxed{2} \times 2 \times \boxed{3}$$

$$B = \boxed{2} \times 3 \times \boxed{3}$$

$$\text{L.C.M.} = 2 \times 2 \times 3 \times 3$$

$$\frac{36}{(1)}$$

(Total for Question 2 is 3 marks)



3 The number of hours,  $H$ , that some machines take to make 5000 bottles is given by

$$H = \frac{72}{n} \quad \text{where } n \text{ is the number of machines.}$$

On Monday, 6 machines made 5000 bottles.

On Tuesday, 9 machines made 5000 bottles.

The machines took more time to make the bottles on Monday than on Tuesday.

How much more time?

$$H_{\text{Mon}} = \frac{72}{6} = 12 \text{ hours}$$

$$H_{\text{Tue}} = \frac{72}{9} = 8 \text{ hours}$$

$$12 - 8 = 4 \text{ hrs}$$

..... 4 ..... hours

(Total for Question 3 is 2 marks)

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- 4 There are only red discs, blue discs and yellow discs in a bag.  
There are 24 yellow discs in the bag.

Mel is going to take at random a disc from the bag.

The probability that the disc will be yellow is 0.16

the number of red discs : the number of blue discs = 5 : 4

Work out the number of red discs in the bag.

$r = \text{N}^{\circ} \text{ of red discs}$

$b = \text{N}^{\circ} \text{ of blue discs}$

$y = \text{N}^{\circ} \text{ of yellow discs}$

$$y = 24$$

$$\frac{24}{r+b+24} = 0.16 = P(y)$$

$$r : b = 5 : 4$$

$$\frac{r}{5} = \frac{5}{4}$$

$$4r = 5b$$

$$\frac{4r}{5} = b$$

$$\frac{24}{r + \frac{4r}{5} + 24} = 0.16$$

$$\frac{24}{1.8r + 24} = 0.16$$

$$24 = 0.16(1.8r + 24) \quad \div 0.16$$

$$150 = 1.8r + 24$$

$$- 24 \quad - 24$$

$$126 = 1.8r \quad \div 1.8$$

$$\underline{\underline{70 = r}}$$

70

(Total for Question 4 is 4 marks)



5 (a) Complete the table of values for  $y = x^2 - x$

$$y = (1)^2 - (1)$$

$$y = 1 - 1$$

$$y = 0$$

$$y = (3)^2 - (3)$$

$$y = 9 - 3$$

$$y = 6$$

(2)

$$y = (-1)^2 - (-1)$$

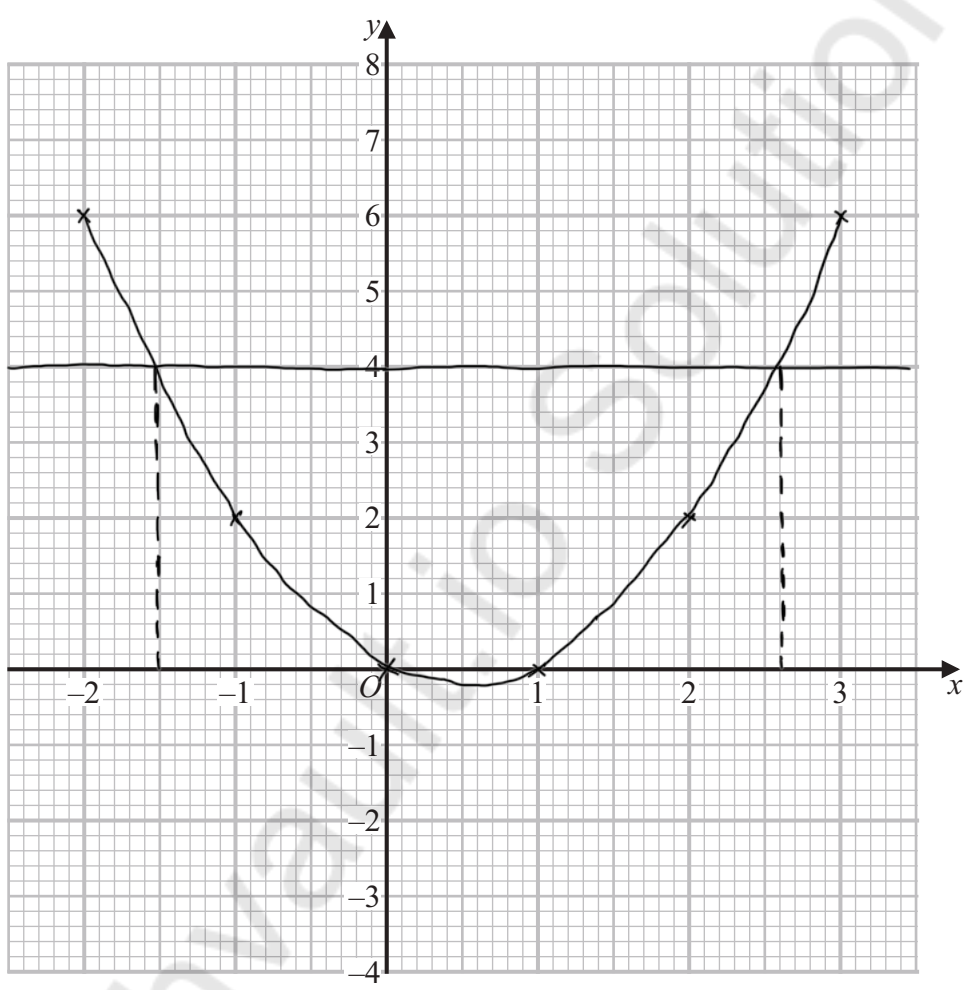
$$y = 1 + 1$$

$$y = 2$$

x	-2	-1	0	1	2	3
y	6	2	0	0	2	6

(b) On the grid, draw the graph of  $y = x^2 - x$  for values of x from -2 to 3

- 2, 6
- 1, 2
- 0, 0
- 1, 0
- 2, 2
- 3, 6



(2)

(c) Use your graph to find estimates for the solutions of the equation  $x^2 - x = 4$

$$y = x^2 - x$$

$$x^2 - x = y$$

$$x^2 - x = 4$$

-1.5 and 2.6

(2)

$$y = 4$$

(Total for Question 5 is 6 marks)



6 Andy, Luke and Tina share some sweets in the ratio 1 : 6 : 14

Tina gives  $\frac{3}{7}$  of her sweets to Andy.

Tina then gives  $12\frac{1}{2}\%$  of the rest of her sweets to Luke.

Tina says,

“Now all three of us have the same number of sweets.”

Is Tina correct?

You must show how you get your answer.

Let total Sweets =  $N$

$$A = \frac{1}{1+6+14} \times N = \frac{1}{21} N$$

$$L = \frac{6}{21} N$$

$$T = \frac{14}{21} N$$

$$T = \frac{14}{21} N - \left( \frac{3}{7} \times \frac{14}{21} N \right)$$

$$A = \frac{1}{21} N + \left( \frac{3}{7} \times \frac{14}{21} N \right)$$

$$T = \frac{14}{21} N - \frac{6}{21} N = \frac{8}{21} N$$

$$A = \frac{1}{21} N + \frac{6}{21} N = \frac{7}{21} N$$

$$T = \frac{8}{21} N - \left( \frac{12.5}{100} \times \frac{8}{21} N \right) = \frac{7}{21} N$$

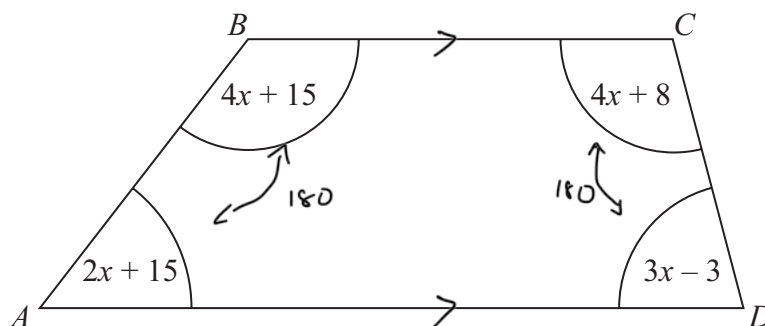
$$L = \frac{6}{21} N + \left( \frac{12.5}{100} \times \frac{8}{21} N \right) = \frac{7}{21} N$$

Yes Tina is correct  
Everyone gets  $\frac{7}{21}$  of the  
total number of sweets

(Total for Question 6 is 4 marks)



7  $ABCD$  is a quadrilateral.



All angles are measured in degrees.

Show that  $ABCD$  is a trapezium.

$$4x + 15 + 2x + 15 + 4x + 8 + 3x - 3 = 360$$

Sum of angles in a quadrilateral is  $360^\circ$ .

$$13x + 35 = 360$$

$$-35 \quad -35$$

$$\frac{13x}{13} = \frac{325}{13}$$

$$x = 25$$

$$\hat{B} = 4x + 15 = 4(25) + 15 = 115^\circ$$

$$\hat{A} = 2x + 15 = 2(25) + 15 = 65^\circ$$

Sum to  $180^\circ$  thus they are co-interior angles

$$\hat{C} = 4x + 8 = 4(25) + 8 = 108^\circ$$

$$\hat{D} = 3x - 3 = 3(25) - 3 = 72^\circ$$

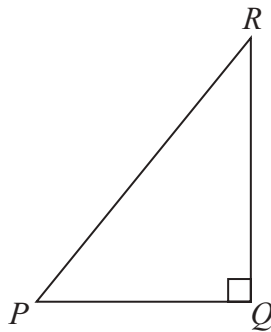
Sum to  $180^\circ$  thus they are co-interior angles

If these angles are co-interior,  $BC$  and  $AD$  are parallel lines which would make shape  $ABCD$  a trapezium.

(Total for Question 7 is 4 marks)



- 8 A playground is in the shape of a right-angled triangle.



Dan makes a scale drawing of the playground.

He uses a scale of 1 cm represents 5 m

The area of the playground on the scale drawing is  $28 \text{ cm}^2$

The real length of  $QR$  is 40 m

Work out the real length of  $PQ$ .

Image : Real

1 cm : 5 m  $\rightarrow$  Ratio of length

1 cm<sup>2</sup> : 25 m<sup>2</sup> Ratio of Area

$$\begin{array}{l} \times 28 \left\{ \begin{array}{l} 1 \text{ cm}^2 : 25 \text{ m}^2 \\ 28 \text{ cm}^2 : x \end{array} \right. \end{array}$$

$x = 700 \text{ m}^2$  (Real Area of playground)

$$A_T = \frac{b \times h}{2} = \frac{PQ \times QR}{2}$$

$$\begin{array}{l} 700 = \frac{PQ \times 40}{2} \\ \times 2 \end{array}$$

$$\begin{array}{l} 1400 = 40 PQ \\ \div 40 \\ 35 = PQ \end{array}$$

35 ..... m

(Total for Question 8 is 3 marks)



- 9 A number  $N$  is rounded to 2 significant figures.  
The result is 7.3

(a) Write down the least possible value of  $N$ .

$$\begin{array}{ccc}
 7.2 & & 7.3 & & 7.4 \\
 \vdots & & \vdots & & \\
 7.25 & & 7.35 & & \\
 & & & & 7.25 \\
 & & & & (1)
 \end{array}$$

Leila says,

“The value of  $N$  cannot be greater than 7.349 because 7.350 would round up to 7.4”

(b) Is Leila correct?

You must give a reason for your answer.

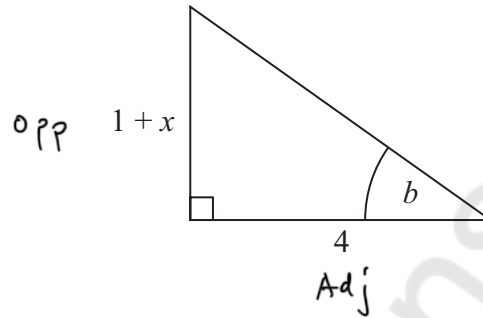
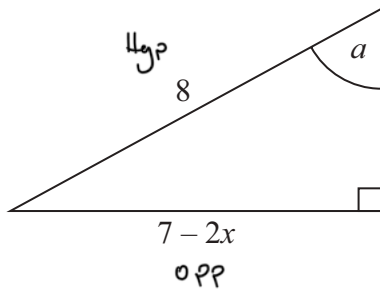
No Leila is incorrect because 7.3499 is greater than 7.349 and it still rounds down to 7.3  
The greatest value of  $N$  is actually 7.349

(1)

(Total for Question 9 is 2 marks)



10 The diagram shows two right-angled triangles.



All lengths are measured in centimetres.

Given that

$$\sin a = \tan b$$

work out the value of  $x$ .

$$\sin a = \frac{7-2x}{8}$$

$$\tan b = \frac{1+x}{4}$$

$$\times 8 \quad \frac{7-2x}{8} = \frac{1+x}{4} \quad \times 8$$

$$7-2x = 2+2x$$

$$7-2 = 2x+2x$$

$$5 = 4x \quad \div 4$$

$$\frac{5}{4} = x$$

$$x = \frac{5}{4} \text{ OR } 1.25$$

(Total for Question 10 is 3 marks)



11 The frequency table gives information about the weights of 60 parcels.

Weight ( $w$ kg)	Frequency
$0 < w \leq 2$	7
$2 < w \leq 4$	21
$4 < w \leq 6$	15
$6 < w \leq 8$	11
$8 < w \leq 10$	6

(a) Complete the cumulative frequency table.

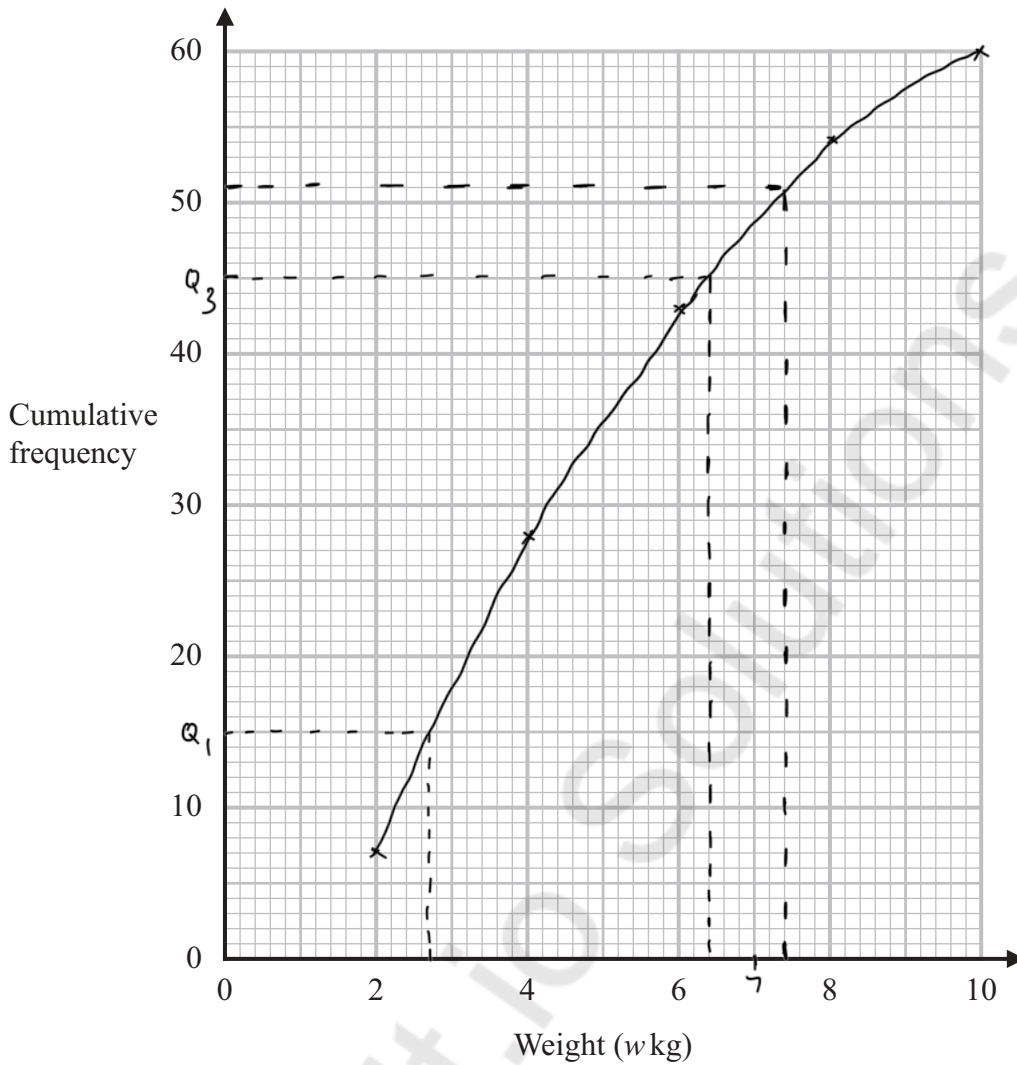
Weight ( $w$ kg)	Cumulative frequency
$0 < w \leq 2$	7
$0 < w \leq 4$	28
$0 < w \leq 6$	43
$0 < w \leq 8$	54
$0 < w \leq 10$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for your table.

(2)





- (c) Use your graph to find an estimate for the interquartile range.

$$Q_3 - Q_1 = 6.4 - 2.7 = 3.7$$

$$Q_3 = \frac{3}{4} \times 60 = 45^{\text{th}} : 6.4 \text{ kg}$$

$$Q_1 = \frac{1}{4} \times 60 = 15^{\text{th}} : 2.7 \text{ kg}$$

..... 3.7 ..... kg  
(2)

- (d) Use your graph to find an estimate for the number of these parcels with a weight greater than 7.4 kg.

$$7.4 \text{ kg} \Rightarrow 51^{\text{st}} \text{ position}$$

$$7.4 < \Rightarrow 9 \text{ parcels}$$

..... 9 .....  
(2)

(Total for Question 11 is 7 marks)



12  $f$  is inversely proportional to  $d^2$

$$f = 3.5 \text{ when } d = 8$$

(a) Find an equation for  $f$  in terms of  $d$ .

$$f \propto \frac{1}{d^2}$$

$$f = \frac{k}{d^2}$$

$$k = f d^2$$

$$k = 3.5 \times (8)^2$$

$$k = 224$$

$$f = \frac{224}{d^2}$$

(2)

(b) Find the positive value of  $d$  when  $f = 10$

Give your answer correct to 3 significant figures.

$$10 = \frac{224}{d^2}$$

$$10d^2 = 224$$

$$d^2 = 22.4$$

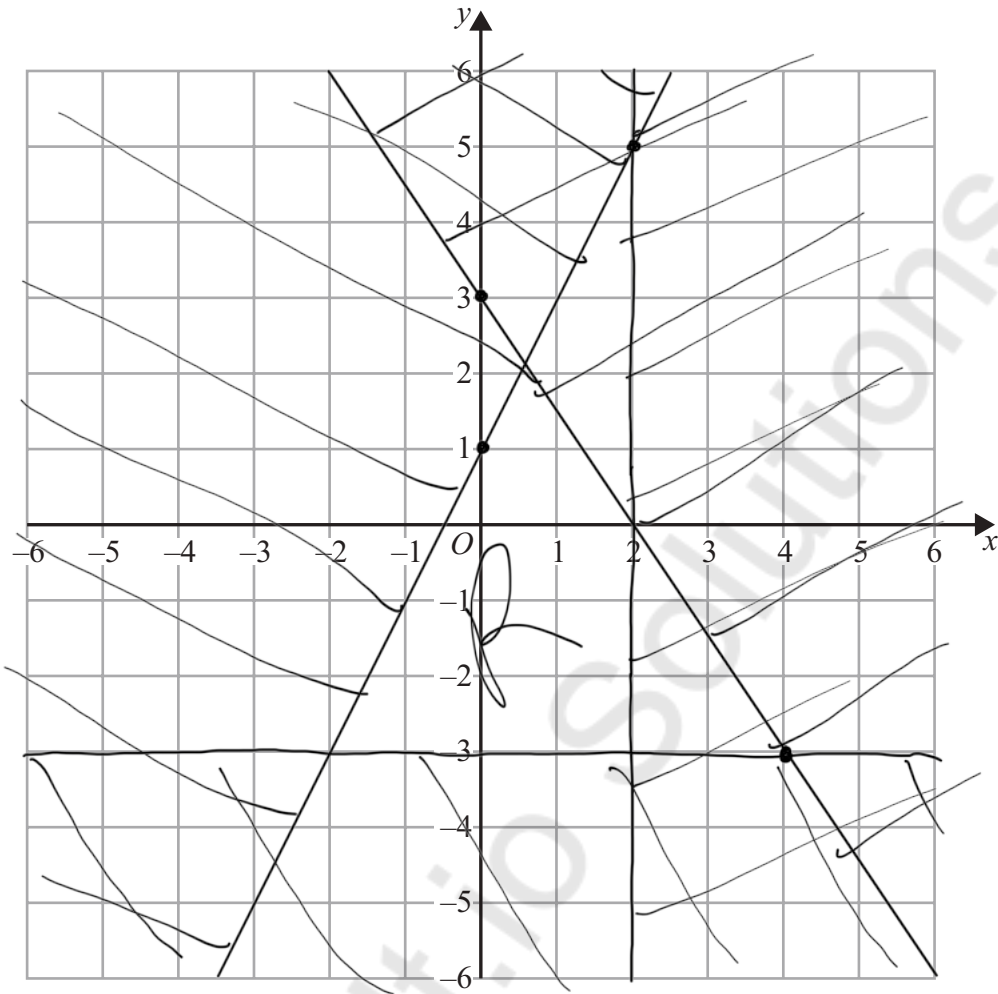
$$d = \sqrt{22.4}$$

$$d = 4.73$$

(2)

(Total for Question 12 is 4 marks)





On the grid, shade the region **R** that satisfies all the following inequalities.

$$x \leq 2$$

$$y \geq -3$$

$$y \leq 2x + 1$$

$$3x + 2y \leq 6$$

Label the region **R**.

$$(0, 1)$$

$$(2, 5)$$

$$2y \leq -3x + 6$$

$$y \leq -\frac{3x}{2} + 3$$

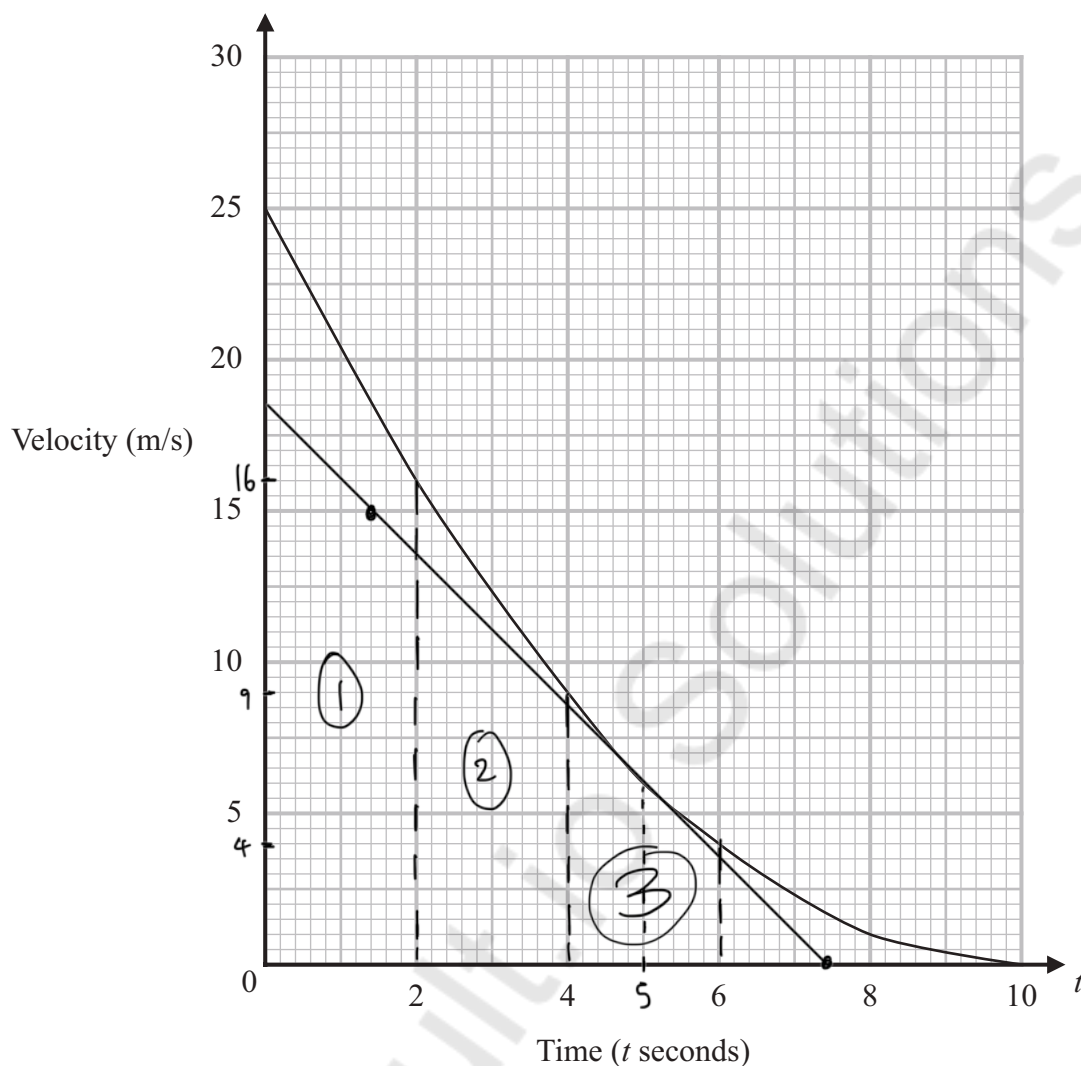
$$(0, 3)$$

$$(4, -3)$$

(Total for Question 13 is 3 marks)



- 14 The graph shows the velocity of a car, in metres per second,  $t$  seconds after it starts to slow down.



- (a) Calculate an estimate for the acceleration of the car when  $t = 5$   
You must show all your working.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$a = \frac{15 - 0}{1.4 - 7.4} = -\frac{5}{2} \text{ m s}^{-2}$$

$$\underline{\underline{-2.5}} \text{ m/s}^2 \quad (3)$$



- (b) Work out an estimate for the distance the car travels in the first 6 seconds after it starts to slow down.

Use 3 strips of equal width.

$$\textcircled{1} : \frac{(25+16) \times 2}{2} = 41 \text{ m}$$

$$\textcircled{2} : \frac{(9+16) \times 2}{2} = 25 \text{ m}$$

$$\textcircled{3} : \frac{(4+9) \times 2}{2} = 13 \text{ m}$$

Total distance  
in first 6s

$$= 41 + 25 + 13$$

79

m

(3)

(Total for Question 14 is 6 marks)

- 15 Given that  $a$  is a prime number, rationalise the denominator of  $\frac{1}{\sqrt{a}+1}$

Give your answer in its simplest form.

$$\frac{1}{\sqrt{a}+1} \times \frac{\sqrt{a}-1}{\sqrt{a}-1}$$

$$\frac{\sqrt{a}-1}{a-1}$$

$$\frac{\sqrt{a}-1}{a-1}$$

(Total for Question 15 is 2 marks)



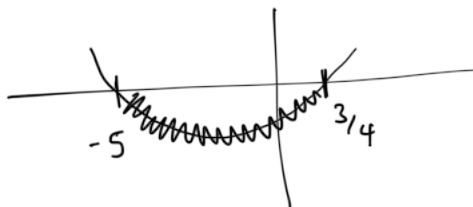
16 Solve  $(4x - 3)(x + 5) < 0$

$$4x - 3 = 0$$

$$x + 5 = 0$$

$$x = \frac{3}{4}$$

$$x = -5$$



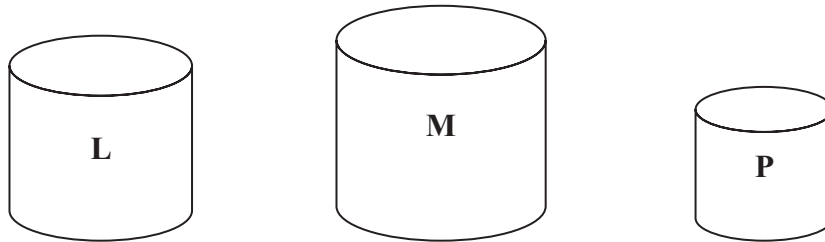
$$-5 < x < \frac{3}{4}$$

$$-5 < x < \frac{3}{4}$$

(Total for Question 16 is 2 marks)



17 L, M and P are three similar solid cylinders made from the same material.



L has a mass of 64 g  
M has a mass of 125 g

M has a total surface area of  $144 \text{ cm}^2$   
P has a total surface area of  $16 \text{ cm}^2$

Work out

height of cylinder L : height of cylinder M : height of cylinder P

$$\text{Density} = \frac{M}{V}$$

$$V = \frac{M}{D}$$

$$\frac{25}{D^{2/3}} : \frac{M_P^{2/3}}{D^{2/3}} = 144 : 16$$

$$\frac{25}{D^{2/3}} = \frac{144}{16}$$

$$\frac{M_P^{2/3}}{D^{2/3}} = \frac{144}{16}$$

$$\frac{25}{M_P^{2/3}} = \frac{144}{16}$$

$$M_P = \left( \frac{25 \times 16}{144} \right)^{3/2}$$

$$M_P = \frac{125}{27}$$

$$(64)^{1/3} : (125)^{1/3} : \left( \frac{125}{27} \right)^{1/3}$$

$$4 : 5 : \frac{5}{3}$$

$$V_L : V_M : V_P$$

$$\frac{64}{D} : \frac{125}{D} : \frac{M_P}{D}$$

$$\left( \frac{64}{D} \right)^{1/3} : \left( \frac{125}{D} \right)^{1/3} : \left( \frac{M_P}{D} \right)^{1/3} \rightarrow \text{Ratio of length}$$

$$\frac{4}{D^{1/3}} : \frac{5}{D^{1/3}} : \frac{M_P^{1/3}}{D^{1/3}} \rightarrow \text{Ratio of length}$$

$$h_L : h_M : h_P$$

$$\frac{16}{D^{2/3}} : \frac{25}{D^{2/3}} : \frac{M_P^{2/3}}{D^{2/3}} \rightarrow \text{Ratio of Area}$$

$$A_L : 144 : 16$$

$$4 : 5 : \frac{5}{3}$$

$$12 : 15 : 5$$

(Total for Question 17 is 4 marks)



18 There are only 4 red counters, 3 yellow counters and 1 green counter in a bag.

Tony takes at random three counters from the bag.

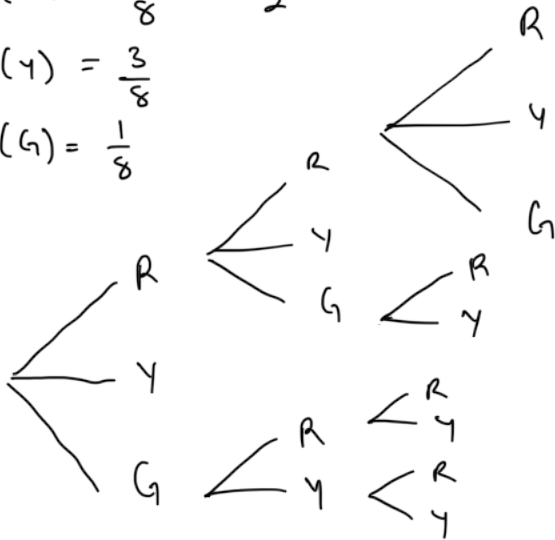
Work out the probability that there are now more yellow counters than red counters in the bag.

You must show all your working.

$$P(R) = \frac{4}{8} = \frac{1}{2}$$

$$P(Y) = \frac{3}{8}$$

$$P(G) = \frac{1}{8}$$



$$R R R \Rightarrow \frac{1}{2} \times \frac{3}{7} \times \frac{2}{6} = \frac{6}{84}$$

$$R R G \Rightarrow \frac{1}{2} \times \frac{3}{7} \times \frac{1}{6} = \frac{3}{84}$$

$$R G R \Rightarrow \frac{1}{2} \times \frac{1}{7} \times \frac{3}{6} = \frac{3}{84}$$

$$G R R \Rightarrow \frac{1}{8} \times \frac{4}{7} \times \frac{3}{6} = \frac{12}{336}$$

$$\frac{6}{84} + \frac{3}{84} + \frac{3}{84} + \frac{12}{336} = \frac{5}{28}$$

$$\frac{5}{28}$$

(Total for Question 18 is 5 marks)

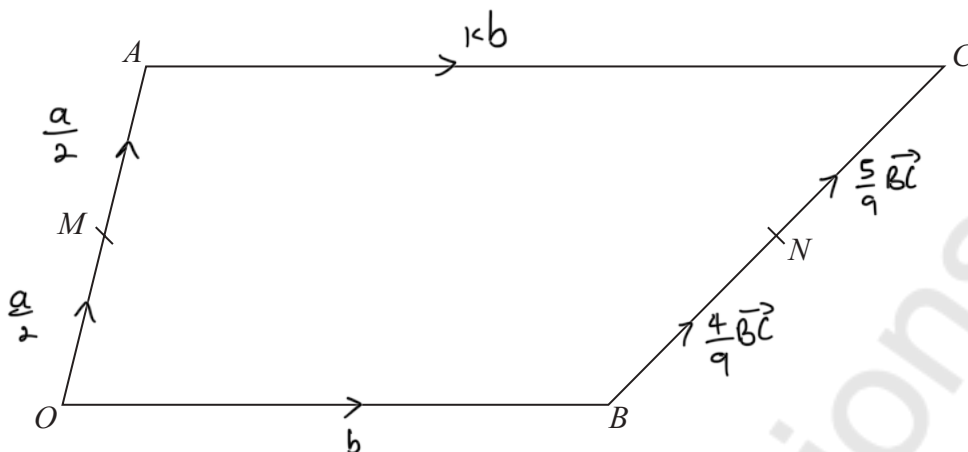
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19 The diagram shows quadrilateral  $OACB$ .



$M$  is the midpoint of  $OA$ .

$N$  is the point on  $BC$  such that  $BN:NC = 4:5$

$\vec{OA} = \mathbf{a}$     $\vec{OB} = \mathbf{b}$     $\vec{AC} = k\mathbf{b}$  where  $k$  is a positive integer.

(a) Express  $\vec{MN}$  in terms of  $k$ ,  $\mathbf{a}$  and  $\mathbf{b}$ .

Give your answer in its simplest form.

$$\vec{MN} = \vec{MA} + \vec{AC} + \vec{CN}$$

$$\vec{MN} = \frac{\mathbf{a}}{2} + k\mathbf{b} - \frac{5}{9}\vec{BC}$$

$$\vec{MN} = \frac{\mathbf{a}}{2} + k\mathbf{b} - \frac{5}{9}(\mathbf{a} + k\mathbf{b} - \mathbf{b})$$

$$\vec{MN} = \frac{\mathbf{a}}{2} + k\mathbf{b} - \frac{5}{9}\mathbf{a} - \frac{5}{9}k\mathbf{b} + \frac{5}{9}\mathbf{b}$$

$$\vec{MN} = -\frac{1}{18}\mathbf{a} + \frac{4}{9}k\mathbf{b} + \frac{5}{9}\mathbf{b}$$

$$\vec{BC} = \vec{BO} + \vec{OA} + \vec{AC}$$

$$\vec{BC} = -\mathbf{b} + \mathbf{a} + k\mathbf{b}$$

$$\vec{BC} = \mathbf{a} + k\mathbf{b} - \mathbf{b}$$

(4)

(b) Is  $MN$  parallel to  $OB$ ?

Give a reason for your answer.

No because  $-\frac{1}{18}\mathbf{a} + \frac{4}{9}k\mathbf{b} + \frac{5}{9}\mathbf{b}$  is not a multiple of  $\mathbf{b}$ .

(1)

(Total for Question 19 is 5 marks)



20 The curve C has equation  $y = 2x^2 - 12x + 7$

Find the coordinates of the turning point on C.

$$y = 2[x^2 - 6x] + 7$$

$$y = 2[(x-3)^2 - 9] + 7$$

$$y = 2(x-3)^2 - 18 + 7$$

$$y = 2(x-3)^2 - 11$$

( 3 , - 1 1 )

(Total for Question 20 is 3 marks)

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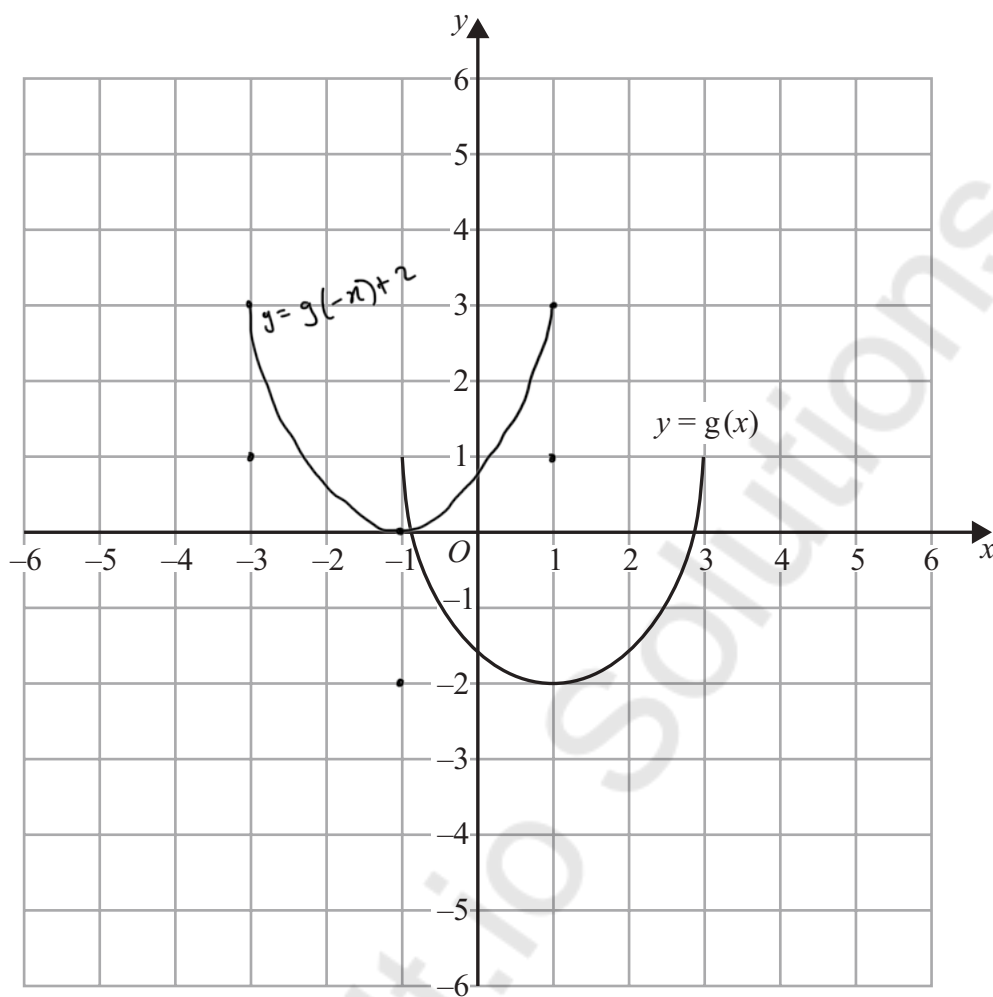


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21 The graph of  $y = g(x)$  is shown on the grid.



On the grid, draw the graph of  $y = g(-x) + 2$

$\uparrow +2$  vertical

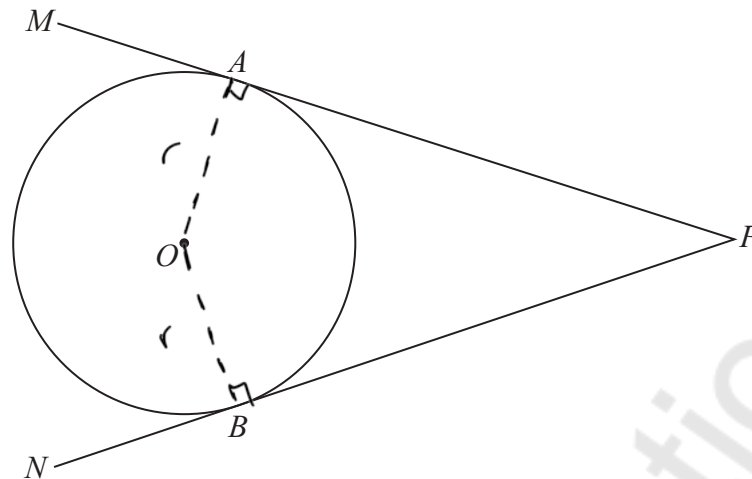
(Total for Question 21 is 2 marks)

Turn over for Question 22



P 7 6 9 2 5 A 0 2 3 2 4

22  $A$  and  $B$  are points on a circle, centre  $O$ .



$MAP$  and  $NBP$  are tangents to the circle.

Prove that  $AP = BP$

$$\hat{PAO} = \hat{PBO} = 90^\circ \quad [\text{Tangent and radius meet at } 90^\circ]$$

$OA$  and  $OB$  are radii,  $OA = OB = r$

$OP$  is a side on  $\triangle OAP$  and  $\triangle OBP$ .  $OP$  is a common side

$$OP^2 = r^2 + AP^2$$

$$OP^2 = r^2 + BP^2$$

$$AP^2 = OP^2 - r^2$$

$$BP^2 = OP^2 - r^2$$

$$AP = \sqrt{OP^2 - r^2}$$

$$BP = \sqrt{OP^2 - r^2}$$

$$\underline{AP = BP}$$

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

