**Please check the examination details below before entering your candidate information**

| Candidate surname | Other names |
|---|---|
| | |

Centre Number

Candidate Number

# 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.

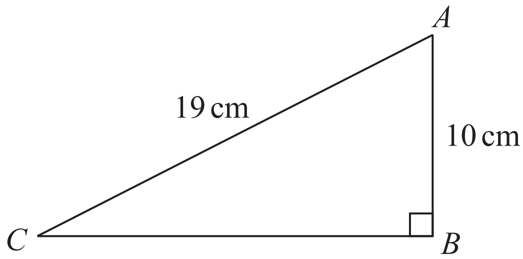
***Turn over***

**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.

By using Pythagoras Theorem :

$BC^2 = 19^2 - 10^2$ 1

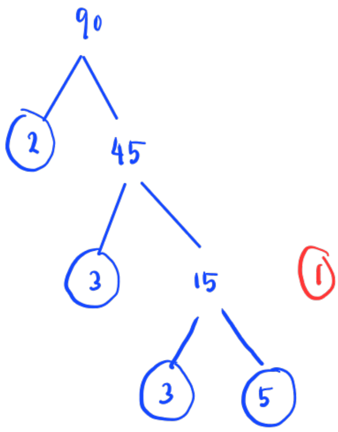
$BC = \sqrt{19^2 - 10^2}$

$= 16.2$ (3 s.f.) 1

16.2 cm

**(Total for Question 1 is 2 marks)**

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




(1)

$2 \times 3 \times 3 \times 5 = 90$

(1)

$2 \times 3 \times 3 \times 5$ ..............................

**(2)**

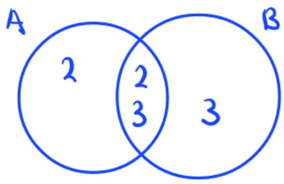
$A = 2^2 \times 3$

$B = 2 \times 3^2$

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

$A = 2^2 \times 3$

$B = 2 \times 3^2$




LCM of A and B is the product of all numbers in the Venn diagram : $2 \times 2 \times 3 \times 3 = 36$

36 (1) ..............................

**(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?

Monday : $H = \frac{72}{6} = 12$ hours (1)

Tuesday : $H = \frac{72}{9} = 8$ hours

12 hours − 8 hours = 4 hours (1)

4 hours

**(Total for Question 3 is 2 marks)**

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P 7 6 9 2 5 A 0 4 2 4

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

**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.

Finding total number of disc in the bag :

Total number of discs $\times$ 0.19 = 24

$= \frac{24}{0.19} = 150$ (1)

Finding total number of red + blue disc :

$150 - 24 = 126$

Number of red discs : $\frac{5}{5+4} \times 126$ (1)

$= \frac{5}{9} \times 126$ (1)

$= 70$ (1)

70 ..........................................

**(Total for Question 4 is 4 marks)**



P 7 6 9 2 5 A 0 5 2 4

*Turn over*

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

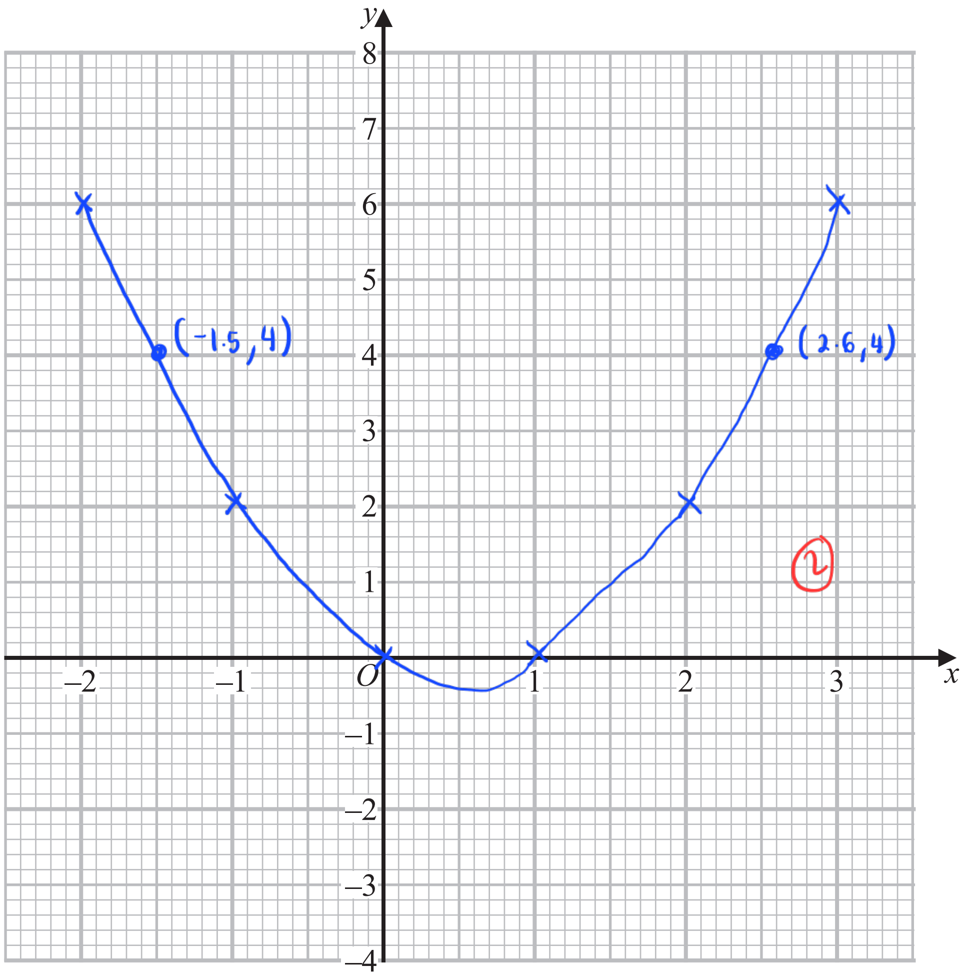
When $x = -1$ : $y = (-1)^2 - (-1) = 2$
$x = 1$ : $y = (1)^2 - 1 = 0$
$x = 3$ : $y = (3)^2 - 3 = 6$

| $x$ | –2 | –1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $y$ | 6 | 2 | 0 | 0 | 2 | 6 |

2

**(2)**

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




**(2)**

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

Find the x-coordinate when $y = 4$

-1.5 , 2.6 ..................................................... 2

**(2)**

**(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.

Initially : Andy : Luke : Tina

1 : 6 : 14

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

$\frac{3}{\cancel{7}_1} \times \cancel{14}^2 = 6$ (1) : Andy now has = 1 + 6 = 7 (1)

Tina now has = 14 − 6 = 8

Now : Andy : Luke : Tina

7 : 6 : 8

when Tina then gives 12.5% of the rest of her sweets to Luke :

$\frac{12.5}{100} \times 8 = 1$ : Tina now has = 8 − 1 = 7 (1)

Luke now has = 6 + 1 = 7

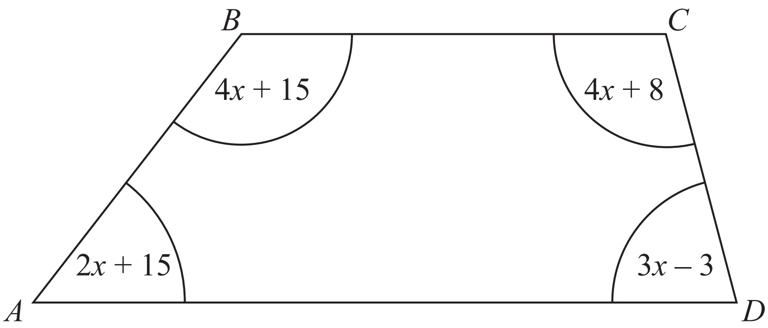
Now : Andy : Luke : Tina

7 : 7 : 7

Yes. Andy, Luke, and Tina now has the same amount of sweets in the ratio of 7 : 7 : 7. (1)

**(Total for Question 6 is 4 marks)**

**7** *ABCD* is a quadrilateral.




All angles are measured in degrees.

Show that *ABCD* is a trapezium.

Total angle = 360°

$(2x+15)+(4x+15)+(4x+8)+(3x-3) = 360°$ 1

$13x + 35 = 360°$

$13x = 325°$ 1

$x = 25°$ 1

∴ C+D should be equal to 180° since co-interior angles sum up to 180°

$4x+8+3x-3 = 4(25)+8+3(25)-3$

$= 100+8+75-3$

$= 180°$ 1 (shown)

∴ since C+D = 180°, BC and AD are parallel which is why ABCD is a trapezium.

**(Total for Question 7 is 4 marks)**

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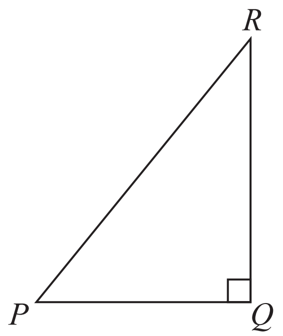
P 7 6 9 2 5 A 0 8 2 4

**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 $PQ$.

Scale 1 cm : 5 m

$(1\text{ cm})^2 = (5\text{ m})^2$

$1\text{ cm}^2 = 25\text{ m}^2$

Area of the playground (real)

$28\text{ cm}^2 \times \frac{25\text{ m}^2}{1\text{ cm}^2} = 700\text{ m}^2$ (1)

Length PQ : $\frac{1}{2} \times QR \times PQ = 700\text{ m}^2$ (1)

$PQ = \frac{2 \times 700}{40} = 35\text{ m}$ (1)

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 $N$.

$7.25 \leq N < 7.35$

7.25 1

(1)

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. Because there are numbers between 7.349 and 7.350. 1

(1)

**(Total for Question 9 is 2 marks)**

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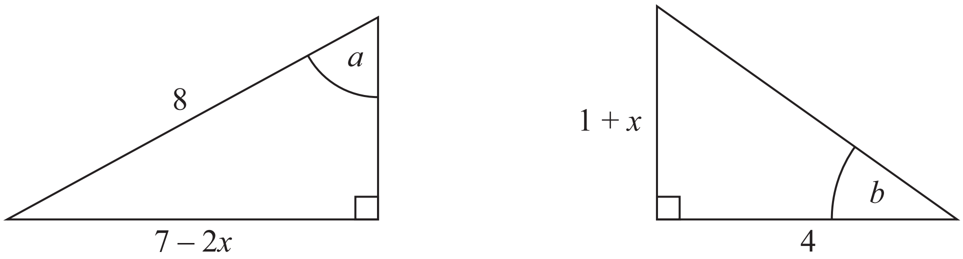
P 7 6 9 2 5 A 0 1 0 2 4

**10** The diagram shows two right-angled triangles.




All lengths are measured in centimetres.

Given that

$\sin = \frac{\text{opposite}}{\text{hypothenus}}$ $\tan = \frac{\text{opposite}}{\text{adjacent}}$

$$\sin a = \tan b$$

work out the value of $x$.

$\sin a = \frac{7-2x}{8}$ 1

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

$\sin a = \tan b$ : $\frac{7-2x}{8} \times 8 = \frac{1+x}{4} \times 8$ 1

$7-2x = (1+x) \times 2$

$7-2x = 2+2x$

$4x = 5$

$x = \frac{5}{4}$ / 1.25 1

$x =$ 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** |
|---|---|
| $0 < w \leqslant 2$ | 7 |
| $2 < w \leqslant 4$ | 21 |
| $4 < w \leqslant 6$ | 15 |
| $6 < w \leqslant 8$ | 11 |
| $8 < w \leqslant 10$ | 6 |

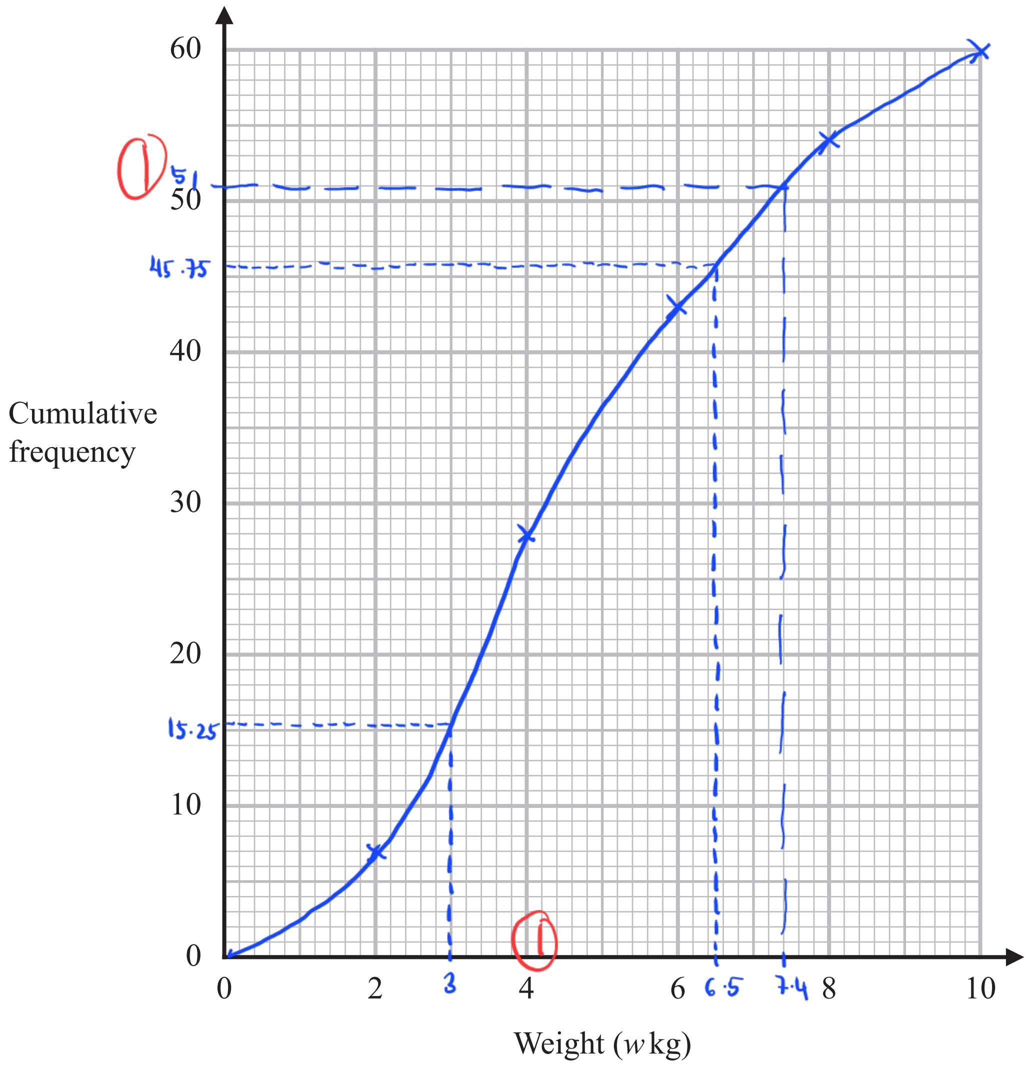
(a) Complete the cumulative frequency table.

| **Weight ($w$ kg)** | **Cumulative frequency** |
|---|---|
| $0 < w \leqslant 2$ | 7 |
| $0 < w \leqslant 4$ | 28 |
| $0 < w \leqslant 6$ | 43 |
| $0 < w \leqslant 8$ | 54 |
| $0 < w \leqslant 10$ | 60 1 |

**(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.

lower quartile : $\frac{(n+1)}{4} = \frac{60+1}{4} = 15.25$ (3 kg)

upper quartile : $\frac{3(n+1)}{4} = 3(15.25) = 45.75$ (6.5 kg)

Interquartile range : 6.5 − 3
= 3.5

3.5 (1) kg
**(2)**

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

from graph : when weight 7.4 kg, c.frequency = 51

60 − 51 = 9 (1)

9
**(2)**

**(Total for Question 11 is 7 marks)**

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

$f = 3.5$ when $d = 8$

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

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

$f = k \times \frac{1}{d^2}$

when $f = 3.5$ and $d = 8$ : $3.5 = k \times \frac{1}{8^2}$ 1

$k = 3.5 \times 64$

$= 224$

$\therefore f = \frac{224}{d^2}$ 1

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

**(2)**

(b) Find the positive value of $d$ when $f = 10$
Give your answer correct to 3 significant figures.

when $f = 10$, $10 = \frac{224}{d^2}$ 1

$d^2 = \frac{224}{10} = 22.4$

$d = \pm\sqrt{22.4}$

$= \pm 4.73$. since only positive value, $d = 4.73$ 1

$d =$ 4.73

**(2)**

**(Total for Question 12 is 4 marks)**

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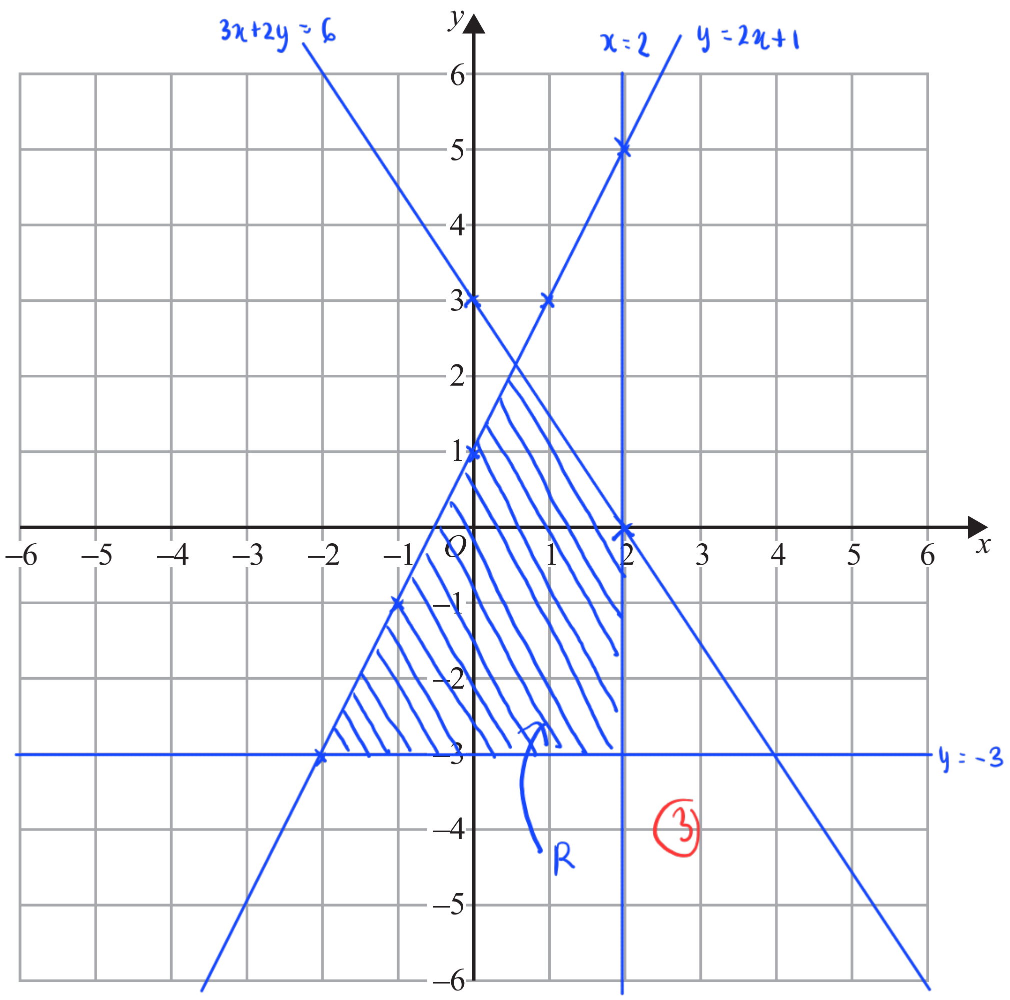
P 7 6 9 2 5 A 0 1 4 2 4

**13**



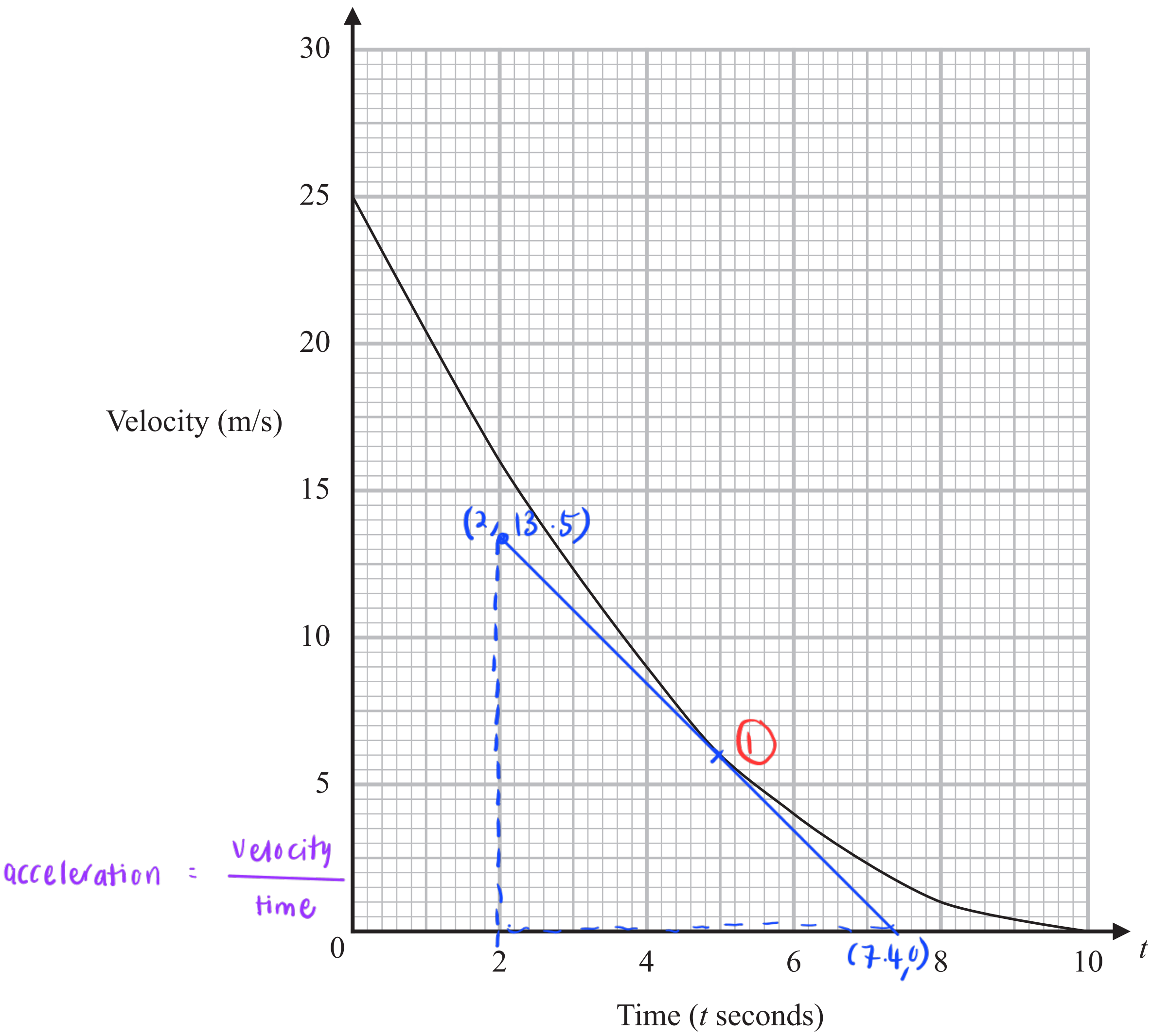

On the grid, shade the region **R** that satisfies all the following inequalities.

$x \leqslant 2 \qquad y \geqslant -3 \qquad y \leqslant 2x + 1 \qquad 3x + 2y \leqslant 6$

Label the region **R**.

**(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.

gradient of tangent when t = 5,

$$m = \frac{13.5 - 0}{2 - 7} = \frac{13.5}{-5} \quad 1$$

$$= -2.7 \quad 1$$

$-2.7$ ........................................ m/s$^2$

**(3)**

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P 7 6 9 2 5 A 0 1 6 2 4

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(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.

distance = area under the graph

from $t=0$ to $t=2$ : $\frac{1}{2} \times 2 \times (25+16) = 41$ m 1

from $t=2$ to $t=4$ : $\frac{1}{2} \times 2 \times (16+9) = 25$ m

from $t=4$ to $t=6$ : $\frac{1}{2} \times 2 \times (9+4) = 13$ m

1 1

Total distance travelled = $(41+25+13) = 79$ m

79 m
**(3)**

**(Total for Question 14 is 6 marks)**

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

Give your answer in its simplest form.

Rationalising denominator :

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

1

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

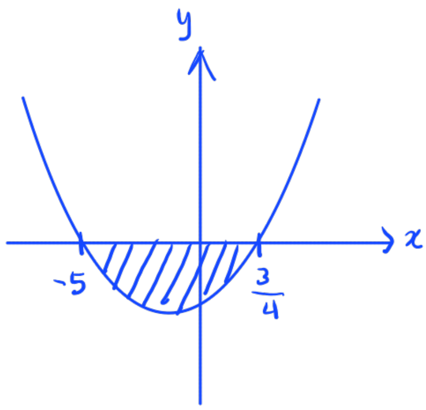
**(Total for Question 15 is 2 marks)**

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

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

$x = \frac{3}{4}$, $x = -5$ (1)

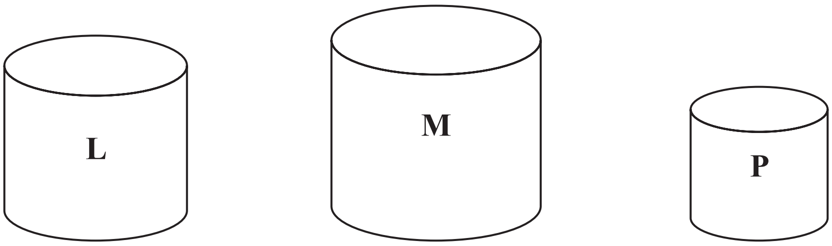
$-5 < x < \frac{3}{4}$ (1)




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

**(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 cm$^2$
**P** has a total surface area of 16 cm$^2$

since ratio of volumes L:M is 64:125,
the ratio of height is the cube root of each

Work out

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

Ratio of height L : M
= 4 : 5 (1)

Height L = $\sqrt[3]{64}$ = 4 cm
Height M = $\sqrt[3]{125}$ = 5 cm

Ratio of height M : P
(÷4) 12 : 4 (÷4)
3 : 1 (1)

Height M = $\sqrt{144}$ = 12 cm
Height P = $\sqrt{16}$ = 4 cm

since ratio of area M:P is 144 : 16,
the ratio of height is the square root of each

Ratio of height L : M : P
3 x 4 : 5 x 3 (1)
5 x 3 : 1 x 5

12 : 15 : 5 (1)

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.

Total counters : $4 + 3 + 1 = 8$

Finding probabilities of having more yellow than red in the bag :

Scenario 1 : Tony takes green, red and red.

$P(1) = \frac{1}{8} \times \frac{4}{7} \times \frac{3}{6} = \frac{1}{28}$ (1)

Scenario 2 : Tony takes red, green and red.

$P(2) = \frac{4}{8} \times \frac{1}{7} \times \frac{3}{6} = \frac{1}{28}$ (1)

Scenario 3 : Tony takes red, red and green.

$P(3) = \frac{4}{8} \times \frac{3}{7} \times \frac{1}{6} = \frac{1}{28}$

Scenario 4 : Tony takes all reds.

$P(4) = \frac{4}{8} \times \frac{3}{7} \times \frac{2}{6} = \frac{1}{14}$ (1)

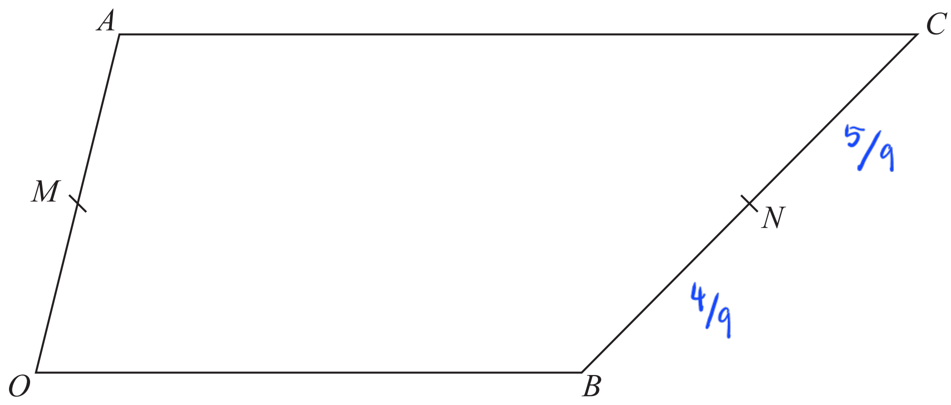
Probabilities of all scenarios combined : $\frac{1}{28} + \frac{1}{28} + \frac{1}{28} + \frac{1}{14}$ (1)

$= \frac{5}{28}$ (1)

$\frac{5}{28}$

**(Total for Question 18 is 5 marks)**

**19** The diagram shows quadrilateral $OACB$.




$M$ is the midpoint of $OA$.
$N$ is the point on $BC$ such that $BN : NC = 4 : 5$

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

(a) Express $\overrightarrow{MN}$ in terms of $k$, $\mathbf{a}$ and $\mathbf{b}$.
Give your answer in its simplest form.

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

$= -\underline{b} + \underline{a} + k\underline{b}$ 1

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

$= \frac{1}{2}(\overrightarrow{OA}) + \overrightarrow{AC} + \frac{5}{9}(-\overrightarrow{BC})$

$= \frac{1}{2}\underline{a} + k\underline{b} + \frac{5}{9}(\underline{b} - \underline{a} - k\underline{b})$ 1 1

$= \frac{1}{2}\underline{a} - \frac{5}{9}\underline{a} + k\underline{b} + \frac{5}{9}\underline{b} - \frac{5}{9}k\underline{b}$

$= -\frac{1}{18}\underline{a} + \left(\frac{5}{9} + \frac{4}{9}k\right)\underline{b}$

$= \frac{1}{18}(8k\underline{b} + 10\underline{b} - \underline{a})$ 1

$\frac{1}{18}(8k\underline{b} + 10\underline{b} - \underline{a})$

**(4)**

(b) Is $MN$ parallel to $OB$?
Give a reason for your answer.

No. Because MN and OB are not multiple of each other. 1

**(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**.

By completing the square,

$$y = 2(x^2 - 6x) + 7 \quad ①$$

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

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

$$= 2(x-3)^2 - 11 \quad ①$$

y-coordinate

x-coordinate

①

( 3 , −11 )

**(Total for Question 20 is 3 marks)**

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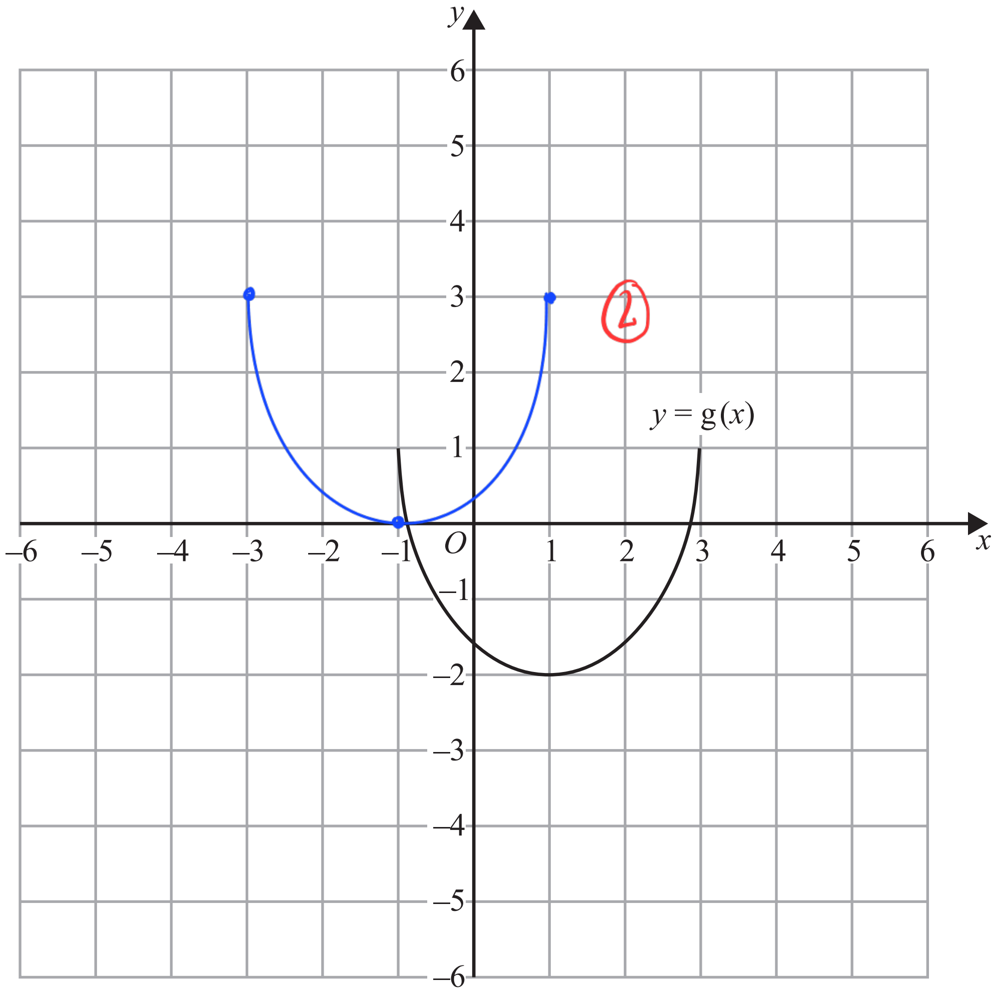
**21** The graph of $y = g(x)$ is shown on the grid.




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

y-coordinate of the image translates by (+2)

x-coordinate of the image becomes (−)

**(Total for Question 21 is 2 marks)**

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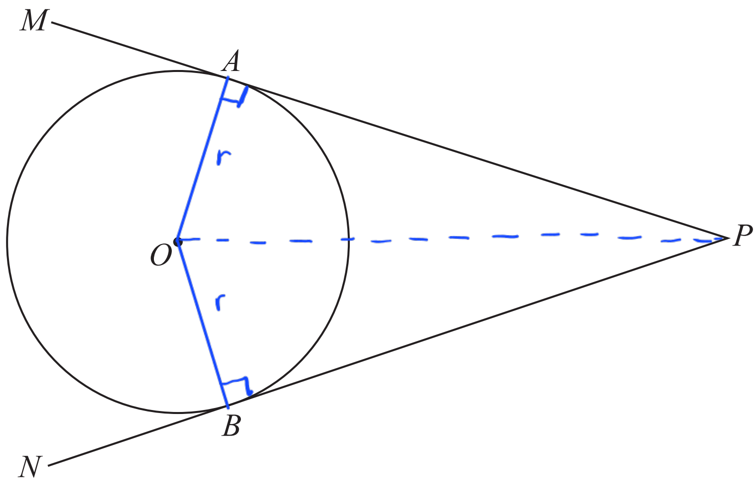
**Turn over for Question 22**

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




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

Prove that $AP = BP$

$\therefore$ angle OAP = angle OBP = $90°$ – since tangent is perpendicular to the radius of the circle. 1

$\therefore$ OA = OB – both are radius of the circle 1

$\therefore$ length of OP is the same for both right angle triangle 1

$AP = \sqrt{OP^2 - OA^2}$ and $BP = \sqrt{OP^2 - OB^2}$

1

Since $OA = OB$, $AP = BP$.

**(Total for Question 22 is 4 marks)**

**TOTAL FOR PAPER IS 80 MARKS**