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)

Thursday 16 May 2024

Morning (Time: 1 hour 30 minutes)

Paper reference **1MA1/1H**

Mathematics

PAPER 1 (Non-Calculator)

Higher Tier

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB or B pencil, eraser, 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 not be used**.

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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F:1/1/1/

P 7 6 9 2 3 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 Here are the first four terms of an arithmetic sequence.

common difference, $d = 4$

first term, $a = 1$

1 (+4) 5 (+4) 9 (+4) 13

Find an expression, in terms of n, for the nth term of this sequence.

nth term : $u_n = a + (n-1)d$

$u_n = 1 + (n-1)4$

$= 1 + 4n - 4$

$= 4n - 3$ (2)

$4n - 3$

(Total for Question 1 is 2 marks)

2 (a) Work out $3\frac{4}{5} - 1\frac{2}{3}$

$a\frac{+b}{\times c} = \frac{ac+b}{c}$

$3\frac{+4}{\times 5} - 1\frac{+2}{\times 3}$

$= \frac{19 \times 3}{5 \times 3} - \frac{5 \times 5}{3 \times 5}$ — method of having common denominator

$= \frac{57}{15} - \frac{25}{15} = \frac{57-25}{15}$ (1)

$= \frac{32}{15} / 2\frac{2}{15}$ (1)

$2\frac{2}{15}$

(2)

Kevin was asked to work out $2\frac{1}{3} \times \frac{5}{8}$

Here is his working and his answer.

$$2\frac{1}{3} \times \frac{5}{8} = \frac{7}{3} \times \frac{5}{8}$$

$$= \frac{35}{24}$$

$$= 1\frac{9}{24}$$

Kevin's answer is wrong.

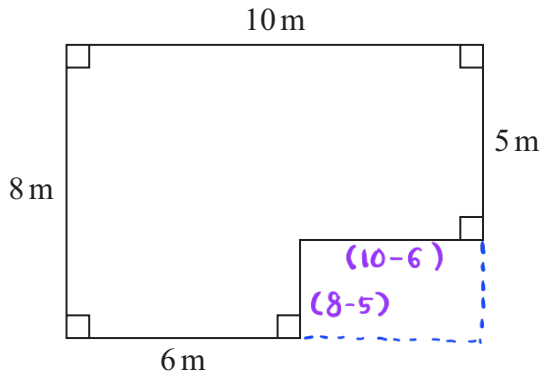
(b) What mistake has Kevin made?

The numerator in his final answer should be 11 instead of 9. (1)

(1)

(Total for Question 2 is 3 marks)

3 The diagram shows a plan of a floor.



Petra is going to cover the floor with paint.

Petra has 3 tins of paint.
There are 2.5 litres of paint in each tin.

Petra thinks 1 litre of paint will cover $10\,m^2$ of floor.

(a) Assuming Petra is correct, does she have enough paint to cover the floor?
You must show all your working.

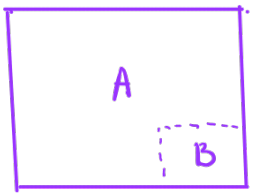
Finding how many litre of paints Petra has :

$$3 \text{ tins} \times \frac{2.5 \text{ litres}}{1 \text{ tin}} = 7.5 \text{ litres}$$

Finding area of floor can be covered with Petra's paint :

$$7.5 \text{ litres} \times \frac{10 \text{ m}^2}{1 \text{ litre}} = 75 \text{ m}^2 \quad (1)$$

Finding area of Petra's floor :



Area of A = 10 m × 8 m

= 80 m^2

Area of B = (10-6) m × (8-5) m

= 4 m × 3 m

= 12 m^2 (1)

(4)

Area of floor = Area A - area B = 80 - 12 = 68 m^2 (1)

∴ 68 < 75. Yes, Petra has enough paint. (1)

Actually, 1 litre of paint will cover 11 m^2 of floor.

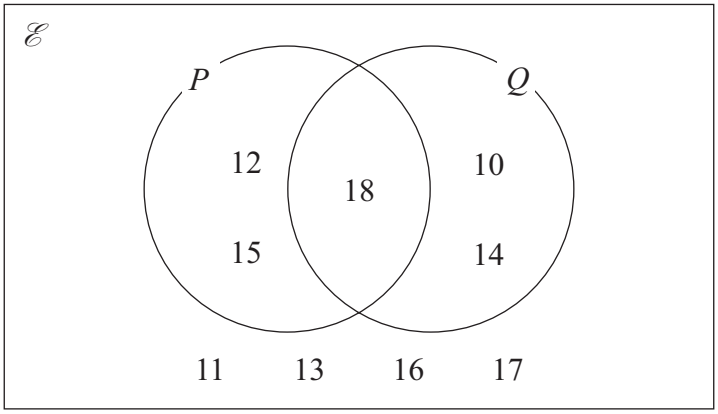
(b) Does this affect your answer to part (a)?
You must give a reason for your answer.

No. She will have more paint since 1 litre of paint can cover more than what she had assumed. (1)

(1)

(Total for Question 3 is 5 marks)

4 Here is a Venn diagram.



(a) Write down the numbers that are in set P' — numbers other than in set P

10, 11, 13, 14, 16, 17 (1)

(1)

A number is chosen at random from the universal set, $\mathscr{E}$

(b) Find the probability that this number is in the set $P \cup Q$

P ∪ Q = numbers that are in set P and Q

= 10, 12, 14, 15, 18 (1)

$P(P \cup Q) = \frac{\text{numbers in set P and Q}}{\text{total numbers}}$

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

$\frac{5}{9}$

(2)

(Total for Question 4 is 3 marks)

5 Sophie drives a distance of 513 kilometres on a motorway in France.
She pays 0.81 euros for every 10 kilometres she drives.

(a) Work out an estimate for the total amount that Sophie pays.

→ round the number to nearest 1 s.f

Total distance travelled : 500 km (1 s.f) (1)

81
× 50
4050

If 10 km, she pays 0.81 euros,

500 km, she pays = 0.81 euros × $\frac{500 \text{ km}}{10 \text{ km}}$ (1)

= 40.5 euros (1)

40.5 ..... euros

(3)

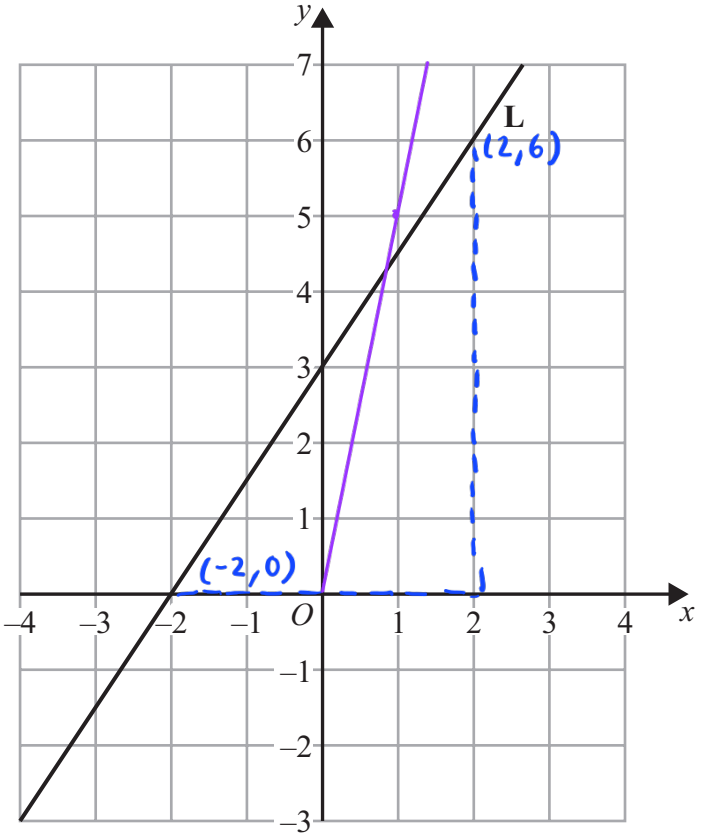
(b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

Underestimate. Because the distance travelled is rounded down to 500 km from 513 km. (1)

(1)

(Total for Question 5 is 4 marks)

6 Here is a straight line **L** drawn on a grid.



(a) Find an equation for **L**.

For equation of a straight line:
requires: x value, y value and a gradient.

Finding gradient:

$m = \frac{6-0}{2-(-2)} = \frac{6}{4} = \frac{3}{2}$ (1)

At (2,6): $6 = \frac{3}{2}(2) + c$ (1)

$c = 3$

Equation of L: $y = \frac{3}{2}x + 3$ (1)

$y = \frac{3}{2}x + 3$

(3)

M is a different straight line with equation $y = 5x$

(b) Write down the equation of a straight line parallel to **M**.

gradient M = 5

$y = 5x + c$, where $c \neq 0$ (1)

if c = 0, will be line M.

$y = 5x + c$

(1)

(Total for Question 6 is 4 marks)

7 Kasim has some small jars, some medium jars and some large jars.
He has a total of 400 jars.

$\frac{3}{8}$ of the 400 jars are empty.

For the empty jars,

number of small jars : number of medium jars = 3 : 4
number of medium jars : number of large jars = 1 : 2

Work out the percentage of Kasim's jars that are empty small jars.

Finding numbers of empty jars :

$\frac{3}{8} \times 400 = 150$ empty jars (1)

For EMPTY JARS :

Finding ratio of small jars : medium jars : large jars

small jars : medium jars : large jars

3 : 4
1 x4 : 2 x4

3 : 4 : 8 (1)

Finding number of empty small jars :

$\frac{3}{3+4+8} \times 150 = \frac{3}{15} \times 150$ (1)

= 30 empty small jars

Finding percentage of empty small jars out of all Kasim's Jar :

$\frac{30}{400} \times 100\% = 7.5\%$ (1) (1)

$30 \div 4 = 7.5$ (30 − 28 = 2, 20 − 20 = 0)

7.5 %

(Total for Question 7 is 5 marks)

8 Len has 8 parcels.

The mean weight of the 8 parcels is 2.5 kg.
The mean weight of 3 of the parcels is 2 kg.

Work out the mean weight of the other 5 parcels.

4
2.5
× 8
20.0

Total weight of 8 parcels :

8 × 2.5 kg = 20 kg (1)

Total weight of 3 of the parcels :

3 × 2 kg = 6 kg

2.8
5) 14
-10
40
-40

Total weight of 5 remaining parcels :

20 kg - 6 kg = 14 kg

Mean weight of 5 remaining parcels :

$\frac{14 \text{ kg}}{5}$ (1) = 2.8 kg (1)

2.8 kg

(Total for Question 8 is 3 marks)

9 In a sale, the normal price of a coat is reduced by R%

Given that

sale price = 0.7 × normal price — (1)

find the value of R.

Sale price = normal price - R% x normal price — (2)

substitute (1) into (2)

0.7 x normal price = normal price - R% x normal price

0.7 = 1 - R%

R% = 0.3 ∴ R = 30

$R =$ 30 (1)

(Total for Question 9 is 1 mark)

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

10 Solve the simultaneous equations

$$5x - 2y = 23$$
$$2x - 3y = 18$$

$5x - 2y = 23$ — ①

$2x - 3y = 18$ — ②

$5x - 2y (+2y) = 23 (+2y)$

$(\div 5)\ 5x = (23 + 2y)(\div 5)$

$x = \frac{23+2y}{5}$ — ③ (1)

Substitute ③ into ②

$2\left(\frac{23+2y}{5}\right) - 3y = 18$ (1)

$(5)\ \frac{46+4y}{5} - 3y\,(5) = 18\,(5)$

$46 + 4y - 15y = 90$

$4y - 15y = 90 - 46$

$-11y = 44$

$y = -4$ (1)

Substitute $y = -4$ into ①

$5x - 2(-4) = 23$

$5x = 23 - 8 = 15$

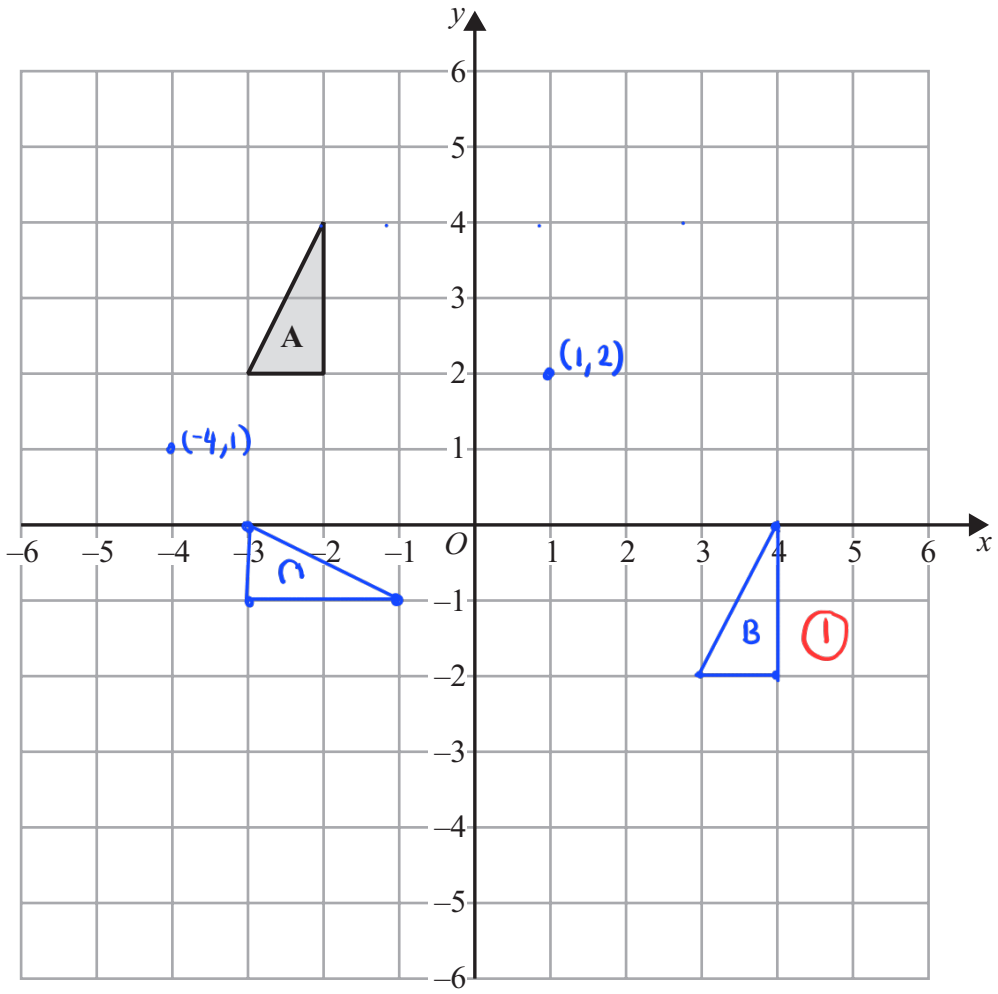
$x = 3$ (1)

$x =$ 3

$y =$ −4

(Total for Question 10 is 4 marks)

11



Triangle **A** is translated by the vector $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$ to give triangle **B**.

Triangle **B** is rotated 90° clockwise about the point (1, 2) to give triangle **C**.

Describe fully the single transformation that maps triangle **A** onto triangle **C**.

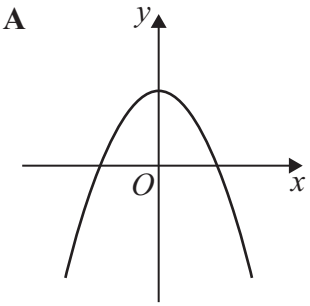
Rotation of 90° clockwise at point (-4, 1)

(2)

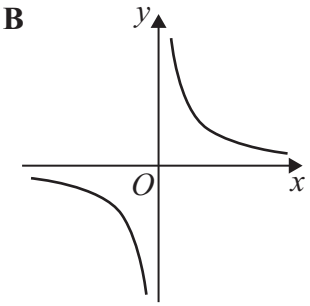
(Total for Question 11 is 3 marks)

12 Here are some graphs.

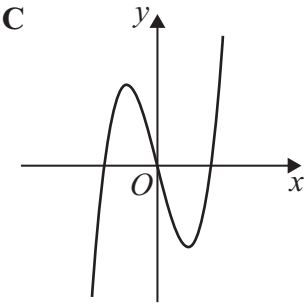
A



B



C



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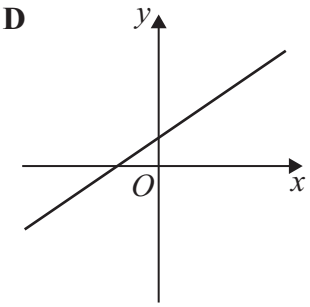

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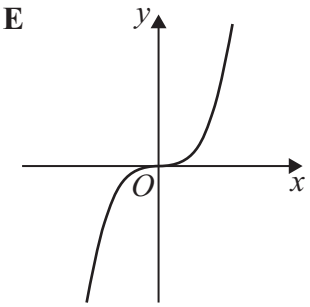
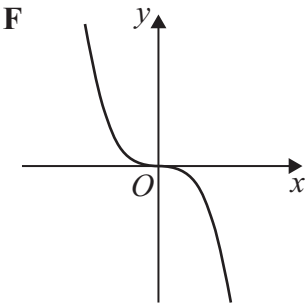
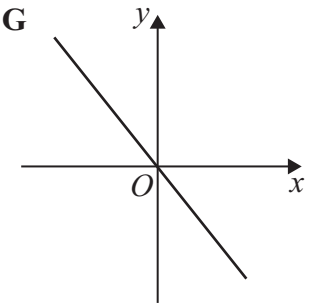


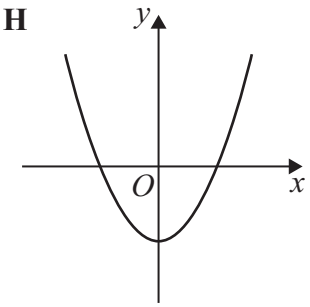
F



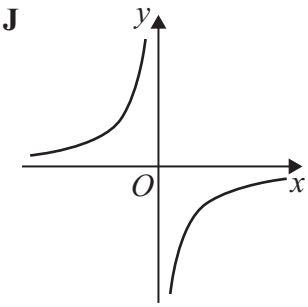
G



H



J



Write down the letter of the graph that could have the equation

(i) $y = x^2 - 4$

Graph of quadratic with y-intercept at -4

H (1)

(1)

(ii) $y = -x^3$

Graph of cubic. when x(+), y(-)
when y(+), x(-)

F (1)

(1)

(iii) $y = -\frac{5}{x}$

Graph of reciprocal. when x(+), y(-)
when y(+), x(-)

J (1)

(1)

(Total for Question 12 is 3 marks)

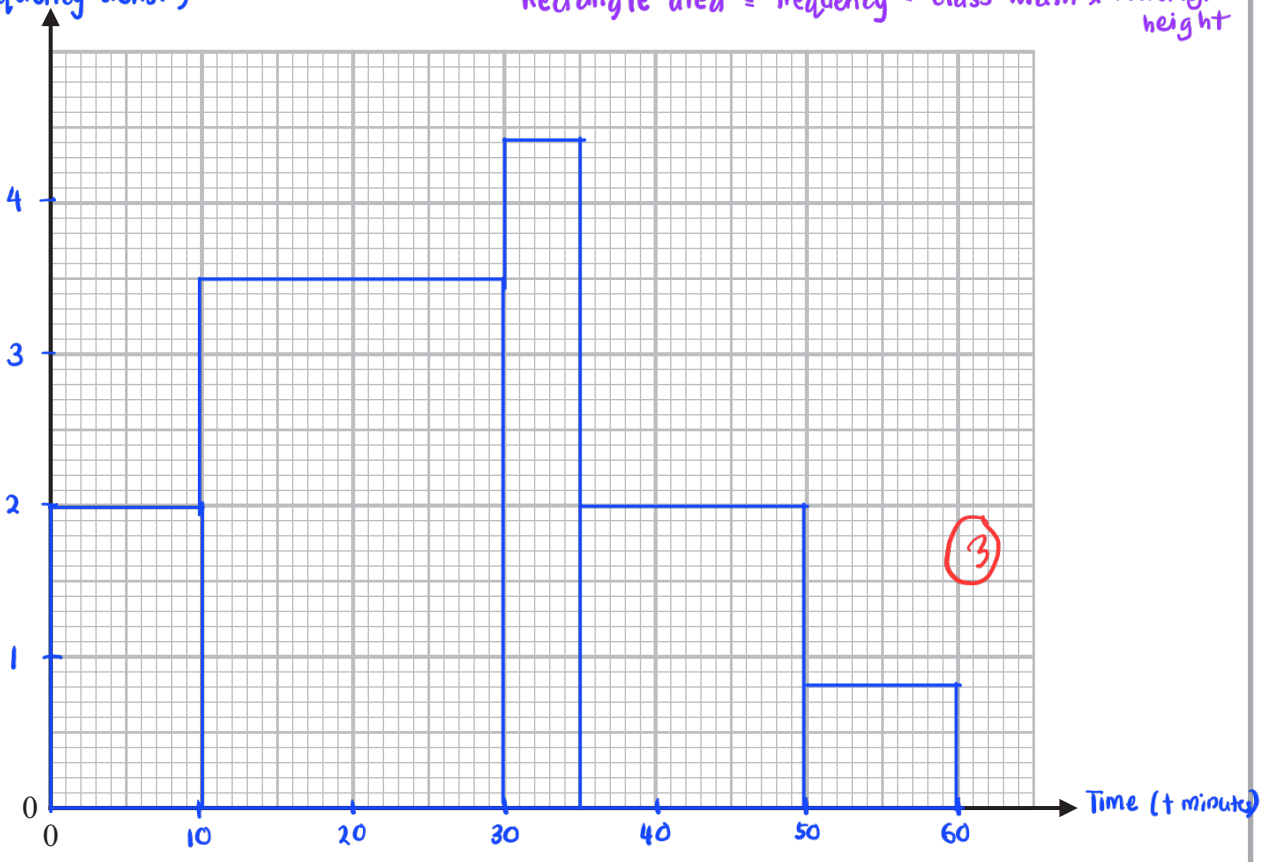
13 The table gives information about the amount of time that each of 150 people were in a shop.

Class width	Time (t minutes)	Frequency	Rectangle's height
10	$0 < t \leqslant 10$	20	$20 \div 10 = 2$
20	$10 < t \leqslant 30$	70	$70 \div 20 = 3.5$
5	$30 < t \leqslant 35$	22	$22 \div 5 = 4.4$
15	$35 < t \leqslant 50$	30	$30 \div 15 = 2$
10	$50 < t \leqslant 60$	8	$8 \div 10 = 0.8$

(a) On the grid, draw a histogram for this information.

Frequency density

Rectangle area = frequency = class width x rectangle's height



(3)

(b) Work out an estimate for the fraction of these 150 people who were in the shop for between 20 minutes and 40 minutes.

Estimation :

$20 < t \leqslant 30 = \frac{1}{2} \times 70 = 35$

$30 < t \leqslant 35 = 22$ (1)

$35 < t \leqslant 40 = \frac{1}{3} \times 30 = 10$

Total = $35 + 22 + 10$

= 67 out of 150

= $\frac{67}{150}$ (1)

$\frac{67}{150}$

(2)

(Total for Question 13 is 5 marks)

14 Expand and simplify $(3x - 1)(2x + 3)(x - 5)$

Expansion of first 2 terms :

$(3x-1)(2x+3) = 6x^2 + 9x - 2x - 3$ (1)

$= 6x^2 + 7x - 3$

Expansion with the final term :

$(6x^2 + 7x - 3)(x - 5)$

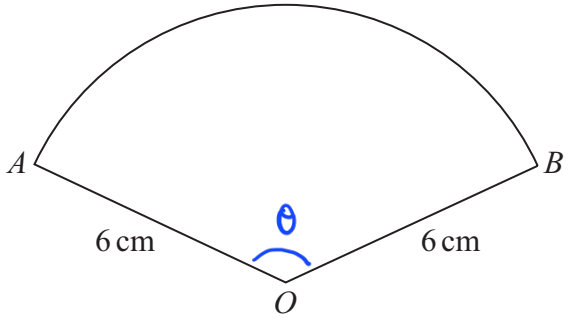
$= 6x^3 - 30x^2 + 7x^2 - 35x - 3x + 15$ (1)

$= 6x^3 - 23x^2 - 38x + 15$ (1)

$6x^3 - 23x^2 - 38x + 15$

(Total for Question 14 is 3 marks)

15 OAB is a sector of a circle with centre O and radius 6 cm.



The length of the arc AB is 5π cm.

Work out, in terms of π, the area of the sector.
Give your answer in its simplest form.

arc AB = $\frac{\theta}{360^\circ} \times 2\pi r$, where $r = 6$

$5\pi = \frac{\theta}{360^\circ} \times 12\pi$ (1)

$\theta = \frac{5\pi}{12\pi} \times 360^\circ = 150^\circ$ (1)

Area of sector : $\frac{150^\circ}{360^\circ} \times \pi \times 6^2$ (1)

$= \frac{5}{12_1} \times \pi \times 36^3$

$= 15\pi$ (1)

15π ..... cm^2

(Total for Question 15 is 4 marks)

16 There are only n orange sweets and 1 white sweet in a bag.

Saira takes at random a sweet from the bag and eats the sweet.
She then takes at random another sweet from the bag and eats this sweet.

Show that the probability that Saira eats two orange sweets is $\frac{n-1}{n+1}$

Total number of sweets : $n+1$

1st take : P(orange sweet) = $\frac{n}{n+1}$

2nd take : P(orange sweet) = $\frac{n-1}{(n+1)-1} = \frac{n-1}{n}$ (1)

include -1 because she already eats 1 orange sweet during first event.

P(orange sweet on both takes) = $\left(\frac{n}{n+1}\right) \times \left(\frac{n-1}{n}\right)$ (1)

$= \frac{n-1}{n+1}$

(Total for Question 16 is 2 marks)

17 (a) Rationalise the denominator of $\frac{1}{\sqrt{7}}$

$\frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{7}$

since $\sqrt{7} \times \sqrt{7} = 7$, we rationalise the denominator to equal to 7.

$\frac{\sqrt{7}}{7}$ (1)

(1)

(b) Simplify fully $\sqrt{80} - \sqrt{5}$

$\sqrt{80} - \sqrt{5}$

$= \sqrt{16 \times 5} - \sqrt{5}$

$= (\sqrt{16} \times \sqrt{5}) - \sqrt{5}$ (1)

$= 4\sqrt{5} - \sqrt{5}$

$= 3\sqrt{5}$ (1)

$3\sqrt{5}$

(2)

(Total for Question 17 is 3 marks)

18 Show that $0.\dot{1}\dot{5} + 0.2\dot{2}\dot{7}$ can be written in the form $\frac{m}{66}$ where m is an integer.

$0.\dot{1}\dot{5} = 0.1515\ldots$

$0.2\dot{2}\dot{7} = 0.22727\ldots$

$0.\dot{1}\dot{5} + 0.2\dot{2}\dot{7} = 0.37878\ldots$ (1)

if $x = 0.37878\ldots$

$10x = 0.37878 \times 10$

$= 3.7878\ldots$

$1000x = 0.37878 \times 1000$

$= 378.78\ldots$

$1000x - 10x = 378.78\ldots - 3.7878\ldots$

$990x = 375$

$x = \frac{375}{990}$ (1)

Simplification of x :

$\frac{375 \div 5}{990 \div 5} = \frac{75 \div 3}{198 \div 3} = \frac{25}{66}$ (1)

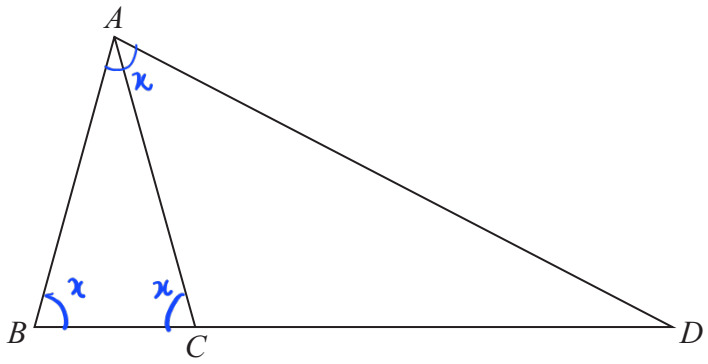
75
5)375
-35
25
-25
0

66
3)198
-18
18
-18
0

198
5)990
-5
49
-45
40

(Total for Question 18 is 3 marks)

19



ABC and DAB are similar isosceles triangles.

$AB = AC$
$AD = BD$

$BC : CD = 4 : 21$

Find the ratio $AB : AD$

Since both triangles are similar :

$$\frac{AB}{BC} = \frac{AD}{AB}$$

slanted height, slanted height, base, base

$$\frac{AB}{4} = \frac{25}{AB} \quad (1)$$

$$AB^2 = 25 \times 4$$

$$\sqrt{AB^2} = \sqrt{100}$$

$$AB = 10$$

common factor

$$\therefore \frac{AD}{AB} = \frac{25 \div 5}{10 \div 5}$$

$$= \frac{5}{2} \quad (1)$$

$\therefore AB : AD = 2 : 5$ (1)

2 : 5

(Total for Question 19 is 3 marks)

20 $2^x = \dfrac{2^n}{\sqrt[3]{2}}$ $\quad 2^y = \left(\sqrt{2}\right)^5$

$\dfrac{2^n}{2^m} = 2^{n-m}$ / $2^n \times 2^m = 2^{n+m}$ / $(2^n)^m = 2^{nm}$

Given that $x + y = 8$

work out the value of n.

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

$2^y = 2^{(\frac{1}{2})\times 5} = 2^{\frac{5}{2}}$

$x = n - \frac{1}{3}$

$y = \frac{5}{2}$ (1)

$\therefore x + y = 8$

$\left(n - \frac{1}{3}\right) + \frac{5}{2} = 8$

$n - \frac{1}{3} = 8 - \frac{5}{2}$

$n = 8 - \frac{5}{2} + \frac{1}{3}$

$= \frac{35}{6} = 5\frac{5}{6}$ (1)

$6\overline{)35}$ 5, -30, 5

$n =$ $5\frac{5}{6}$

(Total for Question 20 is 3 marks)

DO NOT WRITE IN THIS AREA

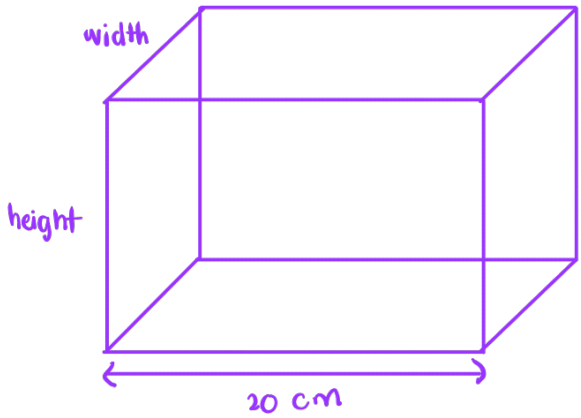
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

21 A solid cuboid has a volume of 300 cm^3
The cuboid has a total surface area of 370 cm^2

The length of the cuboid is 20 cm.
The width of the cuboid is greater than the height of the cuboid.

Work out the height of the cuboid.
You must show all your working.



volume = length × width × height

$300\ cm^3 = 20\ cm \times width \times height$

$width \times height = \frac{300\ cm^3}{20\ cm} = 15\ cm^2$ (1) — (1)

Total surface area = 2 × (20 × height) + 2 × (20 × width) + 2 (width × height)

$370\ cm^2 = 2[(20 \times height) + (20 \times width) + (width \times height)]$ (1)

$\frac{370\ cm^2}{2} = (20 \times (width + height)) + 15\ cm^2$

$20\ (w+h) = 185 - 15$

$= 170$

$w+h = \frac{170}{20} = 8.5$

$w = 8.5 - h$ — (2)

(2) into (1) ← eliminating w

$(8.5 - h)\,h = 15$ (1)

$h^2 - 8.5h + 15 = 0$

$(h - 2.5)(h - 6) = 0$ (1)

$h = 2.5$ or $h = 6$

since $w \times h = 15\ cm^2$,

$h \neq 6$ because that would mean $h > w$.

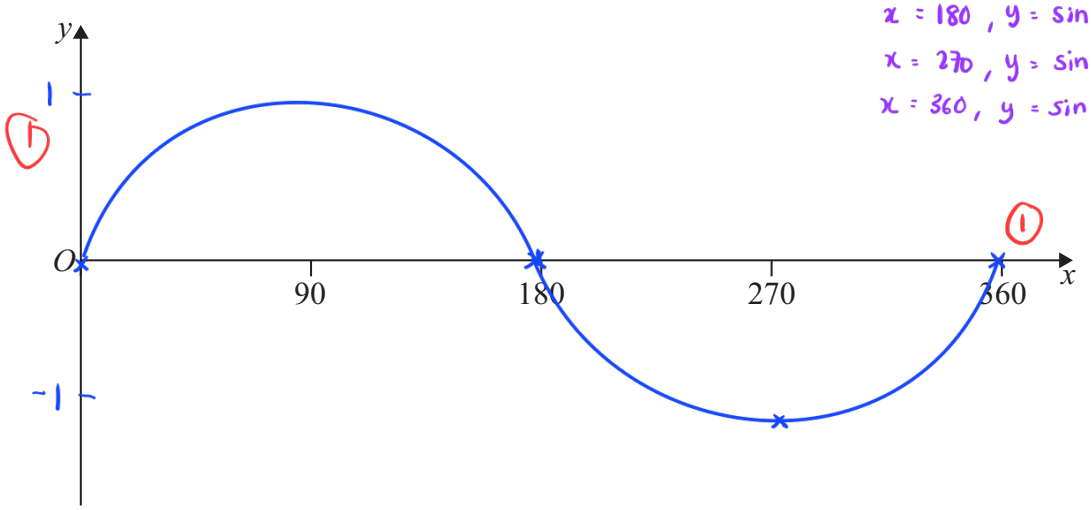
Hence, $h = 2.5$ (1)

2.5 ..... cm

(Total for Question 21 is 5 marks)

22 (a) Sketch the graph of $y = \sin x°$ for $0 \leqslant x \leqslant 360$

when $x = 0$, $y = \sin 0 = 0$
$x = 90$, $y = \sin 90° = 1$
$x = 180$, $y = \sin 180° = 0$
$x = 270$, $y = \sin 270° = -1$
$x = 360$, $y = \sin 360° = 0$



(2)

(b) Solve the equation $2\sin x° = -1$ for $0 \leqslant x \leqslant 360$

$2 \sin x° = -1$

$\sin x° = -\frac{1}{2}$

since $\sin 30° = \frac{1}{2}$,

for $-\frac{1}{2}$, x should be within $180°$ to $360°$ range

$x° = 180° + 30°$ and $360° - 30°$

$= 210°$ and $330°$

$210°$, $330°$

(2)

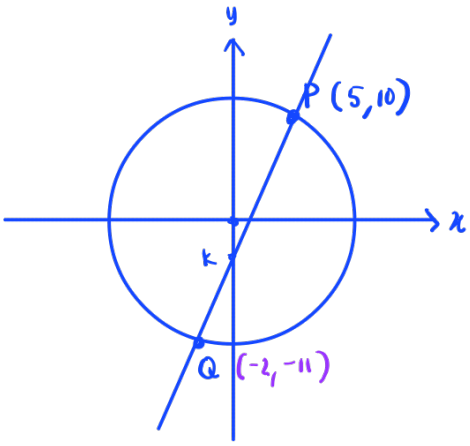
(Total for Question 22 is 4 marks)

23 **C** is a circle with centre (0, 0)
L is a straight line.

The circle **C** and the line **L** intersect at the points P and Q.
The coordinates of P are (5, 10)
The x coordinate of Q is –2

L has a positive gradient and crosses the y-axis at the point $(0, k)$

Find the value of k.



$x^2 + y^2 = 5^2 + 10^2$

$= 25 + 100$ (1)

$= 125$

Finding coordinate of Q : $(-2)^2 + y^2 = 125$

$y^2 = 125 - 4$

$y^2 = 121$ (1)

$y = \pm\sqrt{121} = -11$ (since Q cannot be higher than P with positive gradient) (1)

∴ coordinate of Q : $(-2, -11)$

Gradient, m of line L : $\frac{10-(-11)}{5-(-2)} = \frac{21}{7} = 3$

Equation of line L : $10 = 3(5) + c$ ← take point P (1)

$10 = 15 + c$

$c = -5$

$k = -5$ (1)

$k =$ −5

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

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