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 ▶

P76923A

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.

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

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

$4n$: 4 8 12 16

$4n-3$: 1 5 9 13 (each step −3)

$4n - 3$

(Total for Question 1 is 2 marks)

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

$2^{+}19 \times 3 = 57$

$57 - 25 = 32$

$\frac{19^{\times 3}}{5_{\times 3}} - \frac{5^{\times 5}}{3_{\times 5}}$

$\frac{57}{15} - \frac{25}{15} = \frac{32}{15}$

$\frac{32}{15}$

(2)

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

Here is his working and his answer.

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

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

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

$35 - 24 = 11$

Kevin's answer is wrong.

(b) What mistake has Kevin made?

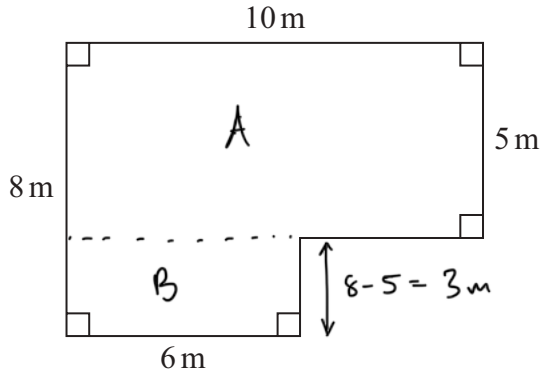
$\frac{7}{3} \times \frac{5}{8} = \frac{35}{24} = 1\frac{11}{24}$

Kevin's answer should be $1\frac{11}{24}$ not $1\frac{9}{24}$

(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.

3 tins = 2.5L x 3 = 7.5L

1 L $\xrightarrow{\times 10}$ $10\,m^2$

7.5L $\Rightarrow$ $75\,m^2$ ($\times 10$)

Area A = $10 \times 5 = 50\,m^2$

Area B = $3 \times 6 = 18\,m^2$

Total Area = $50 + 18 = 68\,m^2$

$68\,m^2 < 75\,m^2$

So Petra has enough paint to cover the floor

(4)

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.

$$\begin{array}{r} 7.5 \\ \times\ 11 \\ \hline 75 \\ 75 \\ \hline 82.5 \end{array}$$

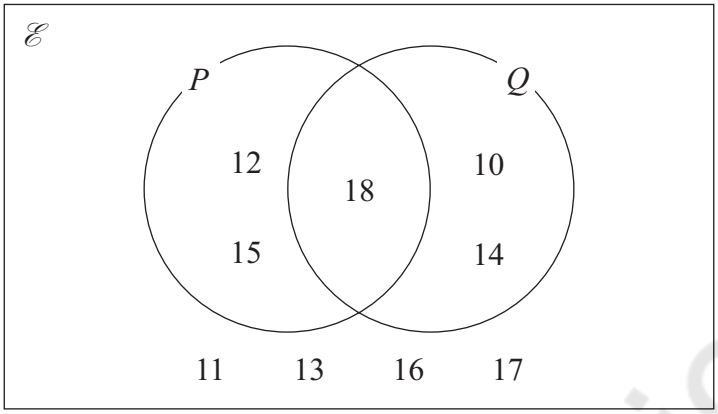
1 L => 11 m^2

7.5 L => 82.5 m^2

82.5 m^2 > 68 m^2 So No the answer does not change Petra still has enough paint to cover the floor. (1)

(Total for Question 3 is 5 marks)

4 Here is a Venn diagram.



(a) Write down the numbers that are in set P' not in P

10, 11, 13, 14, 16, 17

(1)

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

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

$\frac{5}{9}$

(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.

513 ≈ 500 km (1 s.f)
0.81 ≈ €0.80 (1 s.f.)

$\frac{500}{10} = 50$

50 × 0.8 = 40 euros

40 euros

(3)

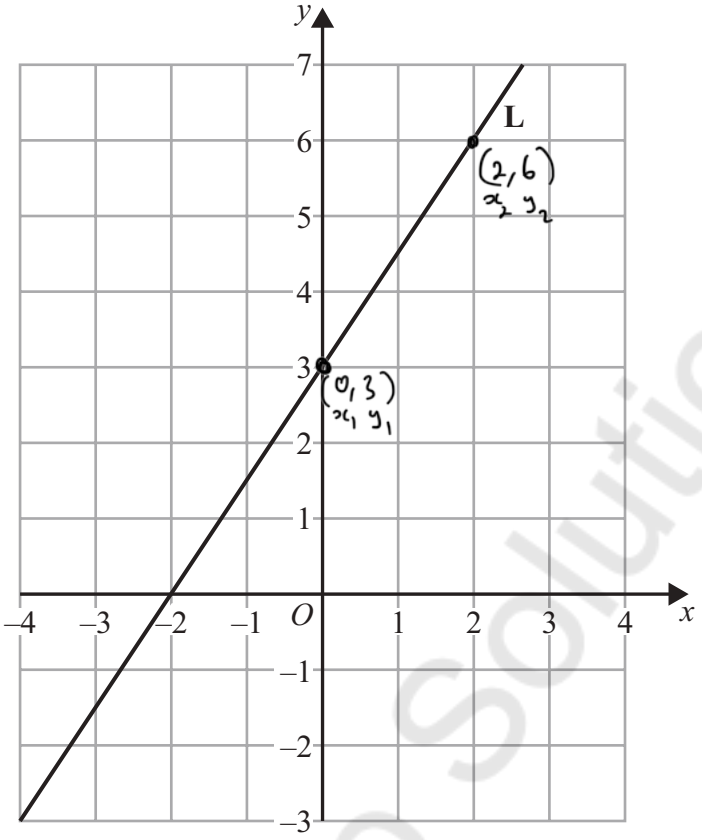
(b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

513 km rounded down to 500 km
€0.81 rounded down to €0.80
This means that the answer to part a) will be an underestimate.

(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**.

$y = mx + c$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 3}{2 - 0} = \frac{3}{2}$

$c = 3$

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

(3)

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

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

$y = 5x + 1$

(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.

$\frac{3}{8} \times 400 = 150$ Jars are empty

S : M
3 : 4

M : L
1 : 2
×4 ↓ ↓ ×4
4 : 8

S : M : L
3 : 4 : 8
150

1 part $= \frac{150}{3+4+8} = \frac{150}{15} = 10$

S : M : L
30 : 40 : 80
Empty Small

$\frac{30}{400} \times 100 = \frac{30}{4}\%$

$= 7.5\%$

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.

x → Total weight of parcels

$\frac{x}{8} = 2.5$

$\times 8 \qquad \times 8$

$x = 20\text{ kg}$

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

$y = 6\text{ kg}$

five Parcels $= 20 - 6 = 14\text{ kg}$

Mean of five Parcels $= \frac{14}{5} \times 2 = \frac{28}{10} = 2.8\text{ kg}$

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

find the value of R.

$100 - R\% = 70\%$

$R\% = 30\%$

$R =$ 30

(Total for Question 9 is 1 mark)

10 Solve the simultaneous equations

$5x - 2y = 23$ — (1)

$2x - 3y = 18$ — (2)

(1) × 3 : $15x - 6y = 69$ — (3)

(2) × 2 : $4x - 6y = 36$ — (4)

(3) − (4) : $11x = 33$

÷11 ÷11

$x = 3$

$2(3) - 3y = 18$

$6 - 3y = 18$

$-3y = 18 - 6$

$-3y = 12$

$\frac{-3y}{-3} = \frac{12}{-3}$

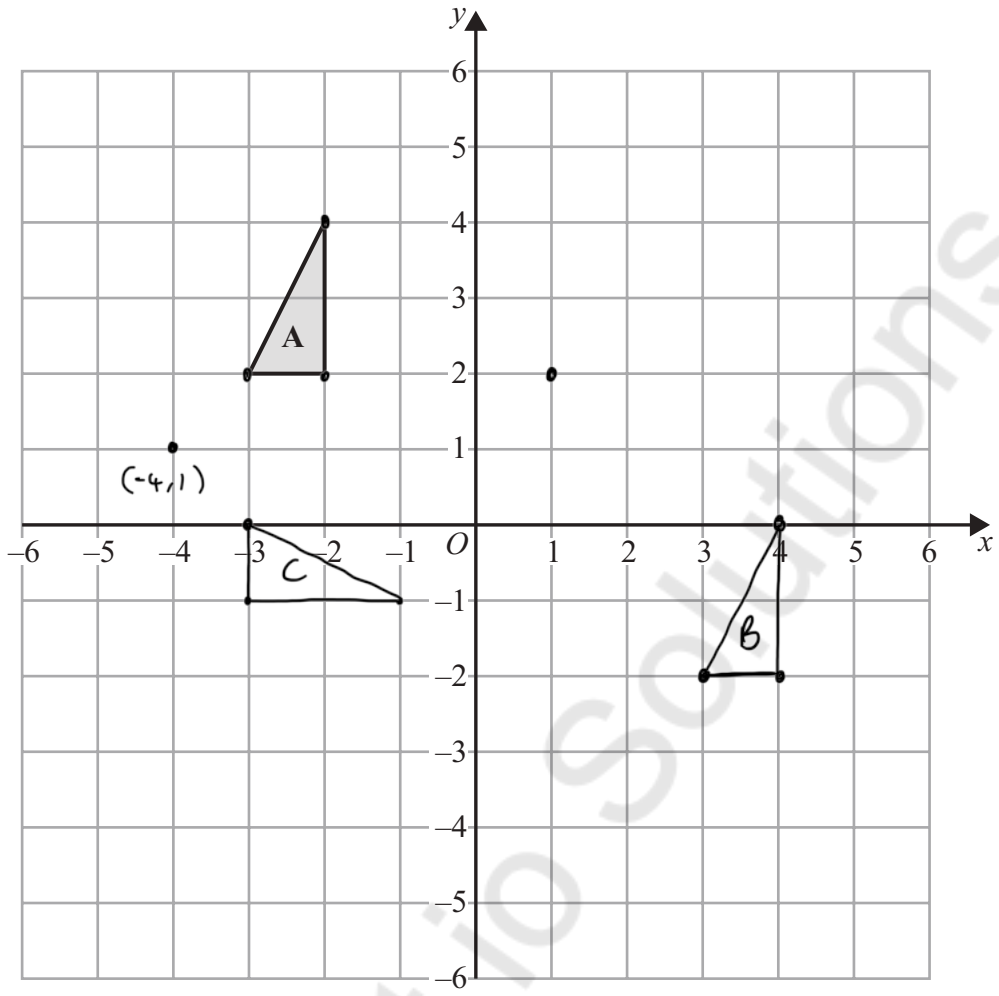
$y = -4$

$x =$ 3

$y =$ −4

(Total for Question 10 is 4 marks)

11



6 right
4 down

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**.

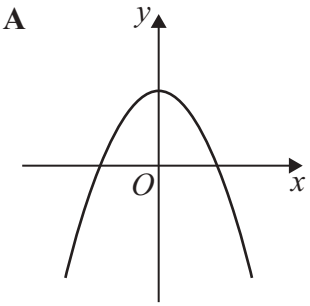
Describe fully the single transformation that maps triangle **A** onto triangle **C**.

90° rotation in the Clockwise direction with centre of rotation (-4, 1)

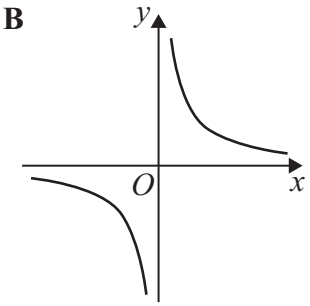
(Total for Question 11 is 3 marks)

12 Here are some graphs.

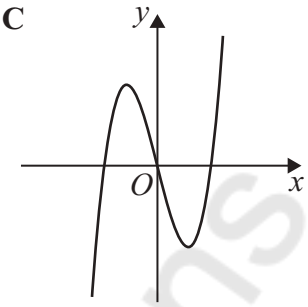
A



B



C



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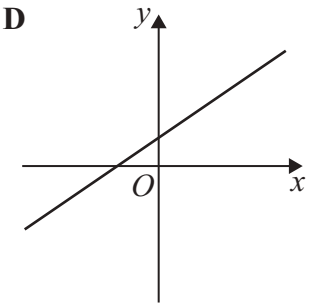

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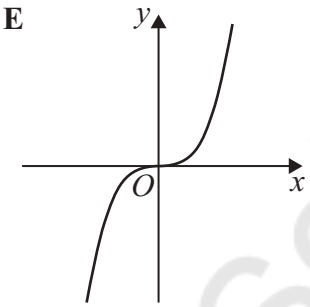
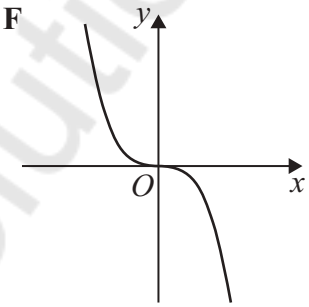
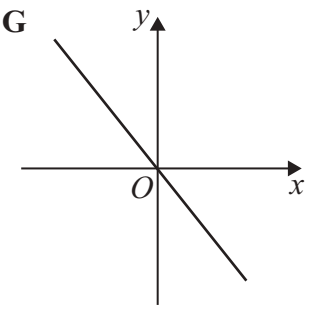


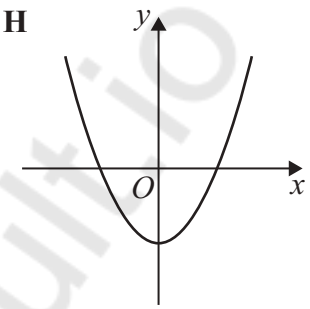
F



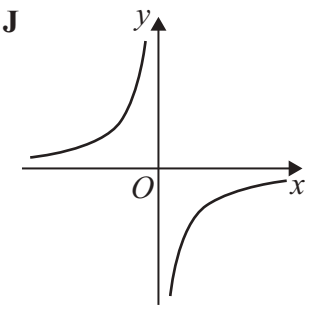
G



H



J



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

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

H

(1)

(ii) $y = -x^3$

F

(1)

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

J

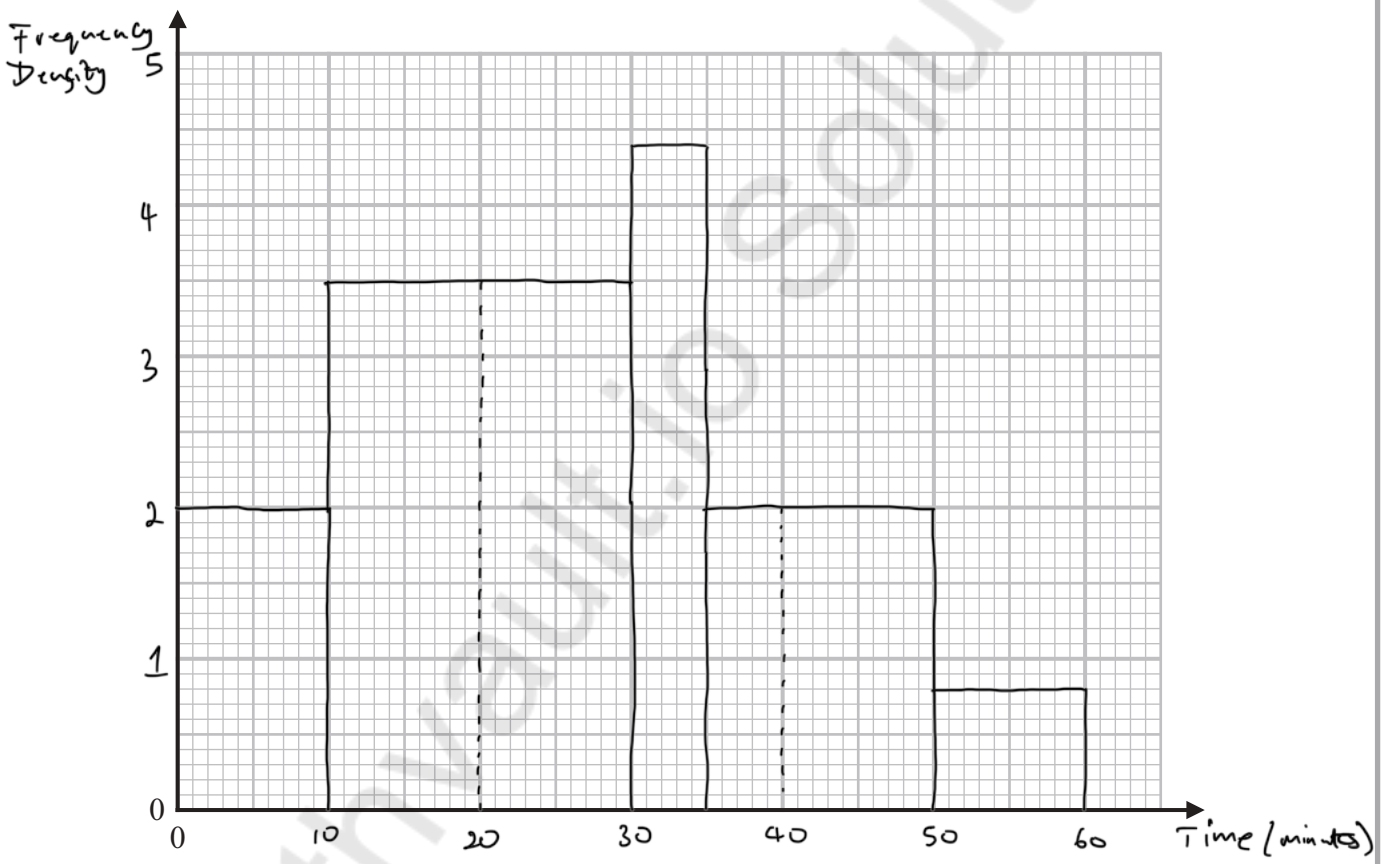
(1)

(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.

Time (t minutes)	Frequency	F.D.
$0 < t \leqslant 10$	20	$\frac{20}{10} = 2$
$10 < t \leqslant 30$	70	$\frac{70}{20} = 3.5$
$30 < t \leqslant 35$	22	$\frac{22}{5} = 4.4$
$35 < t \leqslant 50$	30	$\frac{30}{15} = 2$
$50 < t \leqslant 60$	8	$\frac{8}{10} = 0.8$

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



(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.

$(15 \times 3.5) + (0.9 \times 5) + (5 \times 2)$

$52.5 + 4.5 + 10$

67

$\frac{67}{150}$

(2)

(Total for Question 13 is 5 marks)

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

$(3x-1)(2x+3)$

$6x^2 + 9x - 2x - 3$

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

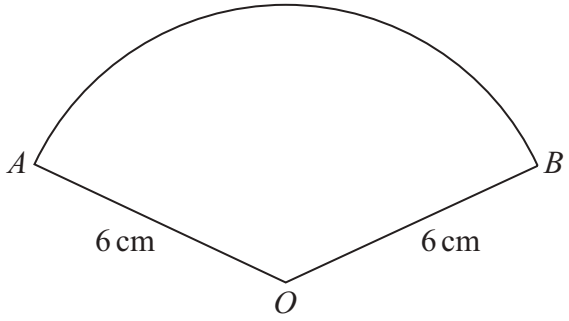
$6x^3 - 30x^2 + 7x^2 - 35x - 3x + 15$

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

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

(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.

$l = \theta r$

$5\pi = \theta \times 6$

$\theta = \frac{5}{6}\pi$

$A = \frac{1}{2} r^2 \theta$

$A = \frac{1}{2} \times 6^2 \times \frac{5}{6}\pi$

$A = 15\pi$

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 Sweet = $n+1$

$P(\text{1st Orange}) = \frac{n}{n+1}$

$P(\text{2nd Orange}) = \frac{n-1}{n}$

$P(\text{1st Orange AND 2nd Orange}) = \frac{n}{n+1} \times \frac{n-1}{n} = \frac{n-1}{n+1}$

(Total for Question 16 is 2 marks)

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

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

$\frac{\sqrt{7}}{7}$

(1)

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

$\sqrt{4 \times 20}$

$\sqrt{4 \times 4 \times 5}$

$\sqrt{16 \times 5}$

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

$4\sqrt{5} - \sqrt{5} = 3\sqrt{5}$

$3\sqrt{5}$

(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.

$$\begin{array}{r} 0.151515151\dot{5}\dot{1}\dot{5} \\ + \quad 0.227272727\dot{2}\dot{7} \\ \hline 0.37878787 \end{array}$$

Let $x = 0.3\dot{7}\dot{8} = 0.378\dot{7}\dot{8}$

$1000x = 378.\dot{7}\dot{8}$

$10x = 3.\dot{7}\dot{8}$

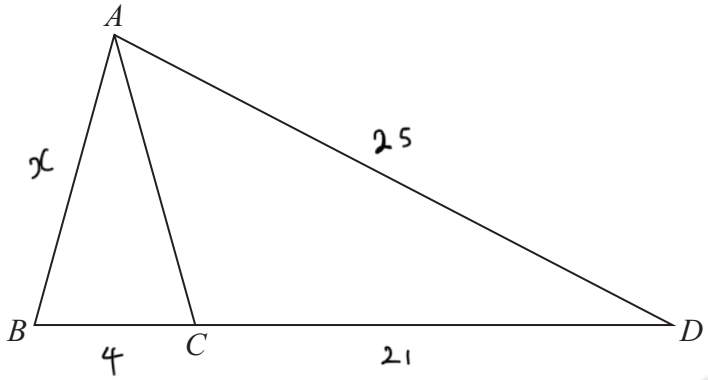
$1000x - 10x = 990x = 375$

$$x = \frac{375}{990} = \frac{125}{330} = \frac{25}{66}$$

$m = 25$

(Total for Question 18 is 3 marks)

19

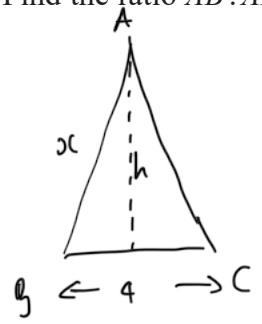


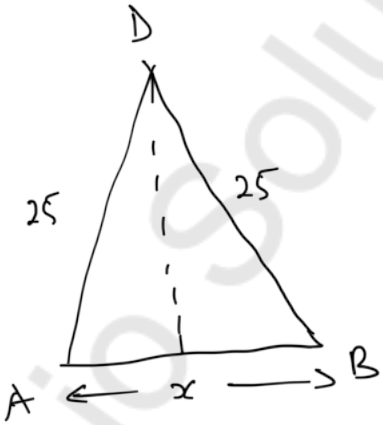
ABC and *DAB* are similar isosceles triangles.

$AB = AC$
$AD = BD$

$BC : CD = 4 : 21$

Find the ratio $AB : AD$





$x \times y = 25 \Rightarrow xy = 25$

$4 \times y = x \Rightarrow 4y = x$

$4y \times y = 25$

$4y^2 = 25$

$y^2 = \frac{25}{4}$

$y = \frac{5}{2}$

$x = 4 \times \frac{5}{2} = \frac{20}{2} = 10$

AB : AD

10 : 25

2 : 5

2 : 5

(Total for Question 19 is 3 marks)

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

Given that $x + y = 8$

work out the value of n.

$2^x \times 2^y = \dfrac{2^n}{2^{1/3}} \times 2^{5/2}$

$2^{x+y} = 2^{n - 1/3 + 5/2}$

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

$8 = n + \frac{15}{6} - \frac{2}{6}$

$8 = n + \frac{13}{6}$

$n = 8 - \frac{13}{6}$

$\frac{8}{1} - \frac{13}{6}$

$\frac{48}{6} - \frac{13}{6}$

$\frac{35}{6}$

$n = \dfrac{35}{6}$

(Total for Question 20 is 3 marks)

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.

$Lwh = 300$

$20wh = 300$

$wh = 15$

$w = \frac{15}{h}$

$15 \times 2 \div 5 = 6$

$2Lw + 2Lh + 2wh = 370$

$L = 20$

$2(20)w + 2(20)h + 2(15) = 370$

$40w + 40h + 30 = 370$

$40w + 40h = 340$

$40\left(\frac{15}{h}\right) + 40h = 340$

$600 + 40h^2 = 340h$

$40h^2 - 340h + 600 = 0$

$4h^2 - 34h + 60 = 0$

$2h^2 - 17h + 30 = 0$

60
-30, -2
-20, -3
-15, -4
-12, -5

$2h^2 - 12h - 5h + 30 = 0$

$2h(h-6) - 5(h-6) = 0$

$(2h-5)(h-6) = 0$

$h = \frac{5}{2}$, $h = 6$ reject

$w = \frac{15}{2.5}$ $w = \frac{15}{6}$

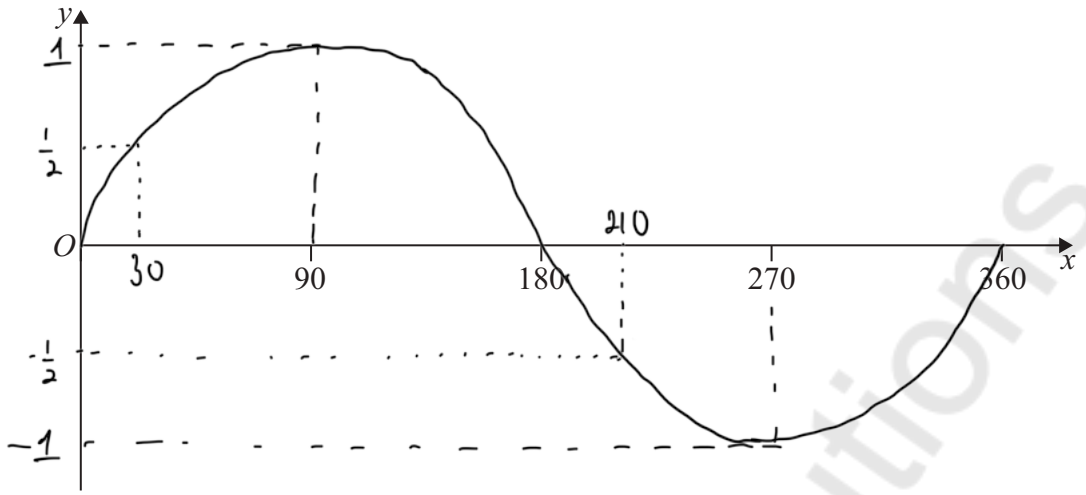
$w = 6$ $w = \frac{5}{2}$ reject

$w > h$

2.5 cm

(Total for Question 21 is 5 marks)

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



(2)

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

÷2 ÷2

$\sin x = -\frac{1}{2}$

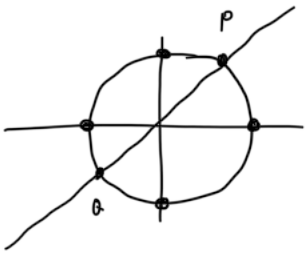
$x = 210$

210

(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.

$x^2 + y^2 = r^2$

$y = mx + c$

$5^2 + 10^2 = r^2$

$25 + 100 = r^2$

$125 = r^2$

$(-2)^2 + y^2 = 125$

$4 + y^2 = 125$

$-4 \qquad -4$

$y^2 = 121$

$y = 11$ and -11
reject

$m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad P(\overset{x_2}{5}, \overset{y_2}{10})$ $\quad Q(\overset{x_1}{-2}, \overset{y_1}{-11})$

$m = \frac{10 - (-11)}{5 - (-2)}$

$m = \frac{10 + 11}{5 + 2} = \frac{21}{7} = 3$

$y = 3x + c$

$10 = 3(5) + k$

$10 = 15 + k$

$k = -5$

$k =$ -5

(Total for Question 23 is 5 marks)

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