WORKED SOLUTIONS

Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

C300U10-1

A20-C300U10-1

TUESDAY, 3 NOVEMBER 2020 – MORNING

MATHEMATICS – Component 1

Non-Calculator Mathematics
FOUNDATION TIER

2 hours 15 minutes

For Examiner's Use Only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	5	
3.	4	
4.	4	
5.	3	
6.	5	
7.	8	
8.	8	
9.	6	
10.	2	
11.	3	
12.	6	
13.	5	
14.	6	
15.	4	
16.	6	
17.	3	
18.	2	
19.	3	
20.	4	
21.	5	
22.	5	
23.	1	
24.	1	
25.	3	
26.	6	
27.	5	
Total	120	

ADDITIONAL MATERIALS

The use of a calculator is not permitted in this examination.

A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

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01

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Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

Curved surface area of a cone = πrl

Surface area of a sphere = $4\pi r^2$

Volume of a sphere = $\frac{4}{3}\pi r^3$

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

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1. *(a)* (i) Work out 30×20. [1]

600 //

(ii) Work out $96 \div 4$. [1]

$$4\overline{)96} = 24$$ //

(b) Write 3% as a decimal. [1]

$\frac{3}{100} = 0.03$ //

(c)

$\frac{3}{20}$	0·35	−0·3	$\frac{1}{4}$	0·031

Use a value from the box to complete the following statement. [2]

$\frac{3}{10}$ is less than 0·35

$\frac{3}{10} = 0.3$

$\frac{3}{20} = \frac{15}{100} = 0.15$ $0.3 < 0.35$

$\frac{1}{4} = 0.25$

(d) Work out $\frac{5}{12}$ of 24. [2]

$24 \div 12 = 2$

$2 \times 5 = 10$ //

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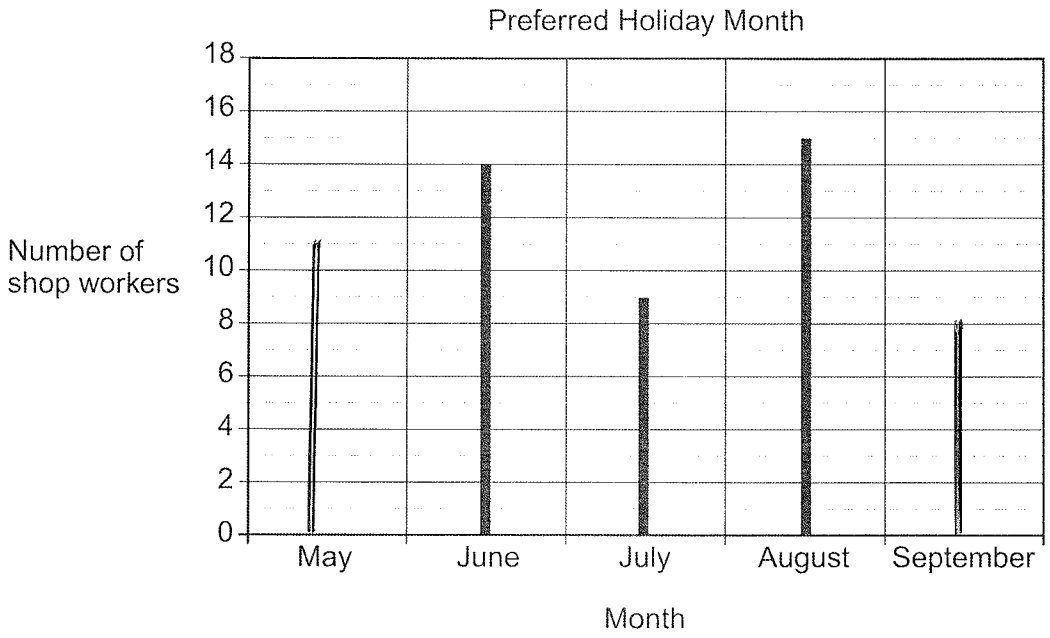
2. Some workers in a large shop were asked to choose the month in which they would like to take a holiday.
Each worker chose a month from May to September.
The vertical line graph and pictogram each show the results for three of the five months.



May	□	□	⌐		11
June	□	□	□	▫	14
July	▭	▭	▭		9
August	▭	▭	▭	⌐	15
September	□	□			8

Key: □ represents 4 shop workers.

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(a) Complete the vertical line graph, pictogram and key. [3]

(b) How many shop workers were asked? [1]

11 + 14 + 9 + 15 + 8 = 57 //

(c) Write down the modal month. [1]

August

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05

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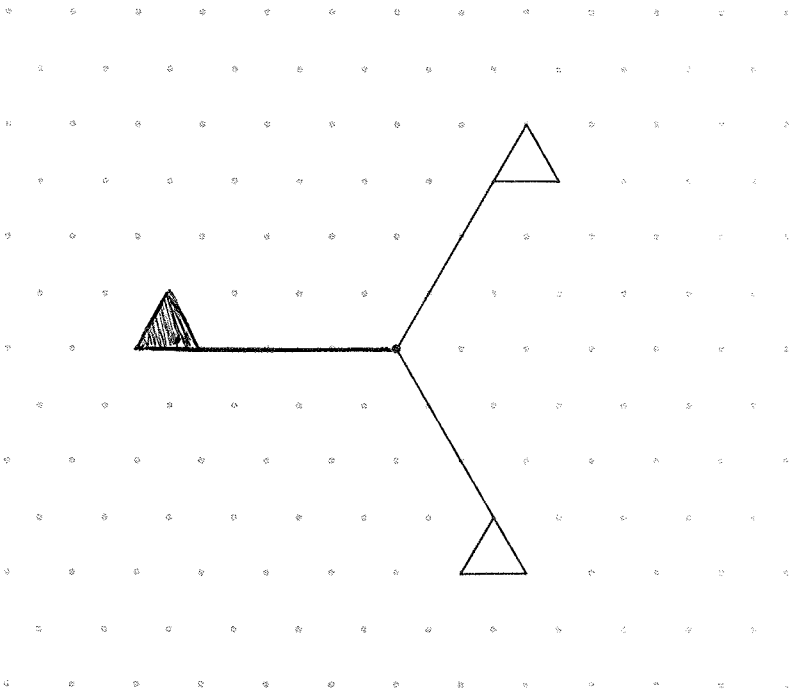
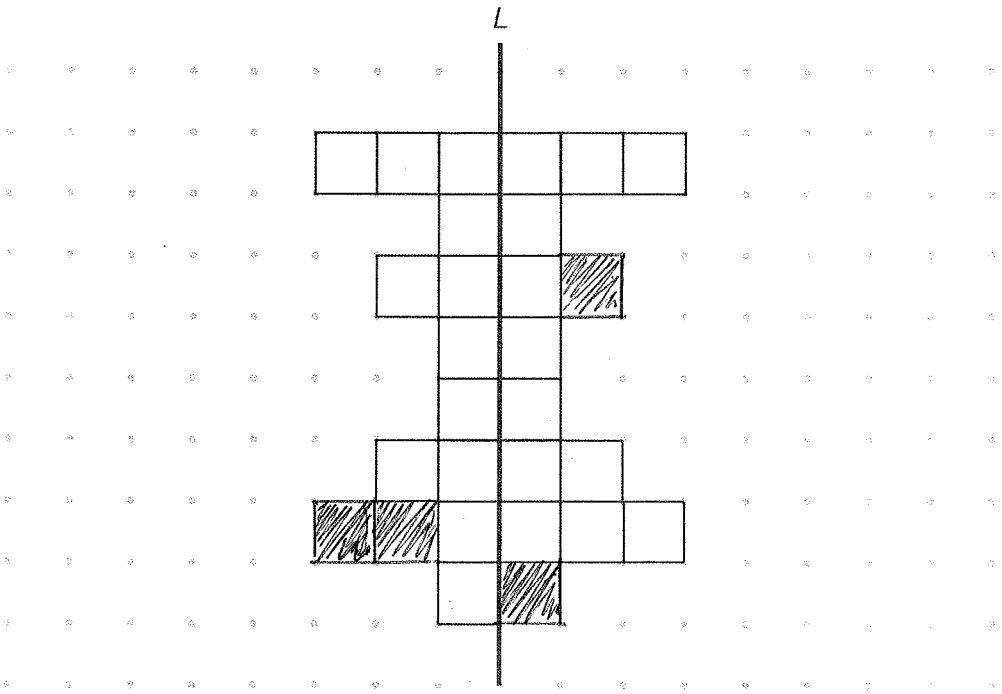
3. *(a)* This shape is drawn on a triangular dotty grid.
Complete this shape so that it has rotational symmetry of order 3. [2]



(b) This shape is drawn on a square dotty grid.
Complete the shaded shape so that *L* is a line of symmetry.

You must shade the smallest possible number of squares. [2]



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4. Fifty students in a small school voted for their Head Girl and Head Boy.

(a) The three candidates for Head Girl were Abby, Bea and Cherry.

The frequency table shows the tally of the votes for 30 of the students.

Candidate	Tally	Frequency
Abby	𝍸 𝍸 𝍸 ||||	19
Bea	𝍸 𝍸 ||||	14
Cherry	𝍸 𝍸 𝍸 ||	17

The remaining 20 votes are shown below.

Abby	Bea	Abby	Abby	Cherry
Bea	Abby	Bea	Cherry	Abby
Cherry	Abby	Bea	Abby	Cherry
Bea	Cherry	Abby	Bea	Abby

Which girl won the vote?
You must show all your working. [2]

Abby

(b) The frequency table shows the results of voting for the Head Boy.

Candidate	Frequency
Dan	13
Eli	20
Fred	17

What percentage of the 50 students voted for the winning boy? [2]

$\frac{20}{50} = \frac{40}{100} = 40\%$ //

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5. The timetable shows some bus times from Newland to Broadacre.

Service	X1	X1	X1	X1	X1
Newland bus station	08:10	09:10	10:15	11:15	12:15
St Mary's hospital	08:17	09:17	10:22	11:22	12:22
Highview castle	08:40	09:40	10:45	11:45	12:45
Whiteview shopping centre	09:09	10:09	11:14	12:14	13:14
Broadacre bus station	09:34	10:34	11:39	12:39	13:39

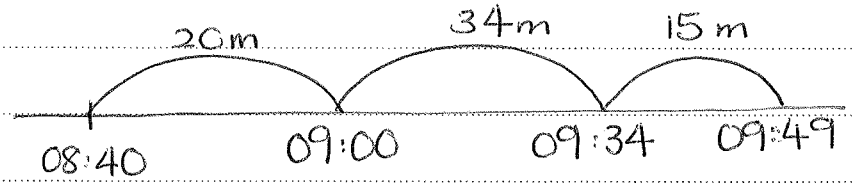
(a) Sid is meeting his friend at Whiteview shopping centre at 1:30 p.m.

What is the time of the latest bus he can take from Newland bus station? [1]

12:15

(b) Pam takes the 08:40 bus from **Highview castle** to Broadacre bus station. The bus leaves Highview castle on time, but arrives at Broadacre bus station 15 minutes late.

How many minutes does Pam's journey take? [2]



$$\begin{array}{r} 20 \\ +\ 34 \\ 15 \\ \hline 69 \end{array}$$

69 minutes

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6. Adesh wanted a 12-month internet and TV contract.
He chose the cheaper of these two deals.

LunarSat	A1 Cable
12-month contract £50 per month	12-month contract £55 per month
No setup cost	First 2 months free (Pays for 10 months only) + £35 setup cost

Which deal did Adesh choose and how much cheaper was it? [5]
You must show all your working.

LunarSat : $50 \times 12 = £600$ //

$$\begin{array}{r} 12 \\ \times\ 50 \\ \hline 600 \end{array}$$

A1 Cable : $55 \times 10 = £550$

$550 + 35 = £585$ //

$600 - 585 = £15$ cheaper

Adesh chose A1 Cable

which was £ 15 cheaper.

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7. *(a)* Simplify each of the following.

(i) $3x-2y+x-7y$ [2]

$4x-9y$

(ii) $7(x+2)-5$ [2]

$=7x+14-5$

$=7x+9$

(iii) $\frac{4x\times 5x}{2}$ [2]

$\frac{20x^2}{2}=10x^2$

(b) (i) A can contains w ml of lemonade.
Taka drinks 15 ml of lemonade from the can.

Write an expression, in terms of w, for the amount of lemonade that is left in the can. [1]

$w-15$

(ii) In the first week of April, Johan made r bird boxes.
In the second week of April, Johan made half as many bird boxes as he did the week before.

Write an expression, in terms of r, for the number of bird boxes Johan made in the second week of April. [1]

$\frac{r}{2}$

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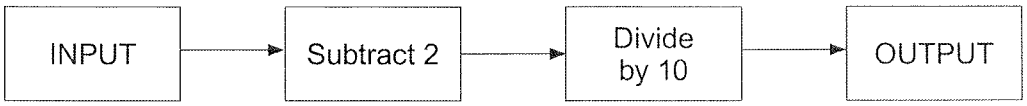
8. *(a)* Here is a number machine.



(i) The input is 45.
What is the output? [1]

45 − 2 = 43

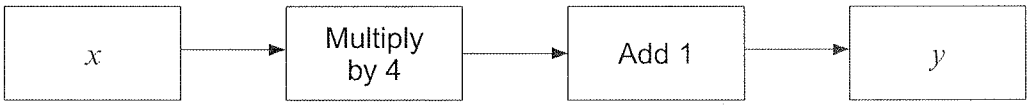
43 ÷ 10 = 4·3

(ii) The output is 0·9.
What is the input? [1]

0·9 × 10 = 9

9 + 2 = 11

(b) This number machine can be used to find coordinates (x, y).



(i) Use the number machine to complete these coordinates. [3]

(2, 9) (0·5, 3) (−1, −3) (1, 5)

2 × 4 = 8
8 + 1 = 9

−1 × 4 = −4
−4 + 1 = −3

5 − 1 = 4
4 ÷ 4 = 1

0·5 × 4 = 2
2 + 1 = 3

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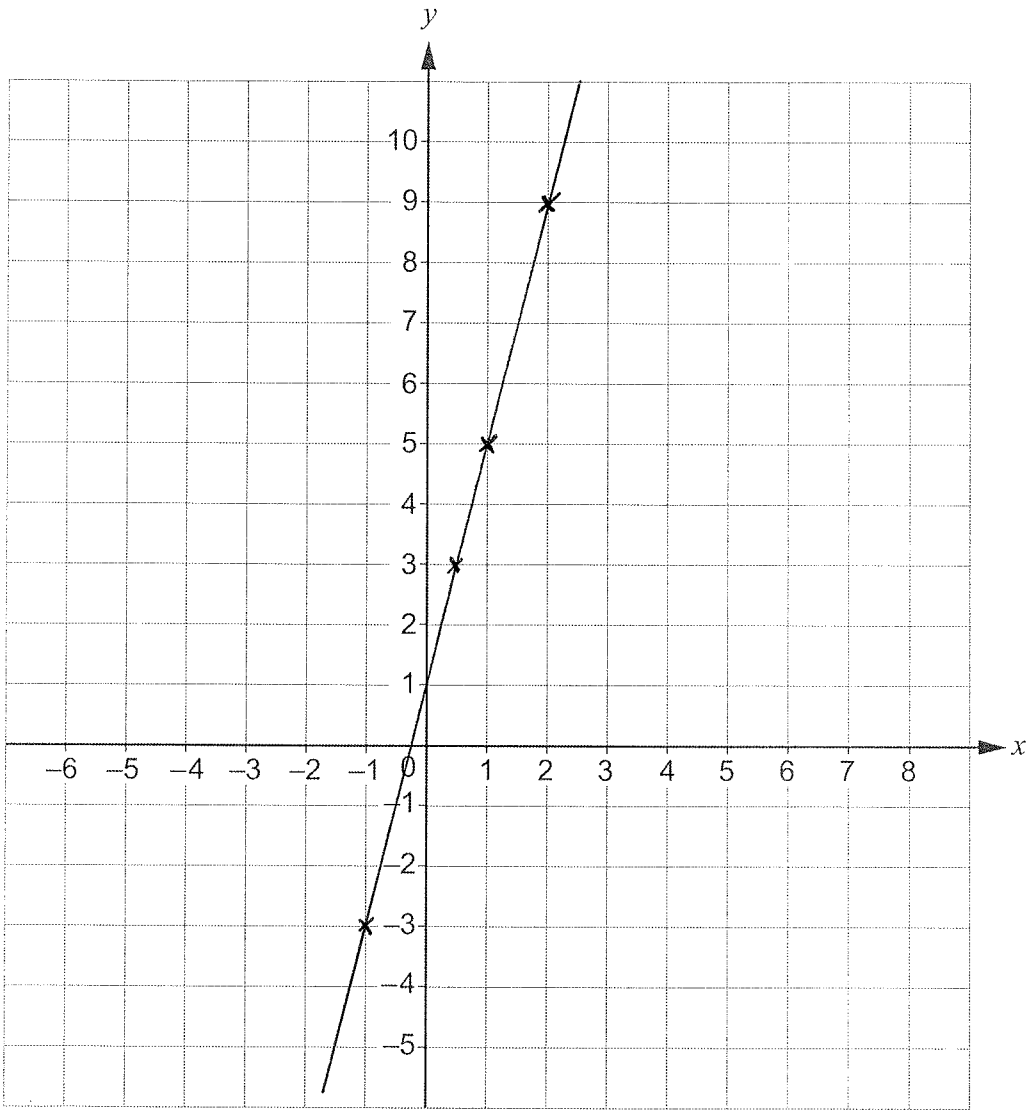
(ii) These coordinates can be used to draw a straight line.

Plot the coordinates found by the number machine and draw the line. [3]



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Turn over.

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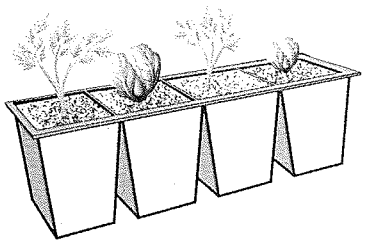
9. Chris and Sue are buying some items for their vegetable garden.

(a)

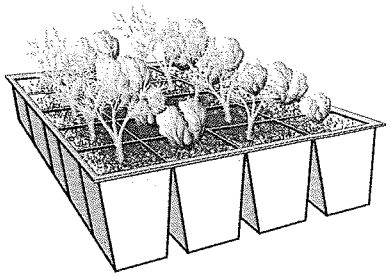


Vegetable Plants

£1.99 for a single strip

OR

£7.50 for a box of 5 strips



Chris buys a box of vegetable plants.

How much money does he save compared to buying 5 single strips? [3]

1·99 9·95
X 5 −7·50
£9·95 £2·45 //

(b) Sue buys 20 bags of compost costing £6.99 each and some packets of seed costing £2.89 each.

She correctly **estimates** her bill to be £170.

How many packets of seed did she buy? [3]

£6·99 → £7 £2·89 → £3
20 × 7 = £140

170 − 140 = £30 on seeds
30 ÷ 3 = 10 packets //

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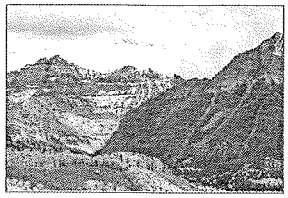
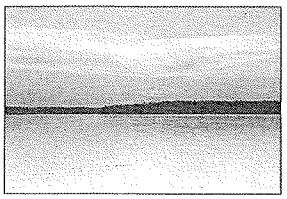
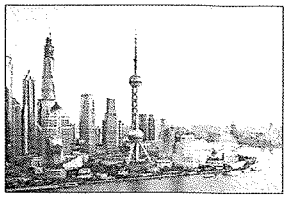
10. An art shop gives away a free copy of a photograph with purchases over £10.

The table shows the probability that each photograph, chosen at random, is given away.

Photograph	Flower	Mountain	Water	City
Probability	0·32	0·28	0·25	0·15

(a) Copies of these 4 photographs are the only photographs given away by the art shop in this offer.
Explain how you know this. [1]

0·32
0·28
0·25
0·15
1·00
1 2

All the probabilities add up to 1 so there are no more options.

(b) Work out the probability that the photograph given away by the art shop is of the Water or City. [1]

0·25 + 0·15 = 0·4 //

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11. Solve the following equations.

(a) $\frac{x}{3} = 8$ [1]

$\frac{x}{3} = 8$

$\times 3 \qquad \times 3$

$x = 24$ //

(b) $5x - 8 = 7$ [2]

$+8 \quad +8$

$\frac{5x}{5} = \frac{15}{5}$

$x = 3$ //

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12. Gemma has her kitchen floor tiled.
The pattern is made up of 80 cream tiles and 24 green tiles.

(a) Write the ratio of cream tiles to green tiles in its simplest form. [2]

C : G
80 : 24
÷8 ↓ ↓ ÷8
10 : 3

cream tiles : green tiles = 10 : 3

(b) Gemma then has her hallway tiled with cream tiles.
For the kitchen **and** hallway, the ratio of cream tiles : green tiles is 19 : 3.

How many cream tiles were used altogether to tile the kitchen **and** hallway? [2]

G : C
19 : 3
21

C : G
19 : 3
×8 ↓
152 : 24

1 part
24 ÷ 3 = 8

19
× 8
152
7

152 cream tiles

(c) Gemma was quoted £820 to have her kitchen tiled.
Tiling the hallway increased this by 70%.

By how much did her quote increase? [2]

10% of £820 = £82
×7 ↓ ↓ ×7
70% = £574

82
× 7
574

Increase of £574

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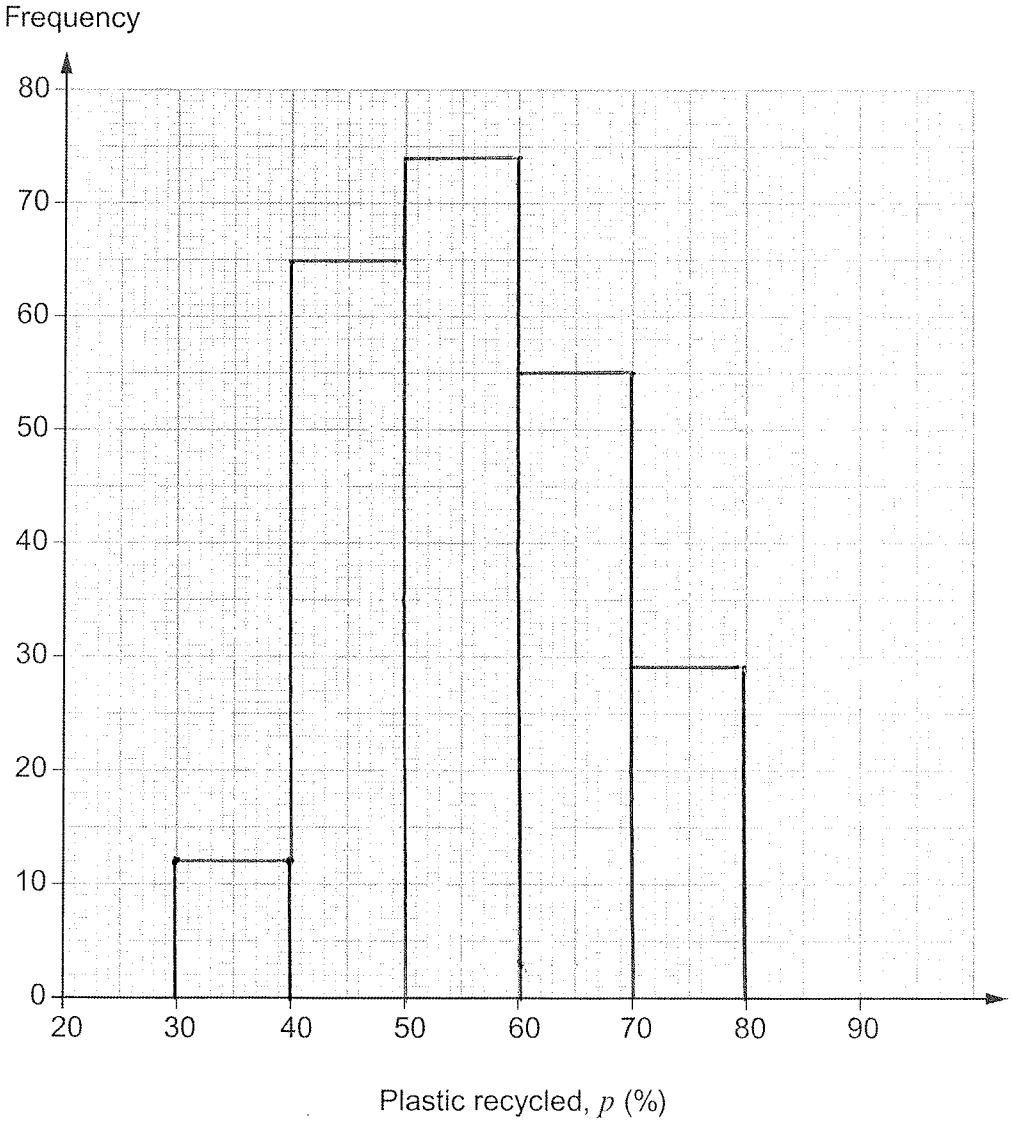
13. The grouped frequency table shows information about the percentage of plastic packaging that each of the 235 members of an eco-group recycled in 2018.

Plastic recycled, p (%)	Frequency
$30 \leq p < 40$	12
$40 \leq p < 50$	65
$50 \leq p < 60$	74
$60 \leq p < 70$	55
$70 \leq p < 80$	29

(a) On the graph paper below, draw a grouped frequency diagram to show this data. [2]

[frequency polygon also acceptable, plot (midpoint, freq)]

Grouped frequency diagram for 2018



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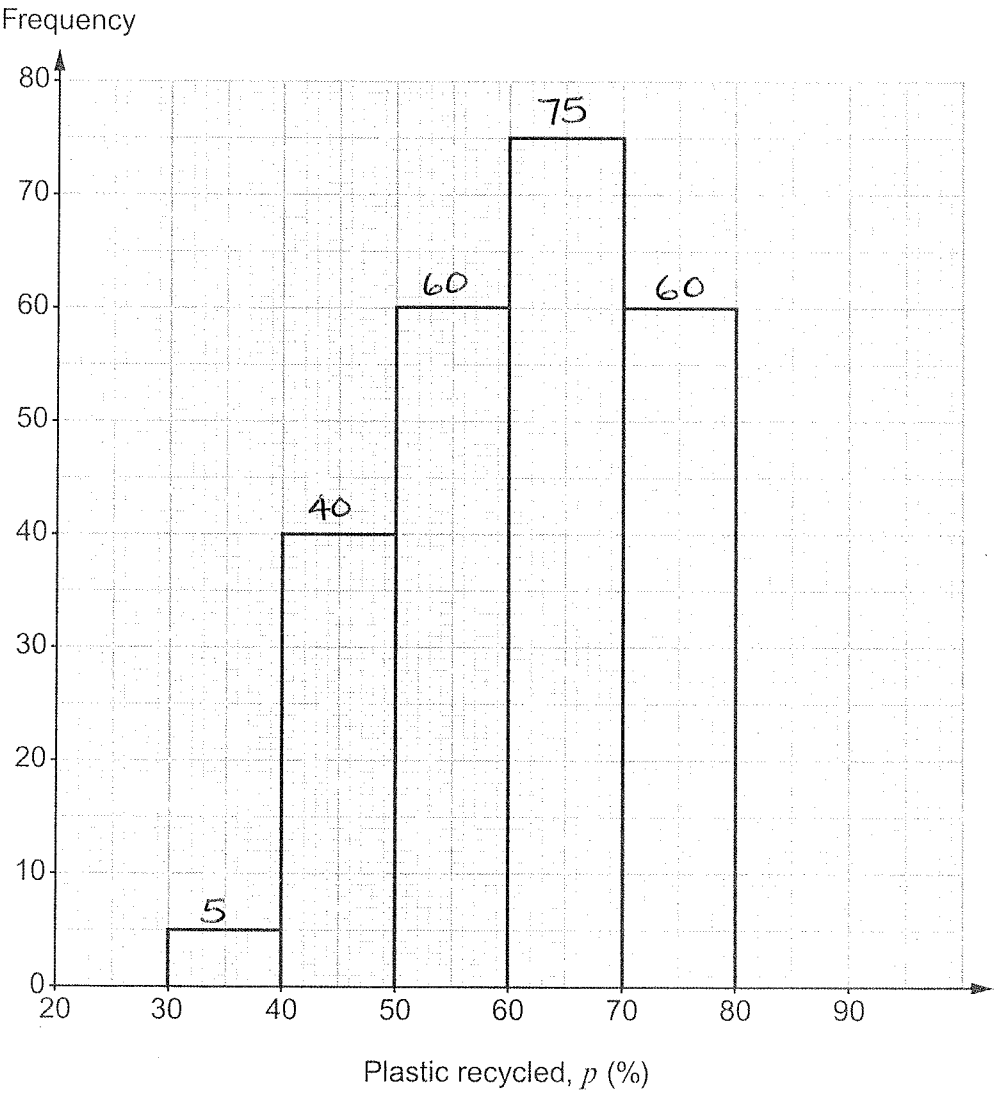
(b) In 2019, the eco-group had more members. – 240 members.
They recorded the percentage of plastic packaging that they each recycled for that year.
The grouped frequency diagram of the results is shown below.

Grouped frequency diagram for 2019



What is the probability that a member of the eco-group recycled at least 70% of their plastic packaging in 2019? [2]

$\frac{60}{240}$

(c) Use the information provided to write a statement **comparing** the percentage of plastic recycled in these two years. [1]

Recycling rates seem to be improving as the modal class in 2019 is 60-70%, in 2018 it was 50-60%.

Other comparisons acceptable.

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14. *(a)*

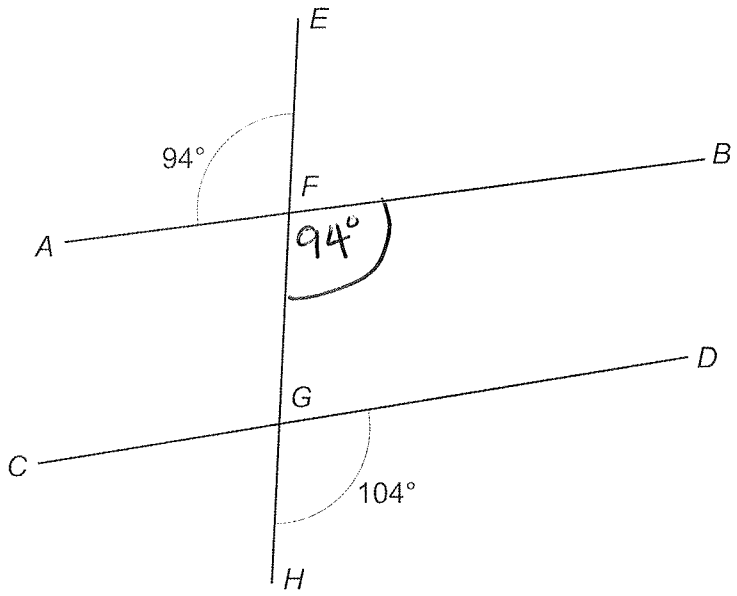

Diagram not drawn to scale

Show that *AB* and *CD* are **not** parallel.
Give a reason for each step of your answer. [2]

Angle BFG = 94° vertically opposite.
If AB and CD were parallel then
BFG = DGH as they are corresponding angles. But they are not equal, so AB and CD are not parallel.

[other explanations possible]

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(b)

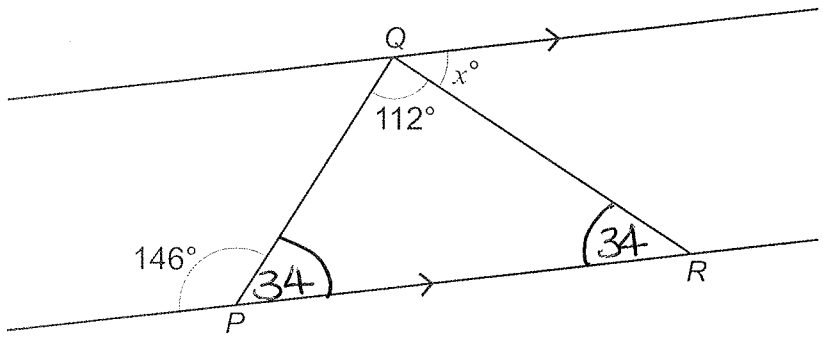

Diagram not drawn to scale

(i) Calculate the value of x.
Give reasons and calculations to support your answer. [3]

180 - 146 = 34° Angles on a straight line = 180°

112 + 34 = 146
180 - 146 = 34° } Angles in a △ = 180°

x = 34° Alternate angles (to QRP) are equal.

$x =$ 34 °

(ii) Write down the mathematical name for triangle *PQR*.
Give a reason for your answer. [1]

Isosceles triangle as two base angles are equal.

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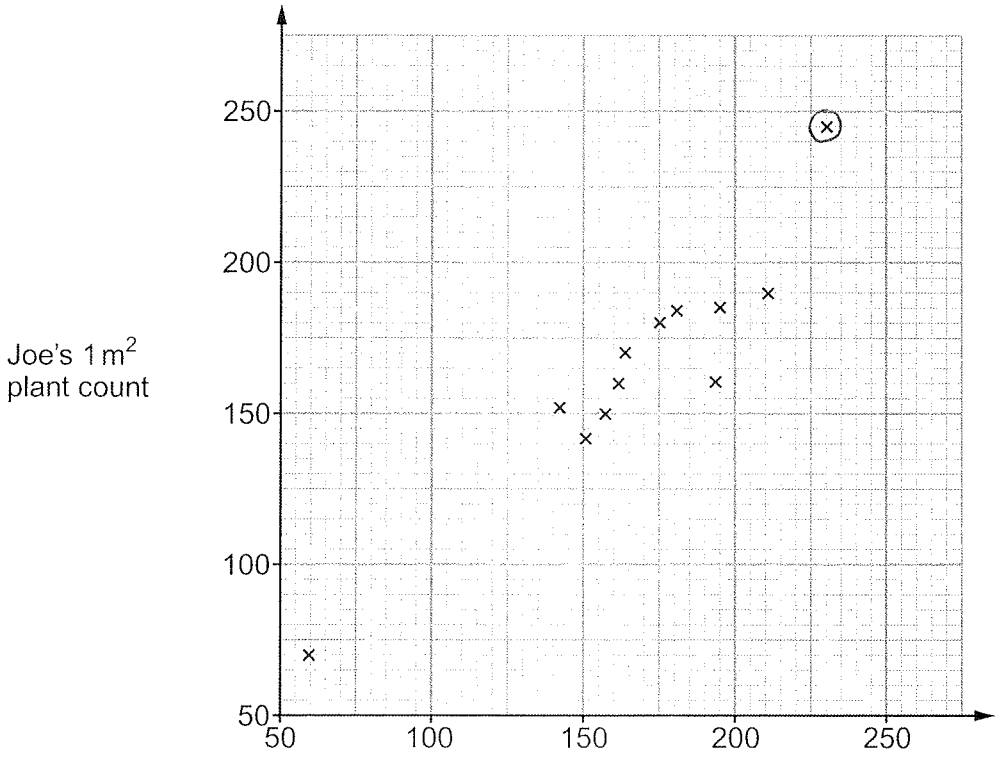
15. A town council has 12 wildflower beds.
Meera and Joe count the number of yellow rattle plants in a **different** 1 m^2 section of each wildflower bed.

Their results are shown in the scatter diagram.



(a) In one of the beds, both Meera and Joe counted many more yellow rattle plants than in the other beds.

Calculate the difference between Joe's plant count and Meera's plant count for this bed. [1]

(M) 230 245 - 230 = 15

(J) 245

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(b) In one wildflower bed, Meera counted 60 yellow rattle plants and Joe counted 70. They want to use these values to estimate the total number of yellow rattle plants in this bed.

Meera says,

> We should use 70 to estimate the number of yellow rattle plants in this bed because it is higher.

Joe says,

> It is better if we add our answers together and use the total number of plants in $2\,m^2$ to estimate the number of yellow rattle plants in this bed.

(i) Who is correct?

Meera ☐ Joe ☑

Explain how you decide. [1]

A bigger sample should give more reliable results

(ii) This wildflower bed has an area of $40\,m^2$.

Use Joe's method to calculate an estimate of the number of yellow rattle plants in this bed. [2]

60 + 70 = 130 → $2m^2$

×20 ↓ 2600 → $40m^2$ ↓ ×20

2600 plants //

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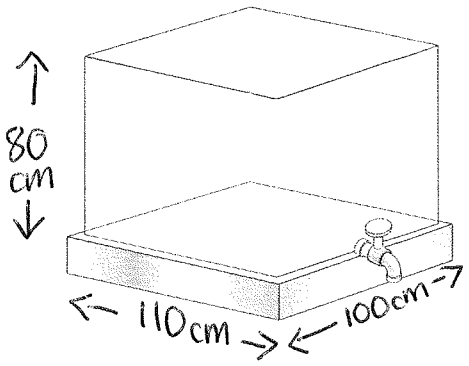
16. Use: 1 litre = 1000 cm^3



A water tank has a tap at the bottom.

The tank is a cuboid with length 110 cm, width 100 cm and height 80 cm.

When the tap is open, water flows from the tap at a constant rate of 20 litres per minute.

The tank is full and at 11:50 the tap is opened.

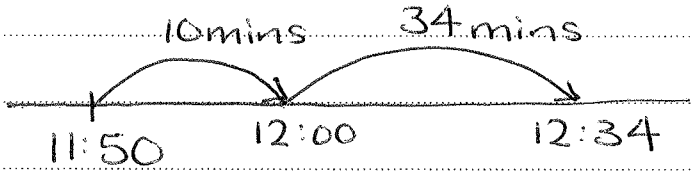
At what time will the tank be empty? [6]

Volume of water in tank = 110 x 100 x 80

= 880 000 cm^3 ↓ ÷ 1000

= 880 litres

Time to empty = $\frac{880}{20}$ = 44 minutes



It will be emtty at 12:34 //

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17. When a fraction is subtracted from $\frac{5}{7}$ the answer is $\frac{2}{21}$.

Find the fraction that is subtracted. [3]

$\frac{5}{7} - \boxed{} = \frac{2}{21}$ OR $\frac{5}{7} - \frac{2}{21} = \boxed{}$

$\frac{15}{21} - \boxed{\frac{13}{21}} = \frac{2}{21}$ $\frac{15}{21} - \frac{2}{21} = \frac{13}{21}$

$\frac{13}{21}$ //

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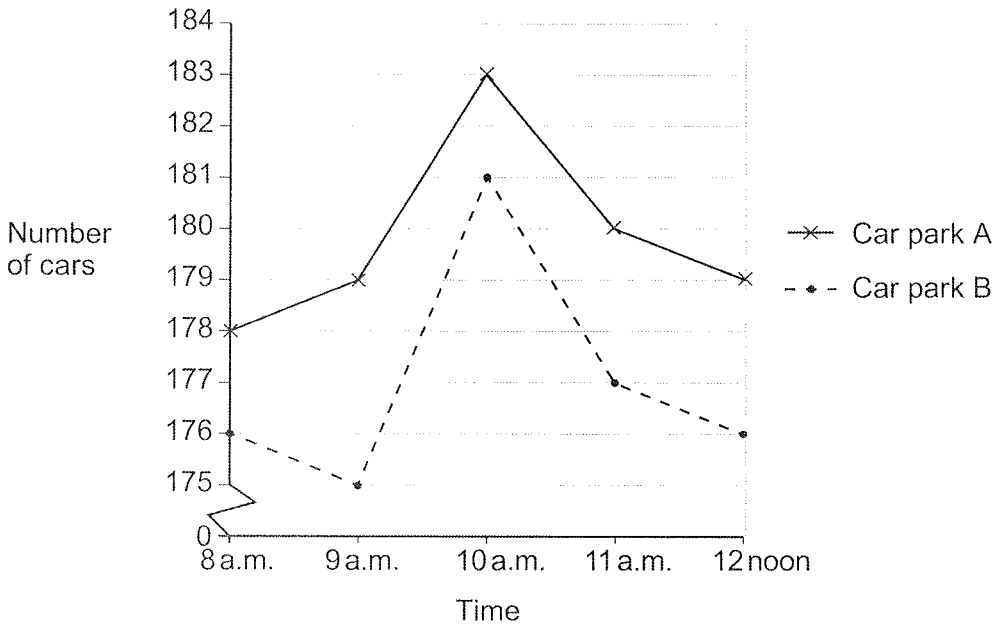
18. Peter and Paula record the number of cars in each of two airport car parks, A and B, between 8 a.m. and 12 noon one Saturday morning.
This was done to find out if there was a peak time for parking during that period.

The table shows the data they collected.

Time	8 a.m.	9 a.m.	10 a.m.	11 a.m.	12 noon
Number of cars in car park A	178	179	183	180	179
Number of cars in car park B	176	175	181	177	176

Paula draws this graph to represent the data.



Peter says,

"This graph is not sensible as it does not show the data fairly."

(a) What has been done in the drawing of the graph that has made Peter think this? [1]

The scale on the vertical axis jumps from 0 to 175.

(b) What error might this lead to, for people who do not look carefully at the graph? [1]

It looks like cars peak at 10am when really the number of cars hardly changes over time.

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19. Lena makes a fruit drink by mixing orange juice, pineapple juice and sparkling water in the ratio

orange : pineapple : water = 3 : 2 : 7.

O P W total 12 parts.

(a) What fraction of the mix is water? [1]

$\frac{7}{12}$ //

(b) Lena pours 300 ml of her fruit drink into a glass.

How much pineapple juice is in Lena's glass? [2]

O : P : W Total

3 : 2 : 7 12

×25

50ml 300ml

1 PART

$\frac{300}{12} = 25$ ml

$12\overline{)300}$ 25

50 ml

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20. *(a)* Simplify $18\pi \div 9\pi$. [1]

$\frac{18\pi}{9\pi} = \frac{18}{9} = 2$ //

(b) The diagram shows two circles, one inside the other.

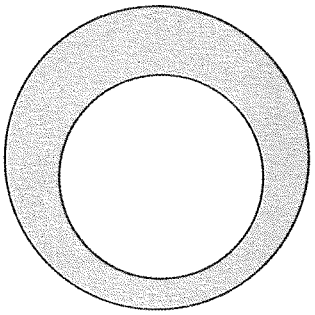

Diagram not drawn to scale

The radius of the outer circle is 6 cm.
The radius of the inner circle is 5 cm.

Work out the area of the shaded region.
Give your answer in terms of π. [3]

Area big circle $= \pi r^2 = \pi \times 6^2 = 36\pi$

Area inner circle $= \pi r^2 = \pi \times 5^2 = 25\pi$

Shaded area $= 36\pi - 25\pi$

$= 11\pi$

Area of shaded region = 11π cm^2

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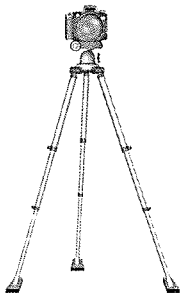
21.

Use:

$$\text{Pressure} = \frac{\text{Force (N)}}{\text{Area (cm}^2\text{)}}$$



A camera is attached to a tripod.
The tripod has 3 legs and stands on horizontal ground.
Each leg exerts the same pressure on the ground.

The tripod has a weight of 34 N.
The camera has a weight of 20 N.

Each foot of the tripod is a rectangle with length 3 cm and width 2 cm.

Work out the pressure exerted by the tripod and camera on the ground.
You must show all your working. [5]

34 + 20 = 54 N total

Area 1 foot = 3 × 2 = 6 cm²

Area 3 feet = 3 × 6 = 18 cm²

$P = \frac{F(N)}{A(cm^2)} = \frac{54}{18} \xrightarrow{\div 6} \frac{9}{3} = 3$ N/cm²

Pressure = 3 N/cm²

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22. Ivan is part of a team making bags of free items to give away at a college open evening.

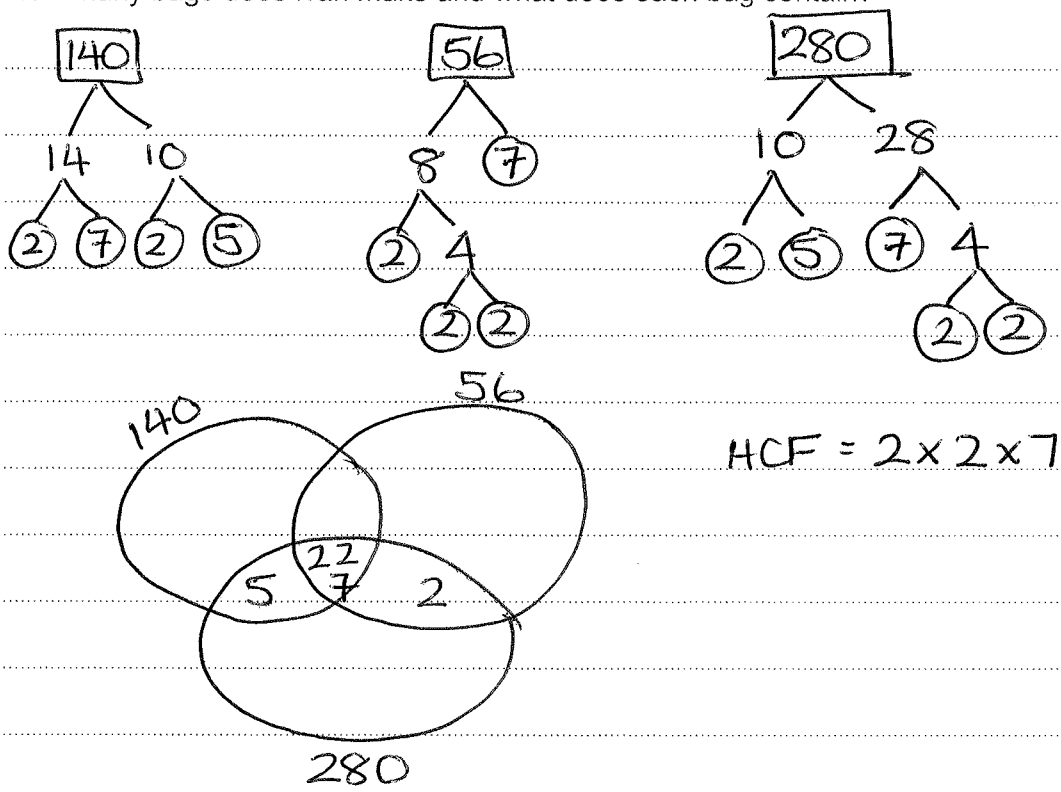
He has:

- 140 discount vouchers,
- 56 pencils,
- 280 sweets

to share between all his bags.

He uses **all** the vouchers, **all** the pencils and **all** the sweets.
He makes as many bags as possible.
The contents of each bag are the same.

How many bags does Ivan make and what does each bag contain? [5]



HCF = 2 × 2 × 7 = 28

Ivan makes 28 bags containing

5 vouchers, 2 pencils, 10 sweets.

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23. A line L has equation $y = 12 - 4x$. $y = mx + c$ $y = -4x + 12$

Write down the equation of a different line that is parallel to L. [1]

Gradient = -4

Parallel lines have same gradient

eg $y = -4x + 10$

24. Factorise $3x^2 - 4xy$. [1]

$x(3x - 4y)$

25. *(a)* Simplify $14\sqrt{5} - 3\sqrt{5}$. [1]

$11\sqrt{5}$

(b) Work out the value of $4^{10} \times 4^{-7}$. [2]

$4^{10+-7} = 4^{10-7} = 4^3$

$= 4 \times 4 \times 4$

$= 16 \times 4$

$= 64$ //

16
×4
64

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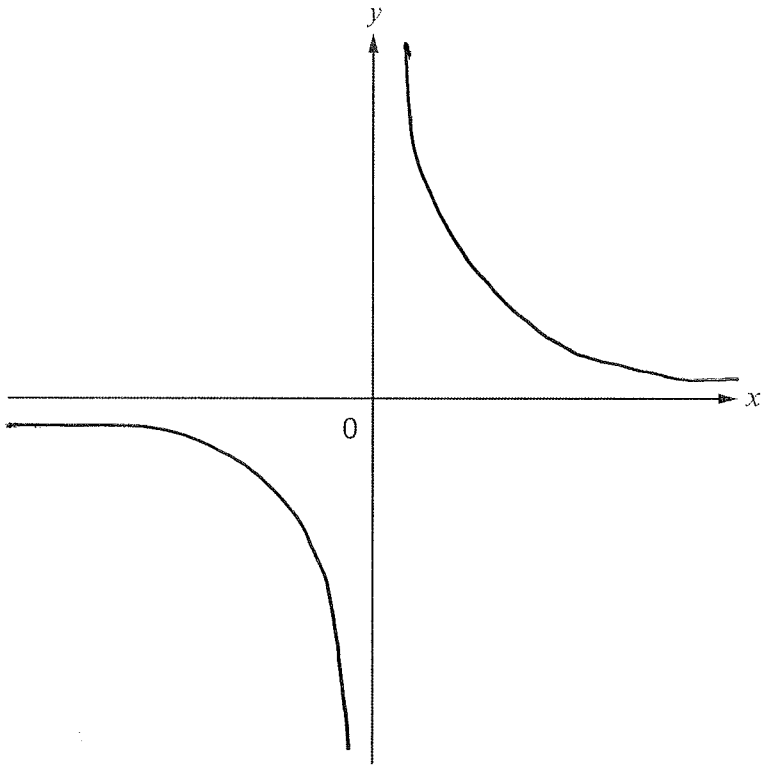
26. *(a)* (i) $xy = 1$

Explain why neither x nor y can be zero. [1]

If either x or y was 0 then x x y = 0 not 1.

(ii) On the axes below, sketch the graph of $y = \frac{1}{x}$. [2]



(iii) Complete this sentence about the graph you have drawn. [1]

The graph shows 'y is inversely proportional to x'.

(b) The variables V and p are connected by the equation $\frac{V}{p^2} = 5$.

Find the value of V when $p = 0{\cdot}1$. [2]

$V = 5p^2$

$V = 5 \times 0{\cdot}1^2 = 5 \times 0{\cdot}01 = 0{\cdot}05$ //

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27. A cinema has standard seats and premier seats.
Omar and Fatima each book some cinema tickets.

x y.

Omar books 3 standard and 2 premier seats and pays £30.
Fatima books 2 standard and 4 premier seats and pays £40.

Use an algebraic method to work out the difference in cost between a standard seat and a premier seat. [5]

Omar: $3x + 2y = 30$ ①

Fatima: $2x + 4y = 40$ ②

① × 2 $6x + 4y = 60$

Sub ② $2x + 4y = 40$

$4x = 20$

$\frac{4x}{4} = \frac{20}{4}$

$x = £5$

Sub $x = 5$ into ① $3(5) + 2y = 30$

$15 + 2y = 30$

$-15 \quad -15$

$2y = 15$ $y = £7.50$

$7.50 - 5.00 = 2.50$

Difference in cost between a standard seat and a premier seat is £ 2.50

END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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