

1. (a) Work out the following.

(i)  $20 \times 40$

[1]

$2 \times 4 = 8$

$20 \times 40 = \underline{\underline{800}}$

(ii)  $57 \div 3$

[1]

$$\begin{array}{r} 19 \\ 3 \overline{) 57} \end{array}$$

(iii)  $\frac{2}{5}$  of 30

[2]

$30 \div 5 = 6$

$6 \times 2 = \underline{\underline{12}}$

(iv) 30% of 70

[2]

$10\% = 7$

$7 \times 3 = \underline{\underline{21}}$

(v)  $1.03 + 12.8$

[1]

$$\begin{array}{r} 12.80 \\ 1.03 \\ \hline 13.83 \end{array}$$

(b) Write 8% as a decimal.

[1]

$8 \div 100 = \underline{\underline{0.08}}$

(c) In the box, write the **smallest** possible whole number to make the statement correct. [1]

4.4

&lt;

5



2. (a) Most numbers have an **even** number of factors.

For example,

10 has **four** factors: 1, 2, 5 and 10.

11 has **two** factors: 1 and 11.

There is one number between 13 and 19 that has an **odd** number of factors.

Find this number.

Write down all the factors of this number.

[2]

16, 1, 2, 8, 4

The number is

16

The factors of this number are

1, 2, 4, 8, 16

- (b) Write down the first three **even** multiples of 7.

[1]

14

28

42



(c) Linda says,

When I round the number of pupils in my class  
to the nearest 5, the answer is 25.

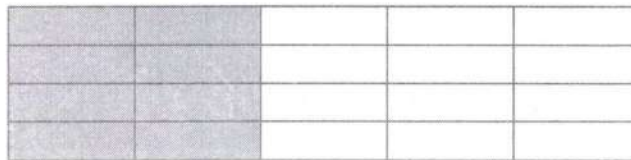
How many pupils could there be in her class?  
Write all the possible answers.

[2]

23, 24, (25), 26, 27

3. What percentage of the following shape is shaded?

[2]



$$\frac{8}{20} = \frac{2}{5} = 40\%$$













4. A teacher asked a group of students to choose their favourite sandwich filling. The five options were: cheese, chicken, ham, salad or tuna. Each student chose **one** option. The table and the pictogram each show some of the results for the five fillings.

→

| Filling | Number of students |
|---------|--------------------|
| Cheese  | 3                  |
| Chicken | 10                 |
| Ham     | 12                 |
| Salad   | 1                  |
| Tuna    | 6                  |

→

|         |   |   |  |
|---------|---|---|--|
| Cheese  |    |   |  |
| Chicken |  |  |  |
| Ham     |  |  |  |
| Salad   |  |   |  |
| Tuna    |  |  |  |

Key:  represents 4 students

- (a) Complete the key, the table and the pictogram.

[3]

- (b) What is the modal choice of sandwich filling?

[1]

Ham



5. (a) Lucy writes down the first five **square** numbers.  
Lucy chooses two square numbers that have a difference of 12.

Which square numbers did Lucy choose?

[2]

1, 4, 9, 16, 25  
12

The two square numbers are 4 and 16

- (b) Mary adds two **odd** numbers together and gets an answer of 21.

Could Mary's answer be correct?

☐

Yes

☒

No

☐

Cannot tell

Give a reason for your answer.

[1]

21 is odd, two odds add to make an even

- (c) Write the following values in ascending order.

[1]

3

0.3

0.302

0.35

0.8

0.3

0.302

0.35

0.8

3

Smallest value

Greatest value



6. (a) Twenty-five players in a rugby team voted for their player of the season.

(i) The three nominations for player of the season were Ashton, Jamal and Oliver.

The frequency table shows the tally of the votes from 10 of the players.

| Candidate | Tally | Frequency |
|-----------|-------|-----------|
| Ashton    | 11    | 7         |
| Jamal     |       | 10        |
| Oliver    |       | 8         |

The remaining 15 votes are shown below.

Ashton ✓

Oliver ✓

Jamal ✓

Oliver ✓

Oliver ✓

Jamal ✓

Oliver ✓

Jamal ✓

Jamal ✓

Oliver ✓

Ashton ✓

Jamal ✓

Oliver ✓

Oliver ✓

Jamal ✓

Which player won the vote for player of the season?  
You must show all your working.

[2]

The player of the season is

Jamal

(ii) What percentage of the 25 students voted for Oliver?

[2]

$$\frac{8}{25} = \frac{32}{100} = 32\%$$





- (b) Some of the players in Lindsey's team have missed games because of injury. She writes a question to find out how many games they have missed. Here is the question:

How many games have you missed this season due to injury?

☐

0-2

☐

2-4

☐

5 or more

State **one** criticism of her question.

[1]

There's overlap in the 1st 2 boxes



7. (a) Robin has a scale drawing of his local park.  
The scale on the drawing is 1 cm represents 250 cm.  
On the drawing a flowerbed is 6 cm long.

What is the actual length of the flowerbed?  
Write your answer in **metres**.

[3]

$$\begin{array}{r} 250 \\ \times 6 \\ \hline 1500 \text{ cm} \end{array}$$

The actual length of the flowerbed is 15 m

- (b) Robin has 240 daffodils and 60 tulips.

What fraction of these flowers are daffodils?  
Give your answer in its simplest form.

[2]

$$\frac{240}{300} = \frac{24}{30} = \frac{4}{5}$$

- (c) Some rose bushes are divided equally between 2 gardeners.

Write this division as a ratio.

[1]

| |

oe





8. A shop sells the same brand of lemonade in two different-sized bottles.



1000 ml for £2.50



300 ml for 81p

Which bottle is the better value for money?



The 1000 ml bottle



The 300 ml bottle

You must show all your working.

[3]

$$A \quad 100 \text{ ml} = \frac{2.50}{10} = 25 \text{p}$$

$$B \quad 100 \text{ ml} = \frac{27}{3} = 27 \text{p}$$



9. (a) Solve  $6x = 42$ .

[1]

$$x = 42 \div 6 = \underline{\underline{7}}$$

- (b) Calculate the value of  $4y$  when  $y = -12$ .

[1]

$$4 \times -12 = \underline{\underline{-48}}$$

- (c) Simplify  $5w + 3(6w - 2)$ .

[2]

$$\begin{aligned} &= 5w + 18w - 6 \\ &= 23w - 6 \end{aligned}$$

- (d) A shirt has  $t$  buttons.

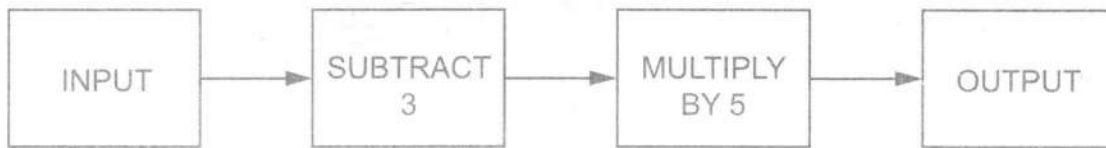
Write down, in terms of  $t$ , the number of buttons on 8 shirts.

[1]

$$\underline{\underline{8t}}$$



10. Here is a number machine.



- (a) The input is 10.  
What is the output?

[1]

$$10 - 3 = 7 \quad 7 \times 5 = \underline{35}$$

- (b) The output is 55.  
What is the input?

[1]

$$55 \div 5 = 11$$

$$11 + 3 = \underline{14}$$



11. Adele and Lewis are shopping in a bakery.

(a)



### Bread rolls

98p each

OR

£4.50 for a bag of 5 rolls



Adele buys a bag of 5 rolls.

How much money does she save compared to buying 5 rolls separately?

[3]

$$\begin{array}{r} 98 \\ \times 5 \\ \hline 490 \text{ p} \end{array}$$

$$\begin{array}{r} 490 \\ - 450 \\ \hline 040 \text{ p saved} \end{array}$$

- (b) Croissants cost 90p each and cinnamon whirls cost £1.25 each.  
Lewis buys 4 croissants and some cinnamon whirls.  
Lewis has £10.

What is the greatest number of cinnamon whirls that Lewis can buy?  
You must show all your working.

[3]

$$\begin{array}{r} 90 \\ \times 4 \\ \hline 360 \text{ p} \end{array}$$

$$\begin{array}{r} 10.00 \\ - 3.60 \\ \hline 6.40 \end{array}$$

$$\begin{array}{r} 1.25 \text{ (1)} \\ 2.50 \text{ (2)} \\ 3.75 \text{ (3)} \\ 5.00 \text{ (4)} \\ 6.25 \text{ (5)} \end{array}$$

= 5 whirls



12. A wind turbine generates 390 units of electricity per hour.

How many units of electricity will this turbine generate if it continues at this rate for 2 hours and 20 minutes? [3]

$$20 \text{ mins} = \frac{1}{3} \text{ hr}$$

$$\begin{array}{r} 390 \\ 390 \\ + 2130 \\ \hline 910 \end{array}$$

Units of electricity generated = 910

13. (a) Ben needs 90 bottles of water for an athletics event.  
The bottles of water are sold in packs of 8.

He makes this calculation to find out the number of packs he needs:

$$90 \div 8 = 11.25$$

He decides to buy 11 packs of water.

Is Ben's decision correct?

You must give a reason for your answer. [1]

☐

Yes

☒

No

He'll only have 88 bottles so  
needs another pack

- (b) Ben divides the 90 bottles in the ratio 4:1.

He says,

"To work out the larger share, we should divide 90 by 4".

Explain what is wrong with Ben's method. [1]

Should  $\div 5$  then  $\times 4$



14. The table shows some of the values of  $y = 1 - 2x$  for  $-2 \leq x \leq 2$ .

|              |    |    |   |    |    |
|--------------|----|----|---|----|----|
| $x$          | -2 | -1 | 0 | 1  | 2  |
| $y = 1 - 2x$ | 5  | 3  | 1 | -1 | -3 |

- (a) Complete the table.

[2]

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- (b) On the grid, draw the line  $y = 1 - 2x$  for  $-2 \leq x \leq 2$ .

[2]

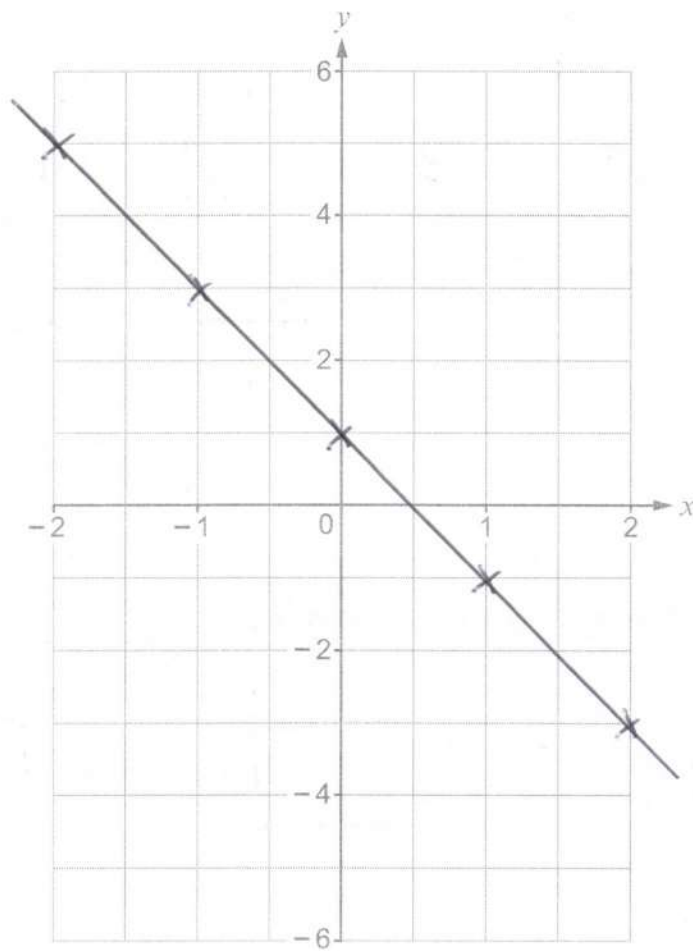
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15. A bag contains 100 identically-sized coloured balls.

A ball is selected at random.

The table shows the probability of choosing a blue ball, a red ball or a green ball.

| Colour      | Blue | Red | Green |
|-------------|------|-----|-------|
| Probability | 0.42 | 0.3 | 0.18  |

Show that the bag must contain 10 balls that are **not** blue, red or green.

[2]

$$\begin{array}{r}
 0.42 \\
 0.30 \\
 0.18 \\
 \hline
 0.90
 \end{array}
 \quad
 \begin{array}{l}
 1 - 0.9 = 0.1 \\
 0.1 \times 100 \\
 = \underline{\underline{10}}
 \end{array}$$

16. Gary owns a garage selling second-hand cars. On Saturday, he had 72 petrol cars and 48 diesel cars for sale.

- (a) Write the number of petrol cars to the number of diesel cars as a ratio in its simplest form.

[2]

$$\begin{array}{l}
 72 : 48 \\
 = 6 : 4 \\
 = \underline{\underline{3 : 2}}
 \end{array}$$

- (b) What percentage of cars are diesel?

[3]

$$\frac{2}{5} = \frac{40}{100} = \underline{\underline{40\%}}$$



17. (a) Calculate 12% of £750.

[2]

$$10\% = 75$$

$$1\% = 7.5$$

$$2\% = 15$$

$$\begin{array}{r} 75 \\ + 15 \\ \hline 90 \end{array}$$

- (b) When a fraction is added to
- $\frac{2}{5}$
- the answer is
- $\frac{7}{15}$
- .

Find the fraction that is added.

[3]

$$\frac{7}{15} - \frac{2}{5} = \frac{7}{15} - \frac{6}{15} = \frac{1}{15}$$



18. Sarah has a water container in the shape of a cuboid.  
The area of the base of the container is  $150\text{ cm}^2$ .

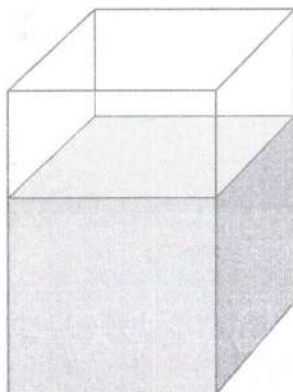


Diagram not drawn to scale

Water is leaking from the container at a constant rate.

At 10:00 the water is 20 cm high.

At 10:15 the water is 17 cm high.

How much water is in the container at 11:00?

Give your answer in litres.

[5]

|       |       |
|-------|-------|
| 10:30 | 14 cm |
| 10:45 | 11 cm |
| 11:00 | 8 cm  |

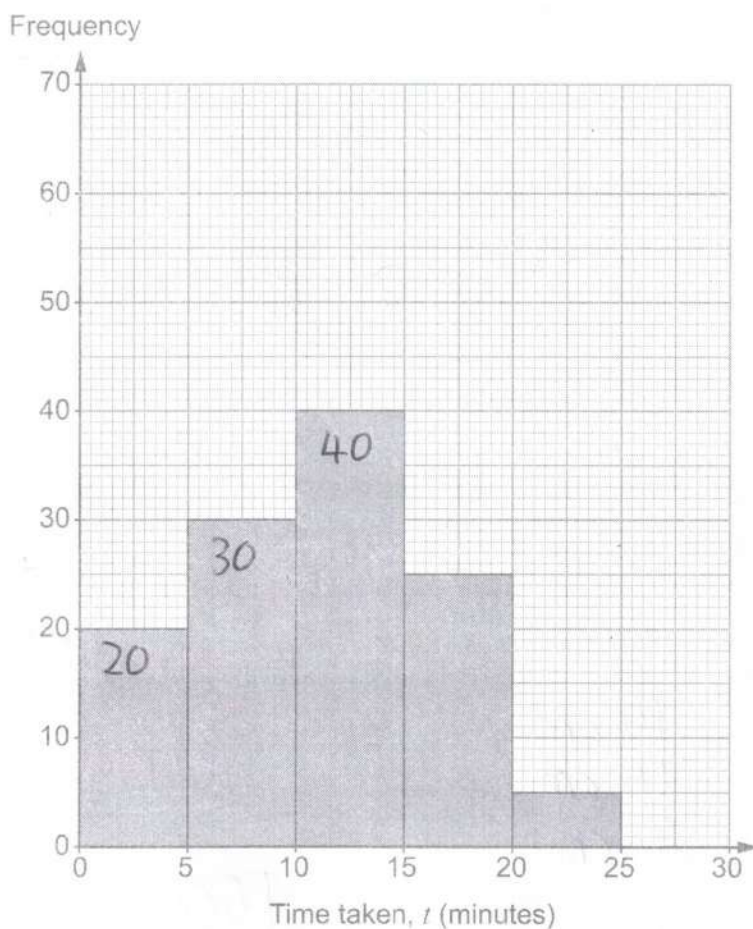
$$\begin{array}{r} 150 \\ \times 8 \\ \hline 1200 \end{array} \text{ cm}^3$$

$$= 1200 \text{ ml}$$

There are 1.2 litres of water in the container at 11:00.



19. 120 people each completed a puzzle.  
 The times taken to complete the puzzle are shown in the diagram below.  
 The diagram uses groups of width 5 minutes:  $0 \leq \text{time} < 5$ ,  $5 \leq \text{time} < 10$ , and so on.



A person is chosen at random.

What is the probability that this person took less than 15 minutes to complete the puzzle? [2]

$$40 + 30 + 20 = 90$$

$$\frac{90}{120}$$

(etc)



20. The diagram below shows three straight lines,  $AB$ ,  $CD$  and  $GH$ .

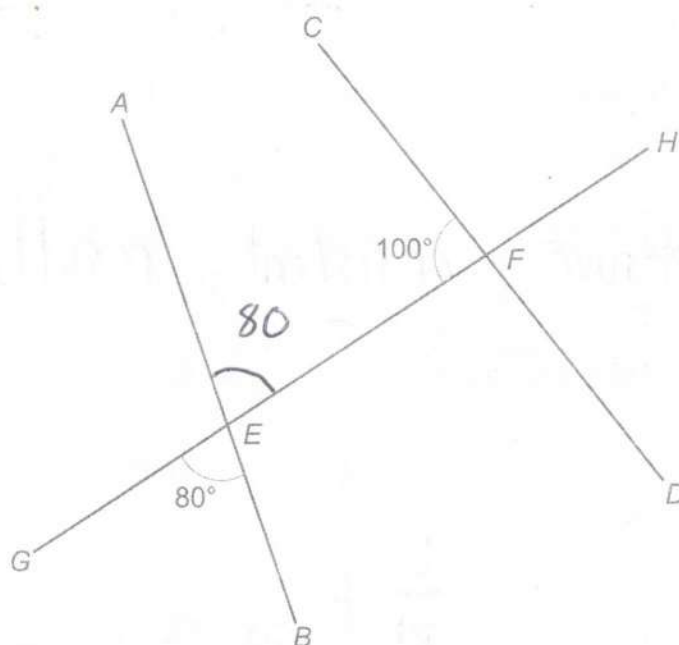


Diagram not drawn to scale

Show that  $AB$  and  $CD$  are parallel.  
You must give reasons to justify your answer.

[2]

$\angle AEF = 80$  (opposite angles are equal)

$$\angle AEF + \angle CFE = 80 + 100 = 180$$

Co-interior angles sum to 180  
hence parallel





21. David and Asif are studying the size of leaves.

Before measuring the leaves, they agreed on the following conditions:

- The length of the leaf does not include the stem.
- The width of the leaf is measured at the widest part of the leaf.

(a) Why do they need to agree on these conditions to measure the leaves?

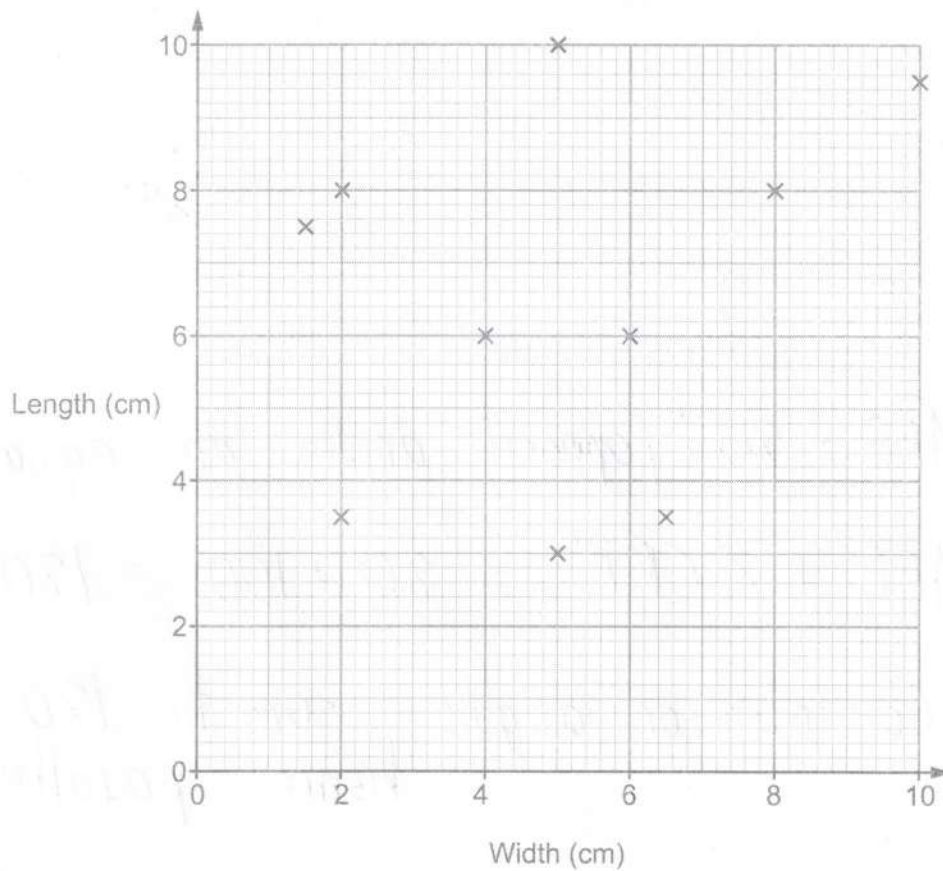
[1]

To ensure consistent results/data

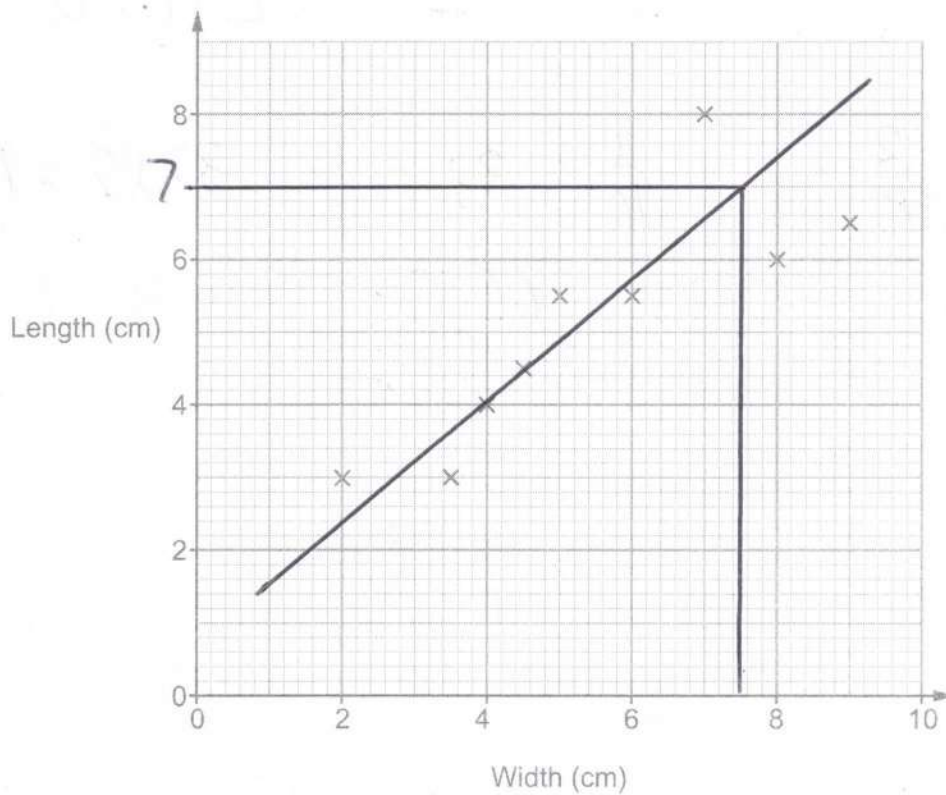
(etc)

(b) David and Asif have each drawn a scatter diagram to show their results.

David's scatter diagram



Asif's scatter diagram



- (i) One of the boys collected all of his leaves from one tree.

Who was this most likely to be?  
Give a reason for your answer.

[1]

☐

David

☒

Asif

Reason: His results have correlation

- (ii) Draw a line of best fit on Asif's scatter diagram. ✓

[1]

- (iii) Asif forgot to include the measurements of one of the leaves on his scatter diagram. The length of this leaf is 7 cm.

Write down an estimate of the width of this leaf.

[1]

7.5

[ms 7 → 9]



22. Ivy mixes lemon juice, pineapple juice and orange juice in the ratio 1 : 2 : 7 to make a fruit drink.  
Ivy has 330 ml of her fruit drink in a glass.

L : P : O

How much pineapple juice is in Ivy's glass?

[2]

$$P = \frac{2}{10}$$

$$\frac{1}{10} = 33$$

$$33 \times 2 = 66$$

66

ml

23. The shape below consists of a square surrounded by four semi-circles. The diameter of each semi-circle is 12 cm.

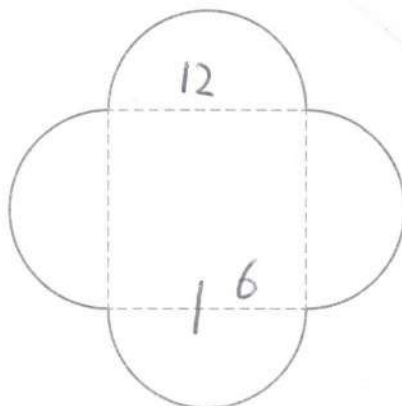


Diagram not drawn to scale

Work out the area of the shape.  
Give your answer in the form  $a + b\pi$ .

[4]

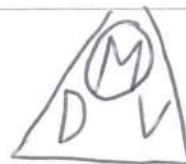
$$\square = 12 \times 12 = 144 \text{ cm}^2$$

$$4\Delta = 2\text{"O"} = \pi \times 6^2 \times 2 = 72\pi \text{ cm}^2$$

$$\text{Area} = 144 + 72\pi \text{ cm}^2$$



24. Izaan has a block of stainless steel with volume  $700 \text{ cm}^3$ .  
The stainless steel has a density of  $7.5 \text{ g/cm}^3$ .



Izaan says,

The block has a mass of less than 5 kg.

Is Izaan correct?

[3]

☐

Yes

☒

No

☐

Cannot tell

Show how you decide.

$$M = D \times V \quad 700 \times 7.5 = 5250 \text{ g}$$

$$\begin{array}{r} 7.5 \\ \times 37 \\ \hline 52.5 \end{array} \quad = 5.25 \text{ kg}$$



25. Write 60 as a product of its prime factors in index form.

[3]

$$\begin{array}{c} \diagup \quad \diagdown \\ 10 \quad 6 \\ \diagdown \quad \diagup \quad \diagdown \quad \diagup \\ (5) (2) (3) (2) \end{array} = 5 \times 3 \times 2 \times 2$$

$$60 = 5 \times 3 \times 2^2$$





26. The diagram below shows an equilateral triangle and a square.

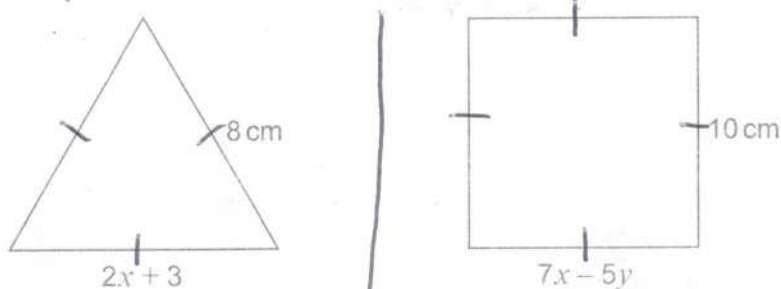


Diagram not drawn to scale

Use an algebraic method to find the value of  $x$  and the value of  $y$ .  
You must show all your working.

[5]

$$2x + 3 = 8$$

$$2x = 5$$

$$x = 2.5$$

$$\begin{array}{r} 2.5 \\ \times 37 \\ \hline 17.5 \end{array}$$

$$7x - 5y = 10$$

$$(17.5) - 5y = 10$$

$$17.5 - 10 = 5y$$

$$7.5 = 5y$$

$$\begin{array}{r} 1.5 \\ 5 \overline{) 7.5} \\ \hline \end{array}$$

$$\begin{array}{l} x = 2.5 \\ y = 1.5 \end{array}$$





30. Kate is visiting London.

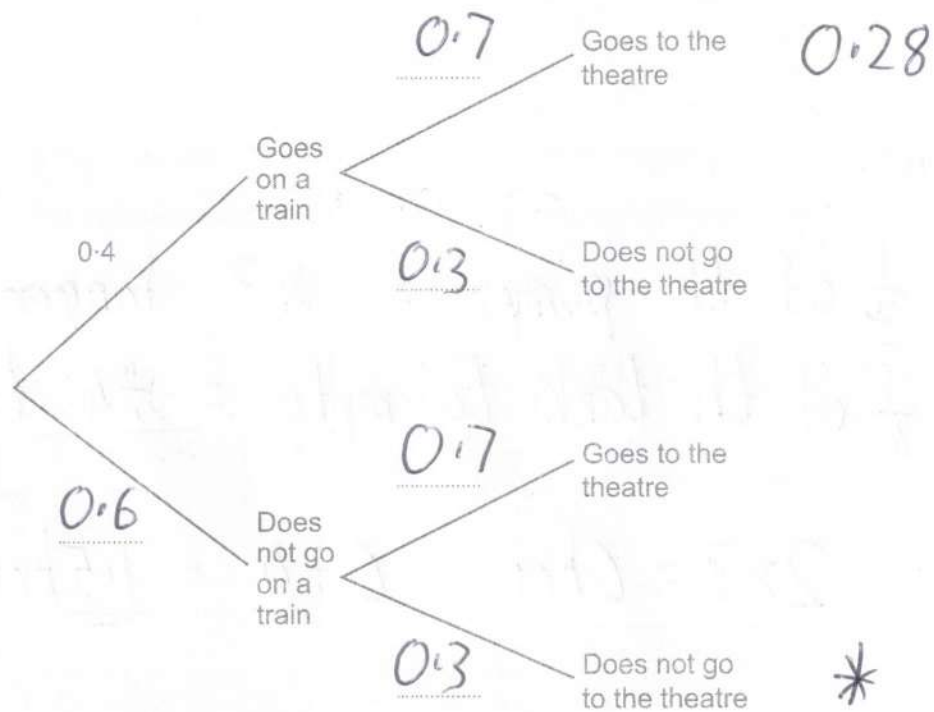
The probability that she will go on a train is 0.4.

The probability of Kate going to the theatre is independent of her going on a train.

The probability that she goes on a train and goes to the theatre is 0.28.

(a) Complete the following tree diagram.

[4]



(b) Calculate the probability that Kate does not go on a train and does not go to the theatre.

[2]

$$0.6 \times 0.3 = 0.18$$



31. Show that the lines

$$3y - 12x = 9 \text{ and } 2y = 8x - 13$$

are parallel to each other.

$$\begin{array}{l|l} 3y = 12x + 9 & y = 4x - \frac{13}{2} \\ y = 4x + 3 & \end{array}$$

[3]

both have gradient of 4 hence parallel

32. It takes 2 hours to empty 8 identical tanks of water using 9 identical pumps.

How long would it take to empty 2 of these tanks using 3 of these pumps?

[3]

$\frac{1}{3}$  of the pumps =  $\times 3$  longer

$\frac{1}{4}$  of the tanks to empty =  $\div 4$  time to complete

$$2 \times 3 = 6 \text{ hrs} \quad 6 \div 4 = \underline{1.5 \text{ hrs}}$$

END OF PAPER

