Probability – GCSE Statistics

1. No.4

4 Here are the scores obtained when a biased spinner is spun 100 times.

Score	4	5	6	7	8	9	10	11
Frequency	17	3	0	2	16	24	18	20

Circle the best estimate of the probability of scoring 9

$\frac{24}{100} = 0.24$ $\frac{\text{Score}}{\text{Total number}}$

[1 mark]

$\frac{1}{24}$ 0.24 $\frac{9}{24}$ $\frac{1}{8}$

2. No.13

13 200 students, 200 parents with young children and 200 retired people were asked what was the first thing they did on their mobile phones that day.

The results are shown in the table.

	Social media	Gaming	News	Other
Students	124	52	13	11
Parents	120	8	37	35
Retired	88	11	67	34
	Σ 332	Σ 71	Σ 117	Σ 80

13 (a) One of the people is chosen at random.

13 (a) (i) Work out the probability that this person goes on social media first that day.

[2 marks]

$$\frac{124+120+88}{332+71+117+80} = \frac{332}{600} = 0.55$$

Answer 0.5533

13 (a) (ii) Work out the probability that this person does **not** go on gaming first that day.

[2 marks]

$$P(\text{does not go on gaming}) = P(\text{Social media}) + P(\text{News}) + P(\text{other})$$

$$= \frac{332}{600} + \frac{117}{600} + \frac{80}{600} = \frac{529}{600} = 0.$$

Answer 0.882

13 (b) One of the people who went on gaming first that day is chosen at random.

What is the probability that this person is retired?

[2 marks]

$$P(\text{retired}) = \frac{11}{52+8+11} = \frac{11}{71} = 0.1549$$

Answer 0.1549

13 (c) Work out the probability that **two** of the 200 retired people, chosen at random, both went on news first that day.

Give your answer to three decimal places.

[3 marks]

P(1st person being chosen) = $\frac{67}{200}$

P(2nd person being chosen) = $\frac{66}{199}$

Total probability of being chosen = $\frac{67}{200} \times \frac{66}{199} = 0.111$

Answer 0.111 (Correct to 3d.p)

13 (d) Joe looks at the data in the table and makes the two statements below.

Is each statement correct?

Give a reason for each decision.

[2 marks]

Statement 1 Most of these 600 people went on social media first **that** day.

Tick (✓) a box.

Yes [✓] No [ ] Cannot tell [ ]

Reason 332 people went on social which is more than half the total people

Statement 2 Most of these 200 retired people go on social media first **every** day.

Tick (✓) a box.

Yes [ ] No [ ] Cannot tell [✓]

Reason These results are just for one day and might not be true for every day.

3. No.15

15 A deadly disease currently has no treatment.

A researcher develops a drug which she believes will treat the disease.

She suggests a statistical experiment to test her drug.

Infect six people chosen at random with the disease.
Give the drug to all six people.
Record whether each person recovers or not.

15 (a) Write down **two** problems with the researcher's experiment.

[2 marks]

Problem 1 The sample size is too small

Problem 2 The researcher cannot infect randomly chosen people with a disease

15 (b) The researcher carries out a more suitable experiment.

She writes an article for a magazine to highlight her results.

She gives the name of each patient in the experiment and records how they responded to the drug.

The magazine editor asks the researcher to rewrite her article.

Explain why.

[1 mark]

Its confidential, names of the patients should not be included.

4. No.7

7 200 students, 200 parents with young children and 200 retired people were asked what was the first thing they did on their mobile phones that day.

The results are shown in the table.

	Social media	Gaming	News	Other
Students	124	52	13	11
Parents	120	8	37	35
Retired	88	11	67	34
	£ 332	£ 71	£ 117	£ 80

7 (a) One of the people is chosen at random.

7 (a) (i) Work out the probability that this person goes on social media first that day. **[2 marks]**

$P(\text{social media}) = \frac{124 + 120 + 88}{200 + 200 + 200}$

$= \frac{332}{600} = 0.5533$

Answer 0.5533

7 (a) (ii) Work out the probability that this person does **not** go on gaming first that day. **[2 marks]**

$P(\text{does not go on gaming}) = \frac{P(\text{goes on social media}) + P(\text{goes to news}) + P(\text{other})}{\text{Total Number of People}}$

$= \frac{332 + 117 + 80}{600} = \frac{529}{600} = 0.8817$

Answer 0.8817

7 (b) One of the people who went on gaming first that day is chosen at random.

What is the probability that this person is retired? **[2 marks]**

$P(\text{retired}) = \frac{11}{71} = 0.1549$

Answer 0.1549

7 (c) Work out the probability that **two** of the 200 retired people, chosen at random, both went on news first that day.

Give your answer to three decimal places.

[3 marks]

$P(\text{1 person going}) = \frac{67}{200}$

$P(\text{second person going}) = \frac{66}{199}$

$P(\text{2 of retired people going on news}) = \frac{67}{200} \times \frac{66}{199} = 0.1111$

Answer 0.1111

7 (d) Joe looks at the data in the table and makes the two statements below.

Is each statement correct?

Give a reason for each decision.

[2 marks]

Statement 1 Most of these 600 people went on social media first **that** day.

Tick (✓) a box.

Yes [✓] No [ ] Cannot tell [ ]

Reason More than half of the people went on social media first that day

Statement 2 Most of these 200 retired people go on social media first **every** day.

Tick (✓) a box.

Yes [ ] No [ ] Cannot tell [✓]

Reason The results from the data given are just for one day and might not be the same every day.

5. No.9

9 In an experiment, Paulo throws three fair coins.

He repeats the experiment 120 times.

How many times should he expect to throw three heads?

[2 marks]

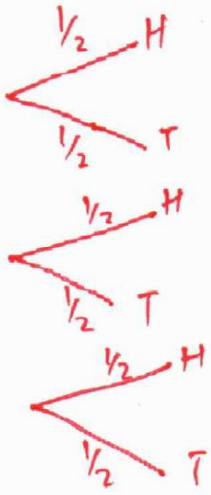
p(throwing three heads in the 1st throw) = $\frac{1}{2} \times \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$

Number of times = $\frac{1}{8}$ × total number of times the coins are thrown

$= \frac{1}{8} \times 120 = 15$

Answer 15

Turn over for the next question



$p(HHH) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

6. No.10

10 Matilda sells drinks from her beach café.

She sells,

- tea (T)
- coffee (C)
- orange (O)
- blackcurrant (B)

Matilda believes that, over time, she sells equal numbers of each drink.

Assume she is correct and that every customer's choice is independent.

10 (a) Write down the probability that she sells the next customer a tea.

[1 mark]

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

10 (b) Work out the probability that she sells each of the next **two** customers a tea.

[2 marks]

P(sells tea to the next two customers) $= \frac{1}{4} \times \frac{1}{4}$

$= \frac{1}{16} = 0.0625$

Answer 0.0625

10 (c) By listing all the possible pairs of drinks, or otherwise, work out the probability she sells the next two customers **different** drinks.

[2 marks]

	T	C	O	B
T	TT	TC	TO	TB
C	CT	CC	CO	CB
O	OT	OC	OO	OB
B	BT	BC	BO	BB

$= \frac{12}{16} = \frac{3}{4}$

Answer $\frac{3}{4}$

10 (d) One hot summer's day Matilda sells,

3 teas
1 coffee
35 orange drinks
41 blackcurrant drinks.

Matilda says,

"It looks like my assumption about selling equal numbers of drinks is wrong."

10 (d) (i) Compare the data with her assumption.

[1 mark]

$3 + 1 + 35 + 41 = 80$

$\frac{1}{4} \times 80 = 20$

Numbers are not equal to 20

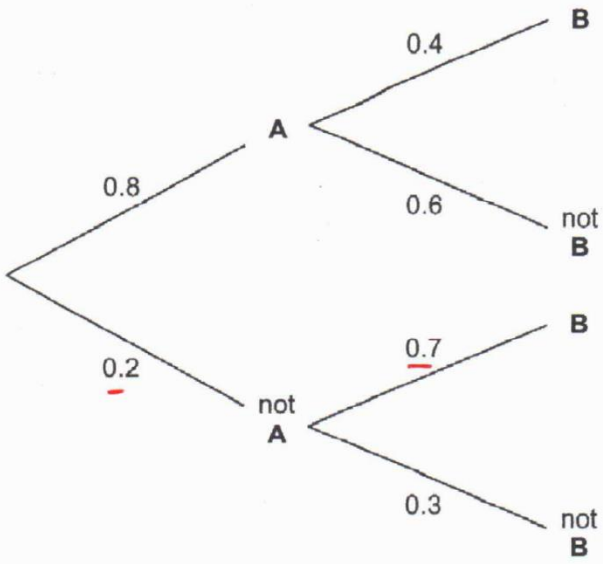
10 (d) (ii) Give a reason why Matilda should perhaps not come to that conclusion yet.

[1 mark]

Matilda's data is obtained from one day which is not enough to make a conclusion.

7. No.3

3 The tree diagram shows some probabilities relating to events A and B.



$P(B \text{ given } A) = \frac{P(A) \times P(B)}{P(A)} = \frac{0.8 \times 0.4}{0.8}$

$= 0.4$

3 (a) Circle the probability of B **given** A.

[1 mark]

0.32 (0.4) 0.42 0.5

3 (b) Circle the probability of B **and** not A.

[1 mark]

0.9 0.7 (0.14) 0.06

$P(B \text{ and not } A) = 0.2 \times 0.7$

$= 0.14$

2

8. No.7

7 A small pottery factory has two designers, Lucy and William.

The factory makes three types of pottery: vases, jugs and teapots.

The table shows some information about the number of items of pottery made in 2018 by each designer.

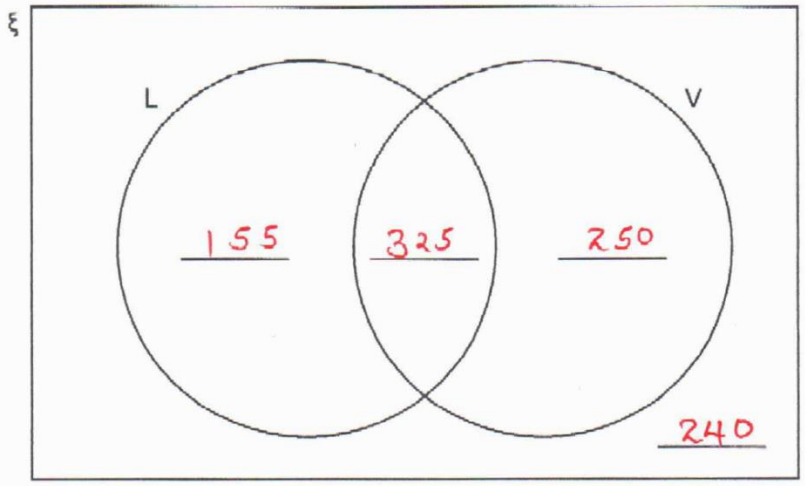
	Vases	Jugs	Teapots	Total
Lucy	325	115	40	**480**
William	250	145	95	**490**
				970

7 (a) Use the information in the table to complete the Venn diagram for these items.

ξ = 970 items of pottery made by Lucy and William

L = Number of items of pottery made by Lucy

V = Number of vases made



L = Number of items of pottery made by Lucy **[3 marks]**

= 325 + 115 + 40 = 480

L ∩ V = Number of vases made by Lucy = 325

Remaining value of L = 480 − 325 = 155

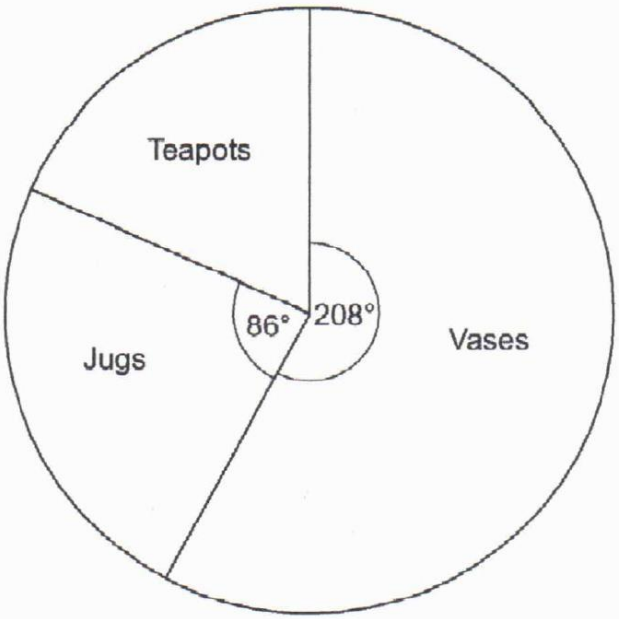
Remaining value of V = Vases made by william

= 250

970 − (155 + 325 + 250)

970 − 730 = 240

7 (b) The pie chart represents the items of pottery made by William in **2019**.



William made 312 Vases in 2019.

Did William make more **teapots** in 2019 than in 2018?

You **must** show your working.

[3 marks]

Angle for teapots = $360° - (86° + 208°)$

$= 360° - 294 = 66°$

Number of teapots made in 2019 = $\frac{66}{208} \times 312$

$= 99$

$99 > 95$ therefore William made more teapots in 2019 than in 2018

9. No.12a

12 A trout is a type of fish.

Gemma wants to estimate the number of trout living in a lake.

She captures 138 trout from the lake.

She marks these trout and then releases them back into the lake.

The following week she captures a second sample of 95 trout.

She finds that 23 trout from her second sample are marked.

12 (a) (i) Calculate an estimate of the number of trout in the lake. **[3 marks]**

Proportion of the first sample = proportion of the second sample

$$\frac{138}{X} = \frac{23}{95}$$

$$X = \frac{138 \times 95}{23} = 570$$

Answer 570

12 (a) (ii) Why does Gemma wait one week before she takes her second sample? **[1 mark]**

To enable the trouts to mix with the rest of the fish population