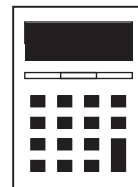# GCSE MATHEMATICS
Relative Frequency

AQA These questions have been taken or modified from previous AQA GCSE Mathematics Papers.

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The marks for questions are shown in brackets.
- The quality of your written communication is specifically assessed in questions that are indicated with an asterisk (*).

Advice
- Read each question carefully before you start to answer it.
- In all calculations, show clearly how you work out your answer.
- Use the number of marks for the question as a guide to the amount of time you need to spend.
- Look at previous parts of the question, e.g. a), b), c) i) as there may be information there you need to answer later parts.
- Check your answer is realistic and appropriate.
- For calculator decimal numbers always write your full calculator display in the working out area and then, if you need to, round the answer on the answer line.

www.thecalculatorguide.com

1   A bag contains white beads, black beads and red beads.

The following trial is repeated 100 times.

> Pick a bead at random.
> Record the colour.
> Put the bead back in the bag.

The graph shows the relative frequency of a white bead after every 20 trials.
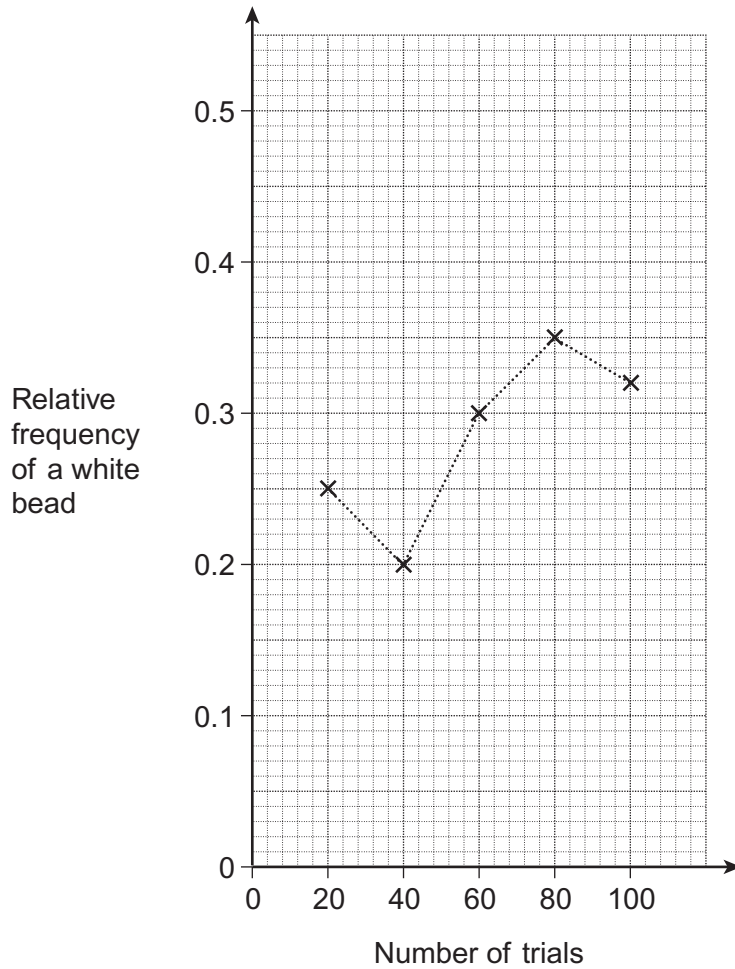
1 (a)   Work out the number of times a white bead was picked in the first 20 trials.

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Answer ....   *(2 marks)*

1 (b) What is the best estimate for the probability of picking a white bead?
Give a reason for your answer.

Answer ....

Reason ....

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(2 marks)

1 (c) There are a total of 1000 beads in the bag.

Estimate the number of beads that are white.

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Answer ....   *(2 marks)*

2   A spinner has coloured sections.

Ellie spins the spinner 50 times.

After every 10 spins she records the total number of times the spinner has landed on blue.
The graph shows the relative frequency of blue after every set of 10 spins.
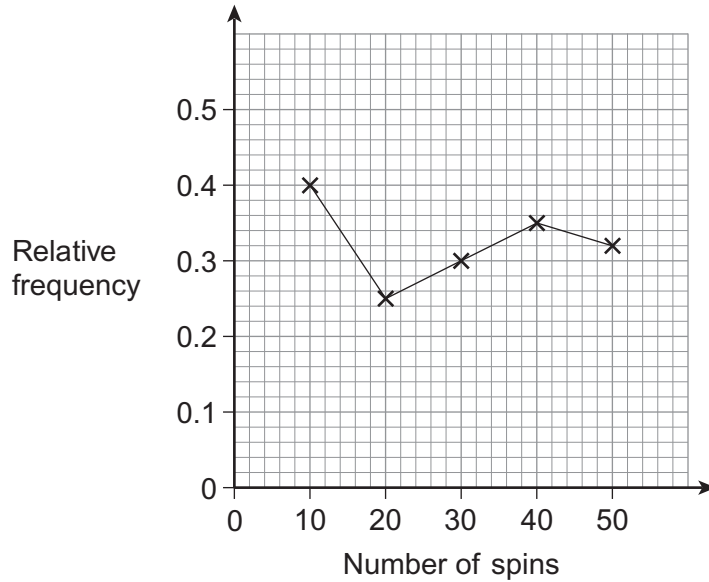
2 (a)   How many times did the spinner land on blue in the first 30 spins?

[2 marks]

Answer _____

2 (b)   Ellie continues to spin the spinner.
In total she spins it 200 times.

What is the best estimate for the number of times Ellie should expect the spinner to land on blue?
You **must** show your working

[2 marks]

Answer _____

3 A machine makes buttons.
The graph shows the relative frequency of buttons that are faulty.
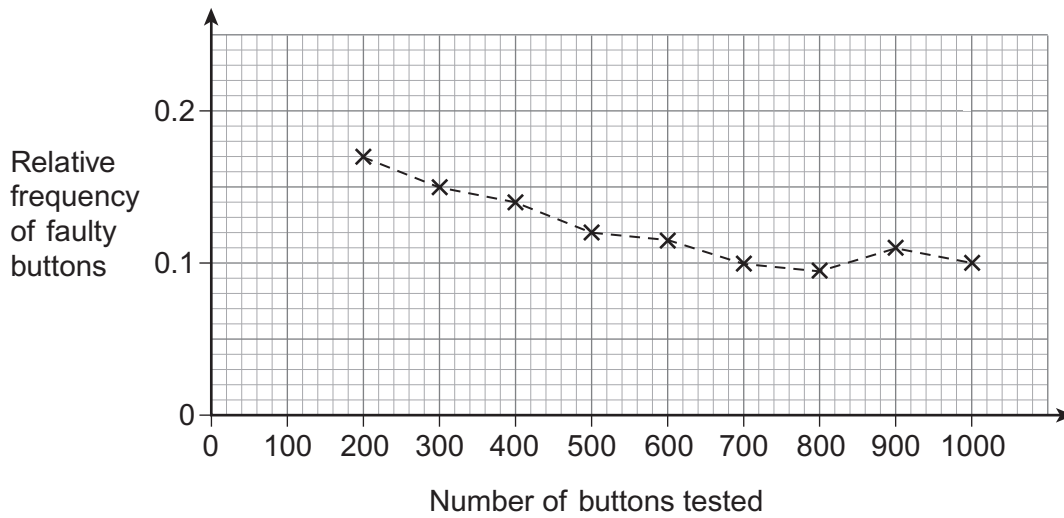
3 (a) 18 of the first 100 buttons are faulty.

Plot the relative frequency on the graph.

[1 mark]

3 (b) One week the machine makes 5000 buttons.

Work out the best estimate of the number of faulty buttons.
Use the graph to help you.

[2 marks]

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Answer ....

4   A play area has thousands of coloured balls.
They are white, pink or yellow.

Sam picks 10 balls at random.
The table shows some of her results.

	white	pink	yellow
Frequency	4		
Relative frequency		0.1	

4 (a)   Complete the table.

(3 marks)

4 (b)   Sam uses her results to estimate the proportion of white balls in the play area.

How could she make her estimate more reliable?

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(1 mark)

5   A spinner has 3 sections.
One section is blue, one section is green and one section is red.

The spinner is spun 200 times.

5 (a)   Here are some of the results for the first 50 spins.

Colour	Blue	Green	Red
Number of times spun	17		20

Work out the relative frequency for **green** after 50 spins.

[2 marks]

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Answer ....

5 (b)   The table shows the relative frequencies for blue after 100, 150 and 200 spins.

Number of spins	100	150	200
Relative frequency for blue	0.32	0.42	0.39

Which relative frequency is the best estimate of the probability of spinning blue?
Give a reason for your answer.

[1 mark]

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6 A gardener plants ten seeds each week from the same seed packet.
The graph shows the relative frequency of seeds that germinate.
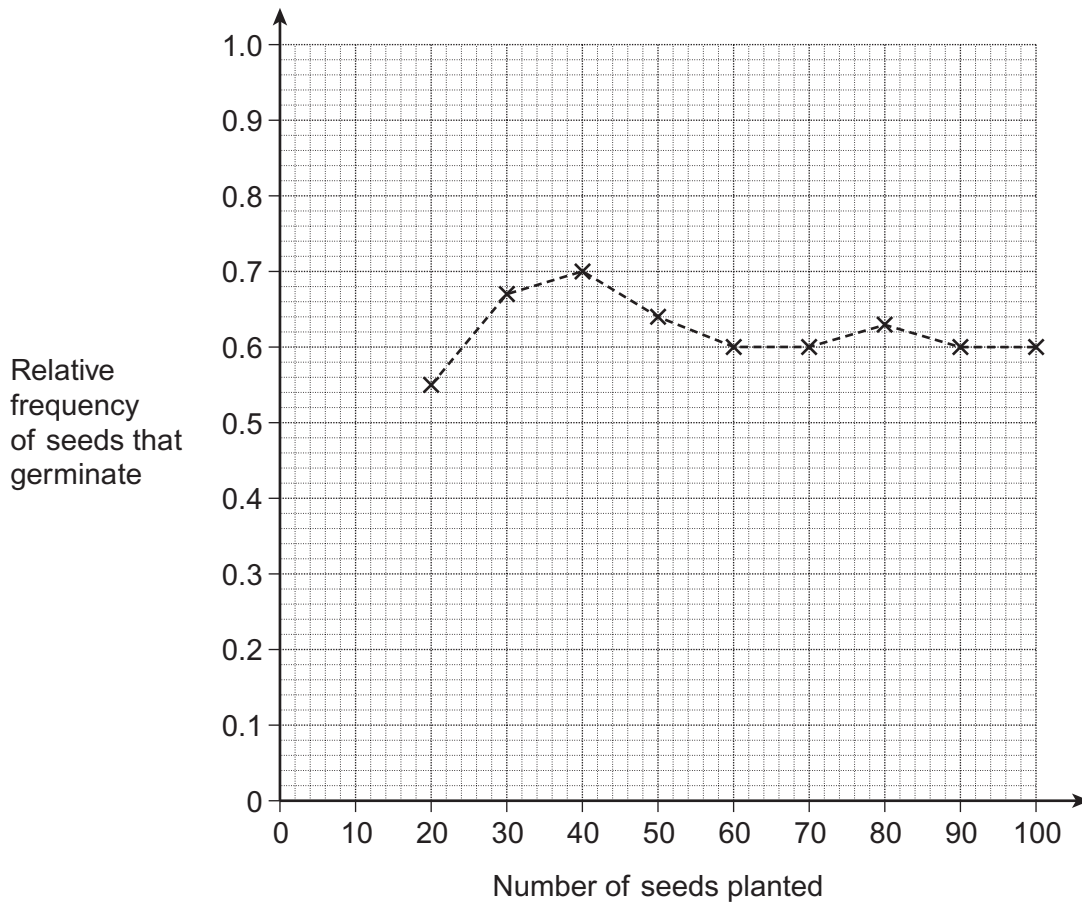
6 (a) Nine seeds out of the ten planted in the first week germinate.

6 (a) (i) Write down the relative frequency of seeds planted in the first week that germinate.

Answer .... *(1 mark)*

6 (a) (ii) Plot your relative frequency on the graph. *(1 mark)*

6 (b) How many of the seeds planted in week 2 germinate?

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Answer .... *(2 marks)*

6 (c) There are 130 seeds in the seed packet.
The label on the packet states:

On average 80 of the seeds will germinate.

Is this statement fair?
Show how you decide.

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(2 marks)

7 The sections of a fair spinner are red, white or blue.

7 (a) The spinner is spun 40 times.

Red	White	Blue	Total
28	9	3	40

Write down the relative frequency of the spinner landing on red.

Answer ...…..............…...............…...... *(1 mark)*

7 (b) The spinner has 10 equal sections.

Work out the most likely number of sections for each colour.

Red	White	Blue	Total
			10

(2 marks)

7 (c)   Jack, Emily and Katy spin the spinner.
They each do a different number of spins.
Here are their relative frequencies for landing on white.

	Jack	**Emily**	**Katy**
Number of spins	80	120	200
Relative frequency	0.475	0.45	0.44

Whose relative frequency gives the best estimate of the probability of landing on white?
Give a reason for your answer.

[1 mark]

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8
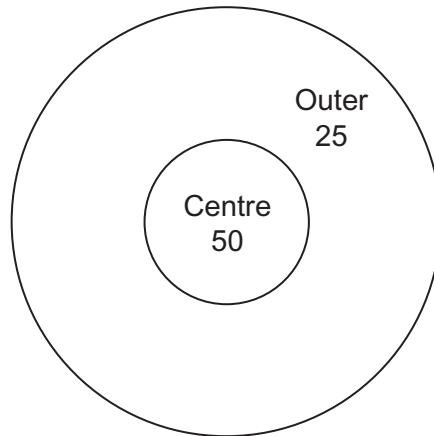
Sam throws darts at a target.
Here are his relative frequencies of hitting the centre, hitting the outer or missing.

	Centre	Outer	Miss
Score	50	25	0
Relative Frequency	0.2	0.5	0.3

Estimate the probability that Sam scores a total of 50 with **two** darts.

[4 marks]

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Answer _____

9   A spinner was spun 200 times.
         The relative frequency of landing on 4 after 50, 100, 150 and 200 spins is shown.

Number of spins	50	100	150	200
Relative frequency	0.14	0.13	0.18	0.16

**9 (a)**   Which relative frequency gives the best estimate of the probability of the spinner landing on 4?

Give a reason for your answer.

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(2 marks)

9 (b)   How many times did the spinner land on 4 from spin 51 to spin 100?

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Answer ....   *(3 marks)*

10 A six-sided dice is numbered 1 to 6.
Gary, Lynn and Michael want to know if the dice is fair.

10 (a) Gary rolls the dice 200 times.
Here are his results.
The relative frequency for **1** is missing.

Number rolled	1	2	3	4	5	6
Relative frequency		0.15	0.1	0.1	0.3	0.15

How many times did Gary roll the number **1**?

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Answer .... *(3 marks)*

10 (b) Lynn says

> If I roll the dice 200 times I am certain to get the same results as Gary.

Is she correct?
Tick the correct box.

Yes ☐   No ☐

Give a reason for your answer.

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(1 mark)

10 (c)   Michael also rolls the dice 200 times.

He says to Gary

> To see if the dice is fair it will be better if we put our results together.

Is he correct?
Tick the correct box.

Yes ☐   No ☐

Give a reason for your answer.

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(1 mark)

11   A bag contains 500 counters.
Each counter has a shape on it.

Ali and Jake do some trials to estimate how many counters in the bag have a square.

A trial consists of

      taking a counter at random

      recording the shape on the counter

      putting the counter back in the bag.

The results of their trials are shown in the table.

	Number of trials	**Number of counters that have a square**
Ali	30	9
Jake	100	37

11 (a)   Write down the relative frequency of Ali taking a counter that has a square.

[1 mark]

Answer ....

11 (b)   Work out the relative frequency of Jake taking a counter that does **not** have a square.

[1 mark]

Answer ....

11 (c) Whose trials would give a more reliable estimate of the number of counters that have a square?
Give a reason for your answer.

[1 mark]

Answer ....

Reason ....

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11 (d) There are 500 counters in the bag.

Estimate the number of counters that have a square.

[1 mark]

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Answer ....

12 Joe, Saj and Abi each do some trials of the same experiment.
The table shows information about the results of the trials.

	Number of trials	Relative frequency of success
Joe	200	0.680
Saj	400	0.740
Abi	600	0.755

Work out the relative frequency of success for all 1200 trials.
Give your answer as a decimal.

[3 marks]

Answer _____