



Aberdare Community School  
Mathematics Department

WJEC GCSE

**Higher – Non Calculator**  
Data

## **Relative frequency**

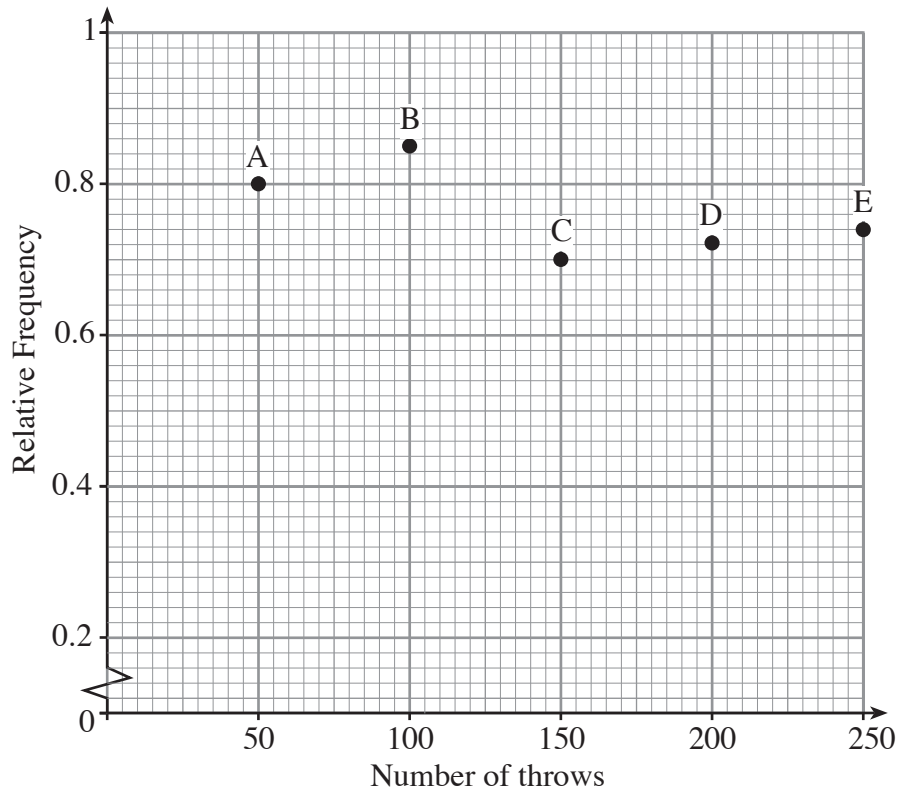
Name: .....

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Teacher: .....

20. A biased coin was tossed. The relative frequency of throwing a “Head” was calculated after a total of 50 throws, 100 throws, 150 throws, 200 throws and 250 throws. The results were plotted on the graph below.



- (a) Which **one** of the readings noted by the letters A, B, C, D and E on the graph is likely to give the best estimate of the probability of throwing a “Head” with this coin? **You must give a reason for your answer.**

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[2]

(b) Using the graph,

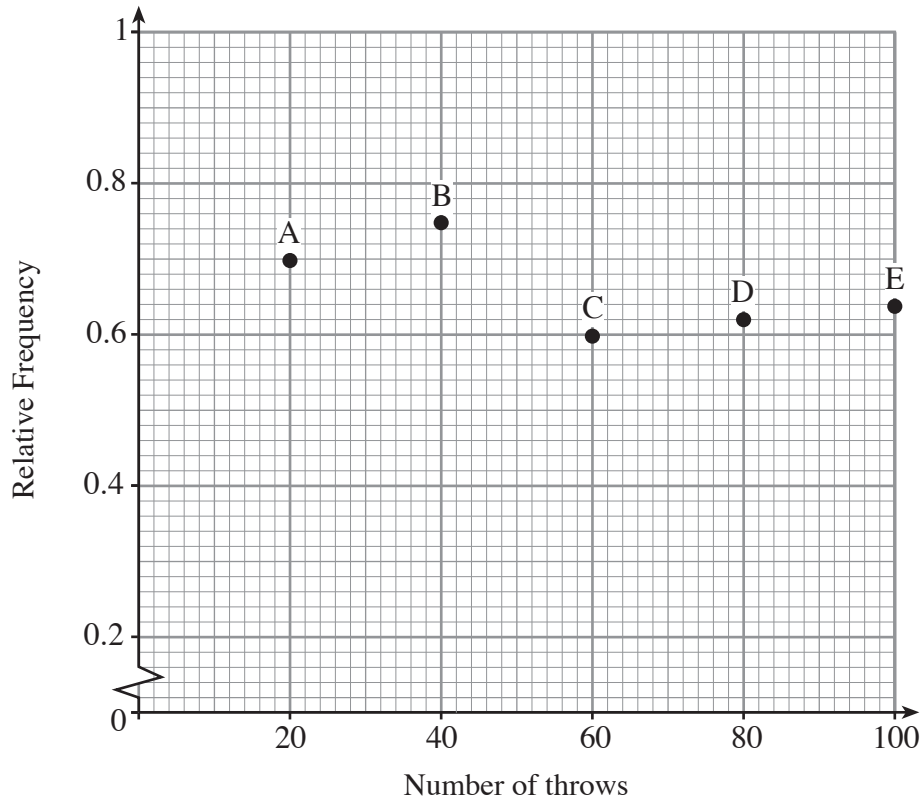
(i) find how many “Heads” were obtained in the first 50 throws,

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[1]

(ii) find how many “Tails” were obtained in the first 100 throws.

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[2]

9. When a drawing pin is thrown it either lands pin-up or pin-down. The relative frequency of the drawing pin landing pin-up was calculated after a total of 20 throws, 40 throws, 60 throws, 80 throws and 100 throws. The results are plotted on the graph below.



- (a) Which **one** of the readings noted by the letters A, B, C, D and E on the graph is likely to give the best estimate of the probability of this drawing pin landing pin-up? You must give a reason for your answer.

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[2]

(b) Using the graph, find how many times the drawing pin

(i) landed pin-up in the first 40 throws,

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(ii) landed pin-down in the 100 throws.

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[4]

9. A computer program is used to generate 100 digits between 0 and 9. It also records the number of times a 2 is generated. The program is run 5 times with the following results.

	1st run	2nd run	3rd run	4th run	5th run
Number of digits generated	100	100	100	100	100
Number of twos	19	21	17	19	14

- (a) Complete the table to show the relative frequency of a 2 being generated.

Total number of digits generated		100	200	300	400	500
Total number of twos		19	40			
Relative frequency	Fraction	$\frac{19}{100}$	$\frac{40}{200}$			
	Decimal	0.19	0.20			

[3]

- (b) Estimate the probability of **this** computer program generating the digit 2.

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[1]

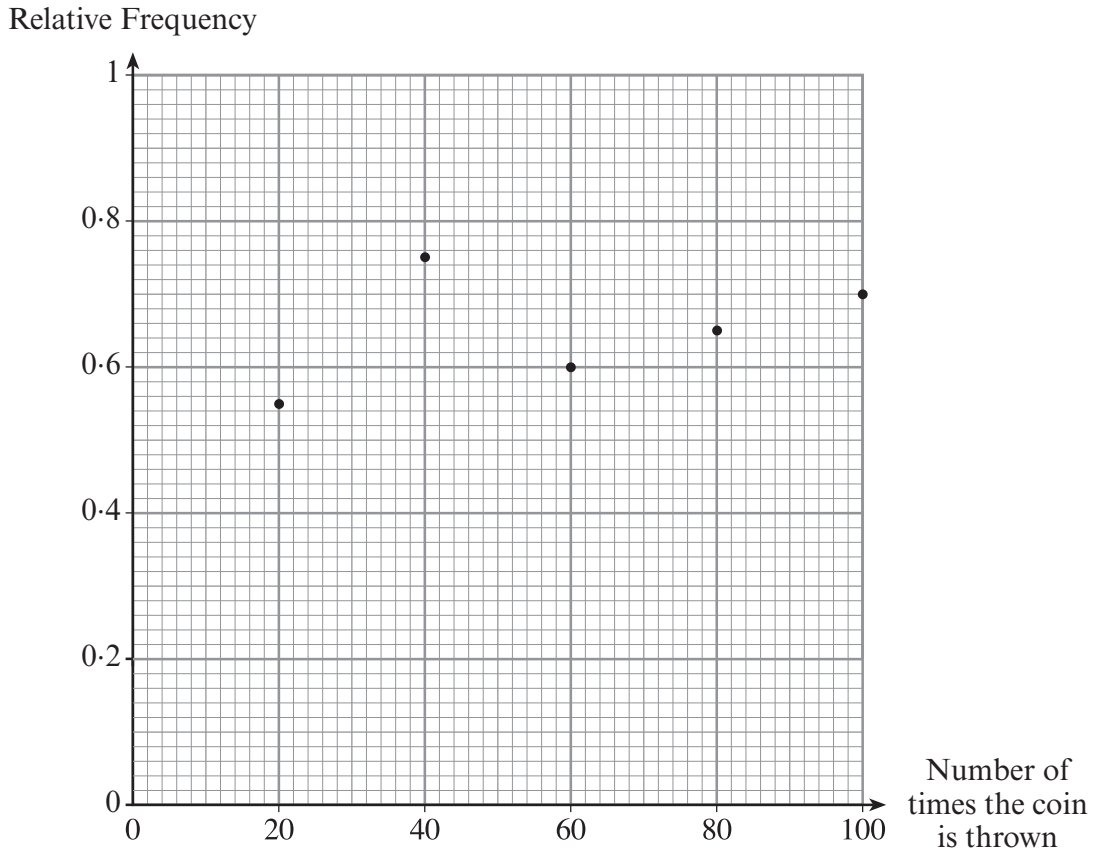
- (c) Given that all the digits 0 to 9 have an equal chance of being generated, what is the probability of getting a 2?

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[1]

- (d) (i) Does it seem that the computer program is fair in generating twos? .....
- (ii) How would you check the reliability of the number of twos generated by the computer?

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[1]

10. An experiment was carried out to investigate the probability of obtaining a tail when a biased coin is thrown.  
The relative frequency of a tail was calculated after throwing the coin a total of 20 times, 40 times, 60 times, 80 times and 100 times.  
The results are plotted on the graph below.



- (a) Which reading do you think gives the best estimate for the probability of obtaining a tail? You must give a reason for your answer.

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[2]

(b) Using the graph, find how many

(i) tails were obtained in the first 60 throws,

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(ii) heads were obtained in the 100 throws.

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[4]



8. An experiment was carried out to investigate the probability of obtaining an even number when a biased dice is thrown. The number of even numbers obtained in each of 5 sets of 20 throws is shown in the table below.

	Number of times an even number is recorded
First set of 20 throws	14
Second set of 20 throws	8
Third set of 20 throws	14
Fourth set of 20 throws	16
Fifth set of 20 throws	10

- (a) Complete the table below to show the relative frequency of an even number occurring after throwing the dice a total of 20 times, 40 times, 60 times, 80 times and 100 times.

Number of times the dice is thrown altogether		20	40	60	80	100
Relative frequency of obtaining an even number	Fraction	$\frac{14}{20}$				
	Decimal					

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[3]

- (b) Using the above results, write down the best estimate for the probability of obtaining an even number when this biased dice is thrown. Give a reason for your answer.

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[2]



(c) Explain what you think might happen to the relative frequency if the experiment was continued with more throws of the biased dice.

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[1]

(d) What would be your best estimate of the probability of obtaining an odd number on this biased dice?

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1. Five children each threw the same dice 12 times.  
They recorded how many sixes they each threw with this dice.  
The results are shown below.

Name	Abbi	Sasha	Meinir	Samad	Jenny
Number of sixes	5	3	2	4	6

- (a) Use Abbi's result to estimate the probability of **not** throwing a six on any single throw of the dice.

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 ..... [2]

- (b) Do you think the dice thrown was fair or biased?  
You must show your working and give a reason for your answer.

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 ..... [3]

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6. Yasmin carried out an experiment.  
In the experiment, she shot 10 balls at a target and recorded the number of shots hitting the target.  
She carried out this experiment 6 times.  
The results are shown in the following table.

Experiment	1st	2nd	3rd	4th	5th	6th
Number of shots hitting the target	3	5	4	4	2	2

Yasmin decided to draw a graph showing the relative frequency of 'shots hitting the target' after 10 shots, 20 shots, 30 shots, 40 shots, 50 shots, 60 shots.

- (a) Use the graph paper opposite to draw the graph of the relative frequencies.

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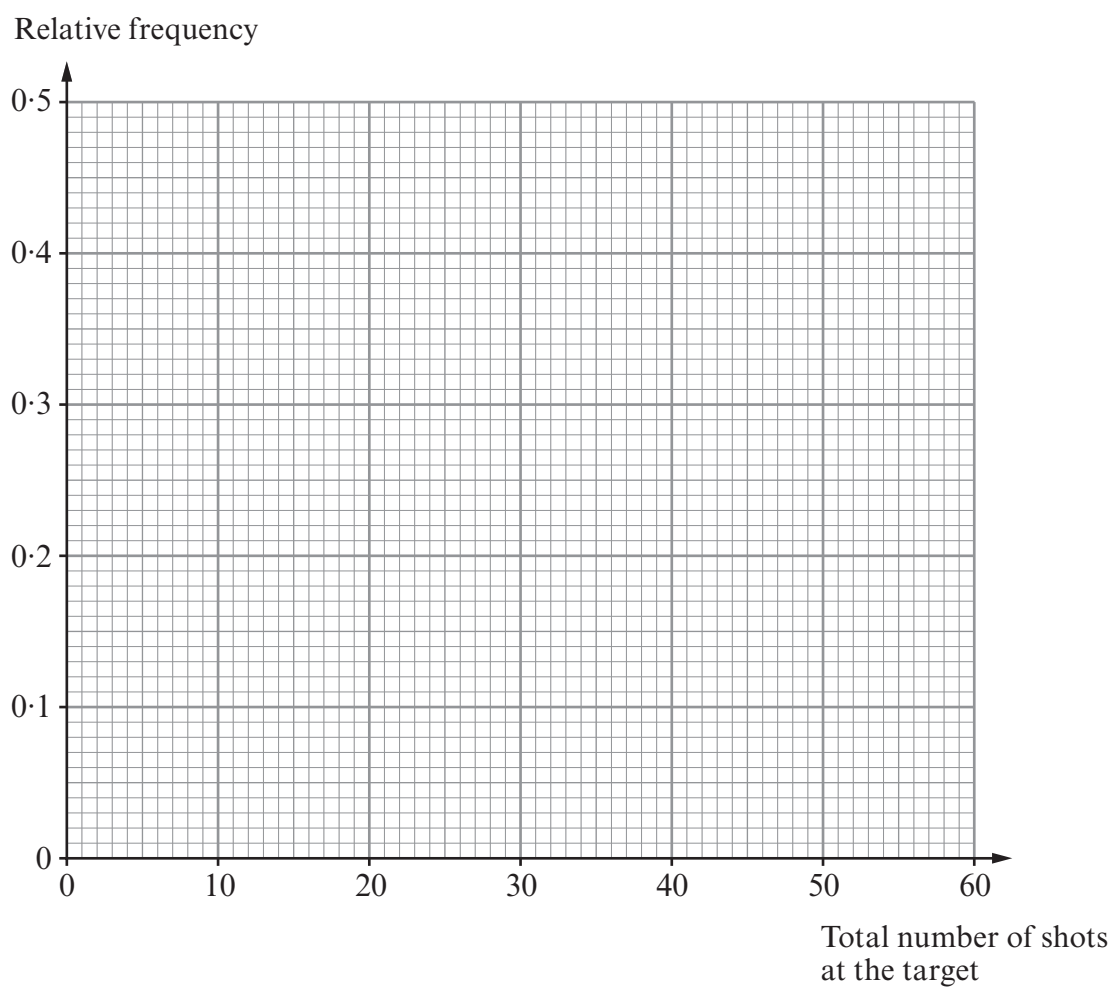
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[5]

- (b) Do you consider that the experiment has been carried out enough times to give a good estimate for the probability of a shot hitting the target?  
You must give a reason for your answer.

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[1]



6. A biased dice is thrown.  
The letter 'o' is recorded when an odd number is thrown.  
The letter 'e' is recorded when an even number is thrown.

The dice is thrown in groups of ten throws.

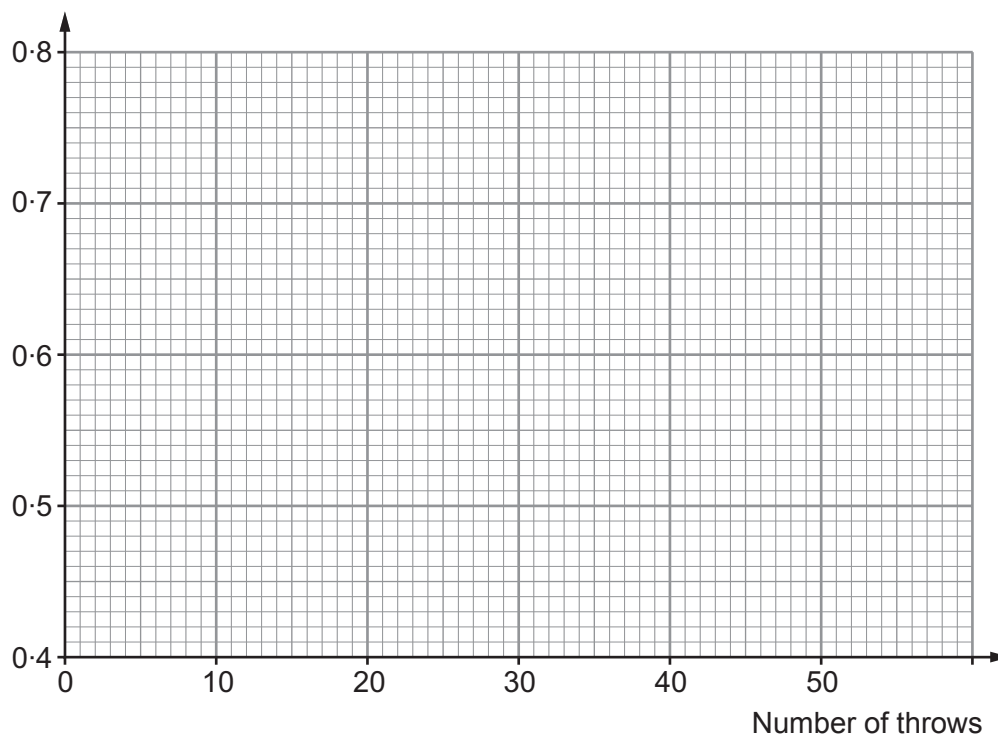
Odd and even numbers recorded in each group	oooo oeeee	oooo eeeeo	eeee oooo	ooooe eeeee	ooooe eeeee
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- (a) Calculate the relative frequency of throwing an odd number after 10, 20, 30, 40, and 50 throws.  
Use your answers to complete the table below. [3]

Total number of throws		10	20	30	40	50
Relative frequency of throwing an odd number	Fraction	$\frac{7}{10}$				
	Decimal	0.7				

- (b) Use the graph paper to plot the relative frequencies. [2]

Relative frequency



- (c) Has the experiment been carried out a sufficient number of times to give a good estimate for the probability of throwing an odd number with this biased dice?  
You must give a reason for your answer. [1]

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8. When dropped onto the floor, a drawing pin will either land on its side or on its head (with the pin pointing upwards).

Three friends, Ahmed, Maxine and Dewi, are conducting an experiment to determine the probability that a drawing pin lands on its head when dropped onto the floor. They each drop a drawing pin a number of times. Their results are given in the following table.

Name	Ahmed	Maxine	Dewi
Number of drops	90	35	75
Number of heads	52	19	57

- (a) The three friends decide to combine their results to estimate the probability that a drawing pin lands on its head.  
 Show clearly how they should reach their answer.  
 Give the final answer **as a decimal**. [3]

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- (b) Suggest a way in which they could improve their estimate. [1]

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9. (a) A fair dice is thrown twice.



The score is noted each time the dice is thrown.  
Calculate the probability of getting at least one six.

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- (b) Carwyn has bought a 10-sided dice.



Carwyn was not sure if the dice was a fair dice.  
He carried out an experiment.  
He recorded the number of sixes he threw in every 10 throws of the dice.

Number of throws	10	10	10	10	10	10	10	10	10	10
Number of sixes	4	3	2	3	2	4	2	4	3	2

He decided to create a table to show the cumulative number of sixes thrown, to calculate the relative frequencies.

Number of throws	10	20	30	40	50	60	70	80	90	100
Number of sixes thrown	4	7	9	12	14	18	20			
Relative frequency of throwing a six	$\frac{4}{10}$	$\frac{7}{20}$	$\frac{9}{30}$	$\frac{12}{40}$	$\frac{14}{50}$	$\frac{18}{60}$	$\frac{20}{70}$			
	0.4	0.35	0.3	0.3	0.28	0.3	0.29			

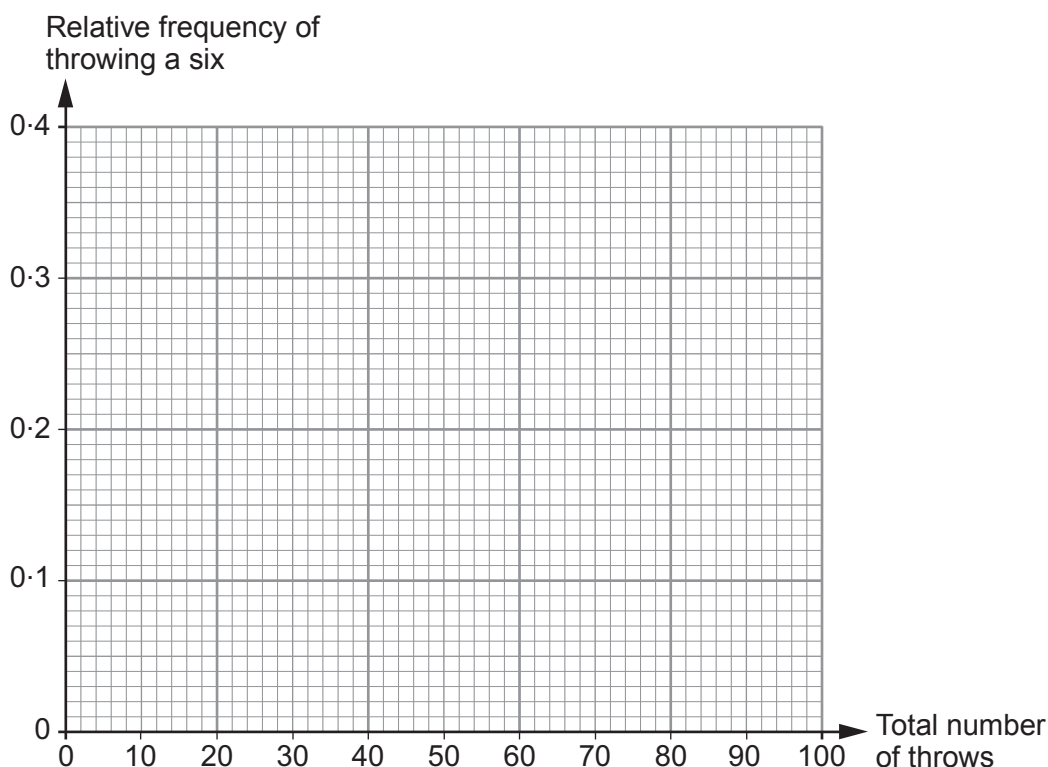
(i) Complete Carwyn's table opposite. [3]

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(ii) Draw a graph to illustrate the relative frequency of throwing a six on Carwyn's 10-sided dice. [2]



(iii) Using the above results, write down the best estimate for the probability of **not** obtaining a six on Carwyn's dice, giving a reason for your answer. [2]

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(iv) Carwyn says that the dice is not a fair dice. Explain why Carwyn's statement could be true. [1]

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