

WA7MPSP2

Probability and statistics

Core + Challenge

Chance Experiments and Relative Frequency — Marking Key

I can conduct chance experiments, calculate relative frequencies and compare them with theoretical probabilities.

For tutors and parents. Award method marks for correct working even if the final answer is wrong.

Marks summary

Section A Fluency: 16 Section B Core: 21 Section C Reasoning: 9 Section D Challenge: 9 **Total: 55**

Fluency: 1 mark each; accept an equivalent unsimplified answer for half credit at tutor's discretion.

A Fluency *answers and working*

/ 16 marks

Q	Answer	Working
1	0.56	RF = frequency ÷ trials; expected = probability × trials
2	0.44	RF = frequency ÷ trials; expected = probability × trials
3	25	RF = frequency ÷ trials; expected = probability × trials
4	3	RF = frequency ÷ trials; expected = probability × trials
5	$\frac{7}{30}$	RF = frequency ÷ trials; expected = probability × trials
6	10	RF = frequency ÷ trials; expected = probability × trials
7	30	RF = frequency ÷ trials; expected = probability × trials
8	45%	RF = frequency ÷ trials; expected = probability × trials
9	75	RF = frequency ÷ trials; expected = probability × trials
10	60	RF = frequency ÷ trials; expected = probability × trials
11	0.3	RF = frequency ÷ trials; expected = probability × trials
12	6	RF = frequency ÷ trials; expected = probability × trials
13	30	RF = frequency ÷ trials; expected = probability × trials
14	0.65	RF = frequency ÷ trials; expected = probability × trials
15	160	RF = frequency ÷ trials; expected = probability × trials
16	500	RF = frequency ÷ trials; expected = probability × trials

B

Core *answers, working and marks*

/ 21 marks

Q	Answer	Working / sample response	Marks
1	(a) $\frac{8}{60}, \frac{11}{60}, \frac{9}{60}, \frac{12}{60}, \frac{7}{60}$, $\frac{13}{60}$ (b) each should be about $\frac{10}{60} = \frac{1}{6}$	Expected 10 of each <i>1 mark: RFs</i> <i>1 mark: $\frac{1}{6}$</i> <i>1 mark: comparison</i>	3
2	Not necessarily – too few trials	$14/20 = 0.7$ could happen by chance; many more tosses are needed. <i>1 mark: not enough evidence</i> <i>1 mark: more trials</i>	2
3	Red about $\frac{1}{2}$, blue and green about $\frac{1}{4}$ each	$RF \approx 0.5, 0.25, 0.25$ <i>2 marks</i>	2
4	e.g. 1, 2, 3 = rain	3 of the 10 numbers represent rain <i>2 marks</i>	2
5	0.52	$104 \div 200$ <i>1 mark: 200 trials</i> <i>1 mark: 0.52</i>	2
6	255	$\frac{36}{120} = 0.3$; 0.3×850 <i>1 mark: 0.3</i> <i>1 mark: 255</i>	2
7	About 6	$RF = 0.64$; $0.64 \times 10 = 6.4$ <i>1 mark: 0.64</i> <i>1 mark: about 6</i>	2
8	14	$\frac{42}{60} = 0.7$; 0.7×20 <i>1 mark: 0.7</i> <i>1 mark: 14</i>	2
9	50 each; no – results vary	$\frac{1}{6} \times 300 = 50$ <i>1 mark: 50</i> <i>1 mark: explanation</i>	2
10	1000 tosses	More trials reduce the effect of chance variation. <i>2 marks</i>	2

C

Reasoning *sample answers and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	Observed vs expected	RF comes from an experiment; theoretical probability comes from equally likely outcomes. <i>2 marks</i>	2
2	Chance variation	Each trial is random, so short runs vary. <i>2 marks</i>	2
3	RF is 0.7, but 10 trials is too few	For a fair coin $P(\text{heads}) = 0.5$; her RF is only an estimate. <i>2 marks</i>	2
4	Many trials (e.g. 200+); compare RFs with expected	Run many spins, record frequencies, compare RFs with $\frac{1}{n}$; large, consistent differences suggest bias. <i>1 mark: many trials</i> <i>1 mark: compare</i> <i>1 mark: conclusion rule</i>	3

D

Challenge *solutions and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	2	$0.248 \approx 0.25 = \frac{2}{8}$ <i>1 mark: $\approx \frac{1}{4}$</i> <i>1 mark: 2</i>	2
2	$\frac{17}{30} \approx 0.567$	$85 \div 150$ <i>1 mark: 85/150</i> <i>1 mark: answer</i>	2
3	Probably biased	Expected 100 sixes; 150 is 50% more. With 600 rolls, a difference this large is unlikely by chance. <i>1 mark: 100 expected</i> <i>1 mark: compares</i> <i>1 mark: conclusion</i>	3
4	Both heads	Toss two coins: HH is 1 of 4 equally likely outcomes (HH, HT, TH, TT). <i>2 marks</i>	2