FOUNDATION & HIGHER

SAME AT BOTH TIERS

Name ..... Class .....

# P5: Sample size

*Reason about relative frequency and sample size*

20 marks · 25 minutes · Non-calculator

**1)** Explain why more trials give a better estimate of a probability.

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**[Question 1: 2 marks]**

**2)** Amy does 20 trials and gets 8 successes. Ben does 500 trials and gets 160 successes. Whose estimate is better? Explain.

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**[Question 2: 2 marks]**

**3)** Show that combining the results in question 2 gives an estimate of 0.323 (to 3 d.p.).

**[Question 3: 2 marks]**

**4)** Sam rolls a dice 10 times and gets three 6s. He says the dice is biased. Explain why he cannot be sure.

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**[Question 4: 2 marks]**

**5)** A graph of relative frequency settles down at 0.25 as the number of trials increases. Explain what this suggests.

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**[Question 5: 1 marks]**

**6)** A coin is flipped 1000 times and lands on heads 610 times. Is it likely to be biased? Explain.

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**[Question 6: 2 marks]**

**7)** Explain why relative frequency can change as more trials are done, but theoretical probability does not.

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**[Question 7: 2 marks]**

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**8)** Kim says that after 5 tails in a row, a head is more likely next time. Explain why she is wrong.

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**[Question 8: 2 marks]**

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**9)** 400 trials give 92 successes. Show that you would expect about 230 successes in 1000 trials.

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**[Question 9: 2 marks]**

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**10)** Explain why two people doing the same experiment may get different results.

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**[Question 10: 1 marks]**

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**11)** Which gives more confidence in an estimate: 50 trials or 5000 trials? Explain.

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**[Question 11: 2 marks]**

**End of paper – 20 marks in total**

# Answers and brief mark scheme

| Q | Answer | Method / notes |
|---|---|---|
| 1 | Explanation | Relative frequency tends towards the true probability (C2). |
| 2 | Ben | More trials (C2). |
| 3 | Shown | $\frac{168}{520}$ (M1); C1. |
| 4 | Explanation | 10 rolls is far too few (C2). |
| 5 | Probability about 0.25 | C1. |
| 6 | Yes | Expected about 500 (M1); 610 is far from 500 for so many flips (C1). |
| 7 | Explanation | Relative frequency comes from random results (C1); theoretical comes from the setup (C1). |
| 8 | Explanation | Each flip is independent (C1); still 0.5 (C1). |
| 9 | Shown | $\frac{92}{400} = 0.23$ (M1); $\times 1000$ (C1). |
| 10 | Explanation | Random variation (C1). |
| 11 | 5000 | Larger samples vary less (C2). |