5.4 Experimental Probability and Relative Frequency: 2-hour Pack

Calculators not allowed · about 120 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 In an experiment a drawing pin is dropped 20 times and lands point up 15 times. Use this to estimate how many times it will land point up in 500 drops.

(3)

2 Lily spins a spinner 50 times and it lands on blue 23 times. Work out the relative frequency of blue. Give your answer as a fraction in its simplest form.

(1)

3 A die is rolled 300 times and a 6 appears 49 times. If the die is fair, a 6 should appear about 50 times. Does the data suggest that the die is biased? Give a reason.

(2)

4 The probability that it rains on a given day is 7/10. Estimate the number of days with rain in a period of 50 days.

(2)

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5 A spinner with 8 equal sections is spun 40 times. The number of times it landed on section A was 6. Find the expected frequency for section A and compare to the experimental frequency. State which is larger.

(2)

6 The probability that it rains on a given day is 7/20. Estimate the number of days with rain in a period of 120 days.

(2)

7 A die is rolled 120 times and a 6 appears 19 times. If the die is fair, a 6 should appear about 20 times. Does the data suggest that the die is biased? Give a reason.

(2)

8 The probability that a seed grows into a plant is 4/5. Sam plants 40 seeds. How many plants should he expect?

(2)

9 A die is rolled 120 times and a 6 appears 21 times. If the die is fair, a 6 should appear about 20 times. Does the data suggest that the die is biased? Give a reason.

(2)

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10 In an experiment a drawing pin is dropped 40 times and lands point up 10 times. Use this to estimate how many times it will land point up in 100 drops.

(3)

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11 In an experiment a drawing pin is dropped 100 times and lands point up 92 times. Use this to estimate how many times it will land point up in 1000 drops.

(3)

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12 A die is rolled 60 times and a 6 appears 20 times. If the die is fair, a 6 should appear about 10 times. Does the data suggest that the die is biased? Give a reason.

(2)

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13 The probability that a seed grows into a plant is 9/10. Sam plants 100 seeds. How many plants should he expect?

(2)

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14 A die is rolled 300 times and a 6 appears 52 times. If the die is fair, a 6 should appear about 50 times. Does the data suggest that the die is biased? Give a reason.

(2)

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15 A coin is thrown 50 times and lands on heads 44 times. Work out the relative frequency of heads as a decimal, and say whether this is close to 0.5.

(2)

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16 The probability that it rains on a given day is 1/2. Estimate the number of days with rain in a period of 200 days.

(2)

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17 A die is rolled 120 times and a 6 appears 18 times. If the die is fair, a 6 should appear about 20 times. Does the data suggest that the die is biased? Give a reason.

(2)

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18 A coin is thrown 50 times and lands on heads 11 times. Work out the relative frequency of heads as a decimal, and say whether this is close to 0.5.

(2)

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19 A die is rolled 120 times and a 6 appears 40 times. If the die is fair, a 6 should appear about 20 times. Does the data suggest that the die is biased? Give a reason.

(2)

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20 The probability that it rains on a given day is 4/5. Estimate the number of days with rain in a period of 80 days.

(2)

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21 The probability that a seed grows into a plant is 2/5. Sam plants 60 seeds. How many plants should he expect?

(2)

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22 A die is rolled 600 times and a 6 appears 98 times. If the die is fair, a 6 should appear about 100 times. Does the data suggest that the die is biased? Give a reason.

(2)

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23 The probability that a seed grows into a plant is 9/20. Sam plants 100 seeds. How many plants should he expect?

(2)

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24 In an experiment a drawing pin is dropped 100 times and lands point up 28 times. Use this to estimate how many times it will land point up in 400 drops.

(3)

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25 A die is rolled 120 times. The face 6 appears 18 times. Calculate the relative frequency of rolling a 6 and compare it to the theoretical probability. Which is higher?

(2)

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26 The probability that a seed grows into a plant is 1/20. Sam plants 40 seeds. How many plants should he expect?

(2)

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27 In an experiment a drawing pin is dropped 200 times and lands point up 162 times. Use this to estimate how many times it will land point up in 400 drops.

(3)

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28 A coin is thrown 100 times and lands on heads 67 times. Work out the relative frequency of heads as a decimal, and say whether this is close to 0.5.

(2)

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29 In an experiment a drawing pin is dropped 25 times and lands point up 16 times. Use this to estimate how many times it will land point up in 500 drops.

(3)

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30 In an experiment a drawing pin is dropped 25 times and lands point up 20 times. Use this to estimate how many times it will land point up in 500 drops.

(3)

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31 In an experiment a drawing pin is dropped 100 times and lands point up 13 times. Use this to estimate how many times it will land point up in 500 drops.

(3)

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32 A coin is thrown 80 times and lands on heads 77 times. Work out the relative frequency of heads as a decimal, and say whether this is close to 0.5.

(2)

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33 In an experiment a drawing pin is dropped 100 times and lands point up 43 times. Use this to estimate how many times it will land point up in 400 drops.

(3)

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34 The probability that a seed grows into a plant is 5/8. Sam plants 80 seeds. How many plants should he expect?

(2)

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35 A class carries out an experiment rolling a spinner with 5 equal sectors. After 75 spins, sector B came up 20 times. Calculate the relative frequency of B and give it as a fraction in simplest form.

(2)

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36 In an experiment a drawing pin is dropped 50 times and lands point up 42 times. Use this to estimate how many times it will land point up in 400 drops.

(3)

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37 The probability that it rains on a given day is 1/4. Estimate the number of days with rain in a period of 100 days.

(2)

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38 The probability that a bus is on time is 3/20. Over 100 journeys, how many buses are expected to be on time?

(2)

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39 The probability that it rains on a given day is 2/5. Estimate the number of days with rain in a period of 500 days.

(2)

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40 A spinner with 6 equal sections is spun 150 times. Section D comes up 40 times. Find the expected frequency of section D, and state the difference between the experimental and expected frequencies.

(2)

41 A biased spinner has probability 0.2 of landing on red. It is spun 200 times. Find the expected number of red results, and the expected number of results that are not red.

(2)

42 A spinner has 5 equal sections. It is spun 45 times. Find the expected frequency of landing on any one particular section.

(1)

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Mark scheme · 5.4 Experimental Probability and Relative Frequency: 2-hour Pack

Question 1

relative frequency 3/4	M1
3/4 x 500	M1
375 cao	A1

Answer: **375**

Question 2

23/50 cao	B1

Answer: **23/50**

Question 3

relative frequency 49/300 = 49/300 compared with 1/6, oe (accept 49 compared with the expected 50)	M1
The relative frequency is close to 1/6, so there is no evidence that the die is biased	A1

Answer: **The relative frequency is close to 1/6, so there is no evidence that the die is biased**

Question 4

7/10 x 50	M1
35 cao	A1

Answer: **35**

Question 5

expected frequency calculated as 1/8 of 40 = 40/8 or 5	M1
expected = 5, experimental = 6 so experimental is larger cao	A1

Answer: **5; experimental 6, experimental is larger**

Question 6

7/20 x 120	M1
42 cao	A1

Answer: **42**

Question 7

relative frequency 19/120 = 19/120 compared with 1/6, oe (accept 19 compared with the expected 20)	M1
The relative frequency is close to 1/6, so there is no evidence that the die is biased	A1

Answer: **The relative frequency is close to 1/6, so there is no evidence that the die is biased**

Question 8

4/5 x 40	M1
32 cao	A1

Answer: **32**

Question 9

relative frequency 21/120 = 7/40 compared with 1/6, oe (accept 21 compared with the expected 20)	M1
The relative frequency is close to 1/6, so there is no evidence that the die is biased	A1

Answer: **The relative frequency is close to 1/6, so there is no evidence that the die is biased**

Question 10

relative frequency 1/4	M1
1/4 x 100	M1
25 cao	A1

Answer: **25**

Question 11

relative frequency 23/25	M1
23/25 x 1000	M1
920 cao	A1

Answer: **920**

Question 12

relative frequency 20/60 = 1/3 compared with 1/6, oe (accept 20 compared with the expected 10)	M1
The relative frequency is much higher than 1/6, so the die may be biased	A1

Answer: **The relative frequency is much higher than 1/6, so the die may be biased**

Question 13

9/10 x 100	M1
90 cao	A1

Answer: **90**

Question 14

relative frequency 52/300 = 13/75 compared with 1/6, oe (accept 52 compared with the expected 50)	M1
The relative frequency is close to 1/6, so there is no evidence that the die is biased	A1

Answer: **The relative frequency is close to 1/6, so there is no evidence that the die is biased**

Question 15

44/50	M1
0.88 and a correct comparison	A1

Answer: **0.88; not close to 0.5**

Question 16

1/2 x 200	M1
100 cao	A1

Answer: **100**

Question 17

relative frequency 18/120 = 3/20 compared with 1/6, oe (accept 18 compared with the expected 20)	M1
The relative frequency is close to 1/6, so there is no evidence that the die is biased	A1

Answer: **The relative frequency is close to 1/6, so there is no evidence that the die is biased**

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Question 18

11/50	M1
0.22 and a correct comparison	A1

Answer: **0.22; not close to 0.5**

Question 19

relative frequency 40/120 = 1/3 compared with 1/6, oe (accept 40 compared with the expected 20)	M1
The relative frequency is much higher than 1/6, so the die may be biased	A1

Answer: **The relative frequency is much higher than 1/6, so the die may be biased**

Question 20

4/5 x 80	M1
64 cao	A1

Answer: **64**

Question 21

2/5 x 60	M1
24 cao	A1

Answer: **24**

Question 22

relative frequency 98/600 = 49/300 compared with 1/6, oe (accept 98 compared with the expected 100)	M1
The relative frequency is close to 1/6, so there is no evidence that the die is biased	A1

Answer: **The relative frequency is close to 1/6, so there is no evidence that the die is biased**

Question 23

9/20 x 100	M1
45 cao	A1

Answer: **45**

Question 24

relative frequency 7/25	M1
7/25 x 400	M1
112 cao	A1

Answer: **112**

Question 25

relative frequency shown as 18/120 = 0.15 or equivalent	M1
theoretical is 1/6 = 0.166... so theoretical is larger cao	A1

Answer: **0.15; theoretical 1/6 (about 0.166...), theoretical is larger**

Question 26

1/20 x 40	M1
2 cao	A1

Answer: **2**

Question 27

relative frequency 81/100	M1
81/100 x 400	M1
324 cao	A1

Answer: **324**

Question 28

67/100	M1
0.67 and a correct comparison	A1

Answer: **0.67; not close to 0.5**

Question 29

relative frequency 16/25	M1
16/25 x 500	M1
320 cao	A1

Answer: **320**

Question 30

relative frequency 4/5	M1
4/5 x 500	M1
400 cao	A1

Answer: **400**

Question 31

relative frequency 13/100	M1
13/100 x 500	M1
65 cao	A1

Answer: **65**

Question 32

77/80	M1
0.9625 and a correct comparison	A1

Answer: **0.9625; not close to 0.5**

Question 33

relative frequency 43/100	M1
43/100 x 400	M1
172 cao	A1

Answer: **172**

Question 34

5/8 x 80	M1
50 cao	A1

Answer: **50**

Question 35

method: 20/75 or equivalent shown	M1
4/15 cao	A1

Answer: **4/15**

Question 36

relative frequency 21/25	M1
21/25 x 400	M1
336 cao	A1

Answer: **336**

Question 37

1/4 x 100	M1
25 cao	A1

Answer: **25**

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Question 38

3/20 x 100	**M1**
15 cao	**A1**

Answer: **15**

Question 39

2/5 x 500	**M1**
200 cao	**A1**

Answer: **200**

Question 40

expected frequency = 150/6 = 25	**M1**
difference = 40 - 25 = 15 (experimental higher) cao	**A1**

Answer: **Expected 25; difference 15**

Question 41

expected red = 200 x 0.2 = 40	**M1**
expected not red = 200 - 40 = 160 cao	**A1**

Answer: **Red 40; not red 160**

Question 42

9 cao	**B1**

Answer: **9**

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