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GCSE MATHEMATICS FOUNDATION TIER

UNIT 5: PROBABILITY

8 chapters | 96 curated questions | 1-4 marks

Student name: _____

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Contents and publication statement

This curated Foundation edition prioritises distinct tasks, accurate tier boundaries, clear working space and visible reasoning. Marks indicate an independent teaching allocation, not an official Eduqas mark scheme.

Chapter	Specification topic
1	FP1 - Experimental frequency and frequency trees
2	FP2 - Randomness, fairness and expected outcomes
3	FP3 - Relative frequency and the probability scale
4	FP4 - Exhaustive and mutually exclusive outcomes
5	FP5 - Sample size and reliable probability estimates
6	FP6 - Systematic listing, tables, Venn diagrams and trees
7	FP7 - Possibility spaces and theoretical probability
8	FP8 - Independent and dependent combined events

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FOUNDATION TIER

UNIT 5 | CHAPTER 1

FP1 - Experimental frequency and frequency trees

12 curated questions | complete solutions

Chapter focus

Record, describe and analyse outcomes from experiments using tables and frequency trees.

Assessment progression

Questions 1-4 secure essential Foundation skills; Questions 5-8 connect representations; Questions 9-12 develop Grade 4-5 reasoning and interpretation.

Working expectation

Show every stage for questions worth 4 marks. For all other questions, write enough working for another student to follow your method.

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Chapter 1: FP1 - Experimental frequency and frequency trees

Q01 | 2 MARKS

A spinner is tested 50 times and lands on blue 12 times. Find the experimental probability of blue in simplest form.

Q02 | 3 MARKS

In 70 trials, red occurs 20 times and blue occurs 24 times. Complete the frequency total for all other outcomes and find its relative frequency.

Chapter 1: FP1 - Experimental frequency and frequency trees

Q03 | 3 MARKS

A frequency tree starts with 85 learners. 45 pass test 1 and 28 pass both tests. How many pass test 1 but not test 2?

Q04 | 2 MARKS

A spinner is tested 80 times and lands on blue 18 times. Find the experimental probability of blue in simplest form.

Chapter 1: FP1 - Experimental frequency and frequency trees

Q05 | 3 MARKS

In 85 trials, red occurs 23 times and blue occurs 27 times. Complete the frequency total for all other outcomes and find its relative frequency.

Q06 | 3 MARKS

A frequency tree starts with 100 learners. 48 pass test 1 and 31 pass both tests. How many pass test 1 but not test 2?

Chapter 1: FP1 - Experimental frequency and frequency trees

Q07 | 2 MARKS

A spinner is tested 110 times and lands on blue 24 times. Find the experimental probability of blue in simplest form.

Q08 | 3 MARKS

In 100 trials, red occurs 26 times and blue occurs 30 times. Complete the frequency total for all other outcomes and find its relative frequency.

Chapter 1: FP1 - Experimental frequency and frequency trees

Q09 | 3 MARKS

A frequency tree starts with 115 learners. 51 pass test 1 and 34 pass both tests. How many pass test 1 but not test 2?

Q10 | 2 MARKS

A spinner is tested 140 times and lands on blue 30 times. Find the experimental probability of blue in simplest form.

Chapter 1: FP1 - Experimental frequency and frequency trees

Q11 | 3 MARKS

In 115 trials, red occurs 29 times and blue occurs 33 times. Complete the frequency total for all other outcomes and find its relative frequency.

Q12 | 3 MARKS

A frequency tree starts with 130 learners. 54 pass test 1 and 37 pass both tests. How many pass test 1 but not test 2?

Worked solutions

Q01 | 2 MARKS

Relative frequency = blue outcomes / total trials = $12/50 = 6/25$.

ANSWER: 6/25

Q02 | 3 MARKS

Other outcomes = $70 - 20 - 24 = 26$. Relative frequency = $26/70 = 13/35$.

ANSWER: 26; 13/35

Worked solutions

Q03 | 3 MARKS

The 45 who pass test 1 split into pass and not-pass on test 2. Therefore $45 - 28 = 17$.

ANSWER: 17

Q04 | 2 MARKS

Relative frequency = blue outcomes / total trials = $18/80 = 9/40$.

ANSWER: 9/40

Worked solutions

Q05 | 3 MARKS

Other outcomes = $85 - 23 - 27 = 35$. Relative frequency = $35/85 = 7/17$.

ANSWER: 35; 7/17

Q06 | 3 MARKS

The 48 who pass test 1 split into pass and not-pass on test 2. Therefore $48 - 31 = 17$.

ANSWER: 17

Worked solutions

Q07 | 2 MARKS

Relative frequency = blue outcomes / total trials = $24/110 = 12/55$.

ANSWER: 12/55**Q08 | 3 MARKS**

Other outcomes = $100 - 26 - 30 = 44$. Relative frequency = $44/100 = 11/25$.

ANSWER: 44; 11/25

Worked solutions

Q09 | 3 MARKS

The 51 who pass test 1 split into pass and not-pass on test 2. Therefore $51 - 34 = 17$.

ANSWER: 17**Q10 | 2 MARKS**

Relative frequency = blue outcomes / total trials = $30/140 = 3/14$.

ANSWER: 3/14

Worked solutions

Q11 | 3 MARKS

Other outcomes = $115 - 29 - 33 = 53$. Relative frequency = $53/115 = 53/115$.

ANSWER: 53; 53/115

Q12 | 3 MARKS

The 54 who pass test 1 split into pass and not-pass on test 2. Therefore $54 - 37 = 17$.

ANSWER: 17

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
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3			
4			
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12			

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FOUNDATION TIER

UNIT 5 | CHAPTER 2

FP2 - Randomness, fairness and expected outcomes

12 curated questions | complete solutions

Chapter focus

Apply randomness, fairness and equally likely outcomes to repeated experiments.

Assessment progression

Questions 1-4 secure essential Foundation skills; Questions 5-8 connect representations; Questions 9-12 develop Grade 4-5 reasoning and interpretation.

Working expectation

Show every stage for questions worth 4 marks. For all other questions, write enough working for another student to follow your method.

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Chapter 2: FP2 - Randomness, fairness and expected outcomes

Q01 | 3 MARKS

A bag contains 3 red and 4 blue counters. A counter is replaced after every draw. In 60 draws, calculate the expected number of reds.

Q02 | 3 MARKS

A spinner has 7 equal sectors labelled 1, 2, 3, 4, 5, 6, 7. Explain why it is fair for selecting one label and state $P(\text{label } 7)$.

Chapter 2: FP2 - Randomness, fairness and expected outcomes

Q03 | 3 MARKS

A standard fair die is rolled 60 times and produces 19 sixes. Does this result prove that the die is biased? Explain.

Q04 | 3 MARKS

A bag contains 6 red and 7 blue counters. A counter is replaced after every draw. In 90 draws, calculate the expected number of reds.

Chapter 2: FP2 - Randomness, fairness and expected outcomes

Q05 | 3 MARKS

A spinner has 10 equal sectors labelled 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. Explain why it is fair for selecting one label and state $P(\text{label } 10)$.

Q06 | 3 MARKS

A standard fair die is rolled 60 times and produces 22 sixes. Does this result prove that the die is biased? Explain.

Chapter 2: FP2 - Randomness, fairness and expected outcomes

Q07 | 3 MARKS

A bag contains 9 red and 10 blue counters. A counter is replaced after every draw. In 120 draws, calculate the expected number of reds.

Q08 | 3 MARKS

A spinner has 13 equal sectors labelled 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13. Explain why it is fair for selecting one label and state $P(\text{label } 13)$.

Chapter 2: FP2 - Randomness, fairness and expected outcomes

Q09 | 3 MARKS

A standard fair die is rolled 60 times and produces 25 sixes. Does this result prove that the die is biased? Explain.

Q10 | 3 MARKS

A bag contains 12 red and 13 blue counters. A counter is replaced after every draw. In 150 draws, calculate the expected number of reds.

Chapter 2: FP2 - Randomness, fairness and expected outcomes

Q11 | 3 MARKS

A spinner has 16 equal sectors labelled 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16. Explain why it is fair for selecting one label and state $P(\text{label } 16)$.

Q12 | 3 MARKS

A standard fair die is rolled 60 times and produces 28 sixes. Does this result prove that the die is biased? Explain.

Worked solutions

Q01 | 3 MARKS

$P(\text{red}) = 3/7$. Expected frequency $= 60 \times 3/7 = 180/7$.

ANSWER: 180/7

Q02 | 3 MARKS

A fair spinner gives each of its 7 equal sectors probability $1/7$.

ANSWER: Equal sectors make outcomes equally likely; $1/7$

Worked solutions

Q03 | 3 MARKS

The theoretical expected number is $60 \times \frac{1}{6} = 10$, but experimental results vary. Further, preferably larger, trials are needed.

ANSWER: No; random variation is expected and one experiment is insufficient evidence

Q04 | 3 MARKS

$P(\text{red}) = \frac{6}{13}$. Expected frequency $= 90 \times \frac{6}{13} = \frac{540}{13}$.

ANSWER: $\frac{540}{13}$

Worked solutions

Q05 | 3 MARKS

A fair spinner gives each of its 10 equal sectors probability $1/10$.

ANSWER: Equal sectors make outcomes equally likely; $1/10$

Q06 | 3 MARKS

The theoretical expected number is $60 \times 1/6 = 10$, but experimental results vary. Further, preferably larger, trials are needed.

ANSWER: No; random variation is expected and one experiment is insufficient evidence

Worked solutions

Q07 | 3 MARKS

$P(\text{red}) = 9/19$. Expected frequency $= 120 \times 9/19 = 1080/19$.

ANSWER: 1080/19

Q08 | 3 MARKS

A fair spinner gives each of its 13 equal sectors probability $1/13$.

ANSWER: Equal sectors make outcomes equally likely; $1/13$

Worked solutions

Q09 | 3 MARKS

The theoretical expected number is $60 \times \frac{1}{6} = 10$, but experimental results vary. Further, preferably larger, trials are needed.

ANSWER: No; random variation is expected and one experiment is insufficient evidence

Q10 | 3 MARKS

$P(\text{red}) = \frac{12}{25}$. Expected frequency $= 150 \times \frac{12}{25} = 72$.

ANSWER: 72

Worked solutions

Q11 | 3 MARKS

A fair spinner gives each of its 16 equal sectors probability $1/16$.

ANSWER: Equal sectors make outcomes equally likely; $1/16$

Q12 | 3 MARKS

The theoretical expected number is $60 \times 1/6 = 10$, but experimental results vary. Further, preferably larger, trials are needed.

ANSWER: No; random variation is expected and one experiment is insufficient evidence

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Question	Score / marks	Repair target	Retest date
1			
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12			

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FOUNDATION TIER

UNIT 5 | CHAPTER 3

FP3 - Relative frequency and the probability scale

12 curated questions | complete solutions

Chapter focus

Relate experimental relative frequency to theoretical probability and use the 0-to-1 scale.

Assessment progression

Questions 1-4 secure essential Foundation skills; Questions 5-8 connect representations; Questions 9-12 develop Grade 4-5 reasoning and interpretation.

Working expectation

Show every stage for questions worth 4 marks. For all other questions, write enough working for another student to follow your method.

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Chapter 3: FP3 - Relative frequency and the probability scale

Q01 | 3 MARKS

An event occurs 14 times in 44 trials. Estimate its probability and describe it as impossible, unlikely, even chance, likely or certain.

Q02 | 3 MARKS

Place the probability $\frac{3}{10}$ on a 0-to-1 scale and state whether its complement is more or less likely.

Chapter 3: FP3 - Relative frequency and the probability scale

Q03 | 4 MARKS

You must show your working.

The theoretical probability of an outcome is $\frac{1}{5}$. In 160 trials it occurs 33 times. Find the relative frequency and compare it with the theoretical value.

Q04 | 3 MARKS

An event occurs 20 times in 56 trials. Estimate its probability and describe it as impossible, unlikely, even chance, likely or certain.

Chapter 3: FP3 - Relative frequency and the probability scale

Q05 | 3 MARKS

Place the probability $\frac{3}{5}$ on a 0-to-1 scale and state whether its complement is more or less likely.

Q06 | 4 MARKS

You must show your working.

The theoretical probability of an outcome is $\frac{1}{5}$. In 220 trials it occurs 43 times. Find the relative frequency and compare it with the theoretical value.

Chapter 3: FP3 - Relative frequency and the probability scale

Q07 | 3 MARKS

An event occurs 26 times in 68 trials. Estimate its probability and describe it as impossible, unlikely, even chance, likely or certain.

Q08 | 3 MARKS

Place the probability $\frac{1}{10}$ on a 0-to-1 scale and state whether its complement is more or less likely.

Chapter 3: FP3 - Relative frequency and the probability scale

Q09 | 4 MARKS

You must show your working.

The theoretical probability of an outcome is $\frac{1}{5}$. In 280 trials it occurs 58 times. Find the relative frequency and compare it with the theoretical value.

Q10 | 3 MARKS

An event occurs 32 times in 80 trials. Estimate its probability and describe it as impossible, unlikely, even chance, likely or certain.

Chapter 3: FP3 - Relative frequency and the probability scale

Q11 | 3 MARKS

Place the probability $\frac{2}{5}$ on a 0-to-1 scale and state whether its complement is more or less likely.

Q12 | 4 MARKS

You must show your working.

The theoretical probability of an outcome is $\frac{1}{5}$. In 340 trials it occurs 68 times. Find the relative frequency and compare it with the theoretical value.

Worked solutions

Q01 | 3 MARKS

Estimated probability= $14/44=7/22$. Compare this value with 0, $1/2$ and 1.

ANSWER: $7/22$; unlikely

Q02 | 3 MARKS

The complement is $1-3/10=7/10$. Compare the two probabilities.

ANSWER: At 0.3; complement $7/10$, more likely

Worked solutions

Q03 | 4 MARKS

Relative frequency = $\frac{33}{160} = \frac{33}{160}$. The theoretical value is $\frac{1}{5}$.

ANSWER: $\frac{33}{160}$; it is above the theoretical value

Q04 | 3 MARKS

Estimated probability = $\frac{20}{56} = \frac{5}{14}$. Compare this value with 0, $\frac{1}{2}$ and 1.

ANSWER: $\frac{5}{14}$; unlikely

Worked solutions

Q05 | 3 MARKS

The complement is $1 - \frac{3}{5} = \frac{2}{5}$. Compare the two probabilities.

ANSWER: At 0.6; complement $\frac{2}{5}$, less likely

Q06 | 4 MARKS

Relative frequency = $\frac{43}{220} = \frac{43}{220}$. The theoretical value is $\frac{1}{5}$.

ANSWER: $\frac{43}{220}$; it is below the theoretical value

Worked solutions

Q07 | 3 MARKS

Estimated probability= $26/68=13/34$. Compare this value with 0, $1/2$ and 1.

ANSWER: $13/34$; unlikely

Q08 | 3 MARKS

The complement is $1-1/10=9/10$. Compare the two probabilities.

ANSWER: At 0.1; complement $9/10$, more likely

Worked solutions

Q09 | 4 MARKS

Relative frequency = $\frac{58}{280} = \frac{29}{140}$. The theoretical value is $\frac{1}{5}$.

ANSWER: $\frac{29}{140}$; it is above the theoretical value

Q10 | 3 MARKS

Estimated probability = $\frac{32}{80} = \frac{2}{5}$. Compare this value with 0, $\frac{1}{2}$ and 1.

ANSWER: $\frac{2}{5}$; unlikely

Worked solutions

Q11 | 3 MARKS

The complement is $1 - \frac{2}{5} = \frac{3}{5}$. Compare the two probabilities.

ANSWER: At 0.4; complement $\frac{3}{5}$, more likely

Q12 | 4 MARKS

Relative frequency = $\frac{68}{340} = \frac{1}{5}$. The theoretical value is $\frac{1}{5}$.

ANSWER: $\frac{1}{5}$; it is equal to the theoretical value

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
2			
3			
4			
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7			
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9			
10			
11			
12			

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UNIT 5 | CHAPTER 4

FP4 - Exhaustive and mutually exclusive outcomes

12 curated questions | complete solutions

Chapter focus

Use the fact that probabilities of exhaustive, mutually exclusive outcomes sum to 1.

Assessment progression

Questions 1-4 secure essential Foundation skills; Questions 5-8 connect representations; Questions 9-12 develop Grade 4-5 reasoning and interpretation.

Working expectation

Show every stage for questions worth 4 marks. For all other questions, write enough working for another student to follow your method.

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Chapter 4: FP4 - Exhaustive and mutually exclusive outcomes

Q01 | 3 MARKS

Three mutually exclusive outcomes A, B and C are exhaustive. $P(A)=1/5$ and $P(B)=1/4$. Find $P(C)$.

Q02 | 2 MARKS

$P(\text{rain})=3/8$. Find $P(\text{no rain})$ and name the probability rule used.

Chapter 4: FP4 - Exhaustive and mutually exclusive outcomes

Q03 | 3 MARKS

A bag contains 13 green counters, 7 yellow counters and some purple counters, 36 altogether. Find $P(\text{purple})$.

Q04 | 3 MARKS

Three mutually exclusive outcomes A, B and C are exhaustive. $P(A)=\frac{1}{2}$ and $P(B)=\frac{1}{4}$. Find $P(C)$.

Chapter 4: FP4 - Exhaustive and mutually exclusive outcomes

Q05 | 2 MARKS

$P(\text{rain}) = 1/8$. Find $P(\text{no rain})$ and name the probability rule used.

Q06 | 3 MARKS

A bag contains 16 green counters, 10 yellow counters and some purple counters, 42 altogether. Find $P(\text{purple})$.

Chapter 4: FP4 - Exhaustive and mutually exclusive outcomes

Q07 | 3 MARKS

Three mutually exclusive outcomes A, B and C are exhaustive. $P(A)=\frac{3}{10}$ and $P(B)=\frac{1}{4}$. Find $P(C)$.

Q08 | 2 MARKS

$P(\text{rain})=\frac{1}{2}$. Find $P(\text{no rain})$ and name the probability rule used.

Chapter 4: FP4 - Exhaustive and mutually exclusive outcomes

Q09 | 3 MARKS

A bag contains 19 green counters, 13 yellow counters and some purple counters, 48 altogether. Find $P(\text{purple})$.

Q10 | 3 MARKS

Three mutually exclusive outcomes A, B and C are exhaustive. $P(A)=1/10$ and $P(B)=1/4$. Find $P(C)$.

Chapter 4: FP4 - Exhaustive and mutually exclusive outcomes

Q11 | 2 MARKS

$P(\text{rain}) = 1/4$. Find $P(\text{no rain})$ and name the probability rule used.

Q12 | 3 MARKS

A bag contains 22 green counters, 16 yellow counters and some purple counters, 54 altogether. Find $P(\text{purple})$.

Worked solutions

Q01 | 3 MARKS

Exhaustive mutually exclusive probabilities total 1, so $P(C)=1-1/5-1/4=11/20$.

ANSWER: 11/20

Q02 | 2 MARKS

Rain and no rain are complementary, so $P(\text{no rain})=1-3/8=5/8$.

ANSWER: 5/8; complementary outcomes sum to 1

Worked solutions

Q03 | 3 MARKS

Purple counters = $36 - 13 - 7 = 16$. Divide by 36.

ANSWER: 4/9**Q04 | 3 MARKS**

Exhaustive mutually exclusive probabilities total 1, so $P(C) = 1 - 1/2 - 1/4 = 1/4$.

ANSWER: 1/4

Worked solutions

Q05 | 2 MARKS

Rain and no rain are complementary, so $P(\text{no rain}) = 1 - 1/8 = 7/8$.

ANSWER: 7/8; complementary outcomes sum to 1

Q06 | 3 MARKS

Purple counters $= 42 - 16 - 10 = 16$. Divide by 42.

ANSWER: 8/21

Worked solutions

Q07 | 3 MARKS

Exhaustive mutually exclusive probabilities total 1, so $P(C)=1-3/10-1/4=9/20$.

ANSWER: 9/20

Q08 | 2 MARKS

Rain and no rain are complementary, so $P(\text{no rain})=1-1/2=1/2$.

ANSWER: 1/2; complementary outcomes sum to 1

Worked solutions

Q09 | 3 MARKS

Purple counters = $48 - 19 - 13 = 16$. Divide by 48.

ANSWER: $1/3$ **Q10 | 3 MARKS**

Exhaustive mutually exclusive probabilities total 1, so $P(C) = 1 - 1/10 - 1/4 = 13/20$.

ANSWER: $13/20$

Worked solutions

Q11 | 2 MARKS

Rain and no rain are complementary, so $P(\text{no rain}) = 1 - 1/4 = 3/4$.

ANSWER: 3/4; complementary outcomes sum to 1

Q12 | 3 MARKS

Purple counters = $54 - 22 - 16 = 16$. Divide by 54.

ANSWER: 8/27

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
2			
3			
4			
5			
6			
7			
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9			
10			
11			
12			

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FOUNDATION TIER

UNIT 5 | CHAPTER 5

FP5 - Sample size and reliable probability estimates

12 curated questions | complete solutions

Chapter focus

Understand why unbiased experimental results tend towards theoretical probabilities as sample size increases.

Assessment progression

Questions 1-4 secure essential Foundation skills; Questions 5-8 connect representations; Questions 9-12 develop Grade 4-5 reasoning and interpretation.

Working expectation

Show every stage for questions worth 4 marks. For all other questions, write enough working for another student to follow your method.

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Chapter 5: FP5 - Sample size and reliable probability estimates

Q01 | 3 MARKS

Two unbiased experiments estimate the same probability: Experiment A uses 25 trials and Experiment B uses 220 trials. Which estimate is generally more reliable, and why?

Q02 | 4 MARKS

You must show your working.

An unbiased trial gives 29 successes in 70 attempts. Use this result to estimate successes in the next 340 attempts, and state one limitation.

Chapter 5: FP5 - Sample size and reliable probability estimates

Q03 | 3 MARKS

A survey numbered 3 asks only members of a sports club whether the town needs more sports facilities. Explain why increasing this sample from 50 to 500 does not remove the main problem.

Q04 | 3 MARKS

Two unbiased experiments estimate the same probability: Experiment A uses 40 trials and Experiment B uses 280 trials. Which estimate is generally more reliable, and why?

Chapter 5: FP5 - Sample size and reliable probability estimates

Q05 | 4 MARKS

You must show your working.

An unbiased trial gives 41 successes in 100 attempts. Use this result to estimate successes in the next 400 attempts, and state one limitation.

Q06 | 3 MARKS

A survey numbered 6 asks only members of a sports club whether the town needs more sports facilities. Explain why increasing this sample from 50 to 500 does not remove the main problem.

Chapter 5: FP5 - Sample size and reliable probability estimates

Q07 | 3 MARKS

Two unbiased experiments estimate the same probability: Experiment A uses 55 trials and Experiment B uses 340 trials. Which estimate is generally more reliable, and why?

Q08 | 4 MARKS

You must show your working.

An unbiased trial gives 53 successes in 130 attempts. Use this result to estimate successes in the next 460 attempts, and state one limitation.

Chapter 5: FP5 - Sample size and reliable probability estimates

Q09 | 3 MARKS

A survey numbered 9 asks only members of a sports club whether the town needs more sports facilities. Explain why increasing this sample from 50 to 500 does not remove the main problem.

Q10 | 3 MARKS

Two unbiased experiments estimate the same probability: Experiment A uses 70 trials and Experiment B uses 400 trials. Which estimate is generally more reliable, and why?

Chapter 5: FP5 - Sample size and reliable probability estimates

Q11 | 4 MARKS

You must show your working.

An unbiased trial gives 65 successes in 160 attempts. Use this result to estimate successes in the next 520 attempts, and state one limitation.

Q12 | 3 MARKS

A survey numbered 12 asks only members of a sports club whether the town needs more sports facilities. Explain why increasing this sample from 50 to 500 does not remove the main problem.

Worked solutions

Q01 | 3 MARKS

For an unbiased experiment, relative frequency tends to settle closer to theoretical probability as the number of trials increases.

ANSWER: Experiment B; a larger sample reduces the effect of random variation

Q02 | 4 MARKS

Estimated probability= $29/70$. Expected successes= $340 \times 29/70=986/7$. It is an estimate, not a guarantee.

ANSWER: $986/7$; the estimate is affected by random variation

Worked solutions

Q03 | 3 MARKS

A large biased sample can still give a systematically misleading estimate. Sampling method matters as well as sample size.

ANSWER: The sample remains biased and is not representative of the whole town

Q04 | 3 MARKS

For an unbiased experiment, relative frequency tends to settle closer to theoretical probability as the number of trials increases.

ANSWER: Experiment B; a larger sample reduces the effect of random variation

Worked solutions

Q05 | 4 MARKS

Estimated probability= $41/100$. Expected successes= $400 \times 41/100=164$. It is an estimate, not a guarantee.

ANSWER: 164; the estimate is affected by random variation

Q06 | 3 MARKS

A large biased sample can still give a systematically misleading estimate. Sampling method matters as well as sample size.

ANSWER: The sample remains biased and is not representative of the whole town

Worked solutions

Q07 | 3 MARKS

For an unbiased experiment, relative frequency tends to settle closer to theoretical probability as the number of trials increases.

ANSWER: Experiment B; a larger sample reduces the effect of random variation

Q08 | 4 MARKS

Estimated probability = $\frac{53}{130}$. Expected successes = $460 \times \frac{53}{130} = \frac{2438}{13}$. It is an estimate, not a guarantee.

ANSWER: $\frac{2438}{13}$; the estimate is affected by random variation

Worked solutions

Q09 | 3 MARKS

A large biased sample can still give a systematically misleading estimate. Sampling method matters as well as sample size.

ANSWER: The sample remains biased and is not representative of the whole town

Q10 | 3 MARKS

For an unbiased experiment, relative frequency tends to settle closer to theoretical probability as the number of trials increases.

ANSWER: Experiment B; a larger sample reduces the effect of random variation

Worked solutions

Q11 | 4 MARKS

Estimated probability= $65/160$. Expected successes= $520 \times 65/160=845/4$. It is an estimate, not a guarantee.

ANSWER: $845/4$; the estimate is affected by random variation

Q12 | 3 MARKS

A large biased sample can still give a systematically misleading estimate. Sampling method matters as well as sample size.

ANSWER: The sample remains biased and is not representative of the whole town

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
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3			
4			
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11			
12			

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UNIT 5 | CHAPTER 6

FP6 - Systematic listing, tables, Venn diagrams and trees

12 curated questions | complete solutions

Chapter focus

Enumerate sets and combinations systematically using appropriate representations.

Assessment progression

Questions 1-4 secure essential Foundation skills; Questions 5-8 connect representations; Questions 9-12 develop Grade 4-5 reasoning and interpretation.

Working expectation

Show every stage for questions worth 4 marks. For all other questions, write enough working for another student to follow your method.

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Chapter 6: FP6 - Systematic listing, tables, Venn diagrams and trees

Q01 | 3 MARKS

A student has 3 tops and 4 pairs of trousers. List combinations systematically or use a table to find the number of outfits.

Q02 | 4 MARKS

You must show your working.

In a group of 28, 8 are in A only, 9 in B only, 6 in both and 5 in neither. Find the number in A union B and $P(A \cup B)$.

Chapter 6: FP6 - Systematic listing, tables, Venn diagrams and trees

Q03 | 3 MARKS

A code contains one of 2 letters followed by one of 6 digits. Draw or describe a tree/list and find the number of possible codes.

Q04 | 3 MARKS

A student has 2 tops and 7 pairs of trousers. List combinations systematically or use a table to find the number of outfits.

Chapter 6: FP6 - Systematic listing, tables, Venn diagrams and trees

Q05 | 4 MARKS

You must show your working.

In a group of 40, 11 are in A only, 12 in B only, 9 in both and 8 in neither. Find the number in A union B and $P(A \cup B)$.

Q06 | 3 MARKS

A code contains one of 2 letters followed by one of 5 digits. Draw or describe a tree/list and find the number of possible codes.

Chapter 6: FP6 - Systematic listing, tables, Venn diagrams and trees

Q07 | 3 MARKS

A student has 5 tops and 5 pairs of trousers. List combinations systematically or use a table to find the number of outfits.

Q08 | 4 MARKS

You must show your working.

In a group of 52, 14 are in A only, 15 in B only, 12 in both and 11 in neither. Find the number in A union B and $P(A \cup B)$.

Chapter 6: FP6 - Systematic listing, tables, Venn diagrams and trees

Q09 | 3 MARKS

A code contains one of 2 letters followed by one of 4 digits. Draw or describe a tree/list and find the number of possible codes.

Q10 | 3 MARKS

A student has 4 tops and 3 pairs of trousers. List combinations systematically or use a table to find the number of outfits.

Chapter 6: FP6 - Systematic listing, tables, Venn diagrams and trees

Q11 | 4 MARKS

You must show your working.

In a group of 64, 17 are in A only, 18 in B only, 15 in both and 14 in neither. Find the number in A union B and $P(A \cup B)$.

Q12 | 3 MARKS

A code contains one of 2 letters followed by one of 3 digits. Draw or describe a tree/list and find the number of possible codes.

Worked solutions

Q01 | 3 MARKS

Each of 3 tops can be paired with each of 4 trousers: $3 \times 4 = 12$.

ANSWER: 12

Q02 | 4 MARKS

A union B includes A only, B only and both: $8+9+6=23$. Divide by 28.

ANSWER: 23; 23/28

Worked solutions

Q03 | 3 MARKS

There are 6 branches for each of 2 letters, giving $2 \times 6 = 12$ codes.

ANSWER: 12**Q04 | 3 MARKS**

Each of 2 tops can be paired with each of 7 trousers: $2 \times 7 = 14$.

ANSWER: 14

Worked solutions

Q05 | 4 MARKS

A union B includes A only, B only and both: $11+12+9=32$. Divide by 40.

ANSWER: 32; 4/5**Q06 | 3 MARKS**

There are 5 branches for each of 2 letters, giving $2 \times 5=10$ codes.

ANSWER: 10

Worked solutions

Q07 | 3 MARKS

Each of 5 tops can be paired with each of 5 trousers: $5 \times 5 = 25$.

ANSWER: 25**Q08 | 4 MARKS**

A union B includes A only, B only and both: $14 + 15 + 12 = 41$. Divide by 52.

ANSWER: 41; 41/52

Worked solutions

Q09 | 3 MARKS

There are 4 branches for each of 2 letters, giving $2 \times 4 = 8$ codes.

ANSWER: 8

Q10 | 3 MARKS

Each of 4 tops can be paired with each of 3 trousers: $4 \times 3 = 12$.

ANSWER: 12

Worked solutions

Q11 | 4 MARKS

A union B includes A only, B only and both: $17+18+15=50$. Divide by 64.

ANSWER: 50; 25/32

Q12 | 3 MARKS

There are 3 branches for each of 2 letters, giving $2 \times 3=6$ codes.

ANSWER: 6

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
2			
3			
4			
5			
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12			

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FOUNDATION TIER

UNIT 5 | CHAPTER 7

FP7 - Possibility spaces and theoretical probability

12 curated questions | complete solutions

Chapter focus

Construct possibility spaces for single and combined equally likely experiments.

Assessment progression

Questions 1-4 secure essential Foundation skills; Questions 5-8 connect representations; Questions 9-12 develop Grade 4-5 reasoning and interpretation.

Working expectation

Show every stage for questions worth 4 marks. For all other questions, write enough working for another student to follow your method.

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Chapter 7: FP7 - Possibility spaces and theoretical probability

Q01 | 4 MARKS

You must show your working.

Two fair 5-sided dice numbered 1 to 5 are rolled. Construct a possibility space and find $P(\text{total}=6)$.

Q02 | 2 MARKS

A fair spinner has 5 colours and another has 4 numbers. Use a sample-space grid to find the number of equally likely combined outcomes.

Chapter 7: FP7 - Possibility spaces and theoretical probability

Q03 | 3 MARKS

A fair die and a fair coin are used. Find the probability of obtaining Heads and a die score greater than 5.

Q04 | 4 MARKS

You must show your working.

Two fair 4-sided dice numbered 1 to 4 are rolled. Construct a possibility space and find $P(\text{total}=5)$.

Chapter 7: FP7 - Possibility spaces and theoretical probability

Q05 | 2 MARKS

A fair spinner has 5 colours and another has 3 numbers. Use a sample-space grid to find the number of equally likely combined outcomes.

Q06 | 3 MARKS

A fair die and a fair coin are used. Find the probability of obtaining Heads and a die score greater than 4.

Chapter 7: FP7 - Possibility spaces and theoretical probability

Q07 | 4 MARKS

You must show your working.

Two fair 7-sided dice numbered 1 to 7 are rolled. Construct a possibility space and find $P(\text{total}=8)$.

Q08 | 2 MARKS

A fair spinner has 5 colours and another has 2 numbers. Use a sample-space grid to find the number of equally likely combined outcomes.

Chapter 7: FP7 - Possibility spaces and theoretical probability

Q09 | 3 MARKS

A fair die and a fair coin are used. Find the probability of obtaining Heads and a die score greater than 3.

Q10 | 4 MARKS

You must show your working.

Two fair 6-sided dice numbered 1 to 6 are rolled. Construct a possibility space and find $P(\text{total}=7)$.

Chapter 7: FP7 - Possibility spaces and theoretical probability

Q11 | 2 MARKS

A fair spinner has 5 colours and another has 5 numbers. Use a sample-space grid to find the number of equally likely combined outcomes.

Q12 | 3 MARKS

A fair die and a fair coin are used. Find the probability of obtaining Heads and a die score greater than 2.

Worked solutions

Q01 | 4 MARKS

There are 25 equally likely ordered pairs. 5 have total 6, so $P=5/25=1/5$.

ANSWER: 1/5

Q02 | 2 MARKS

The grid has 5 rows and 4 columns: $5 \times 4=20$ outcomes.

ANSWER: 20

Worked solutions

Q03 | 3 MARKS

The equally likely possibility space has 12 outcomes. Heads with scores 6 to 6 gives 1 favourable outcomes, so $P=1/12$.

ANSWER: 1/12

Q04 | 4 MARKS

There are 16 equally likely ordered pairs. 4 have total 5, so $P=4/16=1/4$.

ANSWER: 1/4

Worked solutions

Q05 | 2 MARKS

The grid has 5 rows and 3 columns: $5 \times 3 = 15$ outcomes.

ANSWER: 15

Q06 | 3 MARKS

The equally likely possibility space has 12 outcomes. Heads with scores 5 to 6 gives 2 favourable outcomes, so $P = 1/6$.

ANSWER: 1/6

Worked solutions

Q07 | 4 MARKS

There are 49 equally likely ordered pairs. 7 have total 8, so $P=7/49=1/7$.

ANSWER: 1/7**Q08 | 2 MARKS**

The grid has 5 rows and 2 columns: $5 \times 2=10$ outcomes.

ANSWER: 10

Worked solutions

Q09 | 3 MARKS

The equally likely possibility space has 12 outcomes. Heads with scores 4 to 6 gives 3 favourable outcomes, so $P=1/4$.

ANSWER: $1/4$

Q10 | 4 MARKS

There are 36 equally likely ordered pairs. 6 have total 7, so $P=6/36=1/6$.

ANSWER: $1/6$

Worked solutions

Q11 | 2 MARKS

The grid has 5 rows and 5 columns: $5 \times 5 = 25$ outcomes.

ANSWER: 25

Q12 | 3 MARKS

The equally likely possibility space has 12 outcomes. Heads with scores 3 to 6 gives 4 favourable outcomes, so $P = 1/3$.

ANSWER: 1/3

Chapter completion record

Question	Score / marks	Repair target	Retest date
1			
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FOUNDATION TIER

UNIT 5 | CHAPTER 8

FP8 - Independent and dependent combined events

12 curated questions | complete solutions

Chapter focus

Calculate probabilities of combined independent and dependent events, including with tree diagrams.

Assessment progression

Questions 1-4 secure essential Foundation skills; Questions 5-8 connect representations; Questions 9-12 develop Grade 4-5 reasoning and interpretation.

Working expectation

Show every stage for questions worth 4 marks. For all other questions, write enough working for another student to follow your method.

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Chapter 8: FP8 - Independent and dependent combined events

Q01 | 3 MARKS

Independent events A and B have $P(A)=\frac{2}{5}$ and $P(B)=\frac{1}{3}$. Find $P(A \text{ and } B)$ and state the assumption used.

Q02 | 4 MARKS

You must show your working.

A bag contains 5 red and 7 blue counters. Two counters are taken without replacement. Find $P(\text{both red})$ and explain why the second probability changes.

Chapter 8: FP8 - Independent and dependent combined events

Q03 | 4 MARKS

You must show your working.

An independent event has probability $\frac{2}{3}$ on each of two trials. Find the probability that it occurs at least once.

Q04 | 3 MARKS

Independent events A and B have $P(A)=\frac{2}{5}$ and $P(B)=\frac{1}{6}$. Find $P(A \text{ and } B)$ and state the assumption used.

Chapter 8: FP8 - Independent and dependent combined events

Q05 | 4 MARKS

You must show your working.

A bag contains 8 red and 10 blue counters. Two counters are taken without replacement. Find $P(\text{both red})$ and explain why the second probability changes.

Q06 | 4 MARKS

You must show your working.

An independent event has probability $\frac{1}{2}$ on each of two trials. Find the probability that it occurs at least once.

Chapter 8: FP8 - Independent and dependent combined events

Q07 | 3 MARKS

Independent events A and B have $P(A)=\frac{2}{5}$ and $P(B)=\frac{2}{3}$. Find $P(A \text{ and } B)$ and state the assumption used.

Q08 | 4 MARKS

You must show your working.

A bag contains 11 red and 13 blue counters. Two counters are taken without replacement. Find $P(\text{both red})$ and explain why the second probability changes.

Chapter 8: FP8 - Independent and dependent combined events

Q09 | 4 MARKS

You must show your working.

An independent event has probability $\frac{1}{3}$ on each of two trials. Find the probability that it occurs at least once.

Q10 | 3 MARKS

Independent events A and B have $P(A)=\frac{2}{5}$ and $P(B)=\frac{1}{2}$. Find $P(A \text{ and } B)$ and state the assumption used.

Chapter 8: FP8 - Independent and dependent combined events

Q11 | 4 MARKS

You must show your working.

A bag contains 14 red and 16 blue counters. Two counters are taken without replacement. Find $P(\text{both red})$ and explain why the second probability changes.

Q12 | 4 MARKS

You must show your working.

An independent event has probability $\frac{1}{6}$ on each of two trials. Find the probability that it occurs at least once.

Worked solutions

Q01 | 3 MARKS

For independent events, multiply: $2/5 \times 1/3 = 2/15$.

ANSWER: 2/15; independence

Q02 | 4 MARKS

$P(\text{both red}) = 5/12 \times 4/11 = 5/33$. After one red is removed, both the red count and total decrease by 1.

ANSWER: 5/33

Worked solutions

Q03 | 4 MARKS

Use the complement: $P(\text{at least once}) = 1 - P(\text{neither}) = 1 - (1/3)^2 = 8/9$.

ANSWER: 8/9**Q04 | 3 MARKS**

For independent events, multiply: $2/5 \times 1/6 = 1/15$.

ANSWER: 1/15; independence

Worked solutions

Q05 | 4 MARKS

$P(\text{both red}) = \frac{8}{18} \times \frac{7}{17} = \frac{28}{153}$. After one red is removed, both the red count and total decrease by 1.

ANSWER: $\frac{28}{153}$ **Q06 | 4 MARKS**

Use the complement: $P(\text{at least once}) = 1 - P(\text{neither}) = 1 - \left(\frac{1}{2}\right)^2 = \frac{3}{4}$.

ANSWER: $\frac{3}{4}$

Worked solutions

Q07 | 3 MARKS

For independent events, multiply: $\frac{2}{5} \times \frac{2}{3} = \frac{4}{15}$.

ANSWER: $\frac{4}{15}$; independence

Q08 | 4 MARKS

$P(\text{both red}) = \frac{11}{24} \times \frac{10}{23} = \frac{55}{276}$. After one red is removed, both the red count and total decrease by 1.

ANSWER: $\frac{55}{276}$

Worked solutions

Q09 | 4 MARKS

Use the complement: $P(\text{at least once}) = 1 - P(\text{neither}) = 1 - (2/3)^2 = 5/9$.

ANSWER: 5/9

Q10 | 3 MARKS

For independent events, multiply: $2/5 \times 1/2 = 1/5$.

ANSWER: 1/5; independence

Worked solutions

Q11 | 4 MARKS

$P(\text{both red}) = \frac{14}{30} \times \frac{13}{29} = \frac{91}{435}$. After one red is removed, both the red count and total decrease by 1.

ANSWER: $\frac{91}{435}$

Q12 | 4 MARKS

Use the complement: $P(\text{at least once}) = 1 - P(\text{neither}) = 1 - \left(\frac{5}{6}\right)^2 = \frac{11}{36}$.

ANSWER: $\frac{11}{36}$

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1			
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