



eClassroom

GCSE Mathematics

Relative Frequency & Sample Space

Worked Solutions

Pearson Edexcel GCSE & iGCSE Mathematics



Section A — Foundation — Worked Solutions

[Fluency] Question 1

$$28 \div 50$$

$$\therefore \mathbf{0.56}$$

[Fluency] Question 2

Outcomes: HH, HT, TH, TT (4 equally likely)

$$\therefore \mathbf{P(\text{two heads}) = 1/4}$$

[Fluency] Question 3

36 outcomes in total. Sum=7: (1,6)(2,5)(3,4)(4,3)(5,2)(6,1) = 6 ways

\therefore

[Fluency] Question 4

Outcomes: 1H, 1T, 2H, 2T, 3H, 3T (6 total)

Even numbers: 2. $P(2,H)=1/6$

$$\therefore \mathbf{P(\text{even and heads}) = 1/6}$$

[Fluency] Question 5

$$14 \div 40$$

$$\therefore \mathbf{0.35}$$

[Reasoning] Question 6

Theoretical: 0.3. Experimental: $54/200=0.27$

The values are reasonably close; the difference may be due to random variation.

With more trials, relative frequency should converge closer to 0.3.

\therefore **Results are roughly consistent; small difference is expected due to chance.**

[Reasoning] Question 7

Products >15 in 36 outcomes: (3,6)=18,(4,4)=16,(4,5)=20,(4,6)=24,(5,4)=20,(5,5)=25,(5,6)=30,(6,3)=18,(6,4)=24,(6,5)=30,(6,6)=36 \rightarrow 11 outcomes

\therefore





[Reasoning] Question 8

(a) Relative frequency = $62/300 \approx 0.207$

(b) Theoretical for fair die = $1/6 \approx 0.167$. Got 0.207.

This is noticeably higher, suggesting possible bias, but more trials needed to confirm.

\therefore (a) $62/300 \approx 0.207$ (b) Possibly biased; expected ≈ 0.167

[Problem Solving] Question 9

By the Law of Large Numbers: as the number of trials increases, the relative frequency gets closer to the true theoretical probability.

More trials reduces the effect of random variation.

\therefore More trials \rightarrow relative frequency converges to theoretical probability.

[Problem Solving] Question 10

12 total outcomes. $A > B$: (2,1)(3,1)(3,2) = 3 ways

$A + B = 5$: (1,4)(2,3)(3,2) = 3 ways

\therefore (a) $P(A > B) = 3/12 = 1/4$ (b) $P(A + B = 5) = 3/12 = 1/4$





Section B — Higher — Worked Solutions

[Fluency] Question 1

Law of Large Numbers: with many trials, relative frequency \rightarrow true probability.

$$\therefore P \approx 0.42$$

[Fluency] Question 2

Primes ≤ 12 : 2, 3, 5, 7, 11. Count ways:

Sum=2: 1, Sum=3: 2, Sum=5: 4, Sum=7: 6, Sum=11: 2. Total=15

\therefore

[Reasoning] Question 3

The Law of Large Numbers states that as $n \rightarrow \infty$, relative frequency \rightarrow true probability.

Random variations average out over many trials.

\therefore **Larger n reduces random variation; relative frequency converges to P .**

[Reasoning] Question 4

Theoretical $P(4) = 1/6$. Relative frequency = $85/n = 1/6$

$$n = 85 \times 6$$

$$\therefore n \approx 510$$

[Reasoning] Question 5

Pairs with $|\text{diff}| \geq 3$: (1,4)(1,5)(1,6)(2,5)(2,6)(3,6)(4,1)(5,1)(5,2)(6,1)(6,2)(6,3)=12

\therefore

[Reasoning] Question 6

16 total outcomes. Sum divisible by 3: (1,2)(2,1)(2,4)(3,3)(4,2) = 5 outcomes

Also check: sums 3, 6, 9: (1,2)=3, (2,1)=3, (2,4)=6, (3,3)=6, (4,2)=6 ✓

\therefore



**[Problem Solving] Question 7**

Perfect square products from two dice: $1(=1 \times 1)$, $4(=1 \times 4, 2 \times 2, 4 \times 1)$, $9(=3 \times 3)$, $16(=4 \times 4)$, $25(\text{none})$, $36(=6 \times 6)$

Pairs: $(1,1)(1,4)(2,2)(4,1)(3,3)(4,4)(6,6) = 7$ outcomes

\therefore

[Problem Solving] Question 8

(a) RF: $1:8/60=0.133$, $2:0.150$, $3:0.183$, $4:0.167$, $5:0.117$, $6:0.250$

(b) Expected each: $10/60=0.167$. The 6 appears much more frequently (0.250) suggesting possible bias toward 6.

\therefore (a) see working (b) Possibly biased (6 appears too often)

[Problem Solving] Question 9

$P(\text{sum} \geq 9)$: $(3,6)(4,5)(4,6)(5,4)(5,5)(5,6)(6,3)(6,4)(6,5)(6,6) = 10$ outcomes

Of these, at least one 6: $(3,6)(4,6)(5,6)(6,3)(6,4)(6,5)(6,6) = 7$ outcomes

\therefore

[Problem Solving] Question 10

Theoretical probability: calculated from equally likely outcomes (e.g. $P(H)=1/2$ for fair coin).

Relative frequency: observed frequency/total trials from an experiment.

Example where only RF is possible: probability of a train arriving late (no 'equally likely' formula applies).

\therefore See explanation above.