eClassroom

GCSE Mathematics

Basic Probability

Questions

Pearson Edexcel GCSE & iGCSE Mathematics

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Section A — Foundation

Worked Examples

[Fluency]

A bag has 5 red, 3 blue and 2 green counters. A counter is chosen at random. Find P(red).

Total = 10 counters.

$$P(\text{red}) = \frac{5}{10} = \frac{1}{2}$$

[Reasoning]

A spinner has sections: 1, 2, 3, 4, 5, 6. Events A = {even} and B = {greater than 4}. Are A and B mutually exclusive?

A = {2, 4, 6}. B = {5, 6}

$A \cap B = \{6\} \neq \varnothing \rightarrow$ **Not mutually exclusive**

[Problem Solving]

P(win) = 0.35. A game is played 400 times. How many wins are expected?

Expected frequency = probability × number of trials

0.35 × 400 = **140 wins**

[Fluency]

1. A bag contains 3 red, 5 blue and 2 green counters. A counter is picked at random.

(a) Find P(red). (1) **(b)** Find P(not red). (1)

(2 marks)

[Fluency]

2. A fair six-sided die is rolled.

Mark the following probabilities on a probability scale from 0 to 1:

(a) P(rolling a 7) (b) P(rolling less than 7) (c) P(rolling an even number)

(2 marks)

[Fluency]

3. A fair coin is flipped 200 times. P(heads) = 0.6 for a biased coin.

(a) How many heads are expected? (1)

(b) How many tails are expected? (1)

(2 marks)

[Fluency]

4. P(A) = 0.3 and P(B) = 0.5. A and B are mutually exclusive.

Find P(A or B).

(1 mark)

[Fluency]

5. In a class, P(left-handed) = 0.12. There are 25 students.

How many students would you expect to be left-handed?

(2 marks)

[Reasoning]

6. A football team plays 38 games. P(win) = 0.35, P(draw) = 0.25.

(a) Find P(lose). (1)

(b) How many wins are expected over the season? (2)

(3 marks)

[Reasoning]

7. A bag contains 4 red, 3 blue, 2 green and 1 yellow counter.

A counter is chosen at random.

Find the probability of choosing a primary colour (red, blue or yellow).

(2 marks)

[Reasoning]

8. A fair die is rolled 50 times.

(a) Write down the expected frequency of each number. (1)

(b) Explain why the actual frequencies may differ from the expected frequencies. (1)

(2 marks)

[Problem Solving]

9. Three events A, B and C are mutually exclusive.

P(A) = 0.25, P(B) = 0.35.

(a) Find P(A or B or C) if P(C) = 0.2. (1)

(b) An experiment is carried out 500 times. How many times would you expect event B to occur? (2)

(3 marks)

[Problem Solving]

10. P(A) = 0.4 and P(B) = 0.3. A and B are mutually exclusive.

Find:

(a) P(A or B) (1) **(b)** P(neither A nor B) (1) **(c)** P(A but not B) (1)

(3 marks)

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Section B — Higher

Worked Examples

[Fluency]

P(A) = 0.45, P(B) = 0.3, P(A∩B) = 0.15. Find P(A∪B).

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.45 + 0.30 - 0.15 = 0.60$$

[Reasoning]

Are A and B mutually exclusive if P(A)=0.5, P(B)=0.6, P(A∪B)=0.8?

$$P(A \cap B) = 0.5 + 0.6 - 0.8 = 0.3 \neq 0$$

Not mutually exclusive (they can both occur together).

[Problem Solving]

A game costs £1 to play. Roll a die: win £5 if you roll a 6, otherwise lose your £1. Find the expected profit per game.

$$E = \frac{1}{6} \times (5-1) + \frac{5}{6} \times (-1) = \frac{4}{6} - \frac{5}{6} = -\frac{1}{6} \approx -17\text{p}$$

Expected **loss** of about 17p per game.

[Fluency]

1.

P(A)=0.45, P(B)=0.3, P(A∩B)=0.15.

Find P(A∪B).

(2 marks)

[Fluency]

2.

P(A)=1/3, P(B)=1/4. A and B are mutually exclusive.

Find P(A∪B).

(2 marks)

[Reasoning]

3.

P(A)=0.5, P(B)=0.6, P(A∪B)=0.8.

Show that A and B are **not** mutually exclusive.

(2 marks)

[Reasoning]

4. A biased die has P(6) = 1/4. The other five outcomes are equally likely.

(a) Find P(not 6). (1)

(b) Find the probability of rolling a 3. (2)

(3 marks)

[Reasoning]

5. An experiment is carried out 500 times. An event occurs 175 times.

(a) Calculate the relative frequency of the event. (1)

(b) Explain how this could be used to estimate the probability. (1)

(2 marks)

[Reasoning]

6. P(A) = 0.6. P(B|A) = 0.3 and P(B|A') = 0.5.

Find P(B).

(3 marks)

[Problem Solving]

7. A game costs £1 to play. A fair die is rolled.

If a 6 is rolled, the player wins £5. Otherwise they lose their £1.

(a) Find the expected profit per game. (3)

(b) Over 60 games, what is the expected total profit or loss? (1)

(4 marks)

[Problem Solving]

8. $P(A) = 0.7$, $P(B) = 0.4$, $P(A \cap B) = 0.28$.

Show that A and B are independent.

(2 marks)

[Problem Solving]

9. $P(A \cup B) = 0.75$, $P(A) = 0.5$, $P(B) = 0.4$.

(a) Find $P(A \cap B)$. (2)

(b) Are A and B independent? Show your working. (2)

(4 marks)

[Problem Solving]

10. In a group of n people, find the minimum n such that the probability that at least one person shares a birthday with you exceeds 0.5.

Assume 365 equally likely birthdays.

Hint: Consider P(nobody shares your birthday).

(4 marks)