

C8.1 Introduction to probability

Name: _____ Class: _____ Date: _____ **Total: 20 marks**

KEY WORDS outcome 结果 • event 事件 • probability 概率 • random 随机
• venn diagram 维恩图

Objective

Use introduction to probability to solve Core IGCSE Mathematics problems.

You must be able to:

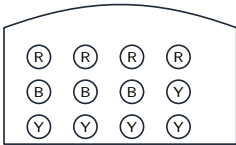
- Use favourable outcomes over equally likely outcomes
- Express probabilities as fractions, decimals or percentages
- Use complements and identify impossible or certain events

1 Key knowledge and worked examples

■ **Key knowledge: Introduction to probability**

Probability is between 0 and 1: impossible is 0, certain is 1, equally likely to happen or not is 1/2. With equally likely outcomes, probability is favourable outcomes divided by total outcomes. For an event not happening, subtract its probability from 1. Fractions, decimals and percentages can express the same probability. Counts from a two-way table or two-set Venn diagram can supply the numerator and denominator.

■ **Worked example: Introduction to probability**



R: red; B: blue; Y: yellow

A bag holds 4 red, 3 blue and 5 yellow counters. Each counter is equally likely to be chosen.

- Total: $N = 4 + 3 + 5 = 12$.
- Blue probability: $p = 3/12 = 1/4 = 0.25 = 25\%$.
- Not blue: $q = 1 - p = 3/4$.
- A fair die has 6 equally likely faces; greater than 4 means 5 or 6, so $p = 2/6 = 1/3$.

■ **Method check**

An outcome is equally likely only when the situation justifies it. Count the whole sample space before counting the requested outcomes.

2 Practice

2.1 Give the probabilities of an impossible event and a certain event. [2]

2.2 A fair die is rolled. Find the probability of an even number. [2]

2.3 The probability of rain is 0.35. Find the probability of no rain. [2]

2.4 A bag has 6 green and 9 white counters. Find the probability of green as a fraction and percentage. [2]

3 Exam-style questions

3.1 Apply the introduction to probability methods below. Show working and include units where appropriate.

(a) Of 30 students, 14 play chess, 11 play tennis and 5 play both. Find the number playing at least one. [2]

(b) Choose one student at random. Find the probability they play neither. [2]

(c) Find the probability they play exactly one of the games. [2]

3.2 Cards numbered 1 to 20 are shuffled and one card is drawn at random.

(a) Find the probability of drawing a multiple of 3, then the probability of not drawing a multiple of 3. [3]

(b) Find the probability of drawing a number that is a multiple of 3 or 5. Explain why adding the separate counts without adjustment is wrong. [3]

Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

- On the scale: **0** and **1**, respectively.

2.2

- Even outcomes are 2, 4, 6: $p = 3/6 = \mathbf{1/2}$.

2.3

- $q = 1 - p = 1 - 0.35 = \mathbf{0.65}$.

2.4

- $p = 6/15 = \mathbf{2/5}$; $p = \mathbf{40\%}$.

3.1

(a)

- $N = 14 + 11 - 5 = \mathbf{20}$.

(b)

- Neither count $n = 30 - 20 = 10$; $p = 10/30 = \mathbf{1/3}$.

(c)

- Exactly one count $n = (14 - 5) + (11 - 5) = 15$; $p = 15/30 = \mathbf{1/2}$.

3.2

(a)

- The multiples are **3, 6, 9, 12, 15, 18**.
- $p = 6/20 = \mathbf{3/10}$.
- Complement $q = 1 - p = \mathbf{7/10}$.

(b)

- There are 6 multiples of 3 and 4 of 5, with **15 counted twice**.
- Favourable count $n = 6 + 4 - 1 = 9$, so $p = 9/20 = \mathbf{0.45}$.