

E8.1 Introduction to probability

Name: _____ Class: _____ Date: _____ **Total: 21 marks**

KEY WORDS probability 概率 • probability scale 概率标度 • outcome 结果
• expected frequency 期望频数 • tree diagrams 树状图

Objective

Build the skills to answer Extended exam questions on **probability** 概率 — the **probability scale** 概率标度, $P(A')$, **expected frequency** 期望频数, and **tree diagrams** 树状图.

You must be able to:

- find a probability and use $P(A') = 1 - P(A)$
- find an expected frequency
- use a tree diagram for combined events (with and without replacement)

1 Worked examples

■ Probability and tree diagrams

1st draw

2nd draw

R

B

$\frac{3}{8} \times \frac{3}{8} = \frac{9}{64}$

$(R, R) = \frac{3}{8} \times \frac{3}{8} = \frac{9}{64}$

$\frac{3}{8} \times \frac{5}{8} = \frac{15}{64}$

$(R, B) = \frac{3}{8} \times \frac{5}{8} = \frac{15}{64}$

$\frac{5}{8} \times \frac{3}{8} = \frac{15}{64}$

$(B, R) = \frac{5}{8} \times \frac{3}{8} = \frac{15}{64}$

$\frac{5}{8} \times \frac{5}{8} = \frac{25}{64}$

$(B, B) = \frac{5}{8} \times \frac{5}{8} = \frac{25}{64}$

Probability runs from 0 (impossible) to 1 (certain)

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		die 2					
		1	2	3	4	5	6
die 1	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

the six highlighted cells all give a total of 7

A sample space lists all equally likely outcomes

$P(\text{event}) = \frac{\text{favourable}}{\text{total}}$ $P(A') = 1 - P(A)$ expected = $P \times n$

- **Worked (bag: 3 red, 5 blue):** $P(\text{not red}) = 1 - \frac{3}{8} = \frac{5}{8}$.
- **Tree (with replacement):** $P(\text{red, red}) = \frac{3}{8} \times \frac{3}{8} = \frac{9}{64}$.

Answer shapes: M1 a correct method, A1 the correct answer.

2 Practice

2.1 A bag has 4 red and 6 green counters. Find the probability of drawing a red. [1]

2.2 The probability of rain is 0.3. Find the probability of no rain. [1]

2.3 The probability of a six is $\frac{1}{6}$. Find the expected number of sixes in 240 rolls. [2]

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3 Exam-style questions

3.1 A bag has 3 red and 5 blue counters. Two are drawn **without replacement**. Find the probability that both are red. [3]

3.2 The probability that a train is late is 0.15. On 200 days, find the expected number of late days. [2]

3.3 A bag holds 5 red, 3 blue and 2 green counters. One counter is taken at random.

(a) Write down $P(\text{red})$ and $P(\text{not red})$, and state the connection between them. [3]

(b) The counter is replaced and the experiment is repeated 250 times. Find the expected number of blue counters. [2]

(c) Two counters are now taken **without** replacement. Draw a tree diagram for “green” and “not green”, and use it to find the probability that exactly one is green. [5]

(d) Explain why the probabilities on the second pair of branches differ from those on the first. [2]
