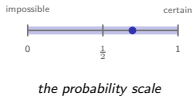
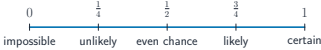


Probability IGCSE Mathematics ■ Topic 8 IGCSE Mathematics 	Probability What we will cover 1 The probability scale 2 Relative & expected frequency 3 Combined events 4 Sample space diagrams 5 Venn diagrams 6 Tree diagrams 
1 Basics	Probability └ Basics The probability scale Probability runs from 0 (impossible) to 1 (certain), with $\frac{1}{2}$ an even chance.  For equally likely outcomes 结果, $P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$ The probability that an event does **not** happen is $P(A') = 1 - P(A).$
Probability └ Basics Relative and expected frequency relative frequency 相对频率 $\frac{\text{times it happened}}{\text{total trials}}$ better with more trials expected frequency 期望频数 $P \times n; \text{ e.g. } \frac{1}{6} \times 300 = 50 \text{ sixes}$	Probability └ Basics Combined events AND – multiply both happen, when independent 独立事件 OR – add either happens, when mutually exclusive 互斥

2 Diagrams

Probability
└ Diagrams

Sample space diagrams

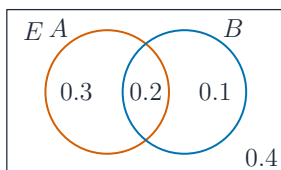
		die 2					
		1	2	3	4	5	6
die 1	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

the six highlighted cells all give a total of 7

A **sample space diagram** 样本空间图 lists every outcome in a grid. Two dice give 36 equally likely cells; count the ones you want.

Probability
└ Diagrams

Venn diagrams

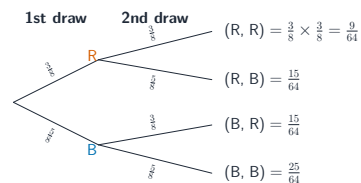


A **Venn diagram** 维恩图 sorts outcomes into sets.

- $P(A \cap B)$ – in **both**
- $P(A \cup B)$ – in **either**

Probability
└ Diagrams

Tree diagrams



$$\begin{aligned} P(R, R) &= \frac{3}{8} \times \frac{2}{7} = \frac{6}{56} \\ P(R, B) &= \frac{15}{64} \\ P(B, R) &= \frac{15}{64} \\ P(B, B) &= \frac{25}{64} \end{aligned}$$

On a **tree diagram** 树状图, **multiply** along branches & **add** the paths you want. Two reds (with replacement): $\frac{3}{8} \times \frac{3}{8} = \frac{9}{64}$.

3 Recap

Probability
└ Recap

Worked example – probability of 'not'

A bag holds 3 red and 5 blue counters. Find the probability of **not** drawing red.

- Total counters = $3 + 5 = 8$.
- $P(\text{red}) = \frac{3}{8}$
- $P(\text{not red}) = 1 - P(\text{red}) = 1 - \frac{3}{8} = \frac{5}{8}$
- Check: there are 5 blue out of 8 – the same answer, as it must be.

$P(\text{not } A) = 1 - P(A)$. All probabilities lie between 0 and 1: a negative answer or one above 1 means you have made a slip.

Topic 8 – key takeaways

1 Scale

0 to 1; $P(A') = 1 - P(A)$

2 Expected

$P \times n$ over n trials

3 Combined

AND multiply, OR add

4 Trees

multiply along branches, add the paths

Check yourself

- 1 What does probability 0 mean?
- 2 If $P(A) = 0.3$, what is $P(A')$?
- 3 Do you add or multiply for AND?
- 4 What do you do along a tree branch?



Answers 1. impossible 2. 0.7 3. multiply 4. multiply the probabilities