

PROBABILITY

Probability Always write as a Fraction (or decimal)

The probability of something that's certain to happen is 1
 The probability of something that can not happen is 0
 All other probabilities are between 0 and 1

#TopTip Probability when two dice thrown always out of 36

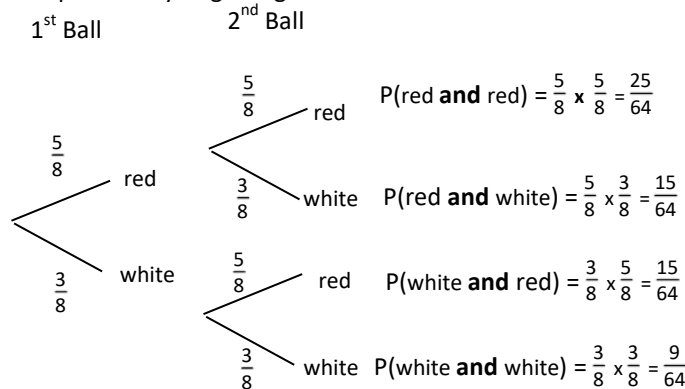
The probability of an event $P(\text{an event happening}) = \frac{\text{Number of favorable outcomes}}{\text{Number of possible outcomes}}$

e.g. The probability of getting a prime number when throwing a fair dice $P(\text{Prime Number } 2,3,5) = \frac{3}{6} = \frac{1}{2}$

- **Addition Rule ('or' rule)** $P(A \text{ or } B) = P(A) + P(B)$
 e.g. $P(\text{four or prime number.}) = P(\text{four}) + P(\text{Prime number.})$
 $= \frac{1}{6} + \frac{3}{6} = \frac{4}{6} = \frac{2}{3}$

- **Multiplication Rule ('and' rule)** $P(A \text{ and } B) = P(A) \times P(B)$
 e.g.1 If a coin is thrown twice $P(\text{Head and Head}) = P(\text{Head}) \times P(\text{Head}) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 e.g.2 If a dice is thrown twice $P(\text{five and five}) = P(\text{five}) \times P(\text{five}) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

- **Tree Diagram.** Is a method for showing all the possible events and calculating the outcomes
 e.g. A bag contains 5 red balls and 3 white balls.
 A ball is chosen randomly, and put back into the bag. A second ball is chosen randomly.
 a) Calculate the probability of getting two red balls
 b) Calculate the probability of getting two balls of different colours



#TopTip Multiply along the branches

Check that the total of the outcomes adds to = 1 $\frac{25}{64} + \frac{15}{64} + \frac{15}{64} + \frac{9}{64} = \frac{64}{64} = 1$

- a) Probability of getting 2 red balls = $P(\text{red and red}) = \frac{25}{64}$
 b) Probability of getting 2 balls of different colour = $P(\text{red and white})$ or $P(\text{white and red}) = \frac{15}{64} + \frac{15}{64} = \frac{30}{64}$

The probability of an event not happening is equal to $1 - P(A)$.
 where $P(A)$ is the probability of an event happening

Example Probability of getting at **least** one white ball.

Method 1. $P(\text{white and white})$ or $P(\text{red and white})$ or $P(\text{white and red})$

$$\frac{9}{64} + \frac{15}{64} + \frac{15}{64} = \frac{39}{64}$$

Method 2 Or find the probability of **not** getting white

$$1 - P(\text{red and red}) = 1 - \frac{25}{64} = \frac{39}{64}$$