

Binomial Distribution



A fair spinner is spun 5 times

For each spin $P(P) = \frac{1}{3}$ (success)

$P(Q) = \frac{2}{3}$ (failure)

Find probability we have 2 successes in 5 spins

$$P(PPQQQ) = \frac{1}{3} \times \frac{1}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} = \left(\frac{1}{3}\right)^2 \times \left(\frac{2}{3}\right)^3$$

$$P(PQPQQ)$$

$$P(PQQPQ)$$

$$P(PQQQP)$$

$$P(QPPQQ)$$

$$P(QPQPQ)$$

$$P(QPQQP)$$

$$P(QQPPQ)$$

$$P(QQPQQ)$$

$$P(QQQPP)$$

$$P(2 \text{ successes}) = 10 \times \left(\frac{1}{3}\right)^2 \times \left(\frac{2}{3}\right)^3 = \frac{80}{243} = 0.329$$

$$= {}^5C_2 \times p^2 q^3$$

where p = prob success

q = prob failure = 1 - probability of success

5C_2 is the number of ways of choosing 2 from 5 when order does not matter

$${}^5C_2 = {}_5C_2 = \binom{5}{2} \quad \underline{\text{Combination}}$$