

chapter **3** Probability 2

Section 3.5 Probability involving permutations and combinations

PROJECT MATHS
Text & Tests 5
 LEAVING CERTIFICATE
 HIGHER LEVEL
 STRAND 1
 PROBABILITY & STATISTICS

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Example 1

In Class 6A, two boys and four girls study music.
 In Class 6B, four boys and six girls study music.
 Two pupils are chosen at random from each of the two classes to perform at a concert.
 (i) In how many ways can the 4 pupils be selected?
 (ii) Calculate the probability that the four chosen consist of 2 boys from 6A and 2 girls from 6B.
 (iii) Calculate the probability that the four pupils are of the same gender.

	6A	6B	Total
Boys	2	4	6
Girls	4	6	10
Total	6	10	16

2 pupils from each class
 chosen at random (i)

How many ways can 4 be selected?

$$\binom{6}{2}_{6A} * \binom{10}{2}_{6B} = (15)(45) = 675$$

(ii) P(2 Boys from 6A & 2 Girls from 6B)?

$$P(E) = \frac{\text{FAVOURABLE}}{\text{TOTAL}}$$

$$\frac{\binom{2}{2} * \binom{6}{2}}{675} = \frac{15}{675} = \frac{1}{45}$$

(iii) P(4 same gender) = P(4 Boys OR 4 GIRLS)

$$= \frac{\binom{2}{2} * \binom{4}{2} + \binom{4}{2} * \binom{6}{2}}{675} = \frac{90}{675} = \frac{32}{225}$$

Example 2

Three cards are drawn at random, and without replacement, from a pack of 52 playing cards. Find the probability that

- the three cards drawn are the Jack of spades, the Queen of clubs and the King of clubs
- the three cards are aces
- two cards are red and the third one is a club
- the three cards are of the same colour.

$$P(E) = \frac{\text{\# favourable outcomes}}{\text{\# possible outcomes}}$$

$$(i) \quad P(\text{Jack of spades, Queen of clubs, King of clubs})$$

$$= \frac{\binom{3}{3}}{\binom{52}{3}} = \frac{1}{22100}$$

$$(ii) \quad P(3 \text{ Aces})$$

$$= \frac{\binom{4}{3}}{22100} = \frac{4}{22100} = \frac{1}{5525}$$

$$(iii) \quad P(2 \text{ Red and One club})$$

$$= \frac{\binom{26}{2} * \binom{13}{1}}{22100} = \frac{13}{68}$$

$$(iv) \quad P(3 \text{ same colour}) = P(3 \text{ Red or } 3 \text{ Black})$$

$$= \frac{\binom{26}{3} + \binom{26}{3}}{22100} = \frac{4}{17}$$