The Exclusion Principle

Starter

1. **(Review of last lesson)** A team of 5 people is chosen from 8 men and 7 women. How many different teams can be selected if the team must contain:
   (a) 3 men and 2 women
   (b) at least 3 men

2. Describe in words a situation which could be represented by
   (a) $\frac{13!}{6!}$ (b) $\frac{14!}{9!5!}$ (c) $6!$

3. Four letters are chosen at random from the word RANDOMLY. Find the probability that all 4 letters are consonants.

Notes

When answering questions it may be quicker using the ***exclusion principle*** i.e. count what you are not interested in and subtract it from the total.

E.g. 1 The nine members of a committee comprise: one married couple, three more men and four more women.
(a) In how many ways can a working party of five people be selected?
(b) How many of these working parties are such that
   (i) at least one man and at least one woman must be chosen
   (ii) the husband *or* the wife but not both, may be included
   (iii) it is formed entirely of women?

Working (a) ${}^9C_5 = 126$ ways

(b) (i) Subtract committees with only male members:
${}^9C_5 - 1 = 125$ ways

(ii) Subtract committees with both husband and wife:
${}^9C_5 - {}^7C_3 = 91$ ways

(iii) 1 way

E.g. 2 Find the number of ways in which a committee of four can be chosen from 6 men and 6 women if:
(a) it must contain 2 men and 2 women
(b) it must contain at least one man
(c) either the youngest man or youngest woman, but not both, must be included?

E.g. 3 To inspect a box of 12 light bulbs, a manufacturer selects 4 light bulbs from the box and rejects the box if more than 1 bulb is faulty. If a box has 3 faulty light bulbs, find the probability that the box will be accepted.

Solutions to Starter and E.g.s

Exercise

p11 1D Qu 1-7, (8-9 red)