

## Exercise 7 - Combinations

1. Evaluate

(a)  ${}^7C_3$  (b)  ${}^6C_4$  (c)  ${}^8C_1$  (d)  ${}^5C_0$

2. Verify that

$$\binom{n}{n-r} = \binom{n}{r}$$

for the cases (a)  $n = 9, r = 3$  (b)  $n = 7, r = 4$  .

3. A shop stocks 8 different kinds of cereal. In how many ways can 3 packets of cereal, each of a different variety, be chosen ?
4. How many different combinations of five letters can be chosen from the letters A, B, C, D, E, F, G, H if each letter is chosen only once ?
5. In how many ways can
- (a) 3 stamps be chosen from a book of 10 different stamps
  - (b) a team of 14 players be selected from a pool of 17 footballers
  - (c) 6 representatives be chosen from 30 students
  - (d) a hand of 5 cards be dealt from a standard pack of 52 cards ?
6. Find the number of different combinations of two letters which can be made from the letters of the word INTEGRAL. How many of these selections do not contain a vowel ?
7. How many different hands of seven cards can be dealt from a suit of thirteen cards? If one of the cards dealt is the ace, how many different hands of seven cards are there ?
8. A team of five children is to be selected from a class of thirty children to compete in an inter-school quiz competition. In how many ways can the team be chosen if
- (a) any five children can be chosen
  - (b) the five chosen must include the oldest in the class ?
9. A debating team of 4 players is to be selected from 12 pupils. In how many ways can the team be chosen if
- (a) the best debater is to be included
  - (b) the best debater and the oldest pupil are to be included ?
10. A shop stocks eight different kinds of chocolate biscuits. In how many ways can a shopper buy four packets of chocolate biscuits if
- (a) each packet is a different kind
  - (b) two packets are the same kind ?

11. A large box of chocolates contains nine different varieties. In how many ways can four chocolates be chosen if
- (a) all four are different varieties
  - (b) two are the same and the others different
  - (c) three are the same - and the fourth is different ?
12. A committee of 8 is to be formed from 12 men and 8 women. In how many ways can the committee be selected given that
- (a) it must consist of 5 men and 3 women
  - (b) it must have at least one member of each sex ?

### Exercise 7 - Combinations

- 1 (a) 35 (b) 15 (c) 8 (d) 1
- 2 (a)  $\binom{9}{6} = \binom{9}{3} = 84$  (b)  $\binom{7}{3} = \binom{7}{4} = 35$
- 3 56
- 4 56
- 5 (a) 120 (b) 680 (c) 593775 (d) 2598960
- 6 28, 10
- 7 1716, 924
- 8 (a) 142506 (b) 23751
- 9 (a) 165 (b) 45 (assuming best debater and oldest pupil are different)
- 10 (a) 70 (b) 168
- 11 (a) 126 (b) 252 (c) 72
- 12 (a) 44352 (b) 125474

### Exercise 8 - Combinations (Probability)

- 1  $\frac{5}{28}$
- 2  $\frac{3}{5}$
- 3  $\frac{18}{35}$
- 4  $\frac{3}{7}$
- 5  $\frac{2}{5}$
- 6 (a)  $\frac{33}{646}$  (b)  $\frac{613}{646}$
- 7  $\frac{7}{30}$
- 8 (a)  $\frac{46}{833}$  (b)  $\frac{1}{270725}$  (c)  $\frac{15229}{54145}$
- 9 (a)  $\frac{1}{55}$  (b)  $\frac{32}{495}$  (c)  $\frac{92}{99}$
- 10 (a)  $\frac{1}{7735}$  (b)  $\frac{9}{1547}$  (c)  $\frac{46}{7735}$
- 11 (a)  $\frac{253}{22372}$  (b)  $\frac{3289}{39151}$  (c)  $\frac{14927}{156604}$
- 12 (a)  $\frac{1}{14}$  (b)  $\frac{1}{2}$