

**PERMUTATION AND COMBINATION**

Form 5

Vol 09

**Part 2C – Permutation**

1. The required number

$$\begin{aligned} &= \frac{10!}{8! \times 2!} \\ &= 45 \end{aligned}$$

2. (a) The word 'ASSIGNMENT' has 10 letters where 'S' occurs 2 times and 'N' occurs 2 times.

The required number of ways

$$\begin{aligned} &= \frac{10!}{2! \times 2!} \\ &= 907\,200 \end{aligned}$$

- (b) Number of arrangements that both S's are together =
- $\frac{9!}{2!} = 181\,440$

Number of arrangements that both N's are together =  $\frac{9!}{2!} = 181\,440$ Number of arrangements that both S's are together and both N's are together =  $8! = 40\,320$ 

The required number of ways

$$\begin{aligned} &= 907\,200 - (181\,440 + 181\,440 - 40\,320) \\ &= 584\,640 \end{aligned}$$

3. (a) The word 'ASSIGNMENT' has 3 vowels: 'A', 'I' and 'E', and 7 consonants: 'S', 'S', 'G', 'N', 'N', 'M' and 'T'.

The required number of ways

$$= \frac{7!}{2! \times 2!} \times 4!$$

$$= 30\,240$$

- (b) The required number of ways

$$= 3! \times \frac{8!}{2! \times 2!}$$

$$= 60\,480$$

- (c) The required number of ways

$$= \frac{7!}{2! \times 2!} \times P_3^8$$

$$= 423\,360$$

4. (a) The required number of arrangements

$$= \frac{10!}{2}$$

$$= 1\,814\,400$$

- (b) The required number of arrangements

$$= \frac{10!}{3!}$$

$$= 604\,800$$

### Part 3A – Combination

1. (a) The required number of ways

$$= C_3^9$$

$$= 84$$

(b) The required number of ways

$$= C_1^1 \times C_2^8$$

$$= 28$$

2. (a) The required number of combinations

$$= C_1^8 \times C_1^5 \times C_1^2$$

$$= 80$$

(b) The required number of combinations

$$= C_1^8 \times C_2^2 + C_2^8 \times C_1^5 + C_2^8 \times C_1^2 + C_3^8$$

$$= 260$$

(c) The required number of combinations

$$= C_3^{15} - C_3^{10}$$

$$= 335$$

3. (a) The required number of combinations

$$= C_3^{18} - C_3^6$$

$$= 796$$

(b) The required number of combinations

$$= C_2^3 \times C_1^6 \times C_2^6 \times 2$$

$$= 540$$

4. (a) The required number of ways

$$= C_4^8$$

$$= 70$$

(b) The required number of ways

$$= C_2^5 \times C_2^3$$

$$= 30$$

(c) The required number of ways

$$= C_3^5 \times C_1^3 + C_4^5$$

$$= 35$$

5. (a) The required number of ways

$$= C_4^{12}$$

$$= 495$$

(b) The required number of ways

$$= C_1^1 \times C_3^{11}$$

$$= 165$$

(c) The required number of ways

$$= C_4^{11}$$

$$= 330$$

6. (a) The required number

$$= C_1^2 \times C_7^{12}$$

$$= 1\,584$$

(b) The required number

$$= C_2^2 \times C_6^{12}$$

$$= 924$$

(c) The required number

$$= C_8^{11} + C_1^3 \times C_7^{11}$$

$$= 1\,155$$

(d) The required number

$$= C_8^{11} + C_1^3 \times C_7^{11}$$

$$= 1\,155$$

7. (a) The required number of ways

$$= C_6^{18} \times C_6^{12} \times C_6^6$$

$$= 17\,153\,136$$

(b) The required number of ways

$$= C_4^{18} - (C_4^{12} + C_1^6 \times C_3^{12})$$

$$= 1\,245$$

8. (a) The required number of ways

$$= C_4^{13}$$

$$= 715$$

(b) The required number of ways

$$= C_4^6 + C_4^4$$

$$= 16$$

(c) The required number of ways

$$= \frac{C_1^6 \times C_1^3 \times C_1^4 \times C_1^{10}}{2}$$

$$= 360$$

9. (a) The required number of ways

$$= C_2^2 \times C_1^4 \times C_1^4 \times C_1^4 \times C_1^4$$

$$= 256$$

(b) The required number of ways

$$= \frac{C_1^4 \times C_1^4 \times C_1^4 \times C_1^4 \times C_1^2 \times C_1^{13}}{2}$$

$$= 3\,328$$

(c) The required number of ways

$$= (C_4^4 \times C_2^4 + C_3^4 \times C_3^4 + C_2^4 \times C_4^4) \times 6 + (C_4^4 \times C_2^2) \times 4$$

$$= 172$$

10. (a) The required number of ways

$$= C_4^{20}$$

$$= 4\,845$$

(b) The required number of ways

$$= C_4^{10} \times 2^4$$

$$= 3\,360$$

(c) The required number of ways

$$= C_1^{10} \times C_2^2 \times C_2^9 \times 2^2$$

$$= 1\,440$$

(d) The required number of ways

$$= C_4^{10} \times (1 + C_1^4)$$

$$= 1\,050$$

11. (a) The required number of ways

$$= C_6^6$$

$$= 1$$

(b) The required number of ways

$$= C_2^6 \times C_4^4 \times C_2^4 \times 2^2$$

$$= 360$$

12 (a) The required number

$$= C_6^{14} - (C_6^6 + C_5^6 \times C_1^8 + C_4^6 \times C_2^8)$$

$$= 2\,534$$

(b) The required number

$$= C_6^{14} - C_3^6 \times C_3^8$$

$$= 1\,883$$

13 (a) The required number

$$= C_2^6 \times (C_4^5 \times C_1^5 + C_3^5 \times C_2^5 + C_2^5 \times C_3^5 + C_1^5 \times C_4^5)$$

$$= 3\ 750$$

(b) The required number

$$= C_3^6 \times (C_1^5 \times C_1^5 \times C_3^5 + C_1^5 \times C_2^5 \times C_2^5 + C_1^5 \times C_3^5 \times C_1^5 + C_2^5 \times C_1^5 \times C_2^5 + C_2^5 \times C_2^5 \times C_1^5 + C_3^5 \times C_1^5 \times C_1^5)$$

$$= 45\ 000$$

14. The required number

$$= 20 + C_2^{20} \times 3 + C_3^{20} \times 3 + C_4^{20}$$

$$= 8\ 855$$