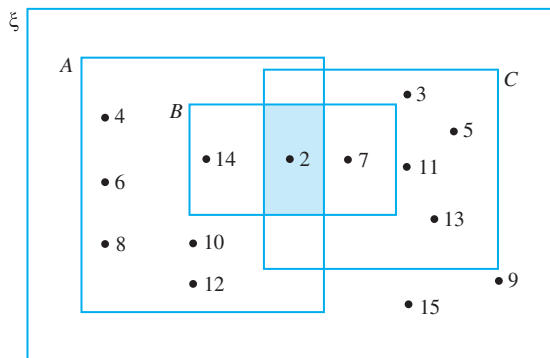


FORM 4

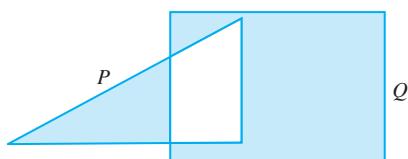
CHAPTER 4

Self Test 1

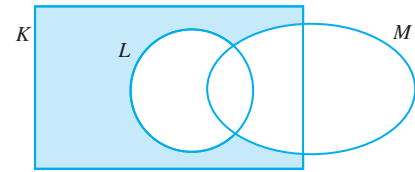
- 1 $\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ $H = \{2, 4, 6, 8, 10\}$
 $J = \{1, 2, 4, 8\}$ $K = \{1, 2, 3, 6, 9\}$
 (a) $H \cap J = \{2, 4, 8\}$ (b) $H \cap K = \{2, 6\}$
 (c) $J \cap K = \{1, 2\}$ (d) $H \cap J \cap K = \{2\}$
- 2 (a) $P \cap Q = \{12, 24\}$
 (b) $P \cap R = \{6, 12, 18, 24\}$
 (c) $Q \cap R = \{12, 24, 44\}$
 (d) $P \cap Q \cap R = \{12, 24\}$
- 3 $\xi = \{x : x \text{ is an integer, } 2 \leq x < 15\}$ $A = \{2, 4, 6, 8, 10, 12, 14\}$
 $B = \{2, 7, 14\}$ $C = \{2, 3, 5, 7, 11, 13\}$
 (a), (b)



- 4 $\xi = \{x : x \text{ is an integer, } 1 \leq x \leq 12\}$
 (a) $P = \{1, 3, 5, 7, 9, 11\}$
 $Q = \{1, 2, 3, 4, 6, 12\}$
 $R = \{3, 6, 9, 12\}$
 (b) (i) $P \cap Q = \{1, 3\}$ (ii) $P \cap R = \{3, 9\}$
 $n(P \cap Q) = 2$ $n(P \cap R) = 2$
 (iii) $Q \cap R = \{3, 6, 12\}$ (iv) $P \cap Q \cap R = \{3\}$
 $n(Q \cap R) = 3$ $n(P \cap Q \cap R) = 1$
- 5 $\xi = \{11, 22, 33, 44, 55, 66, 77, 88, 99\}$
 $P = \{11, 33, 55, 77, 99\}$
 $Q = \{11, 33\}$
 $R = \{22, 44, 77, 99\}$
 (a) $P \cap Q = \{11, 33\}$
 $(P \cap Q)' = \{22, 44, 55, 66, 77, 88, 99\}$
 (b) $P \cap R = \{77, 99\}$
 $(P \cap R)' = \{11, 22, 33, 44, 55, 66, 88\}$
 (c) $Q \cap R = \{\}$ or ϕ
 $(Q \cap R)' = \{11, 22, 33, 44, 55, 66, 77, 88, 99\}$
 (d) $P \cap Q \cap R = \{\}$ or ϕ
 $(P \cap Q \cap R)' = \{11, 22, 33, 44, 55, 66, 77, 88, 99\}$
- 6 (a) $(P \cap Q)' = \{4, 5, 10, 12, 15, 30\}$
 (b) $(P \cap R)' = \{1, 2, 4, 5, 6, 10, 12, 15, 30\}$
 (c) $(Q \cap R)' = \{1, 2, 4, 5, 6, 10, 12, 15, 30\}$
 (d) $(P \cap Q \cap R)' = \{1, 2, 4, 5, 6, 10, 12, 15, 30\}$
- 7 (a) $(P \cap Q)'$



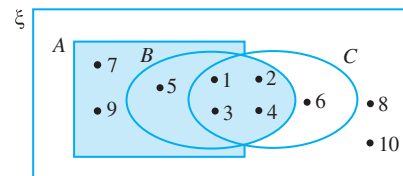
(b) $(L' \cap M')$



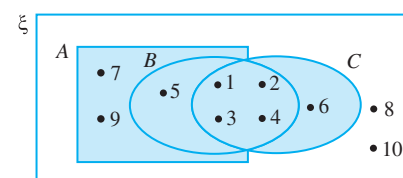
- 8 (a) $n(G \text{ only}) = 100 - 23$
 $= 77$
 (b) $n(\xi) = n(P) + n(G \text{ only})$
 $= 85 + 77$
 $= 162$
- 9 (a) $n(F) + n(C) + n(S) = 98 + 27 + 20 + x + 27 + x + 15 + 10x + 3 + 20 + 35 + 15 + x$
 $(6 + 4 + 3) \text{ units} = 260 + 13x$
 $13 \text{ units} = 13(20 + x)$
 $1 \text{ units} = 20 + x$
 $n(F) = 98 + 27 + 20 + x$
 $6 \text{ units} \times (20 + x) = 145 + x$
 $120 + 6x = 145 + x$
 $5x = 25$
 $x = 5$
- (b) Total number of students who prefer one type of books only
 $= 98 + 10(5) + 3 + 35$
 $= 186$
- (c) Total number of students who do not prefer scientific books
 $= 98 + 27 + 10(5) + 3$
 $= 178$
- (d) Total number of students who involve in the survey
 $= 98 + 27 + 5 + 20 + 35 + 15 + 10(5) + 3$
 $= 253$

Self Test 2

- 1 (a) $P \cup Q = \{a, b, c, d, e, k, t\}$
 (b) $P \cup R = \{a, b, c, d, e, i, o, u\}$
 (c) $Q \cup R = \{a, e, i, o, u, k, t\}$
 (d) $P \cup Q \cup R = \{a, b, c, d, e, i, k, o, t, u\}$
- 2 (a) $\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 $A = \{1, 3, 5, 7, 9\}$
 $B = \{1, 2, 3, 4, 5\}$
 $C = \{1, 2, 3, 4, 6\}$
 (i) $A \cup B = \{1, 2, 3, 4, 5, 7, 9\}$
 (ii) $B \cup C = \{1, 2, 3, 4, 5, 6\}$
 (iii) $A \cup C = \{1, 2, 3, 4, 5, 6, 7, 9\}$
 (iv) $A \cup B \cup C = \{1, 2, 3, 4, 5, 6, 7, 9\}$
- (b) (i) $A \cup B$



(ii) $A \cup C$

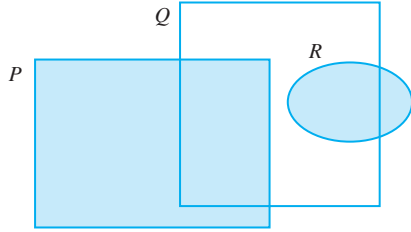


3 (a) $P \cup Q = \{s, t, u, v, w, x, y, z\}$

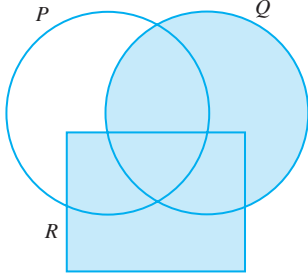
(b) $Q \cup R = \{u, v, w, x, y, z\}$

(c) $P \cup R = \{s, t, v, w, x, z\}$

4 (a) $P \cup R$

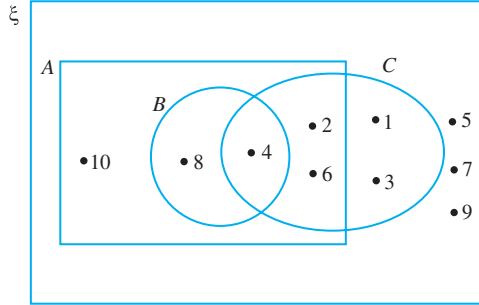


(b) $Q \cup R$



5 $A = \{2, 4, 6, 8, 10\}$ $B = \{4, 8\}$ $C = \{1, 2, 3, 4, 6\}$

(a)

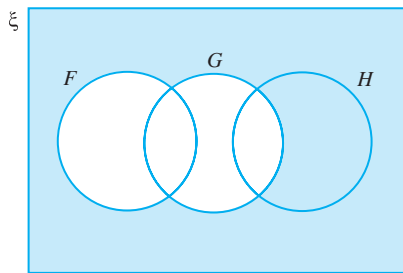


(b) (i) $(A \cup B)' = \{1, 3, 5, 7, 9\}$

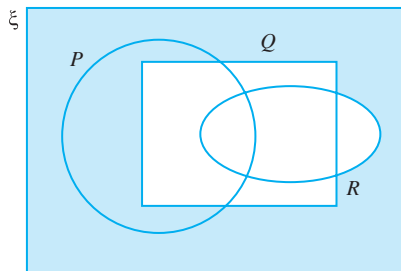
(ii) $(B \cup C)' = \{5, 7, 9, 10\}$

(iii) $(A \cup B \cup C)' = \{5, 7, 9\}$

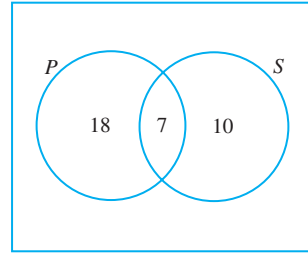
6 (a) $(F \cup G)'$



(b) $(Q \cup R)'$



7 (a)



(b) $n(P \cup S)' = 45 - (18 + 7 + 10)$
 $= 10$

8 (a) $5x + 6 + 9x - 2 + 5 + 5x + 3 = 88$
 $19x + 12 = 88$
 $19x = 76$
 $x = 4$

(b) $n(K \cup L)' = 5(4) + 3$
 $= 23$

(c) $n(K' \cup L') = 88 - 6$
 $= 82$

9 Let $\xi = \{\text{employees of company X involved in the survey}\}$

$n(\xi) = 200$

$I = \{\text{employees who have iPhone}\}$

$n(I) = \frac{2}{5} \times 200$
 $= 80$

$S = \{\text{employees who have Samsung phone}\}$

$n(S) = \frac{1}{2} \times 200$
 $= 100$

$H = \{\text{employees who have Huawei phone}\}$

$n(H) = \frac{1}{5} \times 200$
 $= 40$

$n(I \cap S) = 15, n(I \cap H) = 8, n(S \cap H) = 24, n(I \cap S \cap H) = 3$

$x = \text{Number of employees who do not have any of the three types of phones}$

$= n(I \cup S \cup H)'$

$n(I \text{ only}) = 80 - 15 - 5$
 $= 60$

$n(S \text{ only}) = 100 - 15 - 21$
 $= 64$

$n(H \text{ only}) = 40 - 5 - 3 - 21$
 $= 11$

$n(I \cup S \cup H) = 80 + 64 + 21 + 11$
 $= 176$

$n(I \cup S \cup H)' = 200 - 176$
 $= 24$

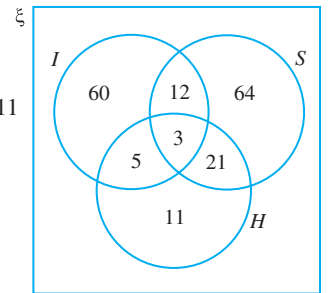
10 (a) $2w + 5w - 1 + w + 9 = 48$
 $8w + 8 = 48$
 $8w = 40$
 $w = 5$

(b) $n(B \cup L \cup S) = 48 + 8 + 2 + 7 + 12$
 $= 77$

$\frac{1}{8} \times n(\xi) = n(\xi) - n(B \cup L \cup S)$

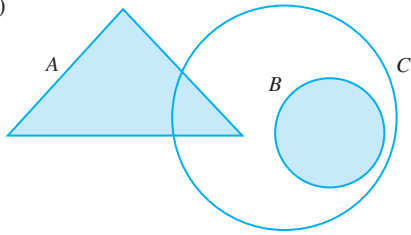
$\frac{7}{8} n(\xi) = 77$

$n(\xi) = 88$



Self Test 3

1 $A \cup (B \cap C)$



2 $\xi = \{x : x \text{ is an integer, } 1 \leq x \leq 12\}$, $A = \{1, 3, 5, 7, 9\}$,
 $B = \{2, 3, 5, 7, 11\}$, $C = \{1, 4, 9\}$
 $A \cap B \cup C = \{3, 5, 7\} \cup C$
 $= \{1, 3, 4, 5, 7, 9\}$

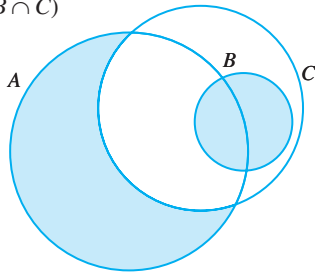
3 (a) $(P \cup Q) \cap R = \{4\}$
 (b) $P \cup (Q \cap R) = \{2, 4, 5, 6, 8\}$
 (c) $Q \cap (P \cup R) = \{4, 6, 8\}$

4 $\xi = \{x : x \in \text{integer, } 1 < x < 12\}$, $A = \{3, 5, 7, 9, 11\}$,
 $B = \{2, 3, 5, 7, 9\}$
 $C = \{2, 3, 4, 5\}$
 (a) $A' = \{2, 4, 6, 8, 10\}$, $B \cup C = \{2, 3, 4, 5, 7, 9\}$
 $A' \cap (B \cup C) = \{2, 4\}$
 (b) $(B \cup C)' = \{6, 8, 10, 11\}$
 $A \cap (B \cup C)' = \{11\}$

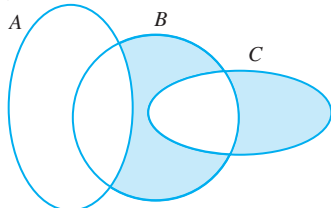
5 $n(\xi) = 47$
 $n(K \cap M) = n[(K \cup L)' \cap M]$
 $3 + x = 5$
 $x = 2$
 $n[K' \cup (L \cap M)] = 47 - (24 + 3 + 2)$
 $= 18$

6 $x + 2 + 3 + 2 + 5 + x + 7 + 2x + 1 = 36$
 $4x + 20 = 36$
 $4x = 16$
 $x = 4$

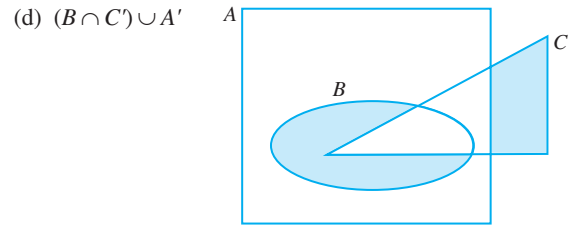
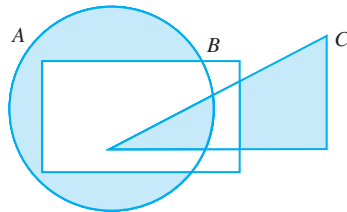
7 (a) $(A \cap C') \cup (B \cap C)$



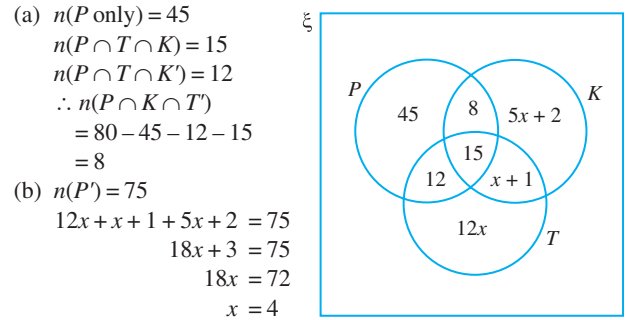
(b) $A' \cap (B \cap C)'$



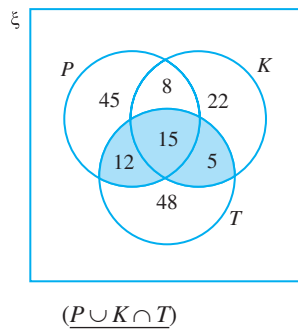
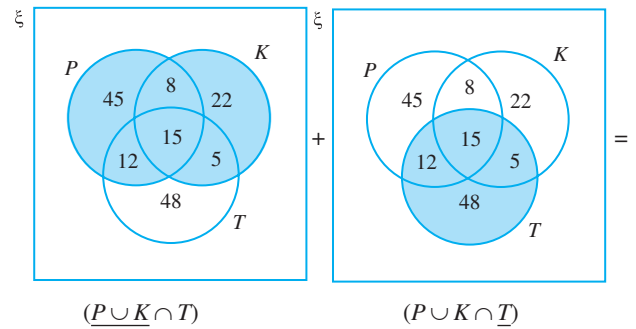
(c) $(A \cap C) \cup B'$



8 Let $\xi = \{\text{number of people involved in the survey}\}$ $n(\xi) = 155$
 $P = \{\text{people who buy grocery at supermarket}\}$ $n(P) = 80$
 $K = \{\text{people who buy grocery at grocery stores}\}$
 $T = \{\text{people who buy grocery online}\}$



(c)



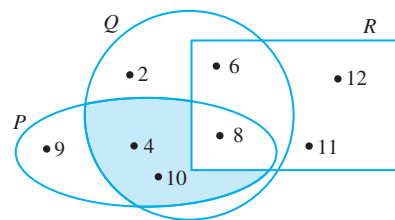
$\therefore n(P \cup K \cap T) = 12 + 15 + 5$
 $= 32$

SPM PRACTICE

Paper 1

1 B $K \cup M = \{12, 14, 15, 16, 17, 18\}$
 $(K \cup M)' = \{10, 11, 13, 19, 20\}$

2 B



$P \cap Q \cap R' = \{4, 10\}$
 $n(P \cap Q \cap R') = 2$

3 B

4 D $G = \{3, 6, 9, 12, 15, 18, 21, 24, 27\}$,
 $H = \{4, 8, 12, 16, 20, 24, 28\}$
 $G \cap H = \{12, 24\}$, $(G \cap H)' = \{3, 4, 6, 8, 9, 15, 16, 18, 20,$
 $21, 27, 28\}$

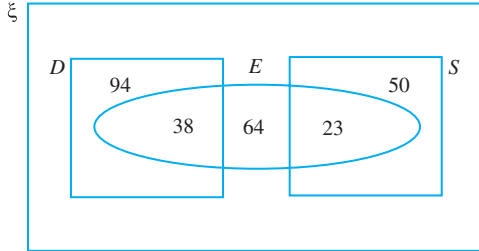
$$n(G \cap H)' = 12$$

5 B

6 C

7 D

8 B



$$n(E \text{ only}) = 125 - 38 - 23$$

$$= 64$$

$$n(D \text{ only}) = 132 - 38$$

$$= 94$$

$$n(S \text{ only}) = 73 - 23$$

$$= 50$$

Total number of students who do not prefer any types of the fruits = $280 - 132 - 64 - 73 = 11$

Total number of students who prefer both types of fruits = $38 + 23 = 61$

$$\text{Difference} = 61 - 11 = 50$$

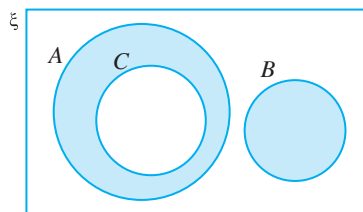
Paper 2

Section A

1 (a), (b)

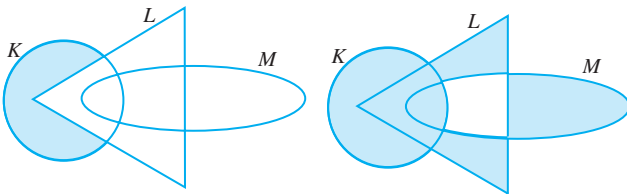
$$\xi = A \cup B \cup C, C \subset A \text{ and } A \cap B = \phi.$$

$$(A \cap C') \cup B$$



2 (a) $K \cap L'$

(b) $(L \cap M)' \cup K$



3 (a) (i) $X \sqsubset Y$ (ii) $X \sqsupset Y = Y$

(b) $X \cap Y' = \{ \}$ or ϕ

(c) Shaded region = $X' \cap Y$

4 $n(X) = n(Y \cup Z)'$

$$11w + 6 + 3 + 4 = 11w + 6w + 1$$

$$6w = 13 - 1$$

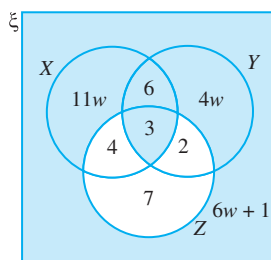
$$w = 2$$

$$n[(X \cap Y) \cup Z]$$

$$= 6 + 3 + 11(2) + 4(2) +$$

$$6(2) + 1$$

$$= 52$$



Section B

$$5 \text{ (a) } n(D) = 43\% \times 1500 \quad n(M) = 51\% \times 1500$$

$$= 645 \quad = 765$$

$$n(U) = 40\% \times 1500$$

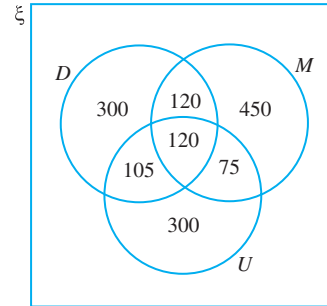
$$= 600$$

$$n(D \cap M) = 16\% \times 1500 \quad n(D \cap U) = 15\% \times 1500$$

$$= 240 \quad = 225$$

$$n(M \cap U) = 13\% \times 1500 \quad n(D \cap M \cap U) = 8\% \times 1500$$

$$= 195 \quad = 120$$



(b) Total number of visitors who did not buy any durian = $1500 - 645 - 450 - 75 - 300 = 30$

Section C

6 $A = \{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37\}$

$B = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38\}$

$C = \{2, 12, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32\}$

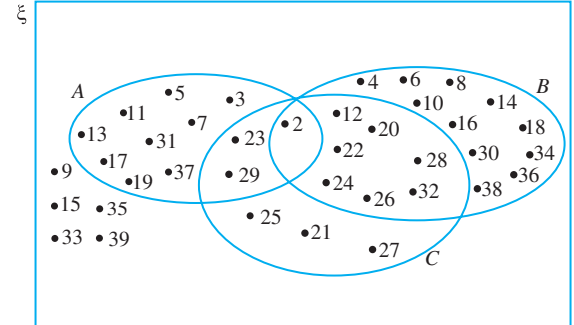
(a) (i) $A \cap B = \{2\}$

(ii) $A \cap C = \{2, 23, 29\}$

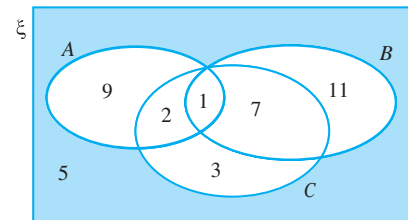
(iii) $B \cap C = \{2, 12, 20, 22, 24, 26, 28, 32\}$

(iv) $A \cap B \cap C = \{2\}$

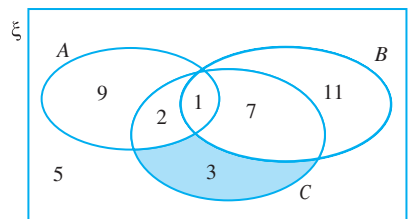
(b)



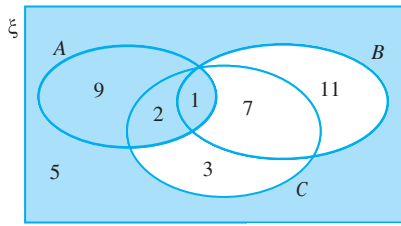
(c) (i) $(A \cup B \cup C)'$



(ii) $A' \cap (B' \cap C)$



(iii) $(A \cap C) \cup (B \cup C)'$



(d) (i) $D = \{2, 23, 29\}$

$$n(D) = 3$$

$$\text{Number of subset} = 2^3$$

$$= 8$$

(ii) Subset $D = \{ \}, \{2\}, \{23\}, \{29\}, \{2, 23\}, \{2, 29\}, \{23, 29\}, \{2, 23, 29\}$