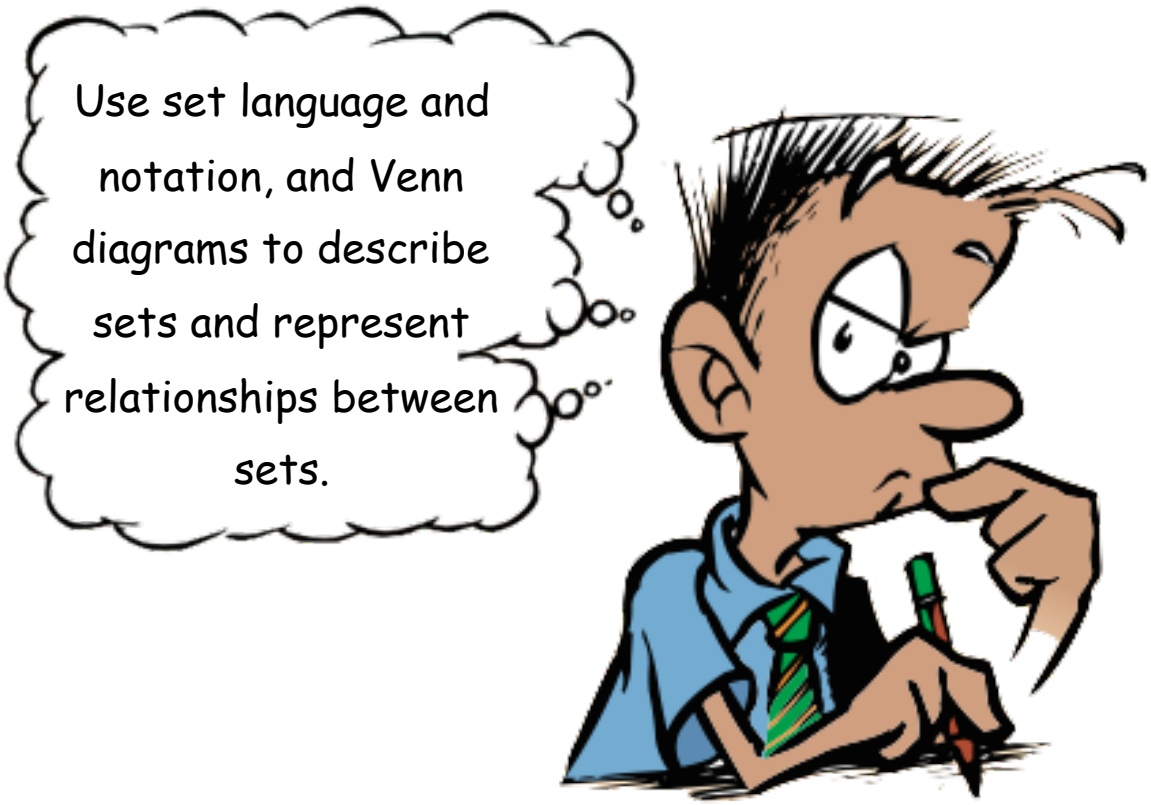
Sets

Learning Objectives

Students should be able to



Nos	Questions	Reference

1 (a) Sets ξ, A and B are such that

$$n(\xi) = 26,\ n(A \cap B') = 7,\ n(A \cap B) = 3 \text{ and } n(B) = 15.$$

Using a Venn diagram, or otherwise, find

(i) $n(A)$, [1]

(ii) $n(A \cup B)$, [1]

(iii) $n(A \cup B)'$. [1]

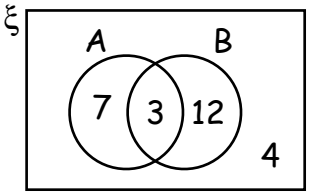
(b) It is given that $\xi = \{x: 0 < x < 30\}$, P = {multiples of 5}, Q = {multiples of 6} and R = {multiples of 2}. Use set notation to complete the following statements.

(i) Q ..... R, [1]

(ii) P + Q = ... [1]

Q1/0606/11/O/N/16 Q1/0606/12/O/N/16

(a)



(i) $n(A) = 10$

(ii) $n(A \cup B) = 22$

(iii) $n(A \cup B)' = 4$

(b) $\xi = \{x: 0 < x < 30\}$, P = {5, 10, 15, 20, 25}, Q = {6, 12, 18, 24} and R = {2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28}

(i) $Q \subseteq R$

(ii) $P \cap Q = \{\ \}$

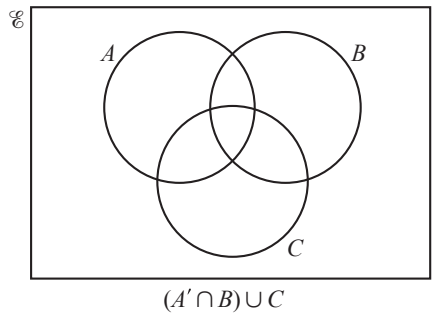
2 (a) The universal set ξ is the set of real numbers and sets X, Y and Z are such that

X = {integer multiples of 5},
Y = {integer multiples of 10},
Z = {r, 2, e}.

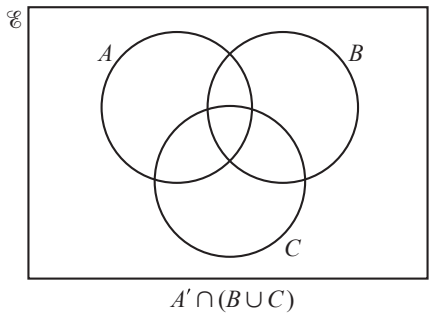
Use set notation to complete the two statements below.

Y ..... X $Y \cap Z$ = ... [2]

(b) On each of the Venn diagrams below, shade the region indicated.



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



$A' \cap (B \cup C)$ [2]

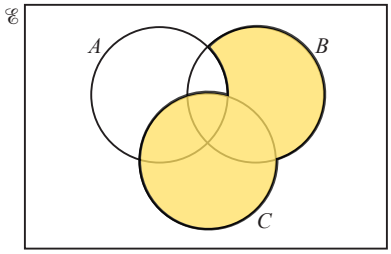
Q1/0606/12/M/J/16

Nos	Questions	Reference

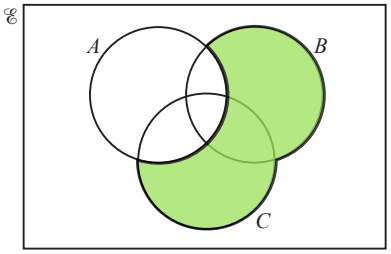
(a) $X = \{5, 10, 15, 20, \ldots\}$,
$Y = \{10, 20, 30, 40, \ldots\}$,
$Z = \{r, 2, e\}$.

$Y \subset X$ $\quad$ $Y \cap Z = \varnothing$

(b)



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



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

3 It is given that $\xi = \{x : 1 \leq x \leq 12$, where x is an integer$\}$ and that sets A, B, C and D are such that

A = {multiples of 3},
B = {prime numbers},
C = {odd integers},
D = {even integers}.

Write down the following sets in terms of their elements.

(i) $A \cap B$ [1]
(ii) $A \cup C$ [1]
(iii) $A' \cap C$ [1]
(iv) $(D \cup B)'$ [1]
(v) Write down a set E such that $E \subset D$. [1]

Q6/0606/11/O/N/15
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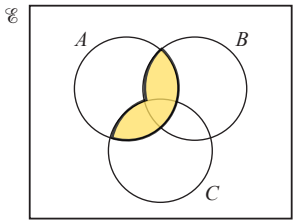
$\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
$A = \{3, 6, 9, 12\}$
$B = \{2, 3, 5, 7, 11\}$
$C = \{1, 3, 5, 7, 9, 11\}$
$D = \{2, 4, 6, 8, 10, 12\}$
(i) $A \cap B = \{3\}$
(ii) $A \cup C = \{1, 3, 5, 6, 7, 9, 11, 12\}$
(iii) $A' \cap C = \{1, 5, 7, 11\}$
(iv) $(D \cup B) = \{2, 3, 4, 5, 6, 7, 8, 10, 11, 12\}$, $(D \cup B)' = \{1, 9\}$
(i) $E = \{2, 4, 6\}$

Nos	Questions	Reference

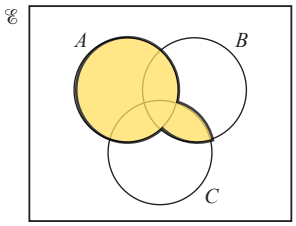
4 On the Venn diagrams below, shade the regions indicated.

(i)



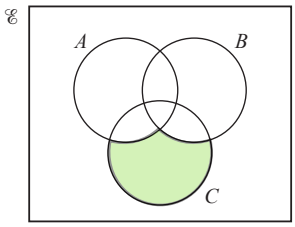
$A \cap (B \cup C)$ [1]

(ii)



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

(iii)



$(A \cup B)' \cap C$ [1]

Q1/0606/13/O/N/15

5 The universal set ξ is the set of real numbers. Sets A, B and C are such that

$$A = \{x : x^2 + 5x + 6 = 0\},$$
$$B = \{x : (x - 3)(x + 2)(x + 1) = 0\},$$
$$C = \{x : x^2 + x + 3 = 0\}.$$

(i) State the value of each of n(A), n(B) and n(C). [3]

(ii) List the elements in the set $A \cup B$. [1]

(iii) List the elements in the set $A \cap B$. [1]

(iv) Describe the set C'. [1]

Q3/0606/13/O/N/14

(i) n(A) = 2 as A = {-2, -3}, n(B) = 3 as B = {3, -2, -1}, n(C) = 0

(ii) $A \cup B$ = {-1, -2, -2, 3}

(iii) $A \cap B$ = {-2}

(iv) C' is the universal set ξ that is the set of real numbers.

Nos	Questions	Reference

16 Set A is such that $A = \{x : 3x^2 - 10x - 8 \leq 0\}$.

(i) Find the set of values of x which define the set A. [3]

Set B is such that $B = \{x : 7 - 2x \leq 1\}$.

(ii) Find the set of values of x which define the set $A \cap B$. [2]

Q6/0606/01/O/N/09

(i) $A = \{x : (3x + 2)(x - 4) \leq 0\} \Rightarrow A = \{x : -\frac{2}{3} \leq x \leq 4\}$

(ii) $B = \{x : x \geq 3\} \Rightarrow A \cap B = \{3 \leq x \leq 4\}$

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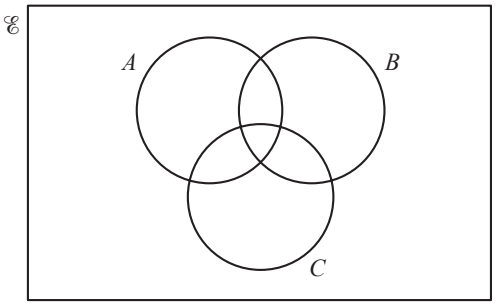


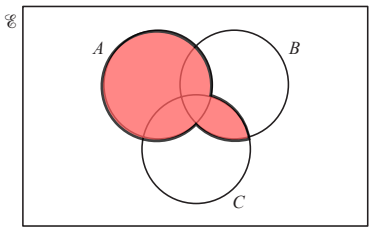
(i) Copy the Venn diagram above and shade the region that represents $A \cup (B \cap C)$. [1]

(ii) Copy the Venn diagram above and shade the region that represents $A \cap (B \cup C)$. [1]

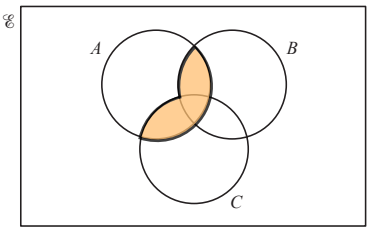
(iii) Copy the Venn diagram above and shade the region that represents $(A \cup B \cup C)'$. [1]

Q1/0606/01/O/N/08

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



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



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