

IB Math Studies: IB Review Set Notation

1. Let $\mathcal{U} = \{x : 1 \leq x < 17, x \in \mathbb{N}\}$.

P , Q and R are the subsets of \mathcal{U} such that

$P = \{\text{multiples of four}\};$

$Q = \{\text{factors of 36}\};$

$R = \{\text{square numbers}\}.$

(a) List the elements of

(i) \mathcal{U}

(ii) $P \cap Q \cap R.$

(2)

(b) Describe in words the set $P \cup Q.$

(1)

2. Let

$\mathcal{U} = \{\text{positive integers less than 15}\};$

$X = \{\text{multiples of 2}\};$

$Y = \{\text{multiples of 3}\}.$

(b) List the elements of:

(i) $X \cap Y$

(1)

(ii) $X \cap \complement Y$ ($\complement Y$ is the same as Y')

(2)

(c) Find the **number of elements** in the complement of $(X \cup Y).$

(2)

3. Let $U = \{-4, -\frac{2}{3}, 1, \pi, 13, 26.7, 69, 10^{33}\}$.

A is the set of all the integers in U .

B is the set of all the rational numbers in U .

(a) List all the prime numbers contained in U .

(b) List all the members of A .

(c) List all the members of B .

(d) List all the members of the set $A \cap B$.

(Total 8 marks)

4. Given \mathbb{Z} the set of integers, \mathbb{Q} the set of rational numbers, \mathbb{R} the set of real numbers.

(a) Write down an element that belongs to $\mathbb{R} \cap \mathbb{Z}$.

(b) Write down an element that belongs to $\mathbb{Q} \cap \mathbb{Z}'$.

(c) Write down an element that belongs to \mathbb{Q}' .

(d) Use a Venn diagram to represent the sets \mathbb{Z} , \mathbb{Q} and \mathbb{R} .

(Total 6 marks)

5. B and C are subsets of a universal set U such that

$$U = \{x : x \in \mathbb{Z}, 0 \leq x < 10\}, B = \{\text{prime numbers} < 10\}, C = \{x : x \in \mathbb{Z}, 1 < x \leq 6\}.$$

(a) List the members of sets

(i) B

(ii) $C \cap B$

(iii) $B \cap C'$

(Total 6 marks)

SOLUTIONS

1. (a) (i) $\mathcal{E} = \{1, 2, 3 \dots 16\}$ (A1)
Note: If they include 17, award (A0)
- (ii) $P \cap Q \cap R = \{4\}$ (A1)
Note: Accept answers without brackets e.g. 4
- (b) $P \cup Q$: the set of numbers that are either multiples of 4 or factors of 36, or everything that is in P or Q (or equivalent) (A1)
- 2.
- (b) (i) $(X \cap Y) = \{6, 12\}$ (A1)
- (ii) $X \cap \complement Y = \{2, 4, 8, 10, 14\}$ (A2) 3
- (c) $(X \cup Y)' = \complement(X \cup Y) = \{1, 5, 7, 11, 13\}$ (A1)
- $n(X \cup Y)' = 5$ (A1) 2
3. (a) The only prime number in U is 13. (A2) (C2)
Note: Award (A1) for $\{1, 13\}$ and (A0) for any other answer.
- (b) $A = \{-4, 1, 13, 69, 10^{33}\}$ (A2) (C2)
- (c) $B = \{-4, -\frac{2}{3}, 1, 13, 26.7, 69, 10^{33}\}$ (A2) (C2)
- (d) $A \cap B = \{-4, 1, 13, 69, 10^{33}\} (= A)$ (A2) (C2)
Note: In (b) and (d) allow (A1) for correct membership with at most one missing or one incorrect entry. A list with no set brackets is acceptable.
In (c) allow at most one missing entry for (A1) but if π is present award (A0).

[8]

4. (a) For example, 2, -3 etc (A1) (C1)
- (b) For example, $\frac{3}{5}$ (not $\frac{6}{1}$) (A1) (C1)
- (c) For example, $\sqrt{2}$, π (A1) (C1)
5. (a) (i) $B = 2,3,5,7$ (A1)
Note: Brackets not required
- (ii) $C \cap B = 2,3,5$ (A1)(ft)
Note: Follow through only from incorrect B
- (iii) $C' = 0,1,7,8,9$ (A1)(ft)
 $B \cup C' = 0,1,2,3,5,7,8,9$ (A1)(ft) (C4)
*Note: Award (A1) for correct C' seen. The first (A1)(ft) in (iii) can be awarded only if C was listed incorrectly **and** a mark was lost as a result in (a)(ii). If C was not listed and C' is wrong, the first mark is lost. The second mark can (ft) within part (iii) as well as from (i).*
- (b) "If x is not a positive integer between 1 and 7, then x is not a prime number less than 10." (A1)(A1) (C2)
*Note: Award (A1) for **both** (not) statements, (A1) for correct order.*

[6]