Chapter 07

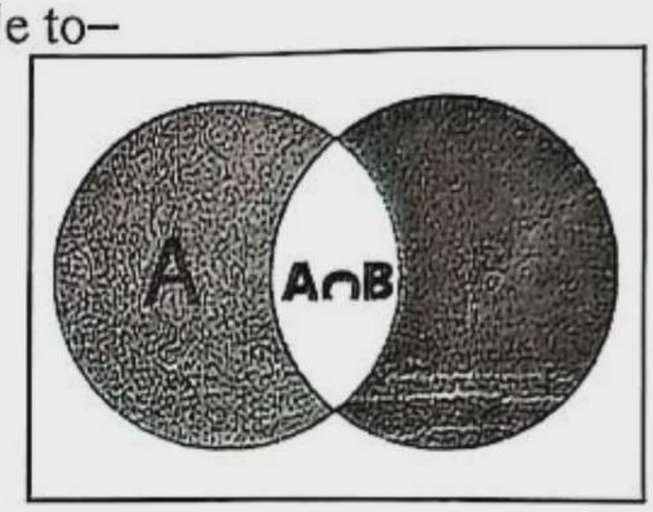
Set

Contents for Discussion

• Set • Methods of expressing set • Classification of Sets • Venn-diagram • Subset • Set operations

Learning Outcomes : After studying this chapter I will be able to–

- Explain and form sets.
- Explain finite set, universal set, complementary set, empty set and express the formation of these sets by symbols.
- Explain the formation of union and intersections of sets.
- Verify and prove simple properties of set operations by Venn diagram and examples.
- Solve problems by applying the properties of set.



Practice

Solutions to Mathematical Problems following 100% accurate format for best prep.

Dear learners, mathematical problems of this chapter have been divided into exercise, multiple choice, short, creative and exercise-based activities in light of the learning outcomes. Practice the solutions well to ensure the best preparation in the exam.

At a Glance Important Contents of Exercise

- **Set :** A set is a well-defined collection or group of objects from the real or conceptual world.
- **Methods of Representing a Set :** A set can be represented mainly in two ways: (i) Roster Method (Listing Method) (ii) Set Builder Method
- **Finite Set :** A set whose elements can be counted is called a finite set.
- **Infinite Set :** A set whose elements cannot be counted is called an infinite set.
- **Empty Set (Null Set) :** A set that contains no elements is called an empty set. It is denoted by $\emptyset$ or {}.
- **Subset :** Any set that can be formed using the elements of a given set is called a subset of that set. The empty set is a subset of every set.
- **Universal Set :** If all sets under discussion are subsets of a particular set, then that specific set is called the universal set in relation to those subsets.
- **Complement of a Set :** If a set **A** is a subset of the universal set **U**, then the set containing all elements of **U** that are not in **A** is called the complement of **A**. It is denoted by A' or A^c.
- **Union of Sets :** A set that consists of all elements from two or more sets is called the union of those sets.
- **Intersection of Sets :** A set that consists of only the common elements of two or more sets is called the intersection of those sets.

Solutions to Exercise Problems Let's solve the textbook problems

MCQs with Answers

1. How many systems are there to express set?

ⓐ 1 ⓑ 2

ⓑ ⓒ 3 ⓓ 4

⏩ **Explanation :** There are 2 methods of expressing set i.e. (i) Tabular method (ii) Set Builder Method.

2. Which one of the following is the subset of any set?

ⓒ ⓐ {0} ⓑ {ϕ} ⓒ ϕ ⓓ (ϕ)

⏩ **Explanation :** Empty set (∅) is the subset of any set.

3. How many elements are there in the set {0}?

ⓑ ⓐ 0 ⓑ 1 ⓒ 2 ⓓ 3

⏩ **Explanation :** There are only one element in the set {0} which is 0.

4. S = {x : x is even number and 1 ≤ x ≤ 7}. Which one of the following is correct in tabular set system?
ⓐ {2, 3, 4} ⓑ {2, 4, 6}
ⓑ ⓒ {1, 3, 5} ⓓ {3, 5, 7}
Explanation : Even numbers greater or equal to 1 and less than or equal 7 are 2, 4, 6
∴ S = {2, 4, 6}

5. If A = {2, 3, 4} and B = {5, 7}, which one will be A ∩ B?
ⓐ φ ⓑ {0}
ⓐ ⓒ {5, 7} ⓓ {2, 3, 4, 5, 7}
Explanation : A ∩ B = {2, 3, 4} ∩ {5, 7} = ∅

6. Which one is the tabular form of A = {x : x is even number and 4 < x < 6} :
ⓐ {5} ⓑ {4, 6}
ⓐ ⓒ {4, 5, 6} ⓓ ∅
Explanation : There is no even number in 4 < x < 6.

7. If P = {x, y, z}, which one of the following is not subset of P?
ⓐ {x, y} ⓑ {x, w, z}
ⓑ ⓒ {x. y, z} ⓓ ∅
Explanation : w is not an element of P set.

8. What is the set of factors of 10?
ⓐ {1, 2, 5, 10} ⓑ {1, 10}
ⓐ, ⓒ {10} ⓓ {10, 20, 30}
Explanation : Multiples of 10 are 1, 2, 5, 10.

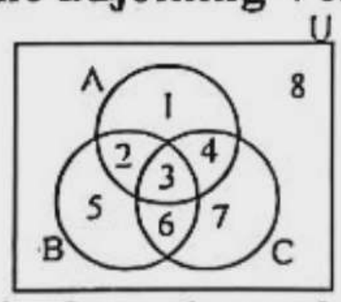
9. If, A = {2, 3, 5}
i. A = {X ∈ N : 1 < x < 6 and x is a prime number}
ii. A = n{X ∈ N : 2 ≤ x < 7 and x is a prime number}
iii. A = {X ∈ N : 2 ≤ x ≤ 5 and x is a prime number}
Which one of the following is correct?
ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii
Explanation : (i) Prime numbers in 1 < x < 6 are 2, 3, 5.
(ii) Prime numbers in 2 ≤ x ≤ 7 are 2, 3, 5.
(iii) Prime numbers in 2 ≤ x ≤ 5 are 2, 3, 5.
So for all three cases, A = {2, 3, 5}

■ **Answer the questions 10 and 11 in light of the information given below :**
U = {2, 3, 5, 7}, A = {2, 5}, B = {3, 5, 7}

10. Which one is A^C?
ⓒ ⓐ {2, 5} ⓑ {3, 5} ⓒ {3, 7} ⓓ {2, 7}
Explanation : Given, U = {2, 3, 5, 7} and A = {2, 5}
∴ A^C = The complement of set A
= The set of elements excluding the elements of A = {3, 7}

11. Which one is $A \cap B^C$?
ⓐ ⓐ {2} ⓑ {5} ⓒ {2, 5} ⓓ {3, 7}
Explanation : Given, U = {2, 3, 5, 7}
A = {2, 5} and B = {3, 5, 7}
∴ B^C = The complement of set B
= The set of elements excluding the elements of B = {2}
∴ $A \cap B^C = \{2, 5\} \cap \{2\} = \{2\}$.

■ **Answer the questions from 12 to 15 in respect of the adjoining Venn diagram.**



12. Which one is the universal set?
ⓓ ⓐ A ⓑ B ⓒ C ⓓ U
Explanation : In Venn-diagram, A, B and C sets are the subsets of U
So, U is the universal set with respect to set A, B and C.

13. Which one is the set B^c ?
ⓐ {5, 6, 7, 8} ⓑ {2, 3, 5, 6}
ⓒ ⓒ {1, 4, 7, 8} ⓓ {3, 6}
Explanation : From Venn-diagram, U = {1, 2, 3, 4, 5, 6, 7, 8}
and B = {2, 3, 5, 6}
∴ B^C = The complement of set B
= The set of elements excluding the elements of B = {1, 4, 7, 8}

14. Which one is the set A ∩ B?
ⓐ {2, 3} ⓑ {2, 3, 5, 6}
ⓐ ⓒ {3, 4, 6, 7} ⓓ {2, 3, 4, 5, 6, 7}

15. Which one is the set A ∪ B?
ⓐ {1, 2, 3, 4, 5, 6} ⓑ {5, 6, 7}
ⓐ ⓒ {8} ⓓ {3}

Solutions to Mathematical Problems

16. Express the following sets in tabular form :
(a) {x : x is odd number and 3 < x < 15}
(b) {x : x is a prime factor of 48}
(c) {x : x is a multiple of 3 and x < 36}
(d) {x : x is an integer and $x^2 < 10$}
Solution :
(a) The set in question (in tabular form) is {5, 7, 9, 11, 13}.
(b) The set in question (in tabular form) is {2, 3}.
(c) The set in question which is in the tabular form can be written as {3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33}
(d) The desired set in tabular form is {1, 2, 3}.

17. Express the following sets in set builder form.
(a) {3, 4, 5, 6, 7, 8}
(b) {4, 8, 12, 16, 20, 24}
(c) {7, 11, 13, 17}

Solution :

(a) The set in set builder form is $\{x \in N : 3 \le x \le 8\}$.

(b) The set in set builder form is $\{x \in N : x$ is the multiple of $4\}$.

(c) The set in set builder form is $\{x \in N : x$ is a prime number and $7 \le x \le 17\}$.

18. Find the subsets and the number of subsets of the following two sets :

(a) $C = \{m, n\}$

(b) $D = \{5, 10, 15\}$

Solution :

(a) The sub-sets of $C = \{m, n\}$ are $\{m\}$, $\{n\}$, $\{m, n\}$ an ϕ.

$\therefore$ number of sub-sets of the set C is 4.

(b) The sub-sets of $D = \{5, 10, 15\}$ are $\{5\}$, $\{10\}$, $\{15\}$, $\{5, 10\}$, $\{10, 15\}$, $\{5, 15\}$, $\{5, 10, 15\}$, ϕ.

$\therefore$ number of sub-sets is 8.

19. If $A = \{1, 2, 3\}$, $B = \{2, a\}$ and $C = \{a, b\}$, find the following sets :

(a) $A \cup B$ (b) $B \cap C$

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

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

Solution :

(a) $A \cup B = \{1, 2, 3\} \cup \{2, a\} = \{1, 2, 3, a\}$.

(b) $B \cap C = \{2, a\} \cap \{a, b\} = \{a\}$.

(c) $A \cap (B \cup C) = \{1, 2, 3\} \cap \{2, a\} \cup \{a, b\}$
$= \{1, 2, 3\} \cap 2, a, b\}$
$= \{2\}$.

(d) $(A \cup B) \cup C$
$= \{\{1, 2, 3\} \cup \{2, a\}\} \cup \{a, b\}$.
$= \{1, 2, 3, a\} \cup \{a, b\}$.
$= \{1, 2, 3, a, b\}$

(e) $(A \cap B) \cup (B \cap C)$
$= \{\{1, 2, 3\} \cap \{2, a\}\} \cup \{\{2, a\} \cap \{a, b\}\}$.
$= \{2\} \cup \{a\}$
$= \{2, a\}$.

20. If $U = \{1, 2, 3, 4, 5, 6, 7\}$, $A = \{1, 2, 5\}$, $B = \{2, 4, 7\}$ and $C = \{4, 5, 6\}$ justify the correctness of the following relations :

(a) $A \cap B = B \cap A$

(b) $(A \cap B)' = A' \cup B'$

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

Solution :

(a) $A \cap B = \{1, 2, 5\} \cap \{2, 4, 7\} = \{2\}$ and
$B \cap A = \{2, 4, 7\} \cap \{1, 2, 5\} = \{2\}$.
$\therefore$ $A \cap B = B \cap A$ is correct.

(b) $A \cap B = \{1, 2, 5\} \cap \{2, 4, 7\} = \{2\}$
$\therefore$ $(A \cap B)' = \{1, 2, 3, 4, 5, 6, 7\} - \{2\}$
$= \{1, 3, 4, 5, 6, 7\}$.....(1)

Again,
$A' = \{1, 2, 3, 4, 5, 6, 7\} - \{1, 2, 5\} = \{3, 4, 6, 7\}$.
$B' = \{1, 2, 3, 4, 5, 6, 7\} - \{2, 4, 7\} = \{1, 3, 5, 6\}$.
$\therefore$ $A' \cup B' = \{1, 3, 4, 5, 6, 7\}$.....(2)
Now from (1) and (2) we find that,
$(A' \cup B') = A' \cup B'$ is correct.

(c) $(A \cup C) = \{1, 2, 5\} \cup \{4, 5, 6\} = \{1, 2, 4, 5, 6\}$.
$\therefore$ $(A \cup C)' = \{1, 2, 3, 4, 5, 6, 7\} - \{1, 2, 4, 5, 6\}$.
$= \{3, 7\}$ .....(i)
Again, $A' = \{1, 2, 3, 4, 5, 6, 7\} - \{1, 2, 5\}$
$= \{3, 4, 6, 7\}$.
$C' = \{1, 2, 3, 4, 5, 6, 7\} - \{4, 5, 6\}$
$= \{1, 2, 3, 7\}$.
$\therefore$ $A' \cap C' = \{3, 7\}$.....(2)
Now, from (1) and (2) we can find that $(A \cap C)' = A' \cap C'$ is correct.

21. If P and Q are the sets of all the factors of 21 and 35 respectively, find $P \cup Q$.

Solution : According to the question,
Set $P = \{1, 3, 7, 21\}$ and Set $Q = \{1, 5, 7, 35\}$.
$\therefore$ $P \cup Q = \{1, 3, 7, 21\} \cup \{1, 5, 7, 35\}$.
$= \{1, 3, 5, 7, 21, 35\}$. **(Ans.)**

Creative Questions with Solutions

Ques. 22 In a hostel, 65% of the students like fish, 55% of the students like meat and 40% of the students like both dishes.

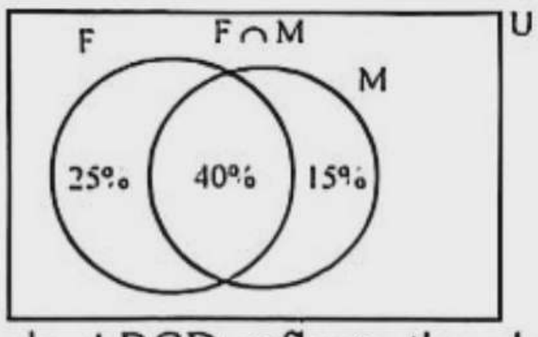
a. Express the stated information by Venn diagram with short explanation. 2

b. Find out the percentage of students who dislike both dishes. 4

c. Find out the intersection set of the sets of factors of those students, who like only one dish. 4

Solution to Question No. 22 :

a



Here the rectangle ABCD reflects the choosers of fish, meat, both fish and meat and those who neither choose fish nor choose meat. The circle with centre C_1 refers to those who are the choosers of fish and the circle with centre C_2 refers to the choosers who like meat. The common portion of the two circles with centre C_1 and C_2 refer to those who like both fish and meat.

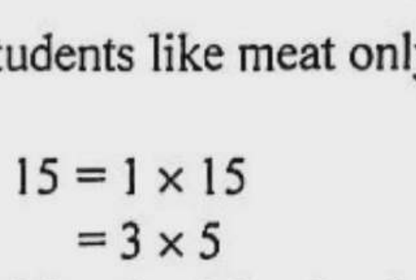
b Let, the students who like fish be denoted by P, who like meat be denoted by Q.

So the students who like both dishes,
$P \cap Q = 40\%$
Students who like fish only = $P \setminus P \cap Q$
$= 65\% - 40\% = 25\%$

Students who like meat only = Q\P∩Q
= 55% – 40% = 15%
So students who like fish only, meat only and both fish and meat only
= P\(P∩Q)∪Q\(P∩Q)∪(P∩Q)
= 25% + 15% + 40%
= 80%
Therefore students who dislike both fish and meat = U\{P\(P∩Q)∪Q\(P∩Q)∪(P∩Q)},
U stands for total students
= 100% – 80% = 20%

c According to question,
65% students like fish,
55% students like meat and 40% students like both the dishes.
∴ Students like fish only = 65% – 40%
= 25%
And students like meat only = 55% – 40%
= 15%
Now, 15 = 1 × 15
= 3 × 5
25 = 1 × 25 = 5 × 5
Let, P denotes the set with the factors of 15 and Q denotes the set with the factors of 25.
∴ P = {1, 3, 5, 15} and
Q = {1, 5, 25}
∴ P ∩ Q = {1, 3, 5, 15} ∩ {1, 5, 25}
= {1, 5}
Therefore, the intersection set of sets of factors of those students who like only one dish is {1, 5}.

Ques. 23



a. Write set A in set Builder Method. 2
b. Express A, B, C in Tabular Method and find A ∩ C and A ∪ B. 4
c. Prove that (A ∪ B)′ = A′ ∩ B′. 4

Solution to Question No. 23 :

a In the given Venn diagram, we get,
A = {3, 4, 5, 6}
Now in set Builder Method,
A = {x : x ∈ ℕ and 3 ≤ x ≤ 6}.

b From the given Venn diagram, we get in tabular method,
A = {3, 4, 5, 6}, B = {4, 5, 8, 9}, C = {5, 6, 7, 8}
Now A ∩ C = {3, 4, 5, 6} ∩ {5, 6, 7, 8} = {5, 6}
Again, A ∪ B = {3, 4, 5, 6} ∪ {4, 5, 8, 9}
= {3, 4, 5, 6, 8, 9}

c According to the Venn diagram,
U = {3, 4, 5, 6, 7, 8, 9, 10}
A = {3, 4, 5, 6} and
B = {4, 5, 8, 9}
∴ A ∪ B = {3, 4, 5, 6, 8, 9}
A′ = U – A
= {3, 4, 5, 6, 7, 8, 9, 10} – {3, 4, 5, 6}
= {7, 8, 9, 10}
Again, B′ = U – B
= {3, 4, 5, 6, 7, 8, 9, 10} – {4, 5, 8, 9}
= {3, 6, 7, 10}
(A ∪ B)′ = U – (A ∪ B)
= {3, 4, 5, 6, 7, 8, 9, 10} – {3, 4, 5, 6, 8, 9}
= {7, 10} .....(i)
And A′ ∩ B′ = {7, 8, 9, 10} ∩ {3, 6, 7, 10}
= {7, 10} .....(ii)
Now from (i) and (ii), we get (A ∪ B)′ = A′ ∩ B′ **(Proved)**

Ques. 24 Universal set U = {1, 2, 3, 4, 5, 6, 7} and its three subsets are–
A = {x ∈ ℕ : x < 7 and x is an odd number}
B = {x ∈ ℕ : x < 7 and x is an even number}
C = {x ∈ ℕ : x ≤ 3 and x is a prime number}
a. Express sets A and B in set Builder form. 2
b. Find out (A ∪ B) ∩ (A ∪ C). 4
c. Write the subsets of (B ∪ C)′. 4

Solution to Question No. 24 :

a Here we have,
A = {x ∈ ℕ : x < 7 and x is an odd number}
= {1, 3, 5} and
B = {x ∈ ℕ : x < 7 and x is an even number}
= {2, 4, 6}.

b From (a) above we get,
A = {1, 3, 5}
and B = {2, 4, 6}
We also have been given that,
C = {x ∈ ℕ : x ≤ 3 and x is a prime number}
= {2, 3}
∴ A ∪ B = {1, 3, 5} ∪ {2, 4, 6} = {1, 2, 3, 4, 5, 6}
And A ∪ C = {1, 3, 5} ∪ {2, 3} = {1, 2, 3, 5}
∴ (A ∪ B) ∩ (A ∪ C)
= {1, 2, 3, 4, 5, 6} ∩ {1, 2, 3, 5}
= {1, 2, 3, 5}
So (A ∪ B) ∩ (A ∪ C) = {1, 2, 3, 5}

c From (b) above, we get,
B = {2, 4, 6} and C = {2, 3}
∴ B ∪ C = {2, 4, 6} ∪ {2, 3} = {2, 3, 4, 6}
We have, U = {1, 2, 3, 4, 5, 6, 7}
∴ (B ∪ C)′ = U – (B ∪ C)
= {1, 2, 3, 4, 5, 6, 7} – {2, 3, 4, 6}
= {1, 5, 7}
∴ Sub sets of (B ∪ C)′ are {{1}, {5}, {7}, (1, 5}, {1, 7}, {5, 7}, {1, 5, 7}, ∅.}

Ques. 25 The sets of the integers by which the numbers 346 and 556 are divided with remainder 31 in each case are A and B.

a. Express set A in set builders form. 2

b. Find A ∩ B. 4

c. Show A∩B in Venn-diagram and write the subsets of A∩B. 4

Solution to Question No. 25 :

a 'A' is a set of natural numbers by which when 346 is divided individually then in each case, 31 is the remainder and the elements of A will be greater than 31.

∴ (346 – 31) or 315 will be exactly divisible by the individual elements of set A.

$315 = 1 \times 315 = 3 \times 105 = 5 \times 63 = 7 \times 45$
$= 9 \times 35 = 15 \times 21$

∴ the required set, A = { x : x∈N and x is 7th, 9th, 21st and 63th multiple of x including 9th multiple of 7}

b From (a) above, A = {35, 45, 63, 105, 315}.

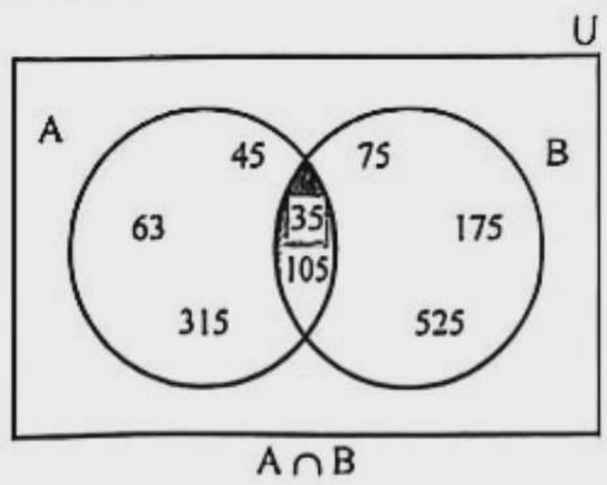
Again, B is a set of natural numbers by which when 556 is divided individually, then 31 will be found as remainder in each case and in that case (556 – 31) or 525 will be exactly divisible by each of the elements of B which are greater than 31.

$525 = 1 \times 525 = 3 \times 175$
$= 5 \times 105 = 7 \times 75 = 15 \times 35 = 21 \times 25$

∴ B = {35, 75, 105, 175, 525}.

∴ A ∩ B = {35, 45, 63, 105, 315} ∩ {35, 75, 105, 175, 525}
= {35, 105}

c A ∩ B is shown below in a Venn diagram :



A ∩ B

Venn diagram of A and B

We have, A ∩ B = {35, 105}

∴ Sub-sets of (A ∩ B) are–

{35}, {105}, {35, 105}, ϕ.

Multiple Choice Q/A Designed as per topic

Lesson-7.1 : Set ▸ Textbook Page 121

1. **Who is the father of modern set theory?** *(Easy)* *[JB '16]*
   ⓐ John Venn ⓑ Galileo
   ⓓ ⓒ Pythagoras ⓓ George Cantor

2. **Who has given the idea of set?** *(Easy)*
   ⓐ Al-Zabir ⓑ George Cantor
   ⓑ ⓒ Newton ⓓ Einstein

3. **George Cantor was a / an —?** *(Easy)*
   ⓐ German ⓑ Japanese
   ⓐ ⓒ Austrian ⓓ American

4. **Which one of the following is a must to represent a set?** *(Medium)*
   ⓐ Element ⓑ Curly Bracket { }
   ⓑ ⓒ Comma (,) ⓓ All of them

5. **A = {2, 0, b, a duster). Which element of A is of our real world?** *(Medium)*
   ⓓ ⓐ 2 ⓑ 0 ⓒ b ⓓ a duster

Lesson-7.2 : Methods of expressing set ▸ Textbook Page 122

6. **Which one is tabular form of set A = {x : x is even number and 2 ≤ x < 8}?** *(Hard)* *[CtgB '16]*
   ⓐ {2, 4, 6} ⓑ {2, 4, 8}
   ⓐ ⓒ {4, 6, 8} ⓓ {2, 4, 6, 8}

7. **Which one is the tabular form of A = {x : x is a prime factor of 6}?** *(Medium)* *[SB '16]*
   ⓐ {2, 3} ⓑ {1, 3, 6}
   ⓐ ⓒ {1, 2, 3, 6} ⓓ {2, 3, 6}

8. **Which one is the tabular form of A = {x : x is even number and 4 < x < 6}?** *(Hard)* *[SB '16]*
   ⓐ {4, 5, 6} ⓑ {4, 6}
   ⓓ ⓒ {5} ⓓ { }

9. **What is the set of factors of 8?** *(Easy)* *[CB '16]*
   ⓐ {1, 8} ⓑ {2, 4}
   ⓓ ⓒ {8, 16, 24} ⓓ {1, 2, 4, 8}

10. **If B = {x; x ∈ N and $x^2 < 25$}, then B = what?** *(Hard)* *[BB '17]*
    ⓐ { } ⓑ {1, 2, 3, 4}
    ⓑ ⓒ {1, 2, 3, 4, 5} ⓓ {..... 2, 3, 4}

11. **R = {x : x odd number and 1 ≤ x ≤ 6}, which one is correct for R?** *(Medium)* *[JB '18]*
    ⓐ {2, 4, 6} ⓑ {1, 3, 5}
    ⓑ ⓒ {1, 3, 6} ⓓ {2, 3, 5}

12. **What is the tabular form of A = {x : x∈N, where 1 < x ≤ 4}?** *(Easy)* *[DB '18]*
    ⓐ {2, 3, 4} ⓑ {1, 2, 3}
    ⓐ ⓒ {2, 3} ⓓ {1, 2, 3, 4}

13. **If A = {x ∈ N : x is prime number and x ≤ 11}: How many elements are there in set A?** *(Easy)* *[CB '19]*
    ⓐ 4 ⓑ 5
    ⓑ ⓒ 6 ⓓ 7

14. **P = {x : x, odd natural number and 1 < x < 7} which one is the tabular form of P?** *(Easy)* *[Ctg.B' 15]*
    ⓓ ⓐ {1} ⓑ {7}
    ⓒ {1, 7} ⓓ {3, 5}

15. Which set is of Set Builder or Rule Method? *(Easy)*
ⓐ {x : x is an integer} ⓑ {2, b, a cup}
ⓐ ⓒ {2, 4, 6} ⓓ {n, n + 1, n + 2}

16. Which set is of Descriptive Method? *(Easy)*
ⓐ {a, 4, α}
ⓑ A = {The set of all divisions of Bangladesh}
ⓒ {x : x is a real number}
ⓑ ⓓ B = {1, 2, 3, ... 10}

17. What is the Roster method of the set {x : x ∈ N and x < 6}? *(Easy)*
ⓐ {x : x ∈ N and x < 6} ⓑ {1, 2, 3, 4, 5}
ⓑ ⓒ {1, 3, 5} ⓓ {2, 4, 6}

18. What is the Roster method of the set {x : x ∈ Z and – 3 < x < 3}? *(Medium)*
ⓐ {0, 1, 2} ⓑ {1, 2}
ⓒ ⓒ {0, ± 1, ±2} ⓓ {±1, ±2}

19. Which is the Set Builder Method of the set {2, 4, 6, 8}? *(Medium)*
ⓐ {x : x ∈ N, x is a multiple of 2 and x < 10}
ⓑ {x : x is odd and x < 10}
ⓒ {x : x is even natural number and x < 10}
ⓓ ⓓ a & c

20. Which one is the tabular form of S = {x : x is a prime factor of 12}? *(Medium)* *[RB '16]*
ⓐ {1, 2, 3} ⓑ {2, 3}
ⓑ ⓒ {2, 3, 6} ⓓ {1, 2, 3, 6}

21. If A = {x : x is a multiple of 4 and x < 16}, A— *(Medium)* *[SB' 15]*
ⓐ {4, 8, 12} ⓑ {4, 8, 12, 16}
ⓐ ⓒ {2, 4, 6} ⓓ {4, 6, 8, 10}

22. If A = {1, 2}, B = {2, 3}— *[DB '17]*
i. A ∩ B = {2}
ii. A ∪ B = {1, 2, 3} iii. 3 ∈ A
Which one is correct? *(Hard)*
ⓐ i & ii ⓑ i & iii
ⓐ ⓒ ii & iii ⓓ i, ii & iii

23. If P = {x ∈ N : x < 7 and x is prime number}, Q = {x ∈ N : x < 5 and x is an even number} and R = {1, 3, 5, 7} then *[CB '18]*
i. P ∩ Q = {2}
ii. The number of elements of set P is 4
iii. R = {x ∈ N : x < 7 and x is odd number
Which one of the following is correct? *(Hard)*
ⓐ i & iii ⓑ iii
ⓐ ⓒ ii & iii ⓓ i, ii & iii

24. If S = {2, 3, 5, 7}, then —. *[JB '18]*
i. S = {x ∈ N : 1 ≤ x < 7 and x is a prime number}
ii. S = {x ∈ N : 1 < x ≤ 7 and x is a prime number}
iii. S = {x ∈ N : 2 ≤ x ≤ 7 and x is a prime number}
Which one of the following is correct? *(Medium)*
ⓐ i & ii ⓑ i & iii
ⓒ ⓒ ii & iii ⓓ i, ii & iii

25. i. Well defined objects of real world are called set
ii. Set is expressed in two methods- Tabular method and Set Builder Method
iii. Elements of a set are mentioned by enclosing them within third bracket
Which one of the following is correct? *(Medium)*
ⓐ i, ii & iii ⓑ ii & iii
ⓓ ⓒ i & iii ⓓ i & ii

26. Read attentively the following statements :
i. The empty set has an element
ii. The empty set is the improper subset of every set
iii. {0} is an empty set
Which one of the following is correct? *(Medium)*
ⓐ i & ii ⓑ ii
ⓑ ⓒ i & iii ⓓ i, ii & iii

27. If A = {2, 3, 5} *[Ideal School & College. Dhaka]*
i. A = {x ∈ N : 1 < x < 6 and x is a prime number}
ii. A = {x ∈ N : 2 ≤ x < 7 and x is a prime number}
iii. A = {x ∈ N : 2 ≤ x ≤ 5 and x is a prime number}
Which one is correct? *(Medium)*
ⓓ ⓐ i & ii ⓑ i & iii
ⓒ ii & iii ⓓ i, ii & iii

Answer the questions No. 28 and 29 in the light of the informations given below :
A = {x : x is an odd number and 1 < x < 7}
B = {x : x is prime number and 1 < x < 9}

28. Which one of the following is set A? *(Medium)* *[JB '17]*
ⓒ ⓐ {2, 3, 5, 7} ⓑ {2, 7} ⓒ {3, 5} ⓓ { }

29. Which one of the following (A\B)? *(Medium)* *[JB '17]*
ⓓ ⓐ {2, 3, 5, 7} ⓑ {2, 7} ⓒ {3, 5} ⓓ { }

Lesson-7.3 : Classification of Sets

▸ Textbook Page 123

30. If A and B are two sets and A ∪ B = ∅, then sets are —. *(Easy)* *[CtgB '16]*
ⓐ Empty set ⓑ Disjoined set
ⓐ ⓒ Universal set ⓓ Complement of a set

31. Which one of the following represents a null or empty or void set? *(Easy)*
ⓓ ⓐ {0} ⓑ {a } ⓒ {∅} ⓓ ϕ

32. Which one of the following is not an empty set? *(Easy)*
ⓐ {0} ⓑ { }
ⓐ ⓒ ∅ ⓓ All of them

33. Which one of the following is a unit set? *(Easy)*
ⓐ ⓐ {0} ⓑ ∅ ⓒ {1} ⓑ a & c

34. Which one of the following is a unit set? *(Easy)*
ⓐ {0} ⓑ {1, 1, 1}
ⓐ ⓒ {2, 2, 2, 2} ⓓ a, b & o

35. Which one is a finite set?
ⓐ {All the English Alphabets}
ⓑ {All the natural numbers}
ⓒ {All the real numbers}
ⓐ ⓓ {All integers}

36. Which one is an infinite set?
ⓐ {The numbers of students of your school}
ⓑ {All the integers}
ⓒ {All the English Alphabets}
ⓑ ⓓ {All the Bengali Alphabets}

37. i. Empty set has only one element
ii. Empty set is subset of all sets
iii. Symbol of empty set ϕ
Which one is correct? *(Medium)* *[DB '16]*
ⓐ i & ii ⓑ i & iii
ⓒ ⓒ ii & iii ⓓ i, ii & iii

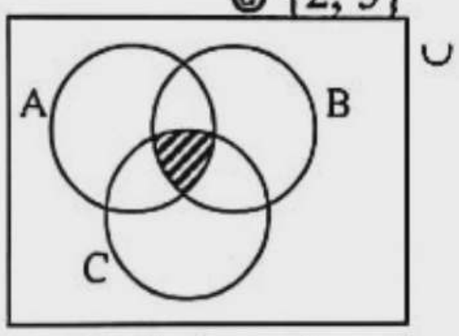
Lesson-7.4 : Venn-diagram ▸ Textbook Page 123

38.

Which set is indicated by the shaded part in the above Venn-diagram? *(Hard)* *[RB '18]*
ⓓ ⓐ $A \cup B$ ⓑ $A \cap B$
ⓒ $A - B$ ⓓ $B - A$

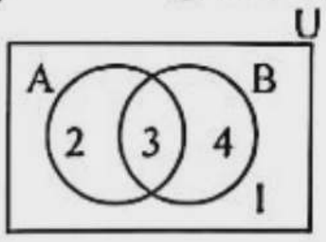
39. Which one is the roaster representation of the set {x : x is a prime factor of 20}? *(Medium)* *[DjB '19]*
ⓐ {1, 2, 4, 5} ⓑ {1, 2, 4}
ⓓ ⓒ {2, 4, 5} ⓓ {2, 5}

40.



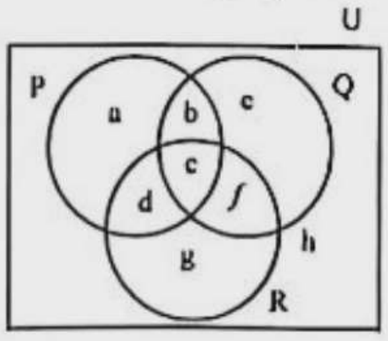
In figure the shaded region is —. *(Medium)* *[Ctg.B' 15]*
ⓐ $A \cap B \cap C$ ⓑ $A \cup B \cup C$
ⓐ ⓒ $A \cap (B \cap C)$ ⓓ $A \cap (B \cap C)$

41.



i. $A^C = \{1, 4\}$
ii. $A \cap B = \{3\}$
iii. $A \cup B = \{1, 2, 3, 4\}$
Which one is correct? *(Hard)* *[RB '16]*
ⓐ ⓐ i & ii ⓑ i & iii
ⓒ ii & iii ⓓ i, ii & iii

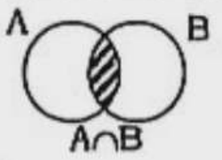
42.



In Venn diagram— *[RB '19]*
i. $P \cap Q = \{b, c\}$
ii. $P \cup Q = \{a, b, c, d, e, f\}$
iii. $R' = \{a, b, e, h\}$

Which one is correct? *(Hard)*
ⓐ i & ii ⓑ i & iii
ⓓ ⓒ ii & iii ⓓ i, ii & iii

43. Observe carefully the following Venn diagrams :

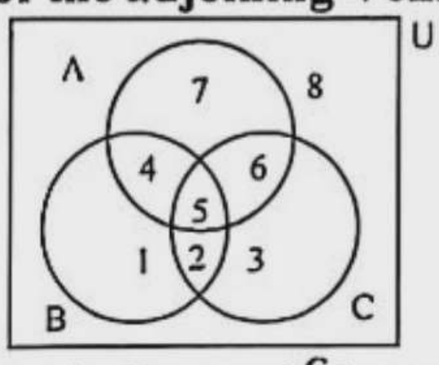
i. 

ii. 

iii. 

Which one of the following is correct? *(Medium)*
ⓐ i & ii ⓑ i & iii
ⓓ ⓒ i & iii ⓓ i, ii & iii

Answer the questions from 44 to 46 in respect of the adjoining Venn diagram :



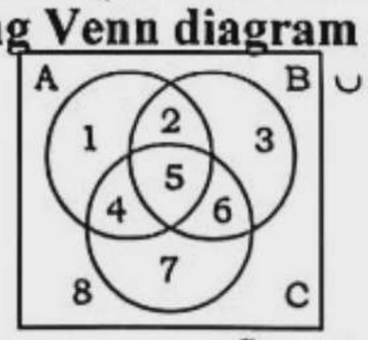
[JB' 15]

44. Which one is the set A^C? *(Hard)*
ⓐ {2, 4, 5, 6} ⓑ {1, 2, 3, 4}
ⓒ ⓒ {1, 2, 3, 8} ⓓ {4, 5, 6, 7}

45. Which one is the set $B \cap C$? *(Medium)*
ⓐ ⓐ {2, 5} ⓑ {1, 3} ⓒ {4, 6} ⓓ {3, 4}

46. We can find out from the above diagram —. *[JB' 15]*
i. $A \cap B \cap C = 5$
ii. $U = A \cup B \cup C$
iii. $B' = \{3, 6, 7, 8\}$
Which one of the following is true? *(Hard)*
ⓐ i & ii ⓑ ii & iii
ⓒ ⓒ i & iii ⓓ i, ii & iii

Answer to the questions No. 47 – 48 from the following Venn diagram :

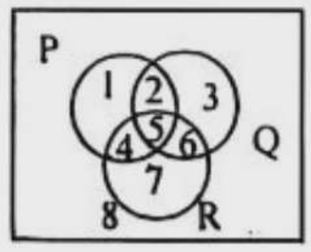


[DB '16]

47. Which one is the set A^C = ? *(Hard)*
ⓐ {1, 4, 7, 8} ⓑ {3, 6, 7, 8}
ⓑ ⓒ {5, 6, 7, 8} ⓓ {1, 2, 4, 5}

48. Which one is the set $(B \cap C)$ = ? *(Medium)*
ⓒ ⓐ {2, 5} ⓑ {4, 5}
ⓒ {5, 6} ⓓ {6, 7}

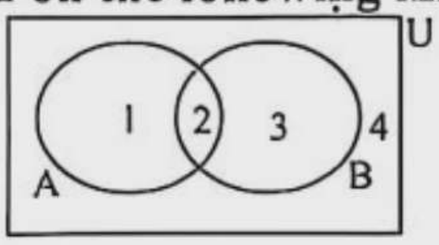
Answer to the questions no. 49 and 50 with the help of the following Venn-diagram :



49. Which one of the following is R^C set? *(Hard)* *[BB '17]*
ⓐ {3, 6, 7, 8} ⓑ {1, 4, 7, 8}
ⓒ ⓒ {1, 2, 3, 8} ⓓ {1, 2, 3}

50. Which one is the P ∩ Q ∩ R set? *(Medium)* *[BB '17]*
ⓑ ⓐ {2} ⓑ {5}
ⓒ {4} ⓓ {6}

Answer to the questions No. 51 and 52 based on the following information :

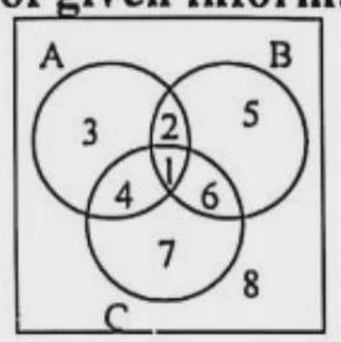


[BB '18]

51. Which one is correct for (A∪B)? *(Medium)*
ⓒ ⓐ {2} ⓑ {1, 3} ⓒ {1, 2, 3} ⓓ {1, 2, 3, 4}

52. Which one is correct for B′? *(Hard)*
ⓑ ⓐ {3, 4} ⓑ {1, 4}
ⓒ {1, 3} ⓓ {1, 2}

Answer to the questions No. 53 and 54 with the help of given information :

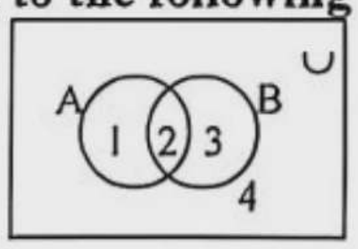


[CtgB '18]

53. Which one of the following is universal set? *(Medium)*
ⓐ A∪B∪C ⓑ A∩B∩C∩{8}
ⓓ ⓒ A∩B∩C∪{8} ⓓ A∪B∪C∪{8}

54. B′∩C′ = What? *(Hard)*
ⓐ ⓐ {3, 8} ⓑ {3, 6}
ⓒ {3, 4} ⓓ {2, 4}

Answer to the questions number 55 and 56 according to the following information :

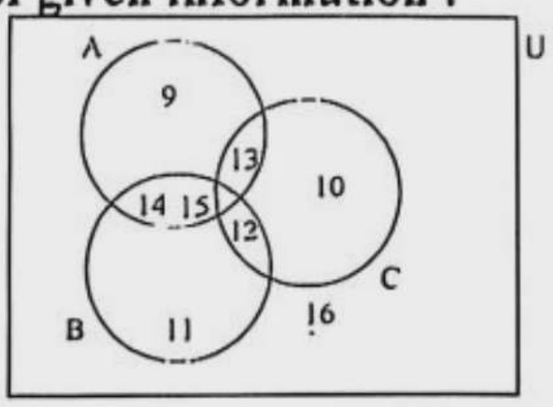


[CB '18]

55. How many numbers of subset of A ∪ B? *(Hard)*
ⓑ ⓐ 9 ⓑ 8 ⓒ 6 ⓓ 3

56. A^c ∪ B = ? *(Hard)*
ⓒ ⓐ {1, 2, 3} ⓑ {1, 3, 4}
ⓒ {2, 3, 4} ⓓ {3, 4}

Answer to the questions 57 and 58 with the help of given information :

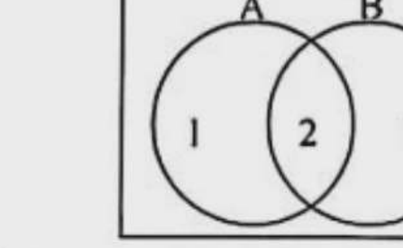


[BB '19]

57. A ∩ B = What? *(Medium)*
ⓐ ⓐ {14, 15} ⓑ {13, 14}
ⓐ ⓒ {12, 15} ⓓ {12, 14, 15}

58. Which one of the following is A^c set? *(Hard)*
ⓑ ⓐ {10, 13, 16} ⓑ {10, 11, 12, 16}
ⓑ ⓒ {9, 13, 16} ⓓ {9, 10, 13, 16}

Answer to the questions no. 59 and 60 based on the following information :



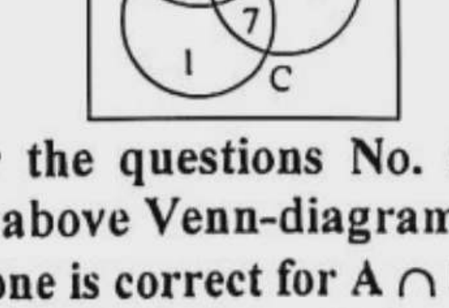
is a Venn diagram

[DjB '19]

59. The set (A ∩ B)′ = ? *(Hard)*
ⓒ ⓐ {3} ⓑ {1, 2}
ⓒ ⓒ {1, 2, 4} ⓓ {1, 2, 3, 4}

60. What is the value of the set (A′ ∪ B)? *(Hard)*
ⓓ ⓐ {2, 3} ⓑ {1, 3}
ⓓ ⓒ {1, 4} ⓓ {1, 3, 4}

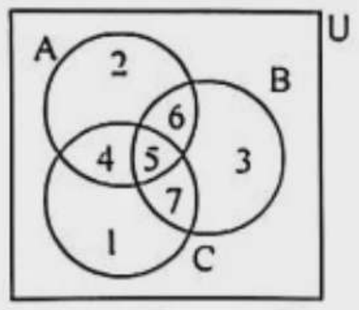
Answer questions 61 and 62 in the light of the Venn diagram, given below :



[CB' 15]

61. Which one of the following represents A∪B? *(Medium)*
ⓒ ⓐ {2} ⓑ {1, 3}
ⓒ ⓒ {1, 2, 3} ⓓ {1, 2, 3, 4}

62. B′ = What? *(Medium)*
ⓑ ⓐ {2} ⓑ {1, 4} ⓒ {2, 3} ⓓ {1, 2, 3}



Answer the questions No. 63 – 65 in the light of above Venn-diagram. *[SB' 15]*

63. Which one is correct for A ∩ B ∩ C? *(Medium)*
ⓑ ⓐ 4 ⓑ 5 ⓒ 6 ⓓ 7

64. B′ ∪ C′ = what? *(Hard)*
ⓒ ⓐ {1, 2, 4, 6} ⓑ {1, 2, 6, 7}
ⓒ ⓒ {1, 2, 3, 4, 6} ⓓ {1, 2, 3, 5, 7}

65. (A ∪ B) ∩ C = ? *(Medium)* *[Din.B' 15]*
ⓓ ⓐ U ⓑ A ⓒ B ⓓ {4, 5, 7}

Lesson-7.5 : Subset ▸ Textbook Page 124

66. Which is the sub-set of A = {a, b, c}? *(Easy)* *[JB' 15]*
ⓓ ⓐ {b, c, d} ⓑ {a, b, d} ⓒ {a, c, d} ⓓ { }

67. What is the number of subsets of the set {1, 2, 3, 4}? *(Easy)* *[CB' 15]*
ⓒ ⓐ 4 ⓑ 8 ⓒ 16 ⓓ 32

Mathematics

68. If C = {1, 2, 3}, then how many subset are there of P(C)? *(Easy)* *[RB' 15]*
c ⓐ 6 ⓑ 7 ⓒ 8 ⓓ 9

69. If A = {2, 4, 6, 7, 8} and B = {2, 4, 6}. How many numbers of subsets are there of the set A ∩ B? *(Easy)* *[JB '16]*
b ⓐ 3 ⓑ 8 ⓒ 16 ⓓ 32

70. How many subset are there of empty set? *(Easy)* *[JB '16]*
b ⓐ 0 ⓑ 1 ⓒ 2 ⓓ uncountable

71. If the number of subsets of the set A is 8 then which one is the number of elements of the set A? *(Easy)* *[RB '16]*
b ⓐ 2 ⓑ 3 ⓒ 4 ⓓ 8

72. What is the number of subsets of the set A = {2, 3, 4, 5}? *(Easy)* *[CtgB '18]*
a ⓐ 16 ⓑ 15 ⓒ 8 ⓓ 4

73. What is the number of sub-sets of the set {a, m, n, p, q}? *(Easy)* *[RB '18]*
d ⓐ 5 ⓑ 10 ⓒ 16 ⓓ 32

74. How many subsets are there in the set P = {a, b, c}? *(Easy)* *[SB '19]*
d ⓐ 3 ⓑ 6 ⓒ 7 ⓓ 8

75. What is the number of subsets of the set B = {a, b, c, d}? *(Easy)* *[BB '19]*
d ⓐ 4 ⓑ 8 ⓒ 15 ⓓ 16

76. How many subsets has the set p = {1, 2, 3, 4} *(Easy)* *[CtgB '19]*
d ⓐ 4 ⓑ 8 ⓒ 15 ⓓ 16

77. If P = {2, 4, 6, 7, 8}, Q = {2, 4, 6}. What is the number of subsets of P ∩ Q? *(Medium)*
b ⓐ 4 ⓑ 8 ⓒ 16 ⓓ 32

78. What is the subset of any set? *(Easy)* *[Ideal School & College, Dhaka]*
c ⓐ {0} ⓑ {∅} ⓒ ∅ ⓓ (∅)

79. If P = {x, y, z}, which one of the following is not subset of P? *(Medium)* *[Ideal School & College, Dhaka]*
b ⓐ {x, y} ⓑ {x, w, z} ⓒ {x, y, z} ⓓ ∅

80. Observe the following information : *[DB' 15]*
i. All sets are subsets of the universal set
ii. Empty set is the subset of all sets
iii. If A and B are mutually disjoint set then A ∩ B = ϕ
Which one of the following is true? *(Medium)*
d ⓐ i & ii ⓑ ii & iii ⓒ i & iii ⓓ i, ii & iii

81. If A = {p, q), B = {q, r} then —. *[SB '18]*
i. A ∩ B = {q}
ii. A ∪ B = {p, q, r}
iii. The number of subsets of A is 4
Which one of the following is correct? *(Medium)*
d ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

82. If A = {5, 6, 7} and B = {4, 6, 7}, then— *[JB '19]*
i. A ∩ B = {6, 7}
ii. A ∪ B = {4, 5, 6, 7}
iii. Number of subset of A is 6
Which one is correct? *(Medium)*
a ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

Answer to the questions No. 83 and 84 based on the following information :—
A = {x : x is a factor of 6},
B = {x : x is a prime No. < 7} *[JB '18]*

83. Which set is A∪B? *(Medium)*
d ⓐ {2, 3, 5} ⓑ {1, 2, 3, 6} ⓒ {2, 3} ⓓ {1, 2, 3, 4, 5, 6}

84. Which one is the subset of B? *(Easy)*
c ⓐ {1, 2} ⓑ {2, 6} ⓒ {2, 3} ⓓ {1, 3, 5}

Answer to the questions number 85 and 86 by using the following informations :
A = {x ∈ N : 1 ≤ x < 7 and x is prime number}
B = {3, 4, 5} and C = {x ∈ N : 6 < x ≤ 12 and x is even number}. *[RB '19]*

85. What is the number of subset of set C? *(Easy)*
c ⓐ 32 ⓑ 16 ⓒ 8 ⓓ 6

86. A ∩ B = What? *(Easy)*
b ⓐ {2, 3, 4, 5} ⓑ {3, 5} ⓒ {2} ⓓ {4}

Lesson-7.6 : Set operations ▸ Textbook Page 125

87. If A = {1, 3, 5} and B = {2, 4, 6}, then A ∩ B = ? *(Medium)* *[RB' 15]*
d ⓐ {3, 4, 6} ⓑ {4, 5} ⓒ {ϕ} ⓓ ϕ

88. If A = {2, 3, 5} and B = {2, 5, 6}, A ∩ B = what? *(Easy)* *[CB '16]*
b ⓐ {2, 3} ⓑ {2, 5} ⓒ {3, 5} ⓓ {2, 3, 5, 6}

89. If A = {3, 4}, B = { }, A ∪ B = what? *(Easy)* *[CB '16]*
a ⓐ {3, 4} ⓑ {4} ⓒ {3} ⓓ { }

90. If U = {1, 2, 3, 4} and A = {2, 4} the A^c = What? *(Medium)* *[CB '16]*
a ⓐ {1, 3} ⓑ (1, 2, 4} ⓒ {1, 3, 4} ⓓ {2, 4, 3}

91. Which one is set A ∩ B ∩ C = ? *(Easy)*
c ⓐ {2, 5} ⓑ {4} ⓒ {5} ⓓ {6}

92. If P = {x, y}, Q = {y, z} then P ∩ Q = ? *(Easy)*
c ⓐ {x, y, z} ⓑ {x} ⓒ {y} ⓓ { }

93. If U = {1, 2, 3, a}, A = {1, 2, 3} then A′ = ? *(Medium)* *[DjB '17]*

ⓐ {1, 2, 3, a} ⓑ {1, 2, 3}
ⓓ ⓒ {2, 3} ⓓ {a}

94. If P = {1, 2, 3}, Q = ϴ then P ∪ Q = ? *(Medium)* *[CtgB '17]*

ⓐ φ ⓑ 1, 2, 3
ⓒ ⓒ {1, 2, 3} ⓓ {1, 2, 3, φ}

95. If U = {a, b, c, d} and X = {b, d} X′ = ? *(Medium)* *[RB '17]*

ⓐ {a, b, c, d} ⓑ {a, b, c}
ⓒ ⓒ {a, c} ⓓ {b, d}

96. In a class, 70% of the students like Bangla, 57% of the students like English and 50% of the students like both. How many students dislike both the subjects? *(Hard)* *[MB '19]*

ⓑ ⓐ 20% ⓑ 23% ⓒ 77% ⓓ 177%

97. If A = {1 , 2}, B = {2, 3}, C = {1, 5, 6}, then C ∩ (A ∪ B) = ? *(Medium)* *[MB '19]*

ⓐ {1} ⓑ {1, 2, 3, 5, 6}
ⓐ ⓒ {1, 2, 3} ⓓ { }

98. Universal set U = {1, 4, 6, 7, 9}, A = {1, 6}, B = {4, 6, 7}, Which one is ($A^c \cap B$)? *(Hard)* *[DB '18]*

ⓒ ⓐ {1} ⓑ {6} ⓒ {4, 7} ⓓ {4, 7, 9}

99. A = {3, 5, 7, 9}, B = {x ∈ N : x is multiple of 3 and x ≤ 9}. What is the value of (A – B)? *(Hard)* *[CB '19]*

ⓐ ⓐ {5, 7} ⓑ {5, 9} ⓒ {7, 9} ⓓ {3, 9}

100. U = {1, 2, 3, 4}, A = {2, 3} and B = {3, 4}. What is the value of (A ∩ B)′? *(Hard)* *[JB '19]*

ⓐ ⓐ {1, 2, 4} ⓑ {1, 4} ⓒ {1, 2} ⓓ {1}

101. If U = {1, 2, 3, 4, 5, 6, 7}, A = {3, 5, 6, 7} what will be equal to A^c? *(Medium)* *[DB '19]*

ⓐ {1, 2, 4} ⓑ {2, 4, 5}
ⓐ ⓒ {2, 4, 6} ⓓ {3, 5, 6, 7}

102. If A and B are Disjoint sets— *[DjB '17]*

i. A ∩ B = ∅ ii. A – B = A
iii. A ∪ B = B

Which one is correct? *(Medium)*

ⓐ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

103. If A = {1, 2, 3} and B = {2, 3, 4} then —. *[DB '18]*

i. A∩B = {2, 3}
ii. A∪B = {1, 4}
iii. A⊂ (A∪B)

Which one of the following is correct? *(Medium)*

ⓑ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

104. If A = {3, 4, 5} and B = {4, 5, 7}, then— *(Easy)* *[DB '19]*

i. A ∪ B = {3, 4, 5, 7}
ii. A ∩ B = {4, 5}
iii. A ⊂ B

Which one is correct?

ⓐ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

105. Let us consider the relationship between any two sets A and B

i. $(A \cup B)^c = A^c \cap B^c$
ii. $(A \cap B)^c = A^c \cap B^c$
iii. $(A \cap B)^c = A^c \cup B^c$

Which are the De Morgan's formulae? *(Hard)*

ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i & iii

Answer to the questions No. 106 and 107 in the light of the following information :
U = {1, 2, 3, 4, 5, 6}, A = {2, 4}, B = {3, 4, 5} *[DjB '16]*

106. What is the number of subset of the set B? *(Easy)*

ⓐ ⓐ 8 ⓑ 7 ⓒ 6 ⓓ 3

107. (A ∪ B)′ = what? *(Medium)*

ⓐ {2, 3, 4, 5} ⓑ {2, 3, 4}
ⓒ ⓒ {1, 6} ⓓ {3, 4}

Answer the questions No. 108 and 109 with the help of given information :
U = {1, 2, 3, 4, 5, 6}, A = {1, 3, 5}, B = {2, 4, 6}.

108. A^c = ? *(Medium)* *[SB '17]*

ⓐ {1, 2} ⓑ {2, 4}
ⓒ ⓒ {2, 4, 6} ⓓ {1, 2, 3, 4, 5, 6}

109. A ∩ B = ? *(Easy)* *[SB '17]*

ⓐ ϕ ⓑ {1, 2}
ⓐ ⓒ {5, 6} ⓓ {1, 2, 3, 4, 5, 6}

Answer the questions No. 110 and 111 according to the following information :
U = {1, 2, 3, 4, 5}, A = {1, 2, 5} and B = {2, 3, 5}. *[DjB '18]*

110. Which one of the following is the subset of A? *(Medium)*

ⓐ {2, 5} ⓑ {1, 4}
ⓐ ⓒ {2, 3, 5} ⓓ {1, 2, 4}

111. Which one of the following is the set A′ ∩ B′? *(Hard)*

ⓐ ⓐ {4} ⓑ {1, 4} ⓒ {3, 4} ⓓ {3}

Answer the questions no. 112 and 113 :
U = {1, 2, 3, 4, 5, 6}, A = {1, 3, 4, 5}, B = {2, 4, 6}, then

112. B′ = ? *(Medium)* *[MB '19]*

ⓐ {4} ⓑ {1, 3, 5}
ⓑ ⓒ {1, 3, 4, 5} ⓓ {1, 2, 3, 4, 5, 6}

113. (A ∩ B)′ = ? *(Hard)* *[MB '19]*

ⓐ {1, 2, 3, 5, 6} ⓑ {4}
ⓐ ⓒ {1, 2, 3, 4, 5, 6} ⓓ ∅

Answer the question 114 and 115 based on the following information :
P = {x : x is a factor of 4 and 1 < x < 8}
Q = {x : x is even number and 1 < x < 6} *[CtgB '19]*

114. The set P = ? *(Medium)*

ⓓ ⓐ {2, 4} ⓑ {1, 4} ⓒ {1, 2} ⓓ {1, 2, 4}

115. Which one of the following is Q\P? *(Medium)*

ⓐ ⓐ { } ⓑ {∅} ⓒ {4} ⓓ {6}

■ **Answer to the questions no. 116 and 117 with the help of given information :**
U = {a, b, c, p, q, r, s}
A = {b, c, q}, B = {a, p, r} *[SB '19]*

116. A ∩ B = What? *(Easy)*

ⓒ ⓐ {φ} ⓑ {0} ⓒ { } ⓓ 0

117. A^C = What? *(Medium)*

ⓐ {a, p, r} ⓑ {b, c, q}

ⓓ ⓒ {a, c, q, r} ⓓ {a, p, r, s}

■ **Read attentively the following statement. Now answer the questions 118 – 120 :**
U is the universal set and U = {all the triangles}, A = {all acute-angled triangles}, B = {all obtuse-angled triangles} and C = {all right-angled triangles}.

118. U ∩ A = — ? *(Medium)*

ⓐ ⓐ A ⓑ B ⓒ C ⓓ A & B

119. U ∩ B = — ? *(Medium)*

ⓑ ⓐ A ⓑ B ⓒ C ⓓ B & C

120. U ∩ C = — ? *(Medium)*

ⓒ ⓐ A ⓑ B ⓒ C ⓓ A & C

■ **Read attentively the following statement. Now answer the questions 121 – 124 :**
U = the set of natural number less than 15, A = the set of all the perfect square integers less than 15, B = the set of all the perfect cube integers less than 15 and C = the set of all even integers less than 15.

121. Then U – A is ... ? *(Medium)*

ⓐ {1, 4, 9} ⓑ {1, 8}
ⓒ {2, 4, 6, 8, 10, 12, 14}
ⓓ ⓓ {2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14}

122. Then U – B is — ? *(Medium)*

ⓐ {1, 4, 9} ⓑ {1, 8}
ⓒ {2, 4, 6, 8, 10, 12, 14}
ⓓ ⓓ {2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14}

123. Then U – C is — ? *(Medium)*

ⓐ {2, 3, 5, 6, 7, 8, 10, —} ⓑ {1, 8}
ⓓ ⓒ {1, 4, 9, ...} ⓓ {1, 3, 5, 7, 9, 11, 13}

124. Then A – B is — ? *(Medium)*

ⓐ {1, 4, 9} ⓑ {1, 8}
ⓑ ⓑ {4, 9} ⓓ {1, 3, 5, 7, 9, 11, 13}

Short Q/A — Designed as per topic

Lesson-7.1 & 7.2 : Set and Methods of expressing set

▸ Textbook Page 121 & 122

Question 1. What is meant by set?
Solution: A well-defined collection of objects of the real or imaginative world is called a set. For example, (a, b, c, d) is a set. Each object of a set is called an element of the set. The set is generally denoted by capital letters of the English alphabet.

Question 2. How many methods are there to express a set and what are they?
Solution: There are two methods of expressing set. They are: (1) Tabular method; (2) Set builder method.

Question 3. What is the tabular method of expressing set?
Solution: The method in which all the elements of a set are mentioned particularly is called the tabular method. If there is more than one element, the elements are separated by commas (,). For example: A = {1, 2, 3}.

Question 4. Explain the set builder method with examples.
Solution: In the set builder method, conditions are given to determine the elements of sets without mentioning them particularly. For example, if the set of natural even numbers which are smaller than 8 is A, then A = {x: x natural even number and x < 8}.

Question 5. Write the set of prime numbers from 1 to 12.
Solution: Let the set of prime numbers from 1 to 12 be A.
Now, the prime numbers from 1 to 12 are: 2, 3, 5, 7, 11.
So, A = {2, 3, 5, 7, 11}.
The required set is {2, 3, 5, 7, 11}.

Question 6. Write the set of the first six odd numbers.
Solution: Let the set of the first six odd numbers be C.
The odd numbers are: 1, 3, 5, 7, 9, 11, 13, 15,.....
So, the first six odd numbers = 1, 3, 5, 7, 9, 11.
∴ C = {1, 3, 5, 7, 9, 11}.
The required set is {1, 3, 5, 7, 9, 11}.

Question 7. Determine the set of factors of 24.
Solution: Let the set of factors of 24 be A.
Here, 24 = 1 × 24
= 2 × 12 = 3 × 8 = 4 × 6.
So, the factors of 24 are 1, 2, 3, 4, 6, 8, 12, 24.
The required set is A = {1, 2, 3, 4, 6, 8, 12, 24}.

Question 8. Express the set B = {3, 6, 9, 12, 15} in the set builder method.
Solution: The elements of set B are 3, 6, 9, 12, 15.
Here, each element is a natural number, a multiple of 3, and not greater than 15.
So, B = {x ∈ N: x is a multiple of 3 and x ≤ 15}.

Question 9. Express the set P = {x: x is the prime factor of 42} in the tabular method.
Solution: The set P is the set of prime factors of 42.
Here, $42 = 1 \times 42$
$= 2 \times 21 = 3 \times 14 = 6 \times 7$.
So, the factors of 42 are 1, 2, 3, 6, 7, 14, 21, 42, among which the prime factors are: 2, 3, 7.
The required set is P = {2, 3, 7}.

Question 10. Express the set {x: x is an integer and $x^2 < 15$} in the tabular method.
Solution: Let A = {x: x is an integer and $x^2 < 15$}.
The given set is the set of integers whose square is less than 15.
Now, if x = 0, then $x^2 = (0)^2 = 0 < 15$.
If $x = \pm 1$, then $x^2 = (\pm 1)^2 = 1 < 15$.
If $x = \pm 2$, then $x^2 = (\pm 2)^2 = 4 < 15$.
If $x = \pm 3$, then $x^2 = (\pm 3)^2 = 9 < 15$.
If $x = \pm 4$, then $x^2 = (\pm 4)^2 = 16 > 15$.
So, the required set is A = {-3, -2, -1, 0, 1, 2, 3}.

Question 11. Express the set {3, 5, 7, 11, 13} in the set builder method.
Solution: Let B = {3, 5, 7, 11, 13}.
The given set is the set of prime numbers that are greater than 2 and less than 17.
So, the required set is A = {x: x is a prime number and $2 < x < 17$}.

Question 12. Express the set C = {x: x is a prime number and $x < 25$} in the tabular method.
Solution: Given that, C = {x: x is a prime number and $x < 25$}.
The given set is the set of prime numbers less than 25.
The prime numbers less than 25 are: 2, 3, 5, 7, 11, 13, 17, 19, 23.
So, C = {2, 3, 5, 7, 11, 13, 17, 19, 23}.
The required set is C = {2, 3, 5, 7, 11, 13, 17, 19, 23}.

Question 13. Express the set Q = {-3, -2, -1, 0, 1} in the set builder method.
Solution: Given that, Q = {-3, -2, -1, 0, 1}.
Here, Q is a set of integers. Its elements are not less than -3 and not greater than 1.
So, in the set builder method, $Q = \{x \in Z: -3 \leq x \leq 1\}$.

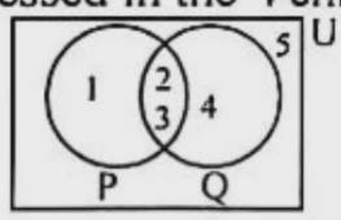
Lesson 7.3 : Classification of Sets
▸ Textbook Page 123

Question 14. What are finite and infinite sets? Give examples.
Solution: Finite Set: The set whose number of elements can be determined by counting is called a finite set. For example: A = {a, b, c, d} is a finite set.
Infinite Set: The set whose elements cannot be determined by counting is called an infinite set. For example: N = {1, 2, 3, 4, 5.....} is an infinite set.

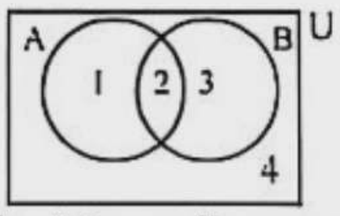
Question 15. Show that {x ∈ N: x is an even number and $4 < x < 6$} is an empty set.
Solution: Let A = {x ∈ N: x is an even number and $4 < x < 6$}.
The given set consists of even numbers that are greater than 4 and less than 6. But there is no natural number that is greater than 4 and less than 6. So, A = {}.
Therefore, {x ∈ N: x is an even number and $4 < x < 6$} is an empty set.

Lesson-7.4 & 7.5 : Venn-diagram and Subset
▸ Textbook Page 123 & 124

Question 16. If U = {1, 2, 3, 4, 5}, P = {1, 2, 3}, and Q = {2, 3, 4}, express these sets in a Venn diagram.
Solution: Given that, U = {1, 2, 3, 4, 5}, P = {1, 2, 3}, and Q = {2, 3, 4}.
The sets are expressed in the Venn diagram below:

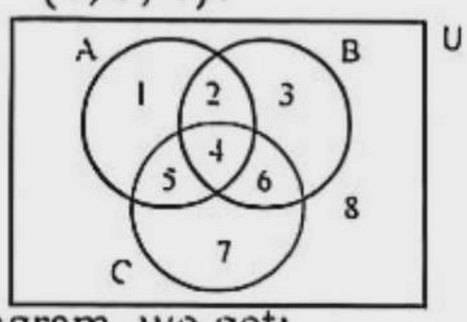


Question 17. Determine (A ∩ B)' from the Venn diagram.



Solution: From the Venn diagram, we get:
U = {1, 2, 3, 4}.
A = {1, 2} and B = {2, 3}.
∴ A ∩ B = {1, 2} ∩ {2, 3} = {2}.
∴ (A ∩ B)' = U - (A ∩ B) = {1, 2, 3, 4} - {2} = {1, 3, 4}.
The required set is (A ∩ B)' = {1, 3, 4}.

Question 18. Determine A ∩ B ∩ C from the Venn diagram.



Solution: From the Venn diagram, we get:
A = {1, 2, 4, 5}, B = {2, 3, 4, 6}, and C = {4, 5, 6, 7}.
∴ A ∩ B = {1, 2, 4, 5} ∩ {2, 3, 4, 6} = {2, 4}.
∴ A ∩ B ∩ C = {2, 4} ∩ {4, 5, 6, 7} = {4}.
The required set is A ∩ B ∩ C = {4}.

Question 19. A = {a, b, c, d} is a set. Find its subsets.
Solution: Given that, A = {a, b, c, d}.
The subsets of set A are: { }, {a}, {b}, {c}, {d}, {a, b}, {a, c}, {a, d}, {b, c}, {b, d}, {c, d}, {a, b, c}, {a, b, d}, {a, c, d}, {b, c, d}, {a, b, c, d}.

Question 20. Find the subsets of the set D = {a, b, 2}.
Solution: Given that, D = {a, b, 2}.
The subsets of D are: { }, {a}, {b}, {2}, {a, b}, {a, 2}, {b, 2}, {a, b, 2}.

Question 21. What is meant by the complement of a set?

Solution: If U is a universal set and A is a subset of U, then the set of all elements that are excluded from set A is called the complement set of A. The complement set of A is denoted by A' or A^c.

Question 22. If U = {1, 2, 3, 4, 5, 6} and A = {1, 3, 5}, then what is A^c?

Solution: Given that, U = {1, 2, 3, 4, 5, 6} and A = {1, 3, 5}.

A^c = The complement set of A

= The set of elements excluding the elements of A

= {2, 4, 6}.

The required set is A^c = {2, 4, 6}.

Question 23. If A = {1, 2, 3, 4, 5, 6}, B = {1, 3, 5}, and C = {3, 4, 5, 6}, then determine the universal set with respect to sets B and C.

Solution: Given that, A = {1, 2, 3, 4, 5, 6}, B = {1, 3, 5}, and C = {3, 4, 5, 6}.

Here, the elements of set B are 1, 3, 5, and the elements of set C are 3, 4, 5, 6, which are all included in set A.

Therefore, with respect to sets B and C, the universal set is A.

Lesson-7.6 : Set operations ▸ Textbook Page 125

Question 24. If P = {x: x is a factor of 8} and Q = {x: x is a factor of 12}, then find P ∪ Q.

Solution: Given that, P = {x: x is a factor of 8}

= {1, 2, 4, 8}

And Q = {x: x is a factor of 12}

= {1, 2, 3, 4, 6, 12}.

∴ P ∪ Q = {1, 2, 4, 8} ∪ {1, 2, 3, 4, 6, 12} = {1, 2, 3, 4, 6, 8, 12}.

The required set is P ∪ Q = {1, 2, 3, 4, 6, 8, 12}.

Question 25. If A = {1, 3, 4, 5} and B = {2, 3, 4, 6}, then find A ∩ B.

Solution: Given that, A = {1, 3, 4, 5} and B = {2, 3, 4, 6}.

∴ A ∩ B = {1, 3, 4, 5} ∩ {2, 3, 4, 6} = {3, 4}.

The required set is A ∩ B = {3, 4}.

Question 26. If U = {1, 2, 3, 4, 5, 6, 7}, A = {1, 3, 5}, and B = {2, 4, 6}, then A' ∩ B' = what?

Solution: Given that, U = {1, 2, 3, 4, 5, 6, 7}, A = {1, 3, 5}, and B = {2, 4, 6}.

Now, A' = The complement set of A = The set of elements excluding the elements of A = {2, 4, 6, 7}.

And B' = The complement set of B = The set of elements excluding the elements of B = {1, 3, 5, 7}.

∴ A' ∩ B' = {2, 4, 6, 7} ∩ {1, 3, 5, 7} = {7}.

The required set is A' ∩ B' = {7}.

Question 27. If R = {x: x is an even natural number and 2 < x < 8} and S = {x: x is a factor of 15}, then show that sets R and S are disjoint sets.

Solution: Given that, R = {x: x is an even natural number and 2 < x < 8}

= {4, 6}

And S = {x: x is a factor of 15}

= {1, 3, 5, 15}.

∴ R ∩ S = {4, 6} ∩ {1, 3, 5, 15} = { }.

Therefore, sets R and S are disjoint sets.

Question 28. If A = {2, 3, 4}, B = {3, a}, and C = {a, b}, then find (A ∪ B) ∩ C.

Solution: Given that, A = {2, 3, 4}, B = {3, a}, and C = {a, b}.

∴ A ∪ B = {2, 3, 4} ∪ {3, a} = {2, 3, 4, a}.

∴ (A ∪ B) ∩ C = {2, 3, 4, a} ∩ {a, b} = {a}.

The required set is (A ∪ B) ∩ C = {a}.

Question 29. If A = {3, 4, 5, a} and B = {4, 5}, then what is A ∪ B?

Solution: Given that, A = {3, 4, 5, a} and B = {4, 5}.

∴ A ∪ B = {3, 4, 5, a} ∪ {4, 5} = {3, 4, 5, a}.

The required set is A ∪ B = {3, 4, 5, a}.

Question 30. If A = {3, 5, 7, 9} and B = {x ∈ N: x is a multiple of 3 and x ≤ 9}, then what is the value of A ∩ B?

Solution: Given that, A = {3, 5, 7, 9}

And B = {x ∈ N: x is a multiple of 3 and x ≤ 9} = {3, 6, 9}.

∴ A ∩ B = {3, 5, 7, 9} ∩ {3, 6, 9} = {3, 9}.

The required set is A ∩ B = {3, 9}.

Question 31. If U = {2, 4, 6, 8, 10} and P = {2, 4, 10}, then what is P ∪ P'?

Solution: Given that, U = {2, 4, 6, 8, 10} and P = {2, 4, 10}.

∴ P' = The complement set of P

= The set of elements excluding the elements of P

= {6, 8}.

∴ P ∪ P' = {2, 4, 10} ∪ {6, 8} = {2, 4, 6, 8, 10}.

The required set is P ∪ P' = {2, 4, 6, 8, 10}.

Question 32. If U = {1, 2, 3, 4, 5, 6}, A = {1, 3, 5}, and B = {2, 4, 6}, then find A' ∪ B'.

Solution: Given that, U = {1, 2, 3, 4, 5, 6}, A = {1, 3, 5}, and B = {2, 4, 6}.

Here, A' = The complement set of A

= The set of elements excluding the elements of A

= {2, 4, 6}.

B' = The complement set of B

= The set of elements excluding the elements of B

= {1, 3, 5}.

∴ A' ∪ B' = {2, 4, 6} ∪ {1, 3, 5} = {1, 2, 3, 4, 5, 6}.

The required set is A' ∪ B' = {1, 2, 3, 4, 5, 6}.

Question 33. If P = {2, 3, 4, 5} and Q = {3, 4, 5, 6}, then find the subsets of P ∩ Q.

Solution: Given that, P = {2, 3, 4, 5} and Q = {3, 4, 5, 6}.

∴ P ∩ Q = {2, 3, 4, 5} ∩ {3, 4, 5, 6} = {3, 4, 5}.

The subsets of P ∩ Q are: {3}, {4}, {5}, {3, 4}, {3, 5}, {4, 5}, {3, 4, 5}.

Question 34. If A = {1, 3, 5}, B = {2, 4, 6}, and C = {2, 3, 4, 5}, then find A ∩ (B ∪ C).

Solution: Given that, A = {1, 3, 5}, B = {2, 4, 6}, and C = {2, 3, 4, 5}.

B ∪ C = {2, 4, 6} ∪ {2, 3, 4, 5} = {2, 3, 4, 5, 6}.

A ∩ (B ∪ C) = A ∩ (B ∪ C) = {1, 3, 5} ∩ {2, 3, 4, 5, 6} = {3, 5}.

The required set is A ∩ (B ∪ C) = {3, 5}.

Question 35. If P and Q are the sets of all factors of 12 and 18 respectively, then find P ∩ Q.

Solution: Here, 12 = 1 x 12 = 2 x 6 = 3 x 4.

So, P = {1, 2, 3, 4, 6, 12}.

Again, 18 = 1 x 18 = 2 x 9 = 3 x 6.

So, Q = {1, 2, 3, 6, 9, 18}.

∴ P ∩ Q = {1, 2, 3, 4, 6, 12} ∩ {1, 2, 3, 6, 9, 18} = {1, 2, 3, 6}.

The required set is P ∩ Q = {1, 2, 3, 6}.

Creative Q/A — Designed as per learning outcomes

Mathematics

Ques. 01 Universal set U = {1, 2, 3, 4, 5, 6, 7, 8}

A = {x : x is odd number and 3 < x < 9}

B = {3, 4, 5}

C = {x : 4 < x < 7}

a. Express A in tabular method. 2

b. Prove that, (A ∪ B)′ = A′ ∩ B′. 4

c. Determine the subsets of (A ∪ C) and what is the number of subses? 4

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Solution to Question No. 01 :

a Given, A = {x : x is odd number and 3 < x < 9}

The set of odd numbers greater than 3 and 9.

The set of odd numbers greater than 3 and 9 are 5, 7

∴ A = {5, 7}.

b Given, U = {1, 2, 3, 4, 5, 6, 7, 8} and B = {3, 4, 5}

From 'a' we get, A = {5, 7}

A ∪ B = {5, 7} ∪ {3, 4, 5}

= {3, 4, 5, 7}

∴ (A ∪ B)′ = The complement of set (A ∪ B)

= The set of the elements excluding the elements of (A ∪ B)

= {1, 2, 6, 8}

Again, A′ = The complement of set A

= The set of the elements excluding the elements of A

= {1, 2, 3, 4, 6, 8}

B′ = The complement of set B

= The set of the elements excluding the elements of B

= {1, 2, 6, 7, 8}

∴ A′ ∩ B′ = {1, 2, 3, 4, 6, 8} ∩ {1, 2, 6, 7, 8}

= {1, 2, 6, 8}

So, (A ∪ B)′ = A′ ∩ B′. **({Proved)**

c From 'a' we get A = {5, 7}

Given, C = {x : 4 < x < 7}

The set of natural numbers greater than 4 and less than 7.

∴ C = {5, 6}

∴ A ∪ C = {5, 7} ∪ {5, 6} = {5, 6, 7}

The subsets of (A ∪ C) are :

∅, {5}, {6}, {7}, {5, 6}, {5, 7}, {6, 7}, {5, 6, 7}

Here, the number of subsets of (A ∪ C) = 8.

Ques. 02 "A, B and C are three sets where A = {x ∈ N : x < 7 and x is an odd number}, B = {x ∈ N : x < 7 and x is a even number} and C = {x ∈ N : x ≤ 3 and x is a prime number}."

a. Now express the sets A and B in tabular method. 2

b. Find P(A ∩ C) and show that the number of its' elements agree with 2n 4

c. Prove that, (A ∩ C) × B = (A × B) ∩ (C × B). 4

Solution to Question No. 02 :

a Given that, A = {x ∈ N : x < 7 and x is an odd number}.

B = {x ∈ N : x < 7 and x is a even number} and

Since x ∈ N under the condition that x < 7.

So, according to the given conditions we get,

A = {x ∈ N : x < 7 and x is an odd number} = {1, 3, 5} and

B = {x ∈ N : x < 7 and x is a even number} = {2, 4, 6}

b Given that, C = {x ∈ N : x ≤ 3 and x is a prime number}.

Since x ∈ N, then x = 1, 2, 3, 4, 5, 6, 7, ... ∝.

But according to the given conditions we get,

C = {x ∈ N : x ≤ 3 and x is a prime number} = {2, 3}.

Also from `a' we get, A = {1, 3, 5}

∴ A ∩ C = {3}

∴ P(A ∩ C) = {{3}, ∅}

Here the number of elements of A ∩ C = 1

Again the number of elements of P(A ∩ C) = 2 = 2^1.

Hence, the number of elements of P(A ∩ C) agree with 2^n **(Showed)**

c From 'a' and 'b' we get, A = {1, 3, 5},
B = {2, 4, 6} and C = {2, 3}.
∴ A ∩ C = {3}.
∴ (A ∩ C) × B = {3} × {2, 4, 6}
= {(3, 2), (3, 4), (3, 6)} ... ... (i)
Again, A × B = {1, 3, 5} × {2, 4, 6}
= {(1, 2), (1, 4), (1, 6), (3, 2), (3, 4), (3, 6), (5, 2), (5, 4), (5, 6)}
and C × B = {2, 3} × {2, 4, 6}
= {(2, 2), (2, 4), (2, 6), (3, 2), (3, 4), (3, 6)}
∴ (A × B) ∩ (C × B) = {(3, 2), (3, 4), (3, 6)} ... (ii)
From equations (i) and (ii) we get,
(A ∩ C) × B = (A × B) ∩ (C × B). **(Proved)**

Ques. 03 Read attentively the following statement :
"A = {x ∈ N : x < 10 and x is even} and B = {the set of natural numbers which on dividing 105 and 147 leaves 35 as remainder in each case}."
a. Now determine the set A. 2
b. Determine the set B. 4
c. Find A × A and P(A ∩ B). 4

Solution to Question No. 03 :

a Given that, {x ∈ N : x < 10 and x is even}.
Since x ∈ N, x < 10 and x is even, so the numbers which satisfy these conditions are 2, 4, 6, 8. So the required set,
A = {x ∈ N : x < 10 and x is even} = {2, 4, 6, 8}.

b Since in every case on dividing leaves 35 as remainder, so the required natural numbers will be the common factors of (105 – 35) = 70 and (147 – 35) = 112 and they are greater than 35. Now we get,

70 = 1 × 70	112 = 1 × 112
= 2 × 35	= 2 × 56
= 5 × 14	= 4 × 28
= 7 × 10	= 7 × 16
	= 8 × 14

From the above, it is obvious that, there is no common factor of 70 and 112 which are greater than 35. Hence the required set, B = ∅.

c From 'a' and 'b' we get, A = {2, 4, 6, 8} and B = ∅.
∴ A × A = {2, 4, 6, 8} × {2, 4, 6, 8}
= {(2, 2), (2, 4), (2, 6), (2, 8), (4, 2), (4, 4), (4, 6), (4, 8), (6, 2), (6, 4), (6, 6), (6, 8), (8, 2), (8, 4), (8, 6), (8, 8)}
Again, A ∩ B = {2, 4, 6, 8} ∩ ∅ = ∅
∴ P(A ∩ B) = ∅.

Ques. 04 U, A, B and C are four sets. Where, U = {x ∈ N : x ≤ 7}
A = {x ∈ N : x < 7 and x is odd number
B = {x ∈ N : x < 7 and x is even number
C = {x ∈ N : x ≤ 5 and x is prime number
a. Determine U by tabular method. 2
b. Determine A ∩ (B ∪ C). 4
c. Show that (A ∪ C)′ = A′ ∩ C′ 4

● *Chattogram Board 2015*

Solution to Question No. 04 :

a U = {x ∈ N : x ≤ 7} and x is odd number
Set of natural numbers less than or equal 7.
∴ U = {1, 2, 3, 4, 5, 6, 7}
Required set, U = {1, 2, 3, 4, 5, 6, 7}.

b A = {x ∈ N : x < 7 and x is odd number}
Set of natural odd numbers less than or equal 7.
∴ A = {1, 3, 5}
B = {x ∈ N : x < 7 and x is even number}
Set of natural even numbers less than or equal 7.
∴ B = {2, 4, 6}
C = {x ∈ N : x ≤ 5 and x is prime number}
Set of natural prime numbers less than or equal 5.
∴ C = {2, 3, 5}
Here, B ∪ C = {2, 4, 6} ∪ {2, 3, 5}
= {2, 3, 4, 5, 6}
∴ A ∩ (B ∪ C) = {1, 3, 5} ∩ {2, 3, 4, 5, 6} = {3, 5}
Required set : A ∩ (B ∪ C) = {3, 5}

c From 'a' we get, U = {1, 2, 3, 4, 5, 6, 7}
From 'b' we get, A = {1, 3, 5}, C = {2, 3, 5}
A ∪ C = {1, 3, 5} ∪ {2, 3, 5}
= {1, 2, 3, 5}
A′ = Complement of set A
= The set of the elements excluding the elements of A = {2, 4, 6, 7}
C′ = Complement of set C
= The set of the elements excluding the elements of C = {1, 4, 6, 7}
∴ (A ∪ C)′ = Complement of set (A ∪ C)
= The set of the elements excluding the elements of (A ∪ C)
= {4, 6, 7}
A′ ∩ C′ = {2, 4, 6, 7} ∩ {1, 4, 6, 7}
= {4, 6, 7}
∴ (A ∪ C)′ = A′ ∩ C′ (Showed)

Solutions to Textual Activities Along with textual reference

Activity 01 ▸ Textbook Page 122

1. **Wirte a set of SAARC countries.**
2. **Write a set of prime numbers from 1 to 20.**
3. **Write a set of any four numbers between 300 and 400 which are divisible by 3.**

Solution :

1. A set of SAARC countries,
   S = {Bangladesh, India, Pakistan, Sri Lank, Nepal, Bhutan, Maldives, Afganistan}.
2. A set of prime numbers from 1 to 20,
   S = {2, 3, 5, 7, 11, 13, 17, 19}.
3. A set of any four numbers between 300 and 400, S = {303, 354, 363, 381}.

Activity 02 ▸ Textbook Page 123

1. **Express the set A = {3, 6, 9, 12, 15, 18} in set builder method.**
2. **Express the set B = {x : x is a factor of 24} in tabular method.**

Solution :

1. Set, A = {3, 6, 9, 12, 15, 18}.
   = {3 × 1, 3 × 2, 3 × 3, 3 × 4, 3 × 5, 3 × 6}.
   = {x ∈ N : x is multiple of 3 and 3 ≤ x ≤ 18}.
2. Set, B = {x : x is a factor of 24}.
   = {1, 2, 3, 4, 6, 8, 12, 24}, Since factors of 24 are 1, 2, 3, 4, 6, 8, 12 and 24.

Activity 03 ▸ Textbook Page 125

If A = {a, b, c}, find the subsets of A and find the complementary set of any three of them.

Solution : Here, A = {a, b, c}

∴ sub sets of A : {a}, {b}, {c}, {ab}, {ac}, {bc}, {abc}, ∅.

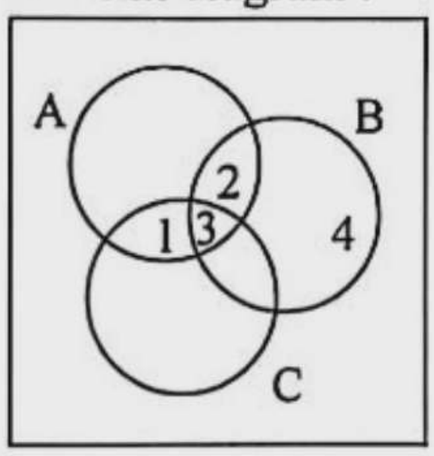
The complementary set of any three subsets :

Now, complementary set of {a}
= {{b}, {c}, {ab}, {bc}, {ca}, {abc}, ∅}.
Complementary set of {ab}
= {{a}, {b}, {c}, {bc}, {ca}, {abc}, ∅}.
Complemantary set of {abc}
= {{a} , {b}, {c}, {ab}, {bc, {ca}, ∅}.

Activity 04 ▸ Textbook Page 126

U = {1, 2, 3, 4}, A = {1, 2, 3}, B = {2, 3, 4}, C = {1, 3} show the sets U ∩ A, C ∩ A and B ∪ C in Venn diagram.

Solution : Set ∪ and subsets A, B and C of ∪ are shown below in a Venn diagram :



Venn diagram

Activity 05 ▸ Textbook Page 128

If P = {2, 3, 4, 5, 6, 7} and Q = {4, 6, 8}

1. **Find P ∪ Q and P ∩ Q.**
2. **Express P ∪ Q and P ∩ Q in set builder form.**

Solution :

Here, P = {2, 3, 4, 5, 6, 7} and Q = {4, 6, 8}.

1. Now, P ∪ Q = {2, 3, 4, 5, 6, 7, 8}.
   P ∩ Q = {4, 6}
2. P ∪ Q in set builder form :
   P ∪ Q = {x : x ∈ N and 2 ≤ x ≤ 8}.
   And P ∩ Q in set builder form :
   P ∩ Q = {x : x is multiple of 2 and 4 ≤ x ≤ 6}.

Super Suggestions

Super Suggestions with 100% preparatory questions selected by the Master Trainer Panel

Dear learners, important multiple choice, short and creative questions of this chapter selected by Master Trainer Panel for Half-Yearly and Annual Exams are presented below. Learn the answers to the mentioned questions well to ensure 100% preparation.

Question Pattern	7★	5★	3★
○ MCQs with Answers	Learn each MCQs in this chapter thoroughly.		
○ Short Q/A	1, 3, 9, 13, 19, 22, 28	2, 8, 15, 24, 29, 33	6, 11, 17, 20, 26, 31, 34
○ Creative Q/A	1, 4	3	2

Assessment & Evaluation

A question bank presented in the form of a class test to assess the preparation

Class Test Time : 3 hours

Mathematics

Class : Eight

Full marks : 100

Multiple Choice Questions (Each question carries 1 mark) $1 \times 30 = 30$

*[N.B. : Answer all the questions. Each question carries **one** mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Question Type Examination.]*

1. George Cantor was a / an —?
ⓐ German ⓑ Japanese ⓒ Austrian ⓓ American

2. R = {x : x odd number and $1 \le x \le 6$}, which one is correct for R?
ⓐ {2, 4, 6} ⓑ {1, 3, 5} ⓒ {1, 3, 6} ⓓ {2, 3, 5}

3. Which one is the tabular form of A = {x : x is even number and $4 < x < 6$}?
ⓐ {4, 5, 6} ⓑ {4, 6} ⓒ {5} ⓓ { }

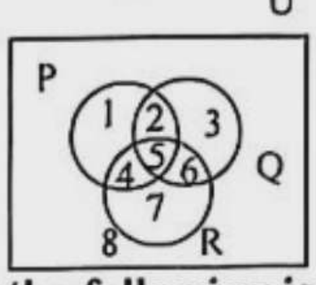
4. Which one is the tabular form of A = {x : x is a prime factor of 6}?
ⓐ {2, 3} ⓑ {1, 3, 6}
ⓒ {1, 2, 3, 6} ⓓ {2, 3, 6}

5. Read attentively the following statements :
i. The empty set has an element
ii. The empty set is the improper subset of every set
iii. {0} is an empty set
Which one of the following is correct?
ⓐ i & ii ⓑ ii ⓒ i & iii ⓓ i, ii & iii

6. Which one of the following is a unit set?
ⓐ {0} ⓑ {1, 1, 1}
ⓒ {2, 2, 2, 2} ⓓ a, b & c

7. Which one is the roaster representation of the set {x : x is a prime factor of 20}?
ⓐ {1, 2, 4, 5} ⓑ {1, 2, 4}
ⓒ {2, 4, 5} ⓓ {2, 5}

Answer to the questions no. 49 and 50 with the help of the following Venn-diagram :



8. Which one of the following is R^C set?
ⓐ {3, 6, 7, 8} ⓑ {1, 4, 7, 8}
ⓒ {1, 2, 3, 8} ⓓ {1, 2, 3}

9. Which one is the $P \cap Q \cap R$ set?
ⓐ {2} ⓑ {5} ⓒ {4} ⓓ {6}

10. Which is the sub-set of A = {a, b, c}?
ⓐ {b, c, d} ⓑ {a, b, d} ⓒ {a, c, d} ⓓ { }

11. What is the number of subsets of the set A = {2, 3, 4, 5}?
ⓐ 16 ⓑ 15 ⓒ 8 ⓓ 4

12. If P = {2, 4, 6, 7, 8}, Q = {2, 4, 6}. What is the number of subsets of $P \cap Q$?
ⓐ 4 ⓑ 8 ⓒ 16 ⓓ 32

13. If P = {x, y, z}, which one of the following is not subset of P?
ⓐ {x, y} ⓑ {x, w, z} ⓒ {x, y, z} ⓓ ∅

14. If A and B are Disjoint sets—
i. $A \cap B = \varnothing$
ii. $A - B = A$
iii. $A \cup B = B$
Which one is correct?
ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

15. If A = {2, 4, 6, 7, 8} and B = {2, 4, 6}. How many numbers of subsets are there of the set $A \cap B$?
ⓐ 3 ⓑ 8 ⓒ 16 ⓓ 32

Answer to the questions no. 116 and 117 with the help of given information :
U = {a, b, c, p, q, r, s}
A = {b, c, q}, B = {a, p, r}

16. $A \cap B$ = What?
ⓐ {φ} ⓑ {0} ⓒ { } ⓓ 0

17. A^C = What?
ⓐ {a, p, r} ⓑ {b, c, q} ⓒ {a, c, q, r} ⓓ {a, p, r, s}

18. If U = {1, 2, 3, a}, A = {1, 2, 3} then A′ = ?
ⓐ {1, 2, 3, a} ⓑ {1, 2, 3}
ⓒ {2, 3} ⓓ {a}

19. If A = {2, 3, 5} and B = {2, 5, 6}, $A \cap B$ = what?
ⓐ {2, 3} ⓑ {2, 5} ⓒ {3, 5} ⓓ {2, 3, 5, 6}

20. If U = {1, 2, 3, 4} and A = {2, 4} the A^C = What?
ⓐ {1, 3} ⓑ (1, 2, 4}
ⓒ {1, 3, 4} ⓓ {2, 4, 3}

21. Which one is an infinite set?
ⓐ {The numbers of students of your school}
ⓑ {All the integers}
ⓒ {All the English Alphabets}
ⓓ {All the Bengali Alphabets}

22. If A and B are two sets and $A \cup B = \varnothing$, then sets are —.
ⓐ Empty set ⓑ Disjoined set
ⓒ Universal set ⓓ Complement of a set

23. Which set is of Set Builder or Rule Method?
ⓐ {x : x is an integer} ⓑ {2, b, a cup}
ⓒ {2, 4, 6} ⓓ {n, n + 1, n + 2}

24. If A = {x ∈ N : x is prime number and $x \le 11$}. How many elements are there in set A?
ⓐ 4 ⓑ 5 ⓒ 6 ⓓ 7

25. What is the Roster method of the set {x : x ∈ N and x < 6}?
ⓐ {x : x ∈ N and x < 6} ⓑ {1, 2, 3, 4, 5}
ⓒ {1, 3, 5} ⓓ {2, 4, 6}

26. If A = {x : x is a multiple of 4 and x < 16}, A—
ⓐ {4, 8, 12} ⓑ {4, 8, 12, 16}
ⓒ {2, 4, 6} ⓓ {4, 6, 8, 10}

27. Which one of the following is not an empty set?
ⓐ {0} ⓑ { } ⓒ ∅ ⓓ All of them

28. If the number of subsets of the set A is 8 then which one is the number of elements of the set A?
ⓐ 2 ⓑ 3 ⓒ 4 ⓓ 8

29. What is the number of subsets of the set B = {a, b, c, d}?
ⓐ 4 ⓑ 8 ⓒ 15 ⓓ 16

30. If P = {x, y}, Q = {y, z} then $P \cap Q$ = ?
ⓐ {x, y, z} ⓑ {x}
ⓒ {y} ⓓ { }

Short-Answer Question (Each question carries 2 marks)

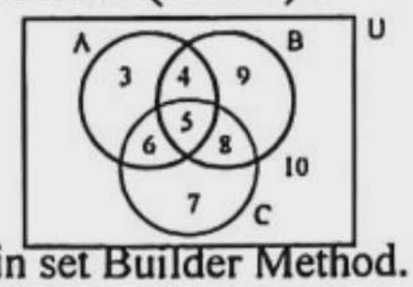
Answer any 10 of the following questions : 2 × 10 = 20

1. What is meant by set?
2. What is the tabular method of expressing set?
3. Write the set of prime numbers from 1 to 12.
4. Determine the set of factors of 24.
5. Express the set B = {3, 6, 9, 12, 15} in the set builder method.
6. Express the set {x: x is an integer and $x^2 < 15$} in the tabular method.
7. Express the set C = {x: x is a prime number and x < 25} in the tabular method.
8. What are finite and infinite sets? Give examples.
9. Show that {x ∈ N: x is an even number and 4 < x < 6} is an empty set.
10. Determine $(A \cap B)'$ from the Venn diagram.
11. A = {a, b, c, d} is a set. Find its subsets.
12. If U = {1, 2, 3, 4, 5, 6} and A = {1, 3, 5}, then what is A^c?
13. If P = {x: x is a factor of 8} and Q = {x: x is a factor of 12}, then find P ∪ Q.
14. If A = {2, 3, 4}, B = {3, a}, and C = {a, b}, then find (A ∪ B) ∩ C.
15. If U = {1, 2, 3, 4, 5, 6}, A = {1, 3, 5}, and B = {2, 4, 6}, then find A' ∪ B'.

Creative Question (Each question carries 10 marks)

Answer any 5 of the following questions : 10 × 5 = 50

Mathematics

1. In a hostel, 65% of the students like fish, 55% of the students like meat and 40% of the students like both dishes.
   a. Express the stated information by Venn diagram with short explanation. 2
   b. Find out the percentage of students who dislike both dishes. 4
   c. Find out the intersection set of the sets of factors of those students, who like only one dish. 4
2. Universal set U = {1, 2, 3, 4, 5, 6, 7} and its three subsets are–
   A = {x ∈ ℕ : x < 7 and x is an odd number}
   B = {x ∈ ℕ : x < 7 and x is an even number}
   C = {x ∈ ℕ : x ≤ 3 and x is a prime number}
   a. Express sets A and B in set Builder form. 2
   b. Find out $(A \cup B) \cap (A \cup C)$. 4
   c. Write the subsets of $(B \cup C)'$. 4
3. 

   a. Write set A in set Builder Method. 2
   b. Express A, B, C in Tabular Method and find A ∩ C and A ∪ B. 4
   c. Prove that $(A \cup B)' = A' \cap B'$. 4
4. The sets of the integers by which the numbers 346 and 556 are divided with remainder 31 in each case are A and B.
   a. Express set A in set builders form. 2
   b. Find A ∩ B. 4
   c. Show A∩B in Venn-diagram and write the subsets of A∩B. 4
5. U, A, B and C are four sets. Where, U = {x ∈ N : x ≤ 7}
   A = {x ∈ N : x < 7 and x is odd number
   B = {x ∈ N : x < 7 and x is even number
   C = {x ∈ N : x ≤ 5 and x is prime number
   a. Determine U by tabular method. 2
   b. Determine A ∩ (B ∪ C). 4
   c. Show that $(A \cup C)' = A' \cap C'$ 4
6. Read attentively the following statement :
   "A = {x ∈ N : x < 10 and x is even} and B = {the set of natural numbers which on dividing 105 and 147 leaves 35 as remainder in each case}."
   a. Now determine the set A. 2
   b. Determine the set B. 4
   c. Find A × A and P(A ∩ B). 4
7. "A, B and C are three sets where A = {x ∈ N : x < 7 and x is an odd number}, B = {x ∈ N : x < 7 and x is a even number} and C = {x ∈ N : x ≤ 3 and x is a prime number}."
   a. Now express the sets A and B in tabular method. 2
   b. Find P(A ∩ C) and show that the number of its' elements agree with 2n 4
   c. Prove that, (A ∩ C) × B = (A × B) ∩ (C × B). 4
8. Universal set U = {1, 2, 3, 4, 5, 6, 7, 8}
   A = {x : x is odd number and 3 < x < 9}
   B = {3, 4, 5}
   C = {x : 4 < x < 7}
   a. Express A in tabular method. 2
   b. Prove that, $(A \cup B)' = A' \cap B'$. 4
   c. Determine the subsets of (A ∪ C) and what is the number of subses? 4

Answer Sheet ▸ Multiple Choice Questions

1	ⓐ	2	ⓑ	3	ⓓ	4	ⓐ	5	ⓑ	6	ⓐ	7	ⓓ	8	ⓒ	9	ⓑ	10	ⓓ	11	ⓐ	12	ⓑ	13	ⓑ	14	ⓐ	15	ⓑ
16	ⓒ	17	ⓓ	18	ⓓ	19	ⓑ	20	ⓐ	21	ⓑ	22	ⓐ	23	ⓐ	24	ⓑ	25	ⓑ	26	ⓐ	27	ⓐ	28	ⓑ	29	ⓓ	30	ⓒ

Solving Reference ▸ Short-Answer Questions

1 ▸ See Page 239; Ques. 01
2 ▸ See Page 239; Ques. 03
3 ▸ See Page 239; Ques. 05
4 ▸ See Page 239; Ques. 07
5 ▸ See Page 239; Ques. 08
6 ▸ See Page 240; Ques. 10
7 ▸ See Page 240; Ques. 12
8 ▸ See Page 240; Ques. 14
9 ▸ See Page 240; Ques. 15
10 ▸ See Page 240; Ques. 17
11 ▸ See Page 240; Ques. 19
12 ▸ See Page 241; Ques. 22
13 ▸ See Page 241; Ques. 24
14 ▸ See Page 241; Ques. 28
15 ▸ See Page 241; Ques. 32

Solving Reference ▸ Creative Questions

1 ▸ See Page 231; Ques. 22
2 ▸ See Page 232; Ques. 24
3 ▸ See Page 232; Ques. 23
4 ▸ See Page 233; Ques. 25
5 ▸ See Page 243; Ques. 04
6 ▸ See Page 243; Ques. 03
7 ▸ See Page 242; Ques. 02
8 ▸ See Page 242; Ques. 01