CLASS 8 ACADEMIC PROGRAM-2020

MATH

Lecture : M-17

Chapter 7 : Set

M-15 → unity

M-16 → Mesurement

Mixed Problem

উদ্ভাস
একাডেমিক এন্ড এডমিশন কেয়ার

POLL

A reservoir contain 8000 liter water . The length of the reservoir 2.56 meter and breadth 1.25 meter .

What is the area of the floor of the reservoir ?

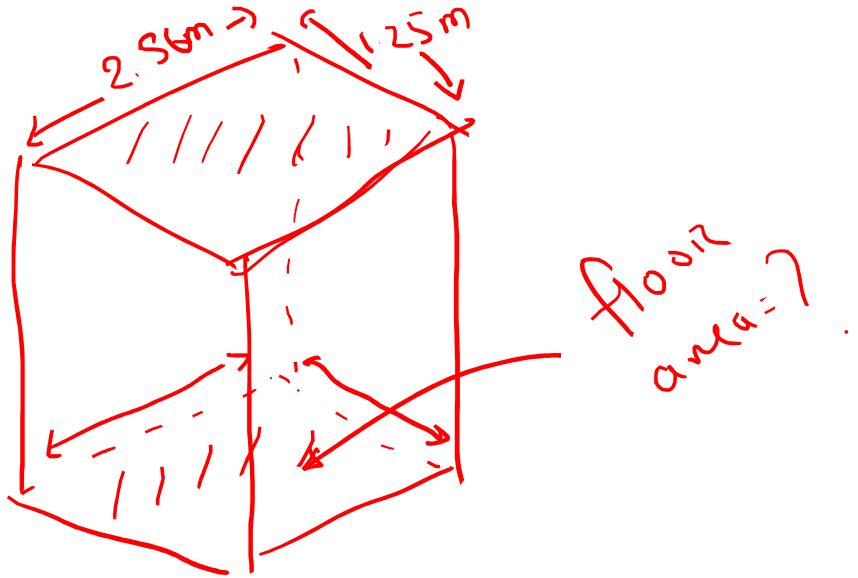
A)3.2

B)2.3

C)3.81

D)1.6

8000L



Area = (2.56 × 1.25) m^2

= 3.2 m^2

POLL

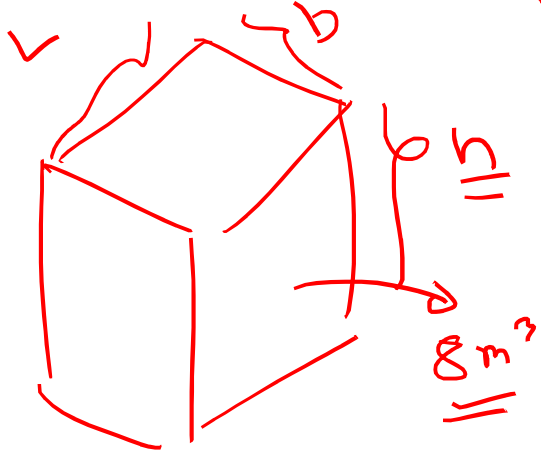
What is the depth of the reservoir ?

A)250 cm

B)400 cm

C)520 cm

D)600 cm



1m = 100cm

2.5m = 250cm

m cm

V = 8000L

1000L = 1m³

∴ 8000L = 8m³

l × b × h = 8

2.56 × 1.25 × h = 8

h = 8 / (2.56 × 1.25) = 2.5m

WHAT WILL WE LEARN FROM CHAPTER-7?

- Defination of set
- Diff sets
- Ven diagram
- Union / intersection of sets

→ Related maths

SET

A well-defined collection of objects of real or imaginative world is called set. Examples of sets of well-defined objects are: the first five English alphabet, the countries of Asia, natural numbers etc. It is to be determined particularly which object is included in the considered set and which is not. There is no repetition and order of the objects in set. Each object of a set is called an element set. Set is generally denoted by capital letters of English alphabet as A, B, C, …. X, Y, Zand the elements are expressed in small letters as a, b, c, …… x, y, z.

The set is expressed by the symbol { } which includes the elements of the set. For example : the set of a, b, c, is {a, b, c}. The set of the Tisha, the Meghna, the Jamuna and the Brahmaputra rivers is {Tisha, Megna, Jamuna, Brahmaputra}. The set of the first two even natural numbers is {2, 4}; the set of the factors of 6 is {1, 2, 3, 6} etc. Let x be an element of set A. Mathematically, it is expressed by $x \in A$. $x \in A$ is read x is an the element of the set A, (x belongs to A). For example, if B={m, n}, then $m \in B$ and $n \in B$.

2, 4, 6, 8, 10, 12 - - -

{2, 4}

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7.2 Methods of expressing set

Set can be expressed mainly in two methods : (1) Tabular Method (2) Set Builder Method.

(1) Tabular Method : In this method, all the elements of a set are mentioned particularly by enclosing them in second brackets { } and if there is more than one element, the elements are separated by using comma (,). For example:
$A = \{1, 2, 3\}, B = (x, y, z\}, C = \{100\}, D = \{Rose, Tube - rose\}, E = \{Rahim, Sumon, Suvro, Changpai\}$ etc.

(2) Set Builder Method : In this 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 10 is A, A={x: x natural even number, $x < 10$}. Here":" means "such that" or in brief "such". In set builder method, one unknown quantity or variable is placed before ":" sign inside { } and then required conditions are applied to the variable. For example, let us express the set {3, 6, 9, 12} in set builder method. Observe that 3, 6, 9, 12 are natural numbers which are divisible by 3 and which are not greater than 12. In this case, if the element of the set is considered to be the variable y. the more than 12 $(y \leq 12)$.

Therefore, in set builder method, it will be {y : y is a natural number, multiple of 3 and $y \leq 12$}

Example: Express the set $P = \{4, 8, 12, 16, 20\}$ in set builder method.

$P = \{x : x$ is a natural number and multiples of 4, $x \leq 20\}$

$4 \times 1 = 4$

$4 \times 2 = 8$

$4 \times 3 = 12$

$4 \times 4 = 16$

$4 \times 5 = 20$

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Example: Express the set $Q = \{x : x \text{ are all the factors of } 42\}$ in Tabular method.

↳ set builder method

$1 \times 42 = 42$
$2 \times 21 = 42$
$3 \times 14 = 42$
$6 \times 7 = 42$

$Q = \{1, 2, 3, 6, 7, 14, 21, 42\}$

POLL

Express the set A={X:X is even and $2 \leq x \leq 8$} in tabular method .

A) {2,4,6}

B) {2,4,6,8} Ans

C) {4,6,8}

D) {2,8}

{2, 4, 6, 8}

POLL

What will be the set builder method expressive form of A={2,3,5,7} ?

A)A={x:x, prime number and x<11}

B)A={x:x, prime number and x>3}

C)A={x:x, prime number and x≤11}

D)A={x:x, prime number and x>7}

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7.3 Classification of Sets

Finite Set :

If the number of elements of a set can be determined by counting, it is called a finite set. For example: $A = \{a, b, c, d\}, B = \{5,10, 15 \ldots\ldots, 100\}$ etc. are finite sets. Here, there are 4 elements in set A and 20 elements in set B.

Infinite set :

The set whose number of elements can bot be determined by counting is called an infinite set. One example of infinite set is, a set of natural numbers, $N = \{1, 2, 3, 4 \ldots \ldots\}$. Here, the number of elements of set N is innumberable, which can not be determined. In this chapter, only the finite sets will be discussed.

Empty Set:

The set which has no element is called an empty set. An empty set is expressed by the symbol ϕ.

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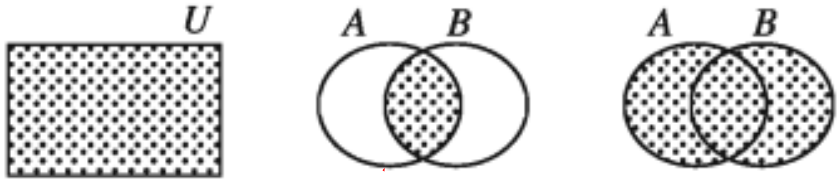
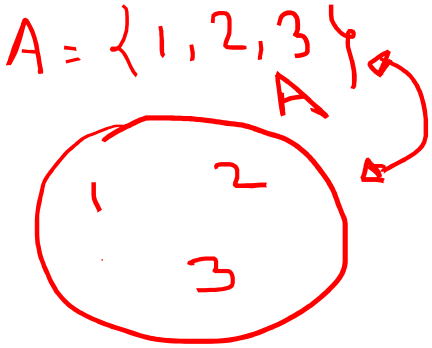
7.4 Venn-Diagram

John Venn (1834-1883) introduced the method of expressing sets by diagrams. These diagrams are named after Venn and called Venn diagram. Generally, in Venn-diagrams are named after Venn and called Venn diagram. Generally, in Venn-diagram, rectangular and circular regions are used. Venn-diagrams are shown below.





By using Venn-diagrams, the properties of sets and operations on sets can be easily determined.

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7.5 Subset

Let, $A = \{a, b\}$ is a set. With the elements of the set A, we can form the sets $\{a, b\}, \{a\}, \{b\}$. The sets $\{a, b\}, \{a\}, \{b\}$ are the subsets of A.

As many sets are formed from the elements of a set, each of those sets is a subset of the given set.

For means, $Q \subseteq P$ because the elements 3, 5, of set Q are also included in set P. Subsets are initiated by using '$\subseteq$' symbol.

Example: Write the subsets of the set $A = \{1, 2, 3\}$.

Solution: The subsets of the set A are shown below: $\{1, 2, 3\}, \{1, 2\}, \{2, 3\}, \{1\}, \{2\}, \{3\}, \emptyset$.

Shortcut $n \rightarrow$ Given element

Subset numbers 2^n

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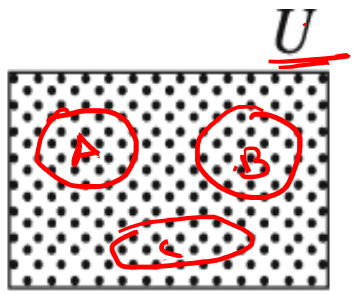
Universal Set:

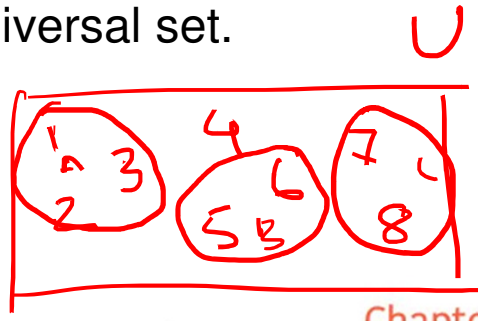
If all the sets in the discussion are the subsets of a particular set, that particular set is called the universal set. A universal set is expressed by the symbol U. For example, in a school, the set of all the students is a universal set and the set of the students of class eight is the subset of the universal set.



All sets are subsets of the universal set in given context.

Example:

If $A = \{1, 2, 3, 4, 5, 6\}, B = \{1, 3, 5\}, C = \{3, 4, 5, 6\}$ determine the universal set.



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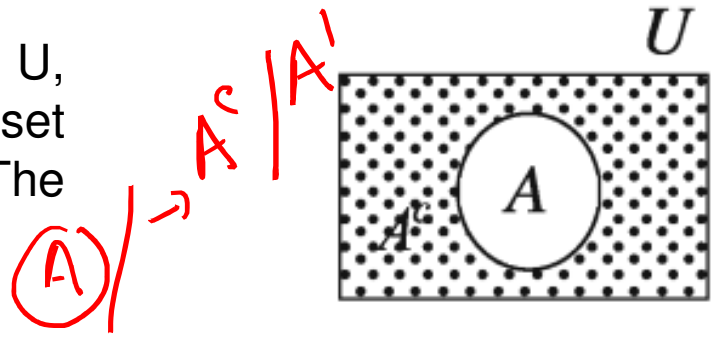
Complement of a Set :

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

$U - A = A^c / A'$



Suppose, in class eight, out of 60 students, 9 students are absent. I the set of all the students of class eight is considered as a universal set, the set of (60-9) or 51 present students will be complement set of the set of those 9 absent students.

Example: If $U = \{1, 2, 3, 4, 5, 6\}$ and $A = \{2, 4, 6\}$, determine A^c.

$B^c = U - B$

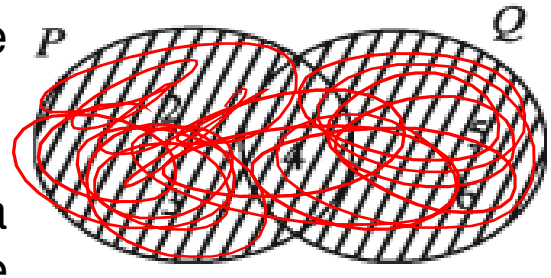
$A^c = U - A = \{1, 2, 3, 4, 5, 6\} - \{2, 4, 6\}$

$= \{1, 3, 5\} = A'$

7.6 Set operations

Union of sets

Let P={2, 3, 4} and {Q=4, 5, 6} be two sets. Here, all the elements included in sets P and Q are 2, 3, 4, 5, 6. The set formed by all the elements of sets P and Q is {2, 3, 4, 5, 6}.



$P \cup Q$

The set formed by all the elements of two or more sets is called a union set. Let, A and B be two sets. The set formed by all the elements of the sets A and B is expressed as $A \cup B$ and read as 'A union B'.

Example:

C={Razzaq, Sakib, Alok} and D={Alok, Mushifq}, then find $C \cup D$.

$C \cup D$ = {Razzaq, Sakib, Alok, Mushifq}

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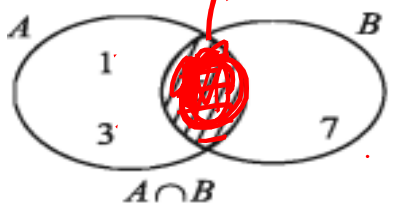
Intersection of sets

Let, Rina can read and rite both Bangla and Arabic and Joya can read and write both Bangla and Hindi. The set of the languages that Rina can read and write is {Bangla, Arabic}, the set of the languages that Joya can read and write is {Bangla, Hindi}. We observe, that the language that Rina and Joya can read and write is Bangla and the set of it is {Bangla}. Here, the set {Bangla} is the intersection of the two sets.

The set formed by the common elements of two or more sets is called intersection of sets.

Let, A and B are two sets. The intersection of the sets A and B is denoted by $A \cap B$ and read 'A intersection B'. In the set builder notation the set is $A \cap B = \{x : x \in A \text{ and } x \in B\}$

Example: If A={1, 3, 5} and B={5, 7}, find $A \cap B$.



Solution: Given that, A = {1, 3, 5} and B = {5, 7}

$\therefore \boldsymbol{A \cap B} = \{\mathbf{1, 3, 5}\} \cap \{\mathbf{5, 7}\} = \{\mathbf{5}\}$

Example: If $P = \{x : x \text{ is the multiple of } 2 \text{ and } x \leq 12\}$, find $P \cap Q$.

POLL

U={1,2,3,4,5,6 }

A= {2,4} and B={3,4,5}

What ~~are~~ the subsets of the set B ?

is the number

A)3

B)6

C)7

D)8

n=3

2^n

2^3

8

POLL

$(A \cup B)' = ?$

A) {2,3,4,5}
B) {2,3,4}
C) {1,6}
D) {3,4}

$U = \{1,2,3,4,5,6\}$

$A = \{2,4\}$

$B = \{3,4,5\}$

$(A \cup B)' = U - (A \cup B)$

$= \{1,2,3,4,5,6\} - \{2,3,4,5\}$

$= \{1,6\}$ Ans

$A \cup B$

$= \{2,4\} \cup \{3,4,5\}$

$= \{2,3,4,5\}$

if

POLL

If P={1,2,3} ,Q=ϕ,

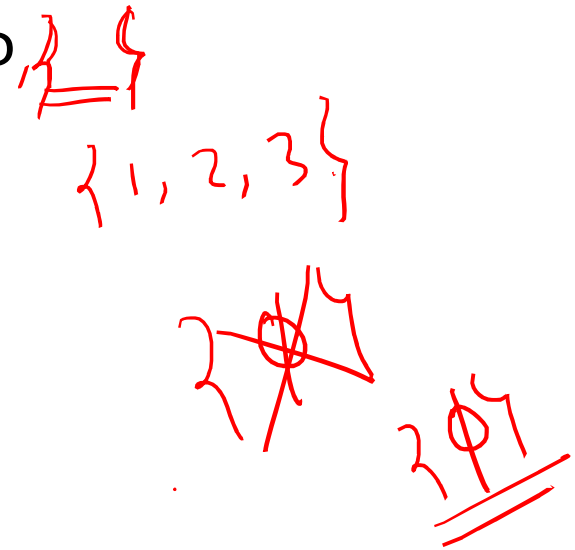
PUQ= ?

A) ϕ

B)1,2,3

C){1,2,3}

D){1,2,3,ϕ}



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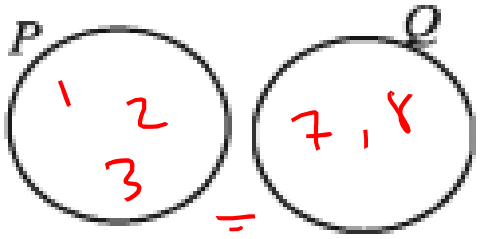
Disjoint Set

Let, there are two villages side-by in Bangladesh. The farmers of one village grow paddy and jute and the farmers of the other village grow potato and vegetables in their fields. If we consider two sets of the cultivated crops, we get {paddy, jute} and {potato, vegetables}.



There is no common crop between the two sets. That means, the farmers of two villages do not grow the same crops. Here, the two sets are disjoint sets to each other

If there is no common element between the elements of two sets, the sets care called disjoint sets.

Let, A and B are two sets, A and B will be disjoint sets to each other if $A \cap B = \phi$

If the intersection of two sets is an empty set, they are disjoint to each other.

Example: $A = \{x : x \text{ is odd natural number and } 1 < x < 7\}$ and $B = \{x : x \text{ is a factor } 8\}$, then show that the sets A and B are disjoint.

$A = \{1, 2, 3, 4\}$ $B = \{7, 8\}$

$A \cap B = \phi, \{\ \}$

Example: If A and B are sets of all factors of 42 and 70 respectively, find $A \cap B$.

Practice

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

a) $A \cup B$

b) $B \cup C$

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

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

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

$(B \cap C)$

$B \cap C$

$= \{2, a\} \cap \{a, b\}$

$= \{a\}$

$A \cup (B \cup C)$

$= \{1, 2, 3\} \cup \{a\} = \{1, 2, 3, a\}$ → Ans

CHAPTER-7

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

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

(b) Find out the number of students who dislike both dishes.

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

না বুঝে মুখস্থ করার অভ্যাস প্রতিভাকে ধ্বংস করে