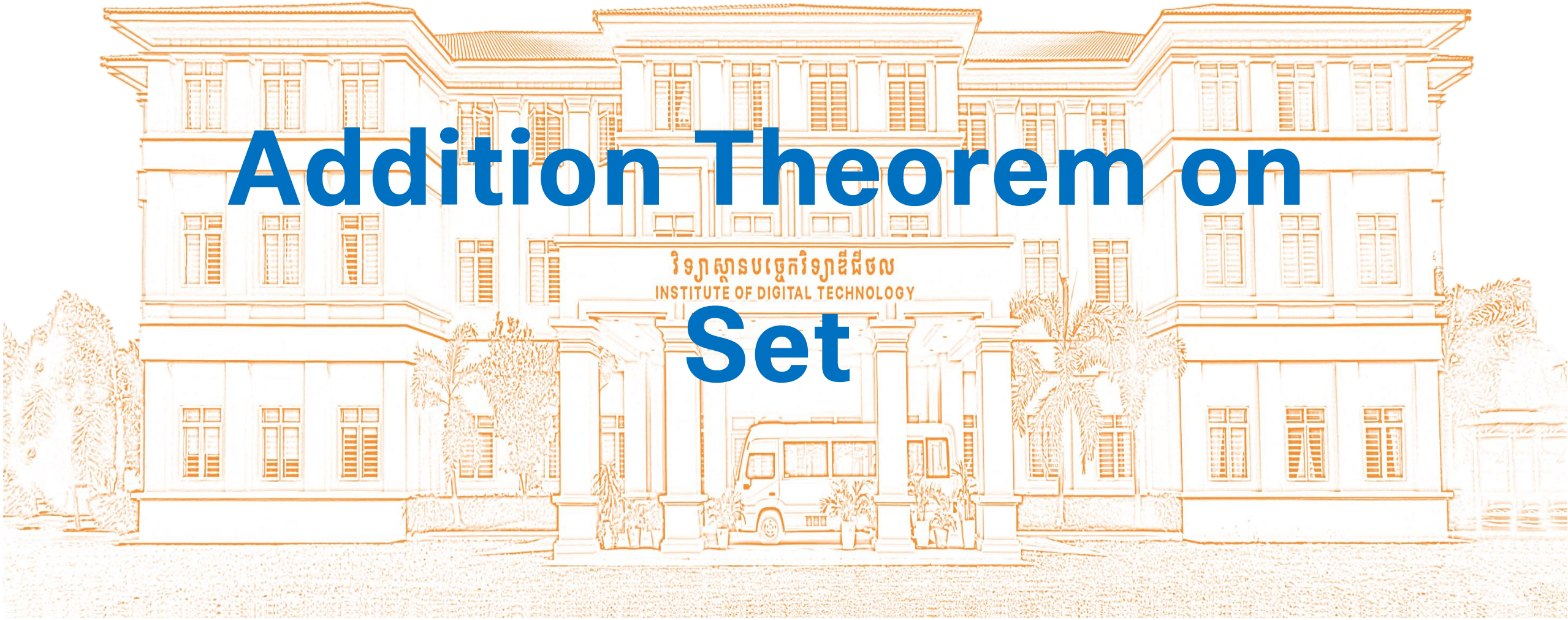
CADT

IDT វិទ្យាស្ថានបច្ចេកវិទ្យាឌីជីថល
Institute of Digital Technology

Department of Foundation Year



Addition Theorem on Set

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Addition Theorem on Sets

To understand, how to solve Venn diagram word problems with 3 circles, we have to know the following basic stuff.

$\cup$ ----> union (or)

$\cap$ ----> intersection (and)

Addition Theorem on Sets

Theorem 1 :

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

Theorem 2 :

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$$

Addition Theorem on Sets

Explanation :

Let us come to know about the following terms in details.

$n(A \cup B)$ = Total number of elements related to any of the two events A & B.

$n(A \cup B \cup C)$ = Total number of elements related to any of the three events A, B & C.

$n(A)$ = Total number of elements related to A

$n(B)$ = Total number of elements related to B

$n(C)$ = Total number of elements related to C

Addition Theorem on Sets

For three events A, B & C, we have

$n(A) - [n(A \cap B) + n(A \cap C) - n(A \cap B \cap C)]$: Total number of elements related to A only

$n(B) - [n(A \cap B) + n(B \cap C) - n(A \cap B \cap C)]$: Total number of elements related to B only

$n(C) - [n(B \cap C) + n(A \cap C) - n(A \cap B \cap C)]$: Total number of elements related to C only

$n(A \cap B)$: Total number of elements related to both A & B

$n(A \cap B) - n(A \cap B \cap C)$: Total number of elements related to both (A & B) only

Addition Theorem on Sets

$n(B \cap C)$: Total number of elements related to both B & C

$n(B \cap C) - n(A \cap B \cap C)$: Total number of elements related to both (B & C) only

$n(A \cap C)$: Total number of elements related to both A & C

$n(A \cap C) - n(A \cap B \cap C)$: Total number of elements related to both (A & C) only

Addition Theorem on Sets

For two events A & B, we have

n(A) - n(AnB) :Total number of elements related to A only

n(B) - n(AnB) :Total number of elements related to B only

Addition Theorem on Sets

1.In a survey of university students, 64 had taken mathematics course, 94 had taken chemistry course, 58 had taken physics course, 28 had taken mathematics and physics, 26 had taken mathematics and chemistry, 22 had taken chemistry and physics course, and 14 had taken all the three courses. Find how many had taken one course only.

Addition Theorem on Sets

Step 1 :

Let M, C, P represent sets of students who had taken mathematics, chemistry and physics respectively.

Step 2 :From the given information, we have

n(M) = 64, n(C) = 94, n(P) = 58, n(MnP) = 28, n(MnC) = 26, n(CnP) = 22 , n(MnCnP) = 14

Step 3 :From the basic stuff, we have

Number of students who had taken only Math

$$= n(M) - [n(MnP) + n(MnC) - n(MnCnP)]$$

$$= 64 - [28 + 26 - 14]$$

$$= 64 - 40$$

$$= 24$$

Addition Theorem on Sets

Step 4 :Number of students who had taken only Chemistry :

$$= n(C) - [n(MnC) + n(CnP) - n(MnCnP)]$$

$$= 94 - [26+22-14] = 94 - 34 = 60$$

Step 5 :Number of students who had taken only Physics :

$$= n(P) - [n(MnP) + n(CnP) - n(MnCnP)] = 58 - [28 + 22 - 14] = 58 - 36 = 22$$

Step 6 :Total number of students who had taken only one course :

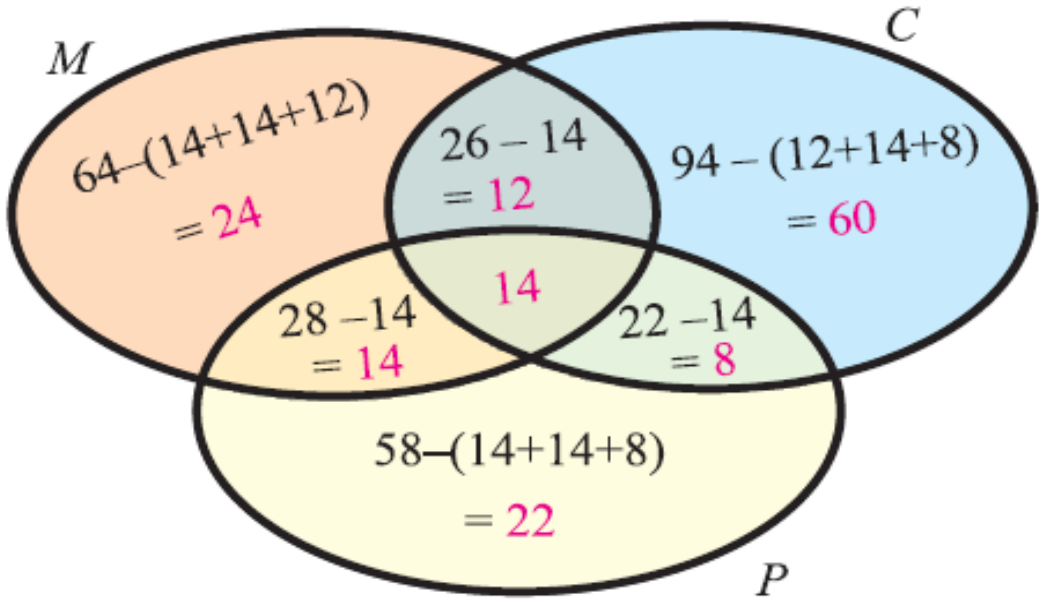
$$= 24 + 60 + 22 = 106$$

Hence, the total number of students who had taken only one course is 106.

Addition Theorem on Sets

Alternative Method (Using venn diagram) :

Step 1 :Venn diagram related to the information given in the question:



Addition Theorem on Sets

Step 2 :From the venn diagram above, we have

Number of students who had taken only math = 24

Number of students who had taken only chemistry = 60

Number of students who had taken only physics = 22

Step 3 :Total Number of students who had taken only one course :

= 24 + 60 + 22

= 106

Hence, the total number of students who had taken only one course is 106.

VENN's Diagram

In a class of 50 students

23 students study Math

25 students study AP

20 students study CCNA

7 students study Math and AP

9 students study AP and CCNA

11 students study Math and CCNA

4 students study neither of these

How many students study Math AP and CCNA

Addition Theorem on Sets

2.In a group of students, 65 play foot ball, 45 play hockey, 42 play cricket, 20 play foot ball and hockey, 25 play foot ball and cricket, 15 play hockey and cricket and 8 play all the three games. Find the total number of students in the group (Assume that each student in the group plays at least one game).

Addition Theorem on Sets

3. In a college, 60 students enrolled in chemistry,40 in physics, 30 in biology, 15 in chemistry and physics,10 in physics and biology, 5 in biology and chemistry. No one enrolled in all the three. Find how many are enrolled in at least one of the subjects.

Addition Theorem on Sets

4. In a town 85% of the people speak Tamil, 40% speak English and 20% speak Hindi. Also 32% speak Tamil and English, 13% speak Tamil and Hindi and 10% speak English and Hindi, find the percentage of people who can speak all the three languages.

Addition Theorem on Sets

5. An advertising agency finds that, of its 170 clients, 115 use Television, 110 use Radio and 130 use Magazines. Also 85 use Television and Magazines, 75 use Television and Radio, 95 use Radio and Magazines, 70 use all the three. Draw Venn diagram to represent these data. Find

(i) how many use only Radio?

(ii) how many use only Television?

(iii) how many use Television and Magazine but not radio?

Addition Theorem on Sets

In a class of 60 students, 40 students like math, 36 like science, 24 like both the subjects.

Find the number of students who like

(i) Math only, (ii) Science only

(iii) Either Math or Science

(iv) Neither Math nor science.

Addition Theorem on Sets

7. At a certain conference of 100 people there are 29 Indian women and 23 Indian men. Out of these Indian people 4 are doctors and 24 are either men or doctors. There are no foreign doctors. Find the number of women doctors attending the conference

Addition Theorem on Sets

8. A university choose students to study in their university. The Top management want to choose students t study in Computer Science , E-commerce and Telecom and Networking and other different major and then they found

83 choose EC

101 choose CS

22 choose TN

31 choose CS and EC

8 choose EC and TN

10 choose CS and TN

6 choose CS, EC and TN

34 choose other majors

a. How many choose EC only?
b. How many choose CS only?
c. How many choose CS or TN?
d. How many choose in total all majors?

Addition Theorem on Sets

9. 350 students were survey at CADT on if they like CS, EC and TN

194 liked CS

153 liked EC

88 liked TN

59 liked CS and EC

37 liked CS and TN

32 liked EC and TN

21 liked all

a. How many liked CS only?

b. How many liked CS and EC but not TN?

c. How many liked CS and TN but not EC?

d. How many liked exactly 2 majors?

e. How many liked no more than 2 majors?

Addition Theorem on Sets

10. In final exam, 53% passed in Math, 61% passed in English, 60% passed in Science, 24% passed in Math and English, 35% passed in English and Science, 27% passed in Math and Science, 5% did not pass in any exam.

a. How many passed Math only?

b. How many passed English only?

c. How many passed Science only?

d. How many passed Math and Science but not English?

e. How many passed Math and English but not Science?

Addition Theorem on Sets

11. In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products.

Find how many liked product C only

Addition Theorem on Sets

12.In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find:

(i) the number of people who read at least one of the newspapers.

(ii) the number of people who read exactly one newspaper.

Addition Theorem on Sets

13.In a pollution study of 1500 Indian rivers the following data were reported. 520 were polluted by sulphur compounds; 335 were polluted by phosphates,425 were polluted by crude oil; 100 were polluted by both crude oil and sulphur compounds; 180 were polluted by both sulphur compounds and phosphate; 150 were polluted by both phosphates and crude oil and 28 were polluted by sulphur compounds, phosphates and crude oil.

How many of the rivers were polluted by exactly one of the three impurities?

Addition Theorem on Sets

7.