SSC CGL Venn Diagram Notes

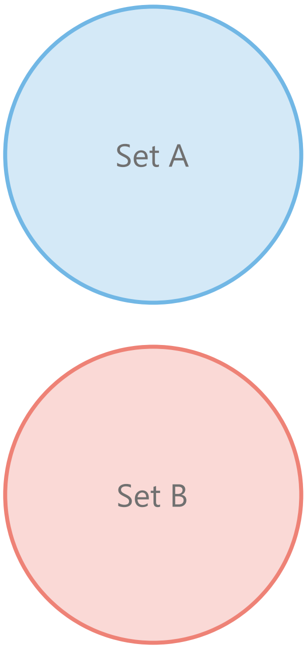
Complete guide to understanding and solving Venn diagram problems

Introduction to Venn Diagrams

A Venn diagram is a visual representation used to show all possible logical relations between a finite collection of different sets. These diagrams were introduced by John Venn in the 1880s.

In SSC CGL exams, Venn diagram questions test your ability to:

Understand relationships between different groups
Calculate the number of elements in different sections of the diagram
Solve problems based on set theory



Basic Components:

Universal Set (U): The set that contains all the elements under consideration.

Intersection (A∩B): Elements that are common to both sets A and B.

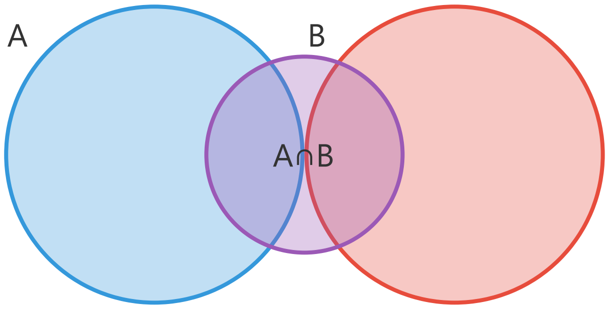
Union (A∪B): All elements that are in A, in B, or in both.

> **Complement (A'):** Elements not in set A but in the universal set.

Types of Venn Diagrams

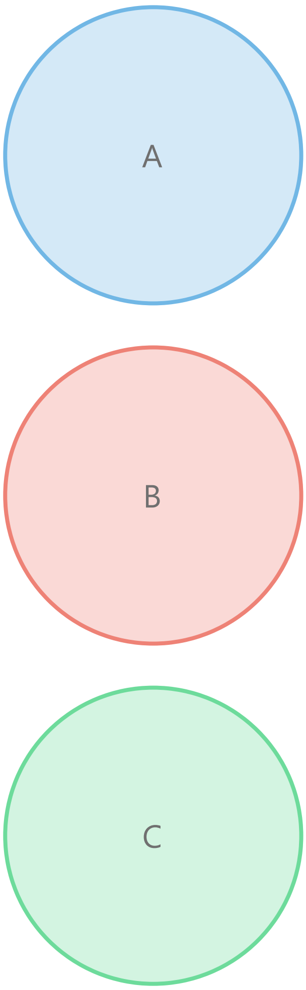
1. Two-Set Venn Diagrams

Used when we have two categories or sets.



2. Three-Set Venn Diagrams

Used when we have three categories or sets.



> In three-set diagrams, we have additional regions:
>
> - A∩B (only A and B, not C)
> - A∩C (only A and C, not B)
> - B∩C (only B and C, not A)
> - A∩B∩C (common to all three sets)

Key Formulas and Relationships

For Two Sets (A and B):

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n(A∪B) = n(A) + n(B) - n(A∩B)
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Where:

n(A) = number of elements in set A
n(B) = number of elements in set B
n(A∩B) = number of elements common to both A and B
n(A∪B) = number of elements in either A or B or both

For Three Sets (A, B and C):

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n(A∪B∪C) = n(A) + n(B) + n(C) - n(A∩B) - n(B∩C) - n(C∩A) + n(A∩B∩C)
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Other Important Formulas:

Concept	Formula
Only A (not in B)	n(A) - n(A∩B)
Only B (not in A)	n(B) - n(A∩B)
Neither A nor B	n(U) - n(A∪B)
Exactly one of A or B	n(A) + n(B) - 2×n(A∩B)

Solved Examples

Example 1: Two Sets

Problem: In a class of 50 students, 30 play cricket, 25 play football, and 10 play both. How many play neither cricket nor football?

Solution:

Let C = students playing cricket, F = students playing football

$n(C) = 30$, $n(F) = 25$, $n(C \cap F) = 10$

$n(C \cup F) = n(C) + n(F) - n(C \cap F) = 30 + 25 - 10 = 45$

Students playing neither = Total students - $n(C \cup F) = 50 - 45 = 5$

Answer: 5 students play neither cricket nor football.

Example 2: Three Sets

Problem: In a survey of 100 people, 60 read newspaper A, 50 read newspaper B, 40 read newspaper C, 25 read both A and B, 20 read both B and C, 15 read both A and C, and 10 read all three. How many read exactly one newspaper?

Solution:

Using the formula for three sets:

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

$n(A \cup B \cup C) = 60 + 50 + 40 - 25 - 20 - 15 + 10 = 100$

Now, to find exactly one newspaper:

Only A = $n(A) - [n(A \cap B) + n(A \cap C)] + n(A \cap B \cap C) = 60 - (25 + 15) + 10 = 30$

Only B = $n(B) - [n(A \cap B) + n(B \cap C)] + n(A \cap B \cap C) = 50 - (25 + 20) + 10 = 15$

Only C = $n(C) - [n(A \cap C) + n(B \cap C)] + n(A \cap B \cap C) = 40 - (15 + 20) + 10 = 15$

Exactly one newspaper = Only A + Only B + Only C = 30 + 15 + 15 = 60

Answer: 60 people read exactly one newspaper.

Example 3: Word Problem

Problem: In a group of 100 people, 72 people can speak English, 43 can speak French, and 20 can speak both English and French. How many can speak English only? How many can speak French only? How many can speak at least one of these languages?

Solution:

Let E = English speakers, F = French speakers

$n(E) = 72$, $n(F) = 43$, $n(E \cap F) = 20$

English only = $n(E) - n(E \cap F) = 72 - 20 = 52$

French only = $n(F) - n(E \cap F) = 43 - 20 = 23$

At least one language = $n(E \cup F) = n(E) + n(F) - n(E \cap F) = 72 + 43 - 20 = 95$

Answer: 52 speak English only, 23 speak French only, and 95 speak at least one language.

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Remember to practice different types of Venn diagram problems regularly!