Overlapping Sets (2 Variables)

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YouTube Video Link to this Post is Here

Following is covered in the video

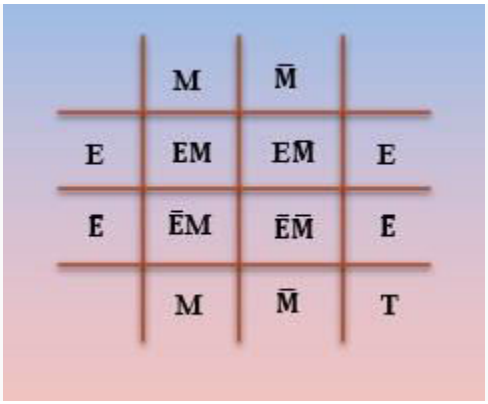
- **Table Method - Theory and Example**
- **Venn Diagram - Theory and Example**

Table Method - Theory

Let's understand the theory using an example:

Some students in the class have taken Maths, some have taken English and we need to find how many have taken both, only maths, only English, neither of them, etc...

We will draw a 2x2 grid/table to solve this (As shown below)



Now, following is the notation in the table:

EM -> Students who have taken Both the subjects
E$\bar{M}$ -> Students who have taken ONLY English
$\bar{E}$M -> Students who have taken ONLY Maths
$\bar{E}\bar{M}$ -> Students who have taken NEITHER
E -> Total students who have taken English
$\bar{E}$ -> Total students who have NOT taken English
M -> Total Students who have taken Maths
$\bar{M}$ -> Total students who have NOT taken Maths

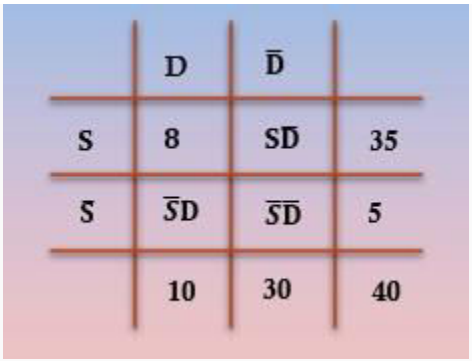
T -> Total students

Now, given the values in the questions we will use a combination of following equations to solve the problem
$E = EM + E\bar{M}$
$\bar{E} = \bar{E}M + \bar{E}\bar{M}$
$M = EM + \bar{E}M$
$\bar{M} = E\bar{M} + \bar{E}\bar{M}$
$E + \bar{E} = M + \bar{M} = T$
$EM + E\bar{M} + \bar{E}M + \bar{E}\bar{M} = T$

Table Method - Example

Q1. Out of the 40 students in a class, 10 are in Drama club, 35 are in Swimming club and 8 are in both. Find out the number of students who are in neither of them.

Solution: Refer below image



$8 + S\bar{D} = 10$
$\Rightarrow S\bar{D} = 2$

$S\bar{D} + S\bar{D}\bar{} = 5$
$\Rightarrow 2 + S\bar{D}\bar{} = 5$
$\Rightarrow S\bar{D}\bar{} = 3$

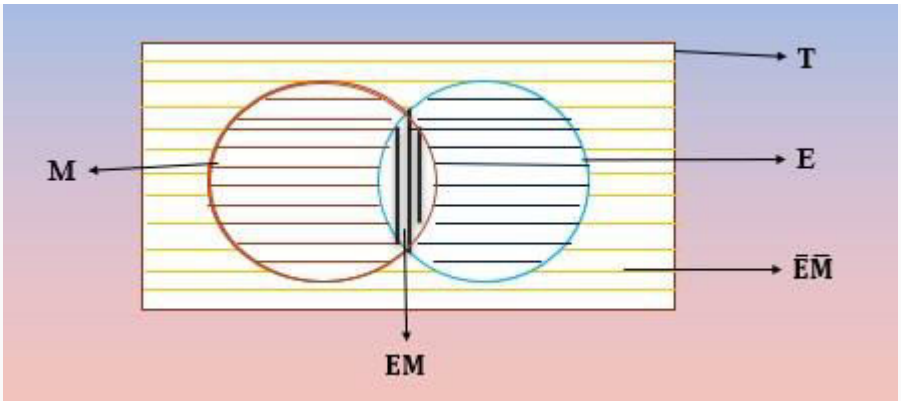
So, **Answer will be 3**
Hope it helps!

Venn Diagram - Theory

Let's understand the theory using an example:

Some students in the class have taken Maths, some have taken English and we need to find how many have taken both, only maths, only English, neither of them, etc...

We will draw a Venn Diagram to solve this (As shown below)



Now, following is the notation in the table:

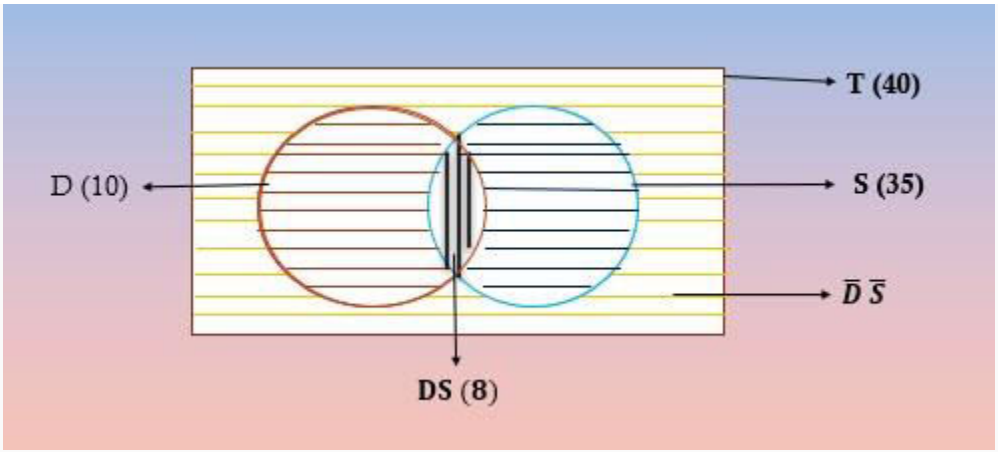
EM -> Vertical black line portion, Students who have taken Both the subjects
E$\bar{M}$ -> Horizontal Blue lines, Students who have taken ONLY English
$\bar{E}$M -> Horizontal Red lines, Students who have taken ONLY Maths
$\bar{E}\bar{M}$ -> Horizontal Yellow lines, Students who have taken NEITHER
E -> Blue Circle, Total students who have taken English
$\bar{E}$ -> Anything outside the blue circle but inside rectangle, Total students who have NOT taken English
M -> Red Circle, Total Students who have taken Maths
$\bar{M}$ -> Anything outside the red circle but inside rectangle, Total students who have NOT taken Maths
T -> Rectangle

Now, given the values in the questions we will use a combination of following equations to solve the problem
E = EM + E$\bar{M}$
$\bar{E}$ = $\bar{E}$M + $\bar{E}\bar{M}$
M = EM + $\bar{E}$M
$\bar{M}$ = E$\bar{M}$ + $\bar{E}\bar{M}$
E + $\bar{E}$ = M + $\bar{M}$ = T
EM + E$\bar{M}$ + $\bar{E}$M + $\bar{E}\bar{M}$ = T

Venn Diagram - Example

Q2. Out of the 40 students in a class, 10 are in Drama club, 35 are in Swimming club and 8 are in both. Find out the number of students who are in neither of them. (Same as above)

Solution: Refer below image



$8 + S\overline{D} = 10$
$\Rightarrow S\overline{D} = 2$

$8 + S\overline{D} = 35$
$\Rightarrow S\overline{D} = 27$

$S\overline{D} + SD + \overline{S}D + \overline{S}\overline{D} = 40$
$\Rightarrow \overline{S}\overline{D} = 40 - 27 - 8 - 2 = 3$

So, **Answer will be 3**
Hope it helps!
Good Luck!