

CIT Mid Question Solution | Session 2019-20

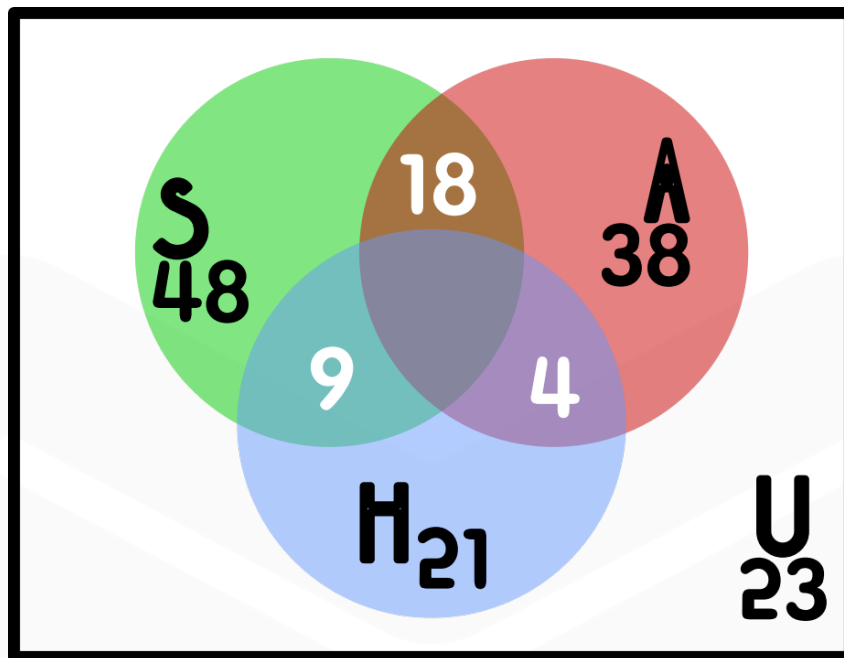
1) One hundred students were asked whether they had taken courses in any of the three areas, sociology, anthropology, and history. The results were:

- 48 had taken sociology
- 38 had taken anthropology
- 21 had taken history
- 18 had taken sociology and anthropology
- 9 had taken sociology and history
- 4 had taken history and anthropology
- and 23 had taken no courses in any of the areas.

- (a) Draw a Venn diagram that will show the results of the survey.
(b) Determine the number k of students who had taken classes in exactly
(I) one of the areas, and
(II) two of the areas.

(a) Here is a Venn diagram showing the above data,
Let,

S = sociology students
 A = anthropology students
 H = history students



(b) Students,
Here,

total students = 100

So, considering x as the students who have taken both 3 subjects,

$$48 + 21 + 38 - 18 - 9 - 4 + x = 100$$

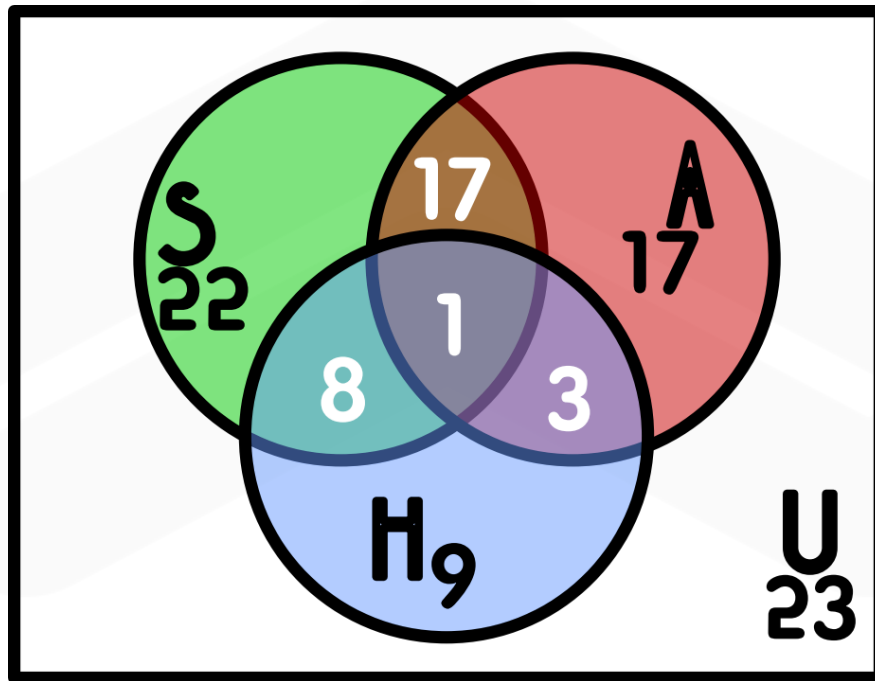
$$\text{or, } x = 1$$

students,

$$\text{taken only sociology} = 48 - (9 + 18 - 1) = 22$$

$$\text{taken only history} = 21 - (9 + 4 - 1) = 9$$

$$\text{taken only anthropology} = 38 - (4 + 18 - 1) = 17$$



So, students taken one of these = $22 + 9 + 17 = 48$

And, students taken two of the areas = $8 + 3 + 17 = 28$

Solution to this problems answer differs from place to place. For example,

<https://brainly.in/question/23019587> , this website will tell you the answer, 42 and 31. Chat GPT will 45 and 31. But I followed a similar answer from the book "", page 16, chapter 1, problem 1.15 (set theory). Fell free to correct me!

2) What is proposition? Show that $(P \wedge Q) \rightarrow (P \vee Q)$ is a tautology.

A proposition is a declarative sentence (that is, a sentence that declares a fact) that is either true or false, but not both (*source, Kenneth book*)

Let's consider a truth table for $(P \wedge Q) \rightarrow (P \vee Q)$,

P	Q	$P \wedge Q$	$P \vee Q$	$(P \wedge Q) \rightarrow (P \vee Q)$
T	T	T	T	T
T	F	F	T	T
F	T	F	T	T
F	F	F	F	T

Here, for every possible values for P and Q variables, the result $(P \wedge Q) \rightarrow (P \vee Q)$ is always true. So we can deduce it as a tautology.

3) Define Universal Quantification. Let $Q(x)$ be the statement " $x < 2$ ". What is the truth value of the quantification $\forall x Q(x)$, whose the domain consist of all real numbers?

Universal Quantification

In mathematical logic, a universal quantification is a type of quantifier, a logical constant which is interpreted as "given any", "for all", or "for any". It expresses that a predicate can be satisfied by every member of a domain of discourse.

$Q(x)$ is not true for every real number x , because, for instance, $Q(3)$ is false. That is, $x = 3$ is a counterexample for the statement $\forall x Q(x)$. Thus,

$\forall x Q(x)$
is false.

source, kenneth book page 45
