Discrete Mathematical Stru :tures (6th Edition)

Problem

In a survey of 260 college students, the following data were obtained:

64 had taken a mathematics course,

94 had taken a computer science course,

58 had taken a business course,

28 had taken both a mathematics and a business course,

26 had taken both a mathematics and a computer science course,

22 had taken both a computer science and a business course, and

14 had taken all three types of courses.

(a) How many students were surveyed who had taken none of the three types of courses?

(b) Of the students surveyed, how many had taken only a computer science course?

Step-by-step solution

Step 1 of 3

(a)

In a survey of 260 college students, 64 had taken a mathematics course, 94 had taken a computer science, 58 had taken a business course, 28 had taken both a mathematics and a business course, 26 had taken both a mathematics and a computer science course, 22 had taken both a computer science and a business course, and 14 had taken all three types of courses. We need to find the number of students was surveyed who had taken none of the three types of courses.

Let A be the set of students who have taken mathematics, B be the set of student who have taken computer science and C be the set of students who have taken business course.

Thus,

$$|A|=64,|B|=94,|C|=58,|A\cap B|=26,|B\cap C|=22,|A\cap C|=28,|A\cap B\cap C|=14.$$

Now, the number of students who have taken at least one course is

$$\begin{aligned}|A\cup B\cup C| &= |A|+|B|+|C|-|A\cap B|-|B\cap C|-|C\cap A|+|A\cap B\cap C| \\ &= 64+94+58-26-22-28+14 \\ &= 154.\end{aligned}$$

Hence, numbers of students who had taken none of the three types of courses is

$$260-154=106.$$

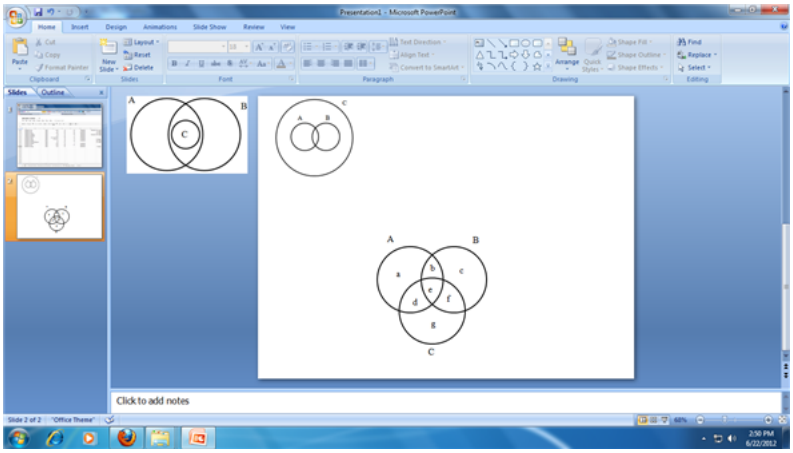
Comment

Step 2 of 3

computer science, 58 had taken a business cou
business course, 26 had taken both a mathema
taken both a computer science and a business course, and 14 had taken all three types of courses. We need to find the number of students who had taken only a computer science course.

Let *A* be the set of students who have taken mathen tics, *B* be the set of student who have taken computer science and *C* be the set of students who have taken business course.

Consider a Venn diagram



In this diagram, small letters denotes the number of student in the respective regions.

Therefore,

$$|B| = b + c + e + f = 94$$

$$|A \cap B| = b + e = 26$$

$$|B \cap C| = e + f = 22$$

$$|A \cap B \cap C| = e = 14.$$

Comment

Step 3 of 3

Put $e = 14$ in $b + e = 26$ and $e + f = 22$, we get

$$b = 12, f = 8.$$

Put *e*, *f*, *b* in $b + c + e + f = 94$, we get

$$c = 60.$$

Thus, number of students who have taken only a computer science course is

$$c = 60.$$

Comment

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See solution

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