

In a village, out of 120 farmers, 93 farmers have grown vegetables, 63 farmers have grown flowers, 45 have grown sugarcane, 45 farmers have grown vegetables and flowers, 24 farmers have grown flowers and sugarcane, 27 farmers have grown vegetables and sugarcane. Find how many farmers have grown vegetables, flowers and sugarcane.

The solution to this problem is:

36 farmers have grown vegetables only. 9 farmers have grown flowers only. 9 farmers have grown sugarcane only. 30 farmers have grown vegetables and flowers only. 12 farmers have grown vegetables and sugarcane only. 9 farmers have grown flowers and sugarcane only. 15 farmers have grown vegetables and flowers and sugarcane. add these up and you get a total of 120.

the explanation for how this solution was obtained is as follows:

there are 120 farmers in total. when you add up all the numbers of farmers, there should be 120. no more and no less.

you have the following numbers to work with.

93 grow vegetables. this includes the farmers who also grow flowers and or sugarcane. if you subtract the farmers who grow both vegetables and flowers, and you subtract the farmers who grow both vegetables and sugarcane, you are left with: $93 - 45 - 27 = 21$ farmers who grow nothing but vegetables.

63 farmers grow flowers. this includes the farmers who also grow vegetables and or sugarcane. if you subtract the farmers who grow both vegetables and flowers, and you subtract the farmers who grow both sugarcane and flowers, you are left with: $63 - 45 - 24 = -6$ farmers who grow nothing but flowers.

45 farmers grow sugarcane. this includes the farmers who also grow vegetables and or flowers. if you subtract the farmers who grow both sugarcane and vegetables, and you subtract the farmers who grow both sugarcane and flowers, you are left with: $45 - 24 - 27 = -6$ farmers who grow nothing but sugarcane.

obviously something is wrong. you subtracted too many farmers. you can't have a negative number of farmers.

the reason is that some of the farmers grow all 3 crops. you need to subtract these from the farmers who grow 2 crops because they are being double counted.

how do you find that out?

the easy way is to ask them. since you can't do that, then use the following formula that will allow you to figure it out.

the formula is:

$$T = V + F + S - VF - VS - SF + VSF$$

V is the farmers who grow vegetables. This includes VF and VS and VSF VF is the farmers who grow vegetables and flowers. VS is the farmers who grow vegetables and sugarcane. VSF is the farmers who grow vegetables and flowers and sugarcane.

F is the farmers who grow flowers. This includes VF and SF and VSF VF is the farmers who grow vegetables and flowers. SF is the farmers who grow sugarcane and flowers. VSF is the farmers who grow vegetables and flowers and sugarcane.

S is the farmers who grow sugarcane. This includes VS and SF and VSF. VS is the farmers who grow vegetables and sugarcane. SF is the farmers who grow sugarcane and flowers. VSF is the farmers who grow vegetables and flowers and sugarcane.

the formula to follow is, once again:

$$T = V + F + S - VF - VS - SF + VSF$$

plug in the numbers that you do know and solve for the numbers that you don't know.

You know that:

$$T = 120 \quad V = 93 \quad F = 63 \quad S = 45 \quad VF = 45 \quad VS = 27 \quad SF = 24 \quad VSF = \text{????}$$

You do not know what VSF is, so you will have to solve for that.

your equation of: $T = V + F + S - VF - VS - SF + VSF$ becomes: $120 = 93 + 63 + 45 - 45 - 27 - 24 + VSF$ simplify by combining like terms to get: $120 = 105 + VSF$ solve for VSF to get: $VSF = 15$

Textual steps to solve this problem is as follows :

The number of farmers who have grown vegetables= $n(V)$ =93

The number of farmers who have grown Flowers= $n(F)$ =63

The number of farmers who have grown Sugarcane= $n(S)$ =45

The number of farmers have grown vegetables and flowers= $n(V \cap F)$ =45

The number of farmers have grown flowers and sugarcane = $n(F \cap S)$ =24

The number of farmers have grown vegetables and sugarcane = $n(V \cap S)$ =27

Total number of farmers = $n(A \cup B \cup C)$ =120

Number of farmers who have grown all the three means vegetables, flowers and sugarcane= $n(A \cap B \cap C)$ =?

Formula to solve this problem is

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

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

$$= 93 + 63 + 45 - 45 - 24 - 27 - 120$$

$$= 15$$