Sets

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WORKED EXAMPLES

EXAMPLE 1

Given the sets A = {2,3,4,5,6} and B = {1 ,3 , 4 , 7}, find:

(a) n (A)
(b) n (B)
(c) n (A $\cap$ B)
(d) n (A $\cup$ B)

Solution

(a) Given A = {2,3,4,5,6}, then the number of elements in A, n (A) = 5

(b) Given B = {1 ,3 , 4 , 7}, then the number of elements in B, n (B) = 4
(c) Now, A $\cap$ B = { 3, 4}; hence n (A $\cap$ B) = 2
(d) A $\cup$ B = {1,2,3,4,5,6,7}; hence n (A $\cup$ B) = 7

EXAMPLE 2

In a school of 150 pupils, 85 take physics and 115 take mathematics. Each pupil takes at least one of these subjects. How many take both?

Solution

Use the formula n (M $\cup$ P) = n(M) + n(P) - n (M $\cap$ P) where

M = {pupils who take mathematics}; n (M) = 115

P = {pupils who take physics}; n (P) = 85

M $\cap$ P = {pupils who take both subjects}; n (M $\cap$ P) = ?

M $\cup$ P = {number of pupils in the school}; n (M $\cup$ P) = 150

Therefore,

150 = 115 + 85 - n (M $\cap$ P)

150 = 200 - n (M $\cap$ P)

n (M $\cap$ P) = 200 – 150 = 50.

Hence the number of pupils who take both subjects is 50.

EXAMPLE 3

At Sunshine Park, the total number of persons playing cricket or hockey or both was 85.

Also, 45 persons play cricket (C)
3x persons play hockey (H)
x persons play both cricket and hockey

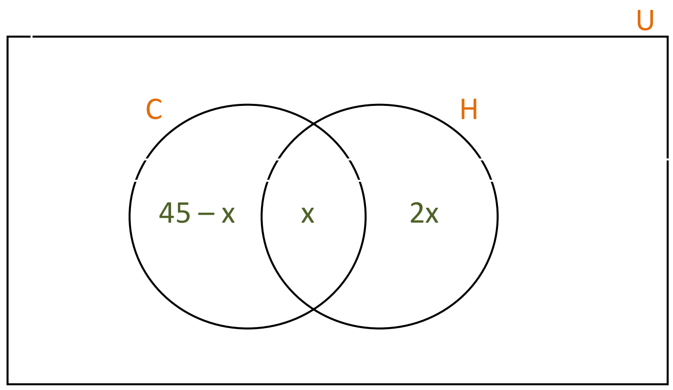
(a) Draw a Venn Diagram to illustrate the above information.

(b) Write an expression, in x, to represent the total number of persons playing cricket or hockey or both.

(c) Find the number of persons who play cricket only.

Solution

(a) The following Venn Diagram represents the information in the problem



(b) The total number of persons playing cricket or hockey or both,

$n(C \cup H) = 45 - x + x + 2x = 45 + 2x.$

(c) Given that the total number of persons playing cricket or hockey or both was 85,

Then $45 + 2x = 85$

And, $2x = 85 - 45 = 40$

Therefore, $x = 40/2 = 20.$

Hence, the number of persons who play cricket only = $45 - x = 45 - 20 = 25.$

EXAMPLE 4

Out of three recreations , gardening , reading and playing sport , 120 people were invited to state in which they were interested. 60 were interested in gardening, 86 were interested in reading and 64 were interested in playing sports. 32 gardened and read, 38 gardened and played sport and 34 read and played sport. How many were interested in all three activities.

We are given,

$n(G \cup R \cup S) = 120$

$n(G) = 60$

$n(R) = 86$

$n(S) = 64$

$n(G \cap R) = 32$

$n(G \cap S) = 38$

$n(R \cap S) = 34$

The problem is to find $n(G \cap R \cap S)$. Using the equation,

$n(G \cup R \cup S) = n(G) + n(R) + n(S) - n(G \cap R) - n(G \cap S) - n(R \cap S) + n(G \cap R \cap S)$

$120 = 60 + 86 + 64 - 32 - 38 - 34 + n(G \cap R \cap S)$

$120 = 106 + n(G \cap R \cap S)$

$n(G \cap R \cap S) = 120 - 106 = 14$

Hence 14 people are interested in all three activities.

(Further Worked Examples will be added after receiving and correcting your Diagnostic Tests)

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