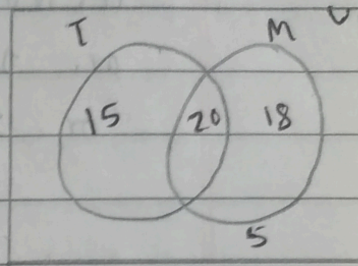
H/W

Exercise - 1.1

General section

1.a. In the adjoining venn-diagram. T and M are sets of students who like tea and milk respectively. Find.



i. $n(T\cup M)$

Soln,

From venn-diagram

$n(T\cup M) = n_o(T) + n_o(M) + n(T\cap M)$

$= 15 + 20 + 18$

$= 53$

ii. $n(T\cap M)$

soln,

$n(T\cap M) = 20$

iii. $n(\overline{T\cup M})$

soln,

From venn-diagram

$n(\overline{T\cup M}) = 5$

iv. $n_o(T)$

soln,

$n_o(T) = 15$

v. $n_o(M)$

soln,

$= n_o(M) = 18$

vi. $n(U)$

soln,

$n(U) = n_o(T) + n_o(M) + n(T\cap M) + n(\overline{T\cup M})$

$= 15 + 20 + 18 + 5$

$= 58$

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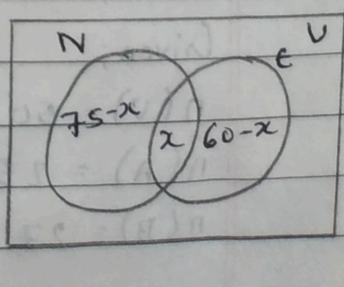
b. In the given venn-diagram, N and E are the sets of people who speaks Nepali and English language respectily. If $n(U) = 150$ and $n(N\cup M) = 110$, find.



Solution:

Given,

$n(U) = 150$

$n(N\cup M) = 110$

i. $n(N \cap M)$

Soln,,

From the venn-diagram :

$n(N \cup M) = n(N) + n(M) - n(M \cap M)$

or, $110 = 75 - x + x + 60 - x + x - x$

or, $x = 135 - 110$

$\therefore x = 25$

$\therefore n(M \cap N) = 25$

ii. $n(\overline{N \cup E})$

Soln,,

$n(\overline{N \cup E}) = n(U) - n(N \cup E)$

$= 150 - 110$

$= 40$

iii. ~~A~~ $n_o(N)$

Soln,

$n_o(N) = n(N) - n(N \cap E)$

$= 50 - 25$

$= 25$

iv. $n_o(E) = n(E) - n(N \cap E)$

$= 35 - 25$

$= 10$

2.a. If $n(U) = 50$, $n(A) = 25$, $n(B) = 27$ and $n(A \cap B) = 10$, find

Soln,,

Given;

$n(U) = 50$

$n(A) = 25$

$n(B) = 27$

$n(A \cap B) = 10$

Now,

i. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$= 25 + 27 - 10$

$= 42$

ii. $n(\overline{A \cup B}) = n(U) - n(A \cup B)$

$= 50 - 42$

$= 8$

iii $n_o(A) = n(A) - n(A \cap B)$

$= 25 - 10$

$= 15$

iv. $n_o(B) = n(B) - n(A \cap B)$

$= 27 - 10$

$= 17$

---

26. If $n(U) = 60$, $n(A) = 30$, $n(B) = 40$ and $n(A \cup B) = 55$, find.

Soln,

Given:

$n(U) = 60$

$n(A) = 30$

$n(B) = 40$

$n(A \cup B) = 55$

Now,

i. $n(A \cap B)$

Soln,

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

or, $55 = 30 + 40 - \cancel{55}\ n(A \cap B)$

or $n(A \cap B) = \cancel{55}\ 70 - 55$

$\therefore n(A \cap B) = 15$

ii. $n(\overline{A \cup B}) = n(U) - n(A \cup B)$

$= 60 - 55$

$= 5$

iii. $n_o(A) = n(A) - n(A \cap B)$

$= 30 - 15$

$= 15$

iv. $n_o(B) = n(B) - n(A \cap B)$

$= 40 - 15$

$= 25$

---

c. P and Q are the subset of a universal set U. If $n(U) = 90$, $n(P) = 45$, $n(Q) = 35$ and $n(\overline{P \cup Q}) = 15$, illustrate this information in a venn-diagram and find.

Solution:

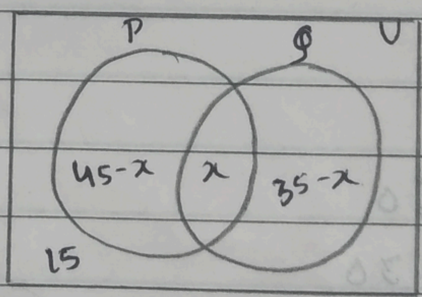
Given:

$n(U) = 90$

$n(P) = 45$

$n(Q) = 35$

$n(\overline{P \cup Q}) = 15$



venn-diagram

i. $n(P \cup Q) = n(U) - n(\overline{P \cup Q})$

$= 90 - 15$

$= 75$

ii. $n(P \cap Q) = n(P) + n(Q) - n(P \cup Q)$

$= 45 + 35 - 75$

$= 80 - 75$

$= 5$

iii. $n_o(P) = n(P) - n(P \cap Q)$

$= 45 - 5$

$= 40$

iv. $n_o(Q) = n(Q) - n(P \cap Q)$

$= 35 - 5$

$= 30$

---

d. If $n(A) = 65$, $n(B) = 80$ and $A \subset B$, then find.

Soln,

Given;

$n(A) = 65$

$n(B) = 80$

$A \subset B$

Now,

i. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$= 65 + 80 - 65$

$= 80$

ii. $n(A \cap B) = n(A)$

$= 65$

iii. $n(A - B) = n(A) - \cancel{A(B)} \, n(A \cap B)$

$= 65 - 65$

$= 0$

iv. $n(B - A) = n(B) - n(A - B)$

$= 80 - 65 = 15$

e. If $n_o(A) = 12$, $n_o(B) = 15$, $n(\overline{A \cup B}) = 11$ and $n(U) = 45$ find.

Solution:

Given;

$n_o(A) = 12$

$n_o(B) = 15$

$n(\overline{A \cup B}) = 11$

$n(U) = 45$

Now,

i. $n(A \cup B) = n(U) - n(\overline{A \cup B})$

$= 45 - 11$

$= 34$

ii. $n(A \cap B) = \cancel{n_o(A)}\ n(A \cup B) - n_o(A) - n_o(B)$

$= 34 - 12 - 15$

$= 7$

iii. $n(A) = n_o(A) + n(A \cap B)$

$= 12 + 7$

$= 19$

iv. $n(B) = n_o(B) + n(A \cap B)$

$= 15 + 7$

$= 22$

Creative Section:

3. a. In a survey of 350 students of a school, 200 liked pokhara, 220 liked chitwan and 120 liked both the places.

i. show above information in a venn-diagram.

ii. find the number of students who liked neither of two places.

iii. Find the number of students who liked only pokhara.

Soln:

Let the no. of students who like pokhara and chitwan be $n(P)$ and $n(C)$ respectively.

By question:

$n(U) = 350$

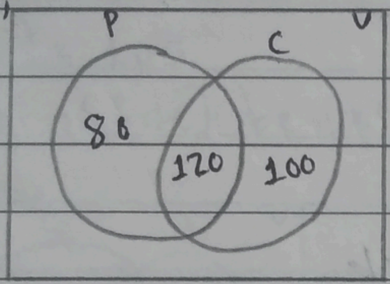
$n(P) = 200$

$n(C) = 220$

$n(P \cap C) = 120$

Now,

i.



ii. $n(\overline{P \cup C}) = n(U) - n(P \cup C)$

$= 350 - 300$

$= 50$

iii. $n_o(P) = n(P) - n(P \cap C)$

$= 200 - 120$

$= 80$

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b. Among 1200 chinese tourists who are visiting Nepal, 45% of them have already visited India, 40% have visited pakistan and 15% have visited both the countries.

i. Illustrate this information in a venn-diagram.

ii. How many tourists have not visited any of these two countries.

Solution:

Let the no. of people who visited India and pakistan be $n(I)$ and $n(P)$ respectively.

Given,

$n(U) = 1200$

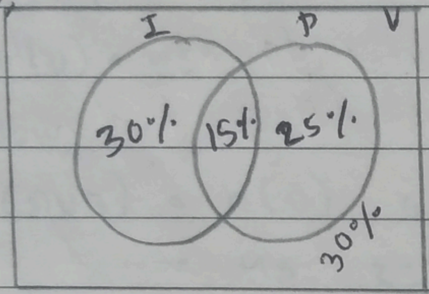
$n(I) = 45\%$

$n(P) = 40\%$

$n(I \cap P) = 15\%$

Now,

i.



Also,

~~A (P~~ from venn-diagram

$n(I \cup P) = 30\% + 15\% + 25\%$

$= 70\%$

Again,

$n(\overline{I \cup P}) = n(U) - n(I \cup P)$

$= 100\% - 70\%$

$= 30\%$

Here,

ii. $n(\overline{I \cup P}) = 30\%$

So, 30% of $1200 = n(\overline{I \cup P})$

~~or, n (I U~~

or, $n(\overline{I \cup P}) = \frac{30}{1\cancel{00}} \times 12\cancel{00}$

or, 30×12

$\therefore n(\overline{I \cup P}) = 360$

$\therefore$ 360 people have not visited any of these two Countries

c. In a group of 200 game lover students, 120 like cricket and 105 like football. By drawing venn-diagram, find

i. How many student like both the games?

ii. How many students like only cricket?

Soln,

Let the no. of students who like cricket and football be $n(c)$ and $n(f)$ respectively.

Given;

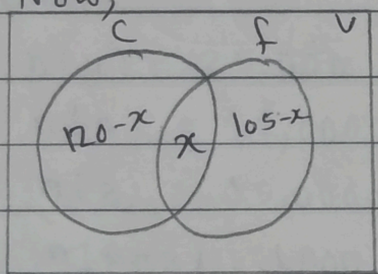
$n(v) = 200$

$n(c) = 120$

$n(f) = 105$

Let $n(f \cap c)$ be 'x'.

Now,



Here,

i. $n(f \cup c) = n(f) + n(c) - n(f \cap c)$

or, $200 = \cancel{120}\ 105 + 120 - n(f \cap c)$

or $n(f \cap c) = 225 - 200$

$\therefore n(f \cap c) = 25$

Also,

ii. $n_o(c) = n(c) - n(f \cap c)$

$= 120 - 25$

$= 95$

$\therefore$ 25 people like both games and 95 people line only cricket.

d. In a school, every student has to participate at least ~~of~~ one of the activities, athletics or music. In a class of 50 students 30 participated in athletics and 25 participated in Music.

i. Draw a venn-diagram to illustrate the above information.

ii. How many student participated in only one activity?

Solution:

Let the no. of students who participate in athletic and music be $n(A)$ and $n(m)$ respectively.

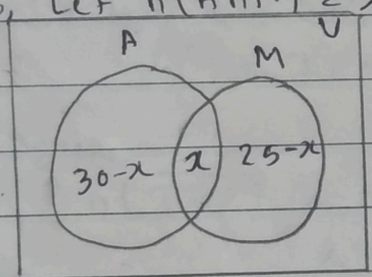
Given;

$n(U) = 50$

$n(A) = 30$

$n(M) = 25$

Now, Let $n(A \cap M) = x$

i. 

Here,

$n(A \cup M) = n(A) + n(M) - n(A \cap M)$

or, $50 = 30 + 25 - n(A \cap M)$

or, $n(A \cap M) = 55 - 50$

$\therefore n(A \cap M) = 5$

Also,

ii. No. of students who took part in only one activity ~~is are~~ is;

$n_o(A) + n_o(M)$

$= n(A) - n(A \cap M) + n(B) - n(A \cap B)$

$= 30 - 5 + 25 - 5$

$= 25 + 20$

$= 45$

e. In an election of municipality, A and B were two candidates for the post of the mayor and 25000 voters were in the voter list. Voters were supposed to cast the votes for a single candidates. 12000 people cast vote for A. 10000 people cast for B and 1000 ~~cast~~ people caste vote for both the candidates.

i. Show these information in a venn-diagram

ii. How many people didn't caste the vote?

iii. How many voters were valid?

Solution:

Let the no. of people who cast vote to A and B be $n(A)$ and $n(B)$ respectively.

Given;

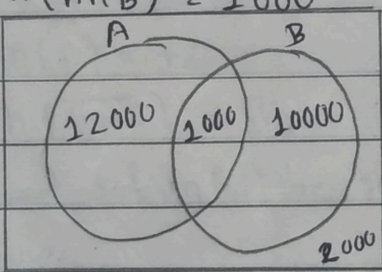
$n(U) = 25,000$

$n_o(A) = 12,000$

$n_o(B) = 10,000$

$n(A \cap B) = 1000$

i.



Also,

$n(A \cup B) = n_o(A) + n_o(B) + n(A \cap B)$

$= 12000 + 10000 + 1000$

$= 23,000$

ii. $n(\overline{A \cup B}) = n(U) - n(A \cup B)$

$= 25000 - 23,000$

$= 2000$

iii. Total valid votes is;

$n_o(A) + n_o(B)$

$= 12000 + 10000$ ~~= 22 000~~

= 22,000

∴ 22,000 votes were valid.

4.a In a survey of 900 students in a school. It was found that 600 students liked tea., 500 liked Coffee and 125 did not liked both the drinks.

i. Draw a venn-diagram to illustrate the above information.

ii. Find the number of students who liked both the drinks.

iii. Find the number of students who didn't like tea only.

Soln,,

Let the no. of students who like Coffee and Tea be n(C) and n(T) respectively.

Given;

$n(U) = 900$

$n(T) = 600$

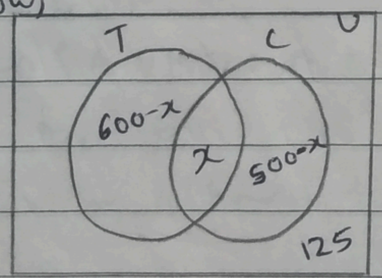
$n(C) = 500$

$n(\overline{T \cup C}) = 125$

Let $n(T \cap C)$ be x

Now,

i.



Also,

ii. $n(\overline{T \cup C}) = n(U) - n(T \cup C)$

or $125 = 900 - n(T \cup C)$

or $n(T \cup C) = 900 - 125$

$\therefore n(T \cup C) = 775$

Again,

$n(T \cup C) = n(T) + n(C) - n(T \cap C)$

or $775 = 600 + 500 - n(T \cap C)$

or, $n(T \cap C) = 1100 - 775$

$\therefore n(T \cap C) = 325$

Again,

iii. Number of students who didn't like tea only is;

~~$n_o(C)$~~ $= n(C) - n(T \cap C)$ +

$= 500 - 325$

$= 175$

---

b. In a group of 120 people, 90 play ~~football~~ volleyball, 72 play football and 10 play neither of games.

i. ~~Solution:~~ Draw a venn-diagram to represent the given data.

ii. How many people play only one game.

Solution:

Let the no. of people who play volleyball and football be n(v) and n(f) respectively.

$n(U) = 120$

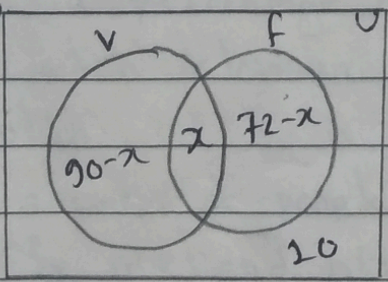
$n(v) = 90$

$n(f) = 72$

$n(\overline{v \cup f}) = 10$

Let $n(v \cap f)$ be x

Now,

i. 

Also,

$n(\overline{v \cup f}) = n(U) - n(v \cup f)$

or, $n(v \cup f) = 120 - 10$

$\therefore n(v \cup f) = 110$

Again,

$n(V \cup F) = n(V) + n(F) - n(V \cap F)$

or, $110 = 90 + 72 - n(V \cap F)$

or, $n(V \cap F) = 162 - 110$

$\therefore n(V \cap F) = 52$

At last,

ii. Number of who play only one game is ;

$n_o(V) + n_o(F)$

$= n_o(V) - n(V \cap F) + n(F) - n(V \cap F)$

$= 90 - 52 + 72 - 52$

$= 38 + 20$

$= 58$ //

$\therefore$ 58 people play only one game.

---

c. In a class of 60 students, 15 students liked maths only, 20 liked English only and 5 didn't like any subject

i. Represent the above information in venn-diagram?

ii. Find the no. of students who liked both the subjects.

iii. How many students liked maths?

Solution:

Let the no. of students who liked maths and ~~se~~ English on be $n(M)$ and $n(E)$ respectively.

Given:

$n(U) = 60$

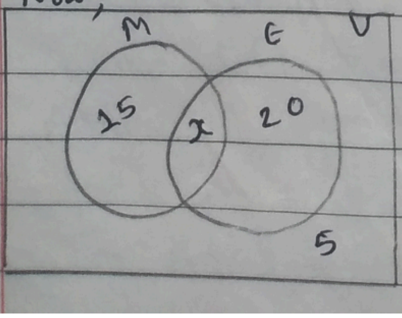
$n_o(M) = 15$

$n_o(E) = 20$

$n(\overline{M \cup E}) = 5$

Now,

i.



Here,

$n(M \cup E) = n(U) - n(\overline{M \cup E})$

or, $= 60 - 5$

$= 55$

Also,

ii. $n(M \cup E) = n_o(M) + n_o(E) + n(M \cap E)$

or, $55 = 15 + 20 + n(M \cap E)$

or, $n(M \cap E) = 55 - 35$

$\therefore n(M \cap E) = 20$

Again,

iii. From the venn-diagram

$n(M) = n_o(M) + n(M \cap E)$

$= 15 + 20$

$= 35$

$\therefore$ 35 student like maths.

---

d. In a survey of a group of people, 50% like to listen radio and 60% like to watch television. If 30% of them neither listen radio nor watch television, then

i. Represent the above information in a venn diagram.

ii. Find the percentage of people who like to listen radio as well as watch television.

Solution:

Let the no. of people who like to listen radio and watch television be $n(R)$ and $n(T)$ respectively.

Given;

$n(U) = 100\%$

$n(R) = 50\%$

$n(T) = 60\%$

$n(\overline{R \cup T}) = 30\%$

Now,

$n(\overline{R \cup T}) = n(U) - n(R \cup T)$

or, $30\% = 100\% - n(R \cup T)$

or, $n(R \cup T) = 100\% - 30\%$

$\therefore n(R \cup T) = 70\%$

Also,

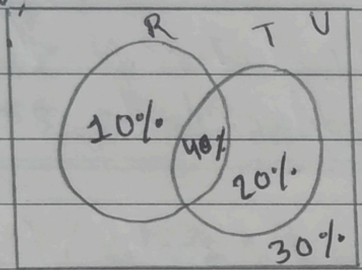
$n(R \cup T) = n(R) + n(T) - n(R \cap T)$

or, $70\% = 50\% + 60\% - n(R \cap T)$

or, $n(R \cap T) = 110\% - 70\%$

$\therefore n(R \cap T) = 40\%$

Now,

i. 

Again,

from venn-diagram

ii. $n(R \cap T) = 40\%$

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g. In a survey of 15,000 students of different schools. 40% of them were found to have tution ~~clas~~ before the SLC examination. Among them 50% studied only mathematics, 30% only science and 20% studied other subjects.

i. Represent the above information in a venn-diagram.

ii. How many students studied Mathematics as well as science?

Solution:

Let the number of student who read tution of mathematics and science be n(M) and n(S) respectively.

Given:

Total student = 1500

No. of student taking tution class $= 40\%$

$= 40\%$ of 15000

$= \frac{40}{1\cancel{00}} \times 15{,}0\cancel{00}$

$= 6000$

$n(U) = 6000 = 100\%$

$n_o(M) = 50\%$

$= \frac{50}{1\cancel{00}} \times 60\cancel{00}$

$= 3000$

$n_o(S) = 30\%$

$= \frac{30}{1\cancel{00}} \times \cancel{30}\ 60\cancel{00}$

$= 1800$

$n(\overline{M \cup S}) = \cancel{30\%}\ 10\%$

$= \frac{10}{1\cancel{00}} \times 60\cancel{00}$

$= 600$

Now,

$n(\overline{M \cup S}) = n(U) - n(M \cup S)$

or, $600 = 6000 - \cancel{600}\ n(M \cup S)$

or, $n(M \cup S) = 5400$

Also,

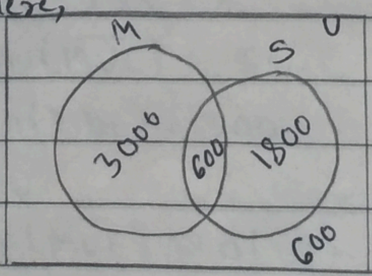
$n(M \cup S) = n_o(M) + n_o(S) + \cancel{n(M \cup S)}\ n(M \cap S)$

or, $5400 = \cancel{15}\ 3000 + 1800 + \cancel{600}\ n(M \cap S)$

or, $n(M \cap S) = 5400 - 4800$

$\therefore n(M \cap S) = 600$

Here,

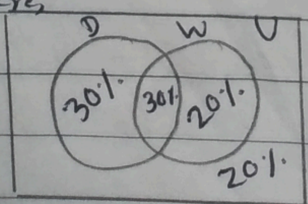
i. 

Page:

ii from the venn-diagram
$n(MUS) = 5400$

e. In a survey of a community, 60% people read daily newspaper, 50% read weekly newspaper and 20% people do not read any type of newspaper.
i. Illustrate the above information in a venn-diagram.
ii. If 1500 people read both type of newspaper, how many people were surveyed.

Soln,
Let the no. of people who read daily newspaper and weekly newspaper be n(D) and n(W) respectively.
Given;
$n(U) = 100\%$
$n(D) = 60\%$
$n(W) = 50\%$
$n(\overline{D \cup W}) = 20\%$
~~Now,~~ $n(D \cap W) = 1500$
Now,
$n(\overline{D \cup W}) = n(U) - n(D \cup W)$
or, $20\% = 100\% - n(D \cup W)$
$\therefore n(D \cup W) = 80\%$
Also,
$n(D \cup W) = n(D) + n(W) - n(D \cap W)$
or, $80\% = 60\% + 50\% - n(D \cap W)$
or, $n(D \cap W) = 110\% - 80\%$
$\therefore n(D \cap W) = 30\%$

Here,
i.


ii. According to question:

$n(U) = 100\%$

Given, $n(D \cap W) = 1500 = 30\%$

Let the total no. of people be 'x'.

Here,

30% of $x = 1500$

or, $\frac{3\cancel{0}}{10\cancel{0}} \times x = 1500$

or, $3x = 15000$

or, $x = \frac{15000}{3}$

$\therefore x = 5000$

$\therefore$ The ~~so~~ no. of people who were surveyed is 5000.

---

f. Out of some students appeared in an examination, 80% passed in mathematics, 75% passed in English and 5% failed in both subjects. If 300 of them were passed in both subjects. How many students were appeared in the examination. find by using a venn-diagram.

Soln,

Let the no. of student who passed in mathematics be n(m) and who passed in English be n(E) respectively.

Given:

$n(U) = 100\%$

$n(M) = 80\%$

$n(E) = 75\%$

$n(\overline{M \cup E}) = 5\%$

$n(M \cap E) = 300$

Now,

$n(\overline{M \cup E}) = n(U) - n(M \cup E)$

or, $5\% = 100\% - n(M \cup E)$

or, $n(M \cup E) = 100\% - 5\%$

$\therefore n(M \cup E) = 95\%$

Also,

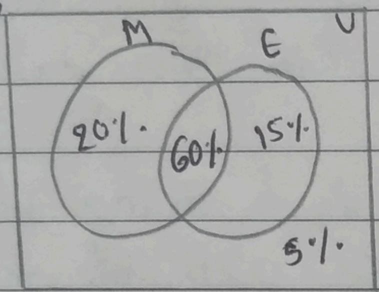
$n(M \cup E) = n(M) + n(E) - n(M \cap E)$

or, $95\% = 80\% + 75\% - n(M \cap E)$

or, $n(M \cap E) = 155\% - 95\%$

$\therefore n(M \cap E) = 60\%$

Here,



Also,

Let the total no. of people be 'x'.

By question:

$60\% \text{ of } x = 300$

or, $\frac{6\cancel{0}}{10\cancel{0}} \times x = 300$

or, $x = \frac{3000}{6}$

$\therefore x = 500$

$\therefore$ 500 people had appear in the examination.

---

h. In an examination 45% student passed science only and 25% passed english only and 5% student failed in both subjects. If 200 students passed in English, find the total number of student by using venn-diagram.

Solution:

Let the no of people who passed in science and english be $n(S)$ and $n(E)$ respectively.

Given:

$n(U) = 100\%$

$n_o(S) = 45\%$

$n_o(E) = 25\%$

$n(\overline{S \cup E}) = 5\%$

$n(E) = 200$

We know,

$n(\overline{S \cup E}) = n(U) - n(S \cup E)$

or, $n(S \cup E) = 100 - 5$

$\therefore n(S \cup E) = 95\%$

Also,

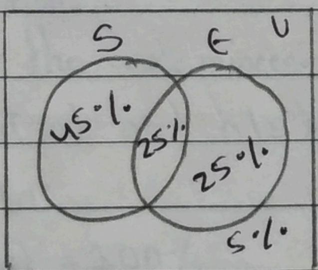
$n(S \cup E) = n_o(S) + n_o(E) + n(S \cap E)$

or, $95\% = 45\% + 25\% + n(S \cap E)$

or, $n(S \cap E) = 95\% - \cancel{25+}\ 70\%$

$\therefore n(S \cap E) = 25\%$

Here,



from venn-diagram:

$n(E) = 25\% + 25\%$

$= 50\%$

By question:

50% of $x = 200$

or, $\frac{5\cancel{0}}{10\cancel{0}} \times x = 200$

or, $x = \frac{2000}{5}$

$\therefore x = 400$

$\therefore$ The total no. of students were 400.

5.a. In a survey of some students it was found that 60% of them studied commerce and 40% studied social science. If 40 student studied both subjects and 10% didn't study any of the subjects, by drawing venn-diagram
i. Find the total no. of students.
ii. Find the no. of students who studied science only.

Solution:
Let the no. of ~~per~~ student who studied Commerce and social science be $n(C)$ and $n(S)$ respectively.

Given,

$n(U) = 100\%$

$n(C) = 60\%$

$n(S) = 40\%$

$n(C \cap S) = 40$

$n(\overline{C \cup S}) = 10\%$

Now,

$n(\overline{C \cup S}) = n(U) - n(C \cup S)$

or $n(C \cup S) = 100\% - 10\%$

$\therefore n(C \cup S) = 90\%$

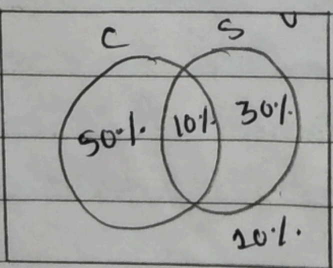
Also,

$n(C \cup S) = n(C) + n(S) - n(C \cap S)$

or $90\% = 60\% + 40\% - n(C \cap S)$

$\therefore n(C \cap S) = 10\%$

Here,



From venn-diagram

i. $10\% ~~of~~ = 40$

or, $1\% = \frac{40}{10}$

$100\% = \frac{40}{1\cancel{0}} \times 10\cancel{0}$

$= 400$

Also,

ii. $n_o(S) = 30\%$

$= \frac{30}{1\cancel{00}} \times 4\cancel{00}$

$= 120$

---

b. In an examination, 50% examinees got grade A in mathemati[cs] 75% got grade A in science and 60 got grade A in both subjects. If none of them ~~grade~~ got grade B in both the subjects.

i. Represent the given information in a venn-diagram.

ii. Find the no. of examinees who got grade A in science only

Solution:

Let the examinees who got grade A in mathematics and scien[ce] be n(M) and n(S) respectively.

Given;

$n(U) = 100\%$

$n(M) = 50\%$

$n(S) = 75\%$

$n(M \cap S) = 60$

Now,

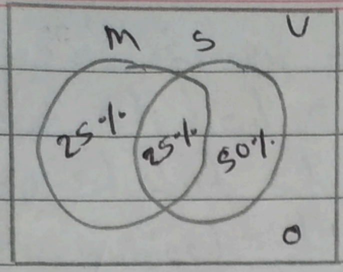
$n(M \cup S) = n(M) + n(S) - n(M \cap S)$

or, $100\% = 50\% + 75\% - n(M \cap S)$

or, $n(M \cap S) = 125\% - 100\%$

$\therefore n(M \cap S) = 25\%$

i.



~~From~~ venn-diagram

$25\% = 60$

$1\% = \frac{60}{25}$

$100\% = \frac{60}{25} \times 100$

$= 240$

Also,

from venn-diagram

ii. $n_o(S) = 50\%$

$= \frac{50}{100} \times 240$

$= 120$

---

c. In an examination, 80% examines passed in English, 70% in maths and 60% in both the subjects. If 45 examinees failed in both subjects.

i. Draw a venn-diagram to represent the above information.

ii. Find the no. of students who ~~failed~~ passed only one subject

iii. Find the number of students who failed mathematics.

Solution:

Let the no. of examines who passed in english and maths be n(E) and n(M) respectively.

Given;

$n(E) = 80\%$

$n(M) = 70\%$

$n(M \cap E) = 60\%$

$n(\overline{M \cup E}) = 45$

We know,

$n(M \cup E) = n(M) + n(E) - n(M \cap E)$

or $n(M \cup E) = 70\% + 80\% - 60\%$

$\cancel{\therefore n(M \cup E)}$ $\therefore n(M \cup E) = 90\%$

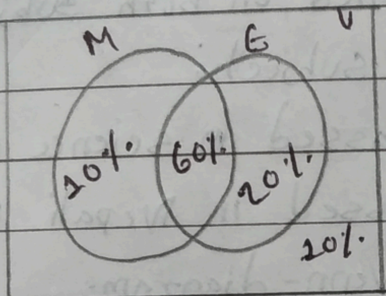
Also,

$n(\overline{M \cup E}) = n(U) - n(M \cup E)$

$= 100\% - 90\%$

$= 10\%$

Now,

i. 

We know,

$n(\overline{M \cup E}) = 10\% = 45$

$1\% = \frac{45}{10}$

$100\% = \frac{45}{1\cancel{0}} \times \cancel{100}\ 10\cancel{0}$

$= 450$

Again,

ii. No. of student who passed only 1 subject.

$n_o(M) + n_o(E)$

or $10\% + 20\%$

$= 30\%$ of 450

$= \frac{3\cancel{0}}{10\cancel{0}} \times 45\cancel{0}$

$= 135$

from venn-diagram:

iii. No. of student who failed mathematics.

$= 20\% + 10\%$

$= 30\%$ of 450

$= \frac{3\cancel{0}}{1\cancel{00}} \times 45\cancel{0}$

$= 135$

---

d. In an examination, 56% examinees failed in science, 54% failed in Nepali and 25 students failed on both subjects. If non-of the examinees passed in both the subjects.

i. Find the no. of examinees who passed in science only.

ii. Find the no. of examinees who passed in Nepali only.

iii. Represent the above information in venn-diagram.

Solution:

Let the no. of examinees who failed in science and Nepali be n(S) and n(N) respectively.

Given;

$n(U) = 100\%$

$n(S) = 56\%$

$n(N) = 54\%$

$n(S \cap N) = 25$

$n(\overline{S \cup N}) = 0$

We know,

$n(S \cup N) = n(S) + n(N) - n(S \cap N)$

or, $100\% = 56\% + 54\% - n(S \cap N)$

or, $n(S \cap N) = \cancel{110 - 26}$ $110\% - 100\%$

$\therefore n(S \cap N) = 10\%$

Here,

$10\% = 25$

$1\% = 25/10$

$100\% = \frac{25}{1\cancel{0}} \times 10\cancel{0}$

$= 250$

Again,

i. $n_o(S) = n(S) - n(S \cap N)$

$= 56\% - 10\%$

$= 46\%$

$= \frac{46}{10\cancel{0}} \times 25\cancel{0}$

$= 115$

Also,

ii. $n_o(N) = n(N) - n(S \cap N)$

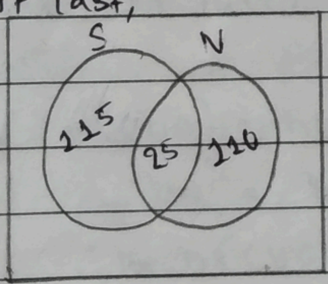
$= 54\% - 10\%$

$= 44\%$

$= \frac{44}{10\cancel{0}} \times 25\cancel{0}$

$= 110$

At last,

iii. 

6.a. 75 students in a class like tea or coffee or both. Out of them 10 like both the drinks. The ratio of the no. of student who like tea ~~or those~~ to those who like coffee is 2:3

i. Find the no. of students who like tea.

ii. Find the no. of students who like coffee only.

iii. Represent the above information in a venn-diagram.

Solution:

Let the no. of people who like tea and coffee be n(T) and n(C) respectively:

Given:

$n(U) = 75$

$n(T \cap C) = 10$

Let the people who like ~~coffee be~~ tea and coffee be $2x$ and $3x$ respectively.

Now,

We know,

$$n(T \cup C) = n(T) + n(C) - n(T \cap C)$$

$$\text{or, } 75 = 2x + 3x - 10$$

$$\text{or, } 75\cancel{65} = 5x - 10$$

$$\text{or, } \cancel{x = \frac{65}{5}} \quad \cancel{85 = 5x} \quad 85 = 5x$$

$$\text{or } x = \frac{85}{5}$$

$$\therefore \cancel{x = 13}$$

$$\therefore x = \cancel{13}\ 17$$

Now,

$$\cancel{n_o(T) = 2x}$$
$$\cancel{= 2 \times 17}$$
$$\cancel{= 24}$$

$$n(C) = 3x$$
$$= 3 \times 17$$
$$= 51$$

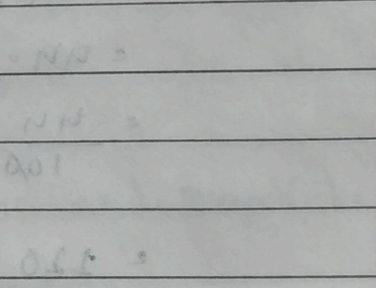
Also,

$$\cancel{n_o(T) = n_o(T) + n(T \cap C)}$$
$$\cancel{= 24 + 10}$$
$$\cancel{= 34}$$

i. $n(T) = 2 \times 17 \ (2x)$

$= 34$

iii.



ii. $n_o(C) = n(C) - n(T \cap C)$

$= 51 - 10$

$= 41$

b. In a survey of 825 farmers, 125 of them were not using any type of fertilizers in their vegetable farming, 150 of them were using chemical as well as organic fertilizers. The ratio of the number of only chemical fertilizer user to that of only organic fertilizer users is 5:6

i. Find the number of chemical fertilizer users.

ii. How many of them were using only one type of fertilizers.

iii. How many of them were not using organic fertilizers?

iv. Illustrate the above information in a venn-diagram.

Solution:

Let n(c) and n(0) represent the no. of farmers using chemical and organic fertilizer respectively.

$n(U) = 825$

$n(\overline{C \cup O}) = 125$

$n(C \cap O) = 150$

$\frac{n_o(C)}{n_o(O)} = \frac{5}{6}$

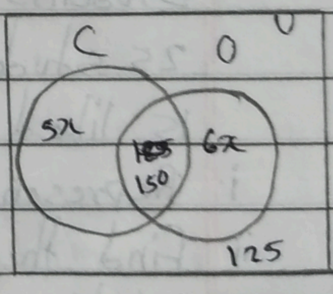
~~Now~~ Let $n_o(C)$ and $n_o(O)$ be $5x$ and $6x$ respectively.

Now

$n(\overline{C \cup O}) = n(U) - n(C \cup O)$

or $125 = 825 - n(C \cup O)$

$\therefore$ ~~or~~ $n(C \cup O) = 700$



Venn-diagram

here,

from venn-diagram

$5x + 150 + 6x = 700$

or $x = \frac{550}{11}$

$\therefore x = 50$

Also,

i. $n(C) = 5x + 150$

$= 5 \times 50$ ~~$= 250$~~ $+ 150$

= 400

Again,

ii. $n_o(C) + n_o(O) = 5x + 6x$

$= 11x$

$= 11 \times 50$

$= 550$

Again,

iii. From venn-diagram:

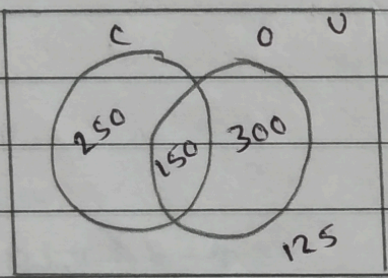
$5x + 125$

$= 5 \times 50 + 125$

$= 250 + 125$

$= 375$

iv.



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c. In a group of students, the ratio of the number of students who like music and sports is 9:7. Out of which 25 students like both activities, 20 liked music only and 15 liked none of the activities.

i. Represent the above information in a venn-diagram.

ii. Find the total number of students in the group.

Solution:

Let the no. of student who like music and sports be $n(M)$ and $n(S)$ respectively.

Given:

$n(M \cap S) = 25$

$n_o(M) = 20$

$n(\overline{M \cup S}) = 15$

$$\frac{n(M)}{n(S)} = \frac{9}{7}$$

Let $n(M)$ and $n(S)$ be $9x$ and $7x$ respectively.

We know,

$n(M) = n_o(M) + n(M \cap S)$

$= 20 + 25$

$= 45$

Also,

$n(M) = 9x$

or, $45 = 9x$

or, $x = \frac{45}{9}$

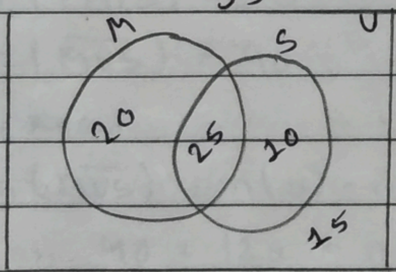
$\therefore x = 5$

Also,

$n(S) = \cancel{9x}\ 7x$

$= 7 \times 5$

$= 35$

i. 

Venn-diagram.

Again,

ii. From venn-diagram

$n(U) = n_o(M) + n_o(S) + n(M \cap S) + n(\overline{M \cup S})$

$= 20 + \underline{10} + 25 + 15$

$= 70$

$\therefore$ The total number of students in the group is 70.

d. In a survey of 80 people, it was found that 60 liked oranges only and 10 liked both oranges and apples. The number of people who liked orange is five times the number of people who liked apple. By using a venn-diagram, find the number of people who liked apples only and who didn't like any of these fruits.

Solution:

Let the no. of people who like orange and apple be $n(O)$ and $n(A)$ respectively:

Given;

$n(U) = 80$

$n_o(O) = 60$

~~n (U∩O~~ $n(O \cap A) = 10$

Let the number of people who like apple be x and no. of people who like orange will be $5x$ i.e.

$n(O) = 5x$

$n(A) = x$

We know,

$n(O) = n_o(O) + n(O \cap A)$

$= 60 + 10$

$= 70$

Also,

$n(O) = 5x$

or $70 = 5x$

or $x = \frac{70}{5}$

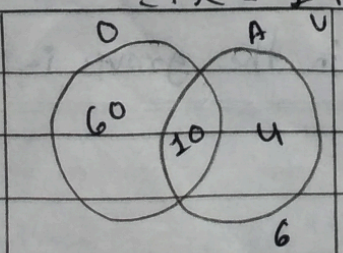
$\therefore x = 14$

Again,

$n(O) = 5x$

$= 5 \times 14$

$= 70$



from venn-diagram;

$n_o(A) = 4$

$n(\overline{A \cup O}) = 6$

---

e. Out of 120 students appeared in an examination, the number of students who passed in Mathematics only is twice the number of students who passed science only. If 50 students passed in both the subjects and 40 students failed in both the subjects.

i. find the number of students who passed in Mathematics.

ii. find the number of student who passed in science.

iii. Show the result in a venn-diagram.

Solution:

Let the no. of student who ~~tit~~ passed in mathematics and science be $n(M)$ and $n(S)$ respectively.

Given;

$n(U) = 120$

$n(M \cap S) = 50$

$n(\overline{M \cup S}) = 40$

we know

$n(\overline{M \cup S}) = n(U) - n(M \cup S)$

or, $40 = 120 - n(M \cup S)$

$\therefore n(M \cup S) = 80$

Also, Let ~~$n_o(M)$~~ the no. of student who passed in science only be 'x' and mathematics only will be $2x$ i.e.

$n_o(M) = 2x$

$n_o(S) = x$

We know

$n(M \cup S) = n_o(M) + n_o(S) + n(M \cap S)$

or, $80 = 2x + x + 50$

or, $x = \frac{30}{3} = 10$

Now,

i. $n(M) = 2x + n(M \cap S)$

$= 2 \times 10 + 50$

$= 20 + 50$

$= 70$

Also,

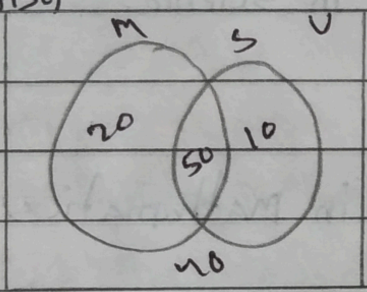
ii. $n(S) = n_o(S) + n(M \cap S)$

$= 10 + 50$

$= 60$

Also,

iii.



venn-diagram

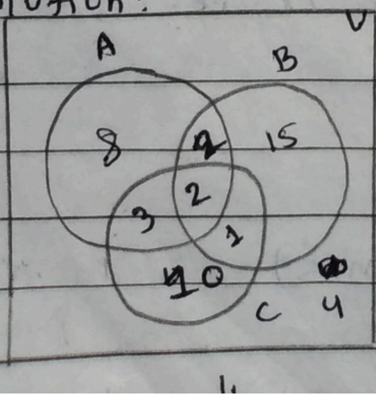
Exercise - 1.2

General Section.

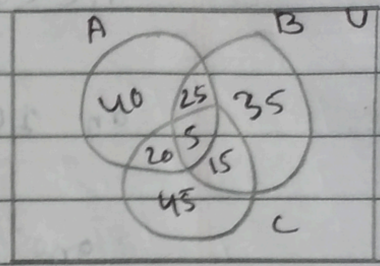
1.a. A, B and C are the subsets of a universal set U. Draw a venn-diagram and insert the cardinally of the following information.

$n(U) = 45$, $n(A) = 15$, $n(B) = 20$, $n(C) = 16$, $n(A \cap B) = 4$
$n(B \cap C) = 3$, $n(A \cap C) = 5$ and $n(A \cap B \cap C) = 2$

Solution:



b. In the given venn-diagram, A, B and C represent the sets of people who like cricket, football and ~~baseball~~ basketball respectively. If $n(U) = 200$, find.



Solution:

From venn-diagram

i. $n(A) = 90$

ii. $\cancel{A(B) = 200}$ $n(B) = 80$

iii. $n(C) = 85$

iv. $n(A \cup B \cup C) = 185$

v. $n(\overline{A \cup B \cup C}) = 15$

vi. $n(A \cap B \cap C) = 5$

vii. $n_o(A) = 40$

viii. $n_o(B) = 35$

ix. $n_o(C) = 45$

x. $n(A \cap B) = 30$

xi. $n(B \cap C) = 20$

xii. $n(A \cap C) = 25$

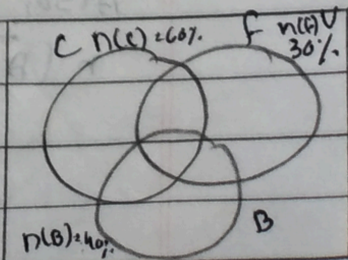
xiii. $n_o(A \cap B) = 25$

xiv. $n_o(B \cap C) = 15$

xv. $n_o(A \cap C) = 20$

---

c. The given venn-diagram shows the set of students C, F and B who play cricket, football, basketball respectively. If $C \cup F \cup B = 100\%$, $n(C \cap F) = 10\%$, $n(F \cap B) = 10\%$ and $n(C \cap B) = 15\%$. Find the percentage of the students who plays all three type of games.



Solution:

Given;

$n(C \cup F \cup B) = 100\%$

$n(C \cap F) = 10\%$

$n(F \cap B) = 10\%$

$n(C \cap B) = 15\%$.

we know,

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

$$\text{or } 100\% = 60\% + 30\% + 40\% - 10\% - 10\% - 15\% + n(C \cap F \cap B)$$

$$\text{or } 100\% = 95\% + n(C \cap F \cap B)$$

$$\therefore n(C \cap F \cap B) = 5\%.$$

Creative section.

2.a. If $n(A) = 48$, $n(B) = 51$, $n(C) = 40$, $n(A \cap B) = 11$, $n(B \cap C) = 10$, $n(C \cap A) = 9$, $n(A \cap B \cap C) = 4$ and $n(U) = 120$ find the value of $n(\overline{A \cup B \cup C})$ and represent the above information in a venn-diagram.

Solution:

Given;

$n(A) = 48$ $\qquad$ $n(A \cap B) = 11$

$n(B) = 51$ $\qquad$ $n(B \cap C) = 10$

$n(C) = 40$ $\qquad$ $n(C \cap A) = 9$

$n(A \cap B \cap C) = 4$

$n(U) = 120$

Now,

we know $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

$$= 48 + 51 + 40 - 11 - 10 - 9 + 4$$

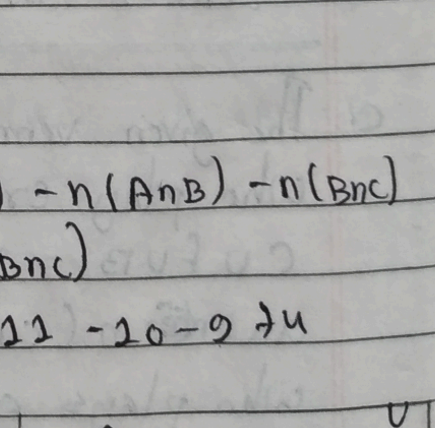
$$= 113$$

Also,

$$n(\overline{A \cup B \cup C}) = n(U) - n(A \cup B \cup C)$$

$$= 120 - 113$$

$$= 7$$



b. Given that, $n(U) = 100$, $n(P) = 45$, $n(Q) = 48$, $n(R) = 40$
$n_o(P) = 15$, $n_o(Q) = 18$, $n_o(P \cap Q) = 10$, $n_o(Q \cap R) = 8$, find.

i. $n(P \cap Q \cap R)$

ii. $n_o(P \cap R)$

iii. $n_o(R)$

iv. $n(\overline{P \cup Q \cup R})$

Illustrate the above information in a venn-diagram.

Solution:

Given; $n(U) = 100$ $\quad$ $n_o(P) = 15$

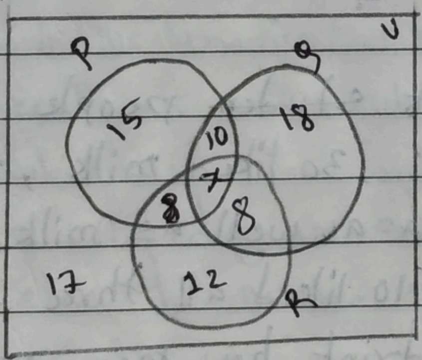
$n(P) = 45$ $\quad$ $n_o(Q) = 18$

$n(Q) = 48$ $\quad$ $n_o(P \cap Q) = 10$

$n(R) = 40$ $\quad$ $n_o(Q \cap R) = 8$

~~we know,~~ Let, $n(P \cap Q \cap R)$ be 'x'.

iv.



From venn-diagram,

$n(Q) = 10 + 18 + 8 + x$

or $48 = 36 + x$

or $x = 48 - 36$

$\therefore x = 12$

$\therefore n(P \cap Q \cap R) = 12$

ii. $n_o(P \cap R) = n(P) - 10 - x - 15$

$= 45 - 10 - 12 - 15$

$= 8$

From venn-diagram

iii. $n_o(R) = n(R) - 8 - x - n_o(P \cap R)$

$= 40 - 8 - 12 - 8$

$= 12$

iv. $n(\overline{P \cup Q \cup R}) = n(U) - n(P \cup Q \cup R)$

$= 100 - (15 + 10 + 18 + 8 + 12 + 8 + 12)$

$= 100 - 83$

$= 17$

Creative Section

2.a. ~~If $n(A) = 48$, $n(B) = 51$, $n(C) = 40$, $n(A \cap B) = 11$, $n(B$~~
~~$n(B \cap C) = 10$, $n(C \cap A)$~~

3.a. The survey of a group of ~~studen~~ people showed that 60 like tea, 45 like coffee, 30 liked milk, 25 liked coffee as well as tea, 20 liked tea as well as milk, 15 liked coffee as well as milk and 10 liked all three. If every person liked at least one drink, how many people were asked this question? Solved it by drawing venn-diagram.

Solution:

Let the number of people who like tea, coffee and milk be $n(T)$, $n(C)$ and $n(M)$ respectively.

Given;

$n(T) = 60$

$n(C) = 45$

$n(M) = 30$

$n(C \cap T) = 25$

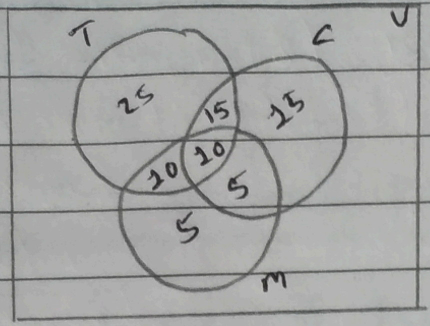
$n(T \cap M) = 20$

$n(C \cap M) = 15$

$n(T \cap C \cap M) = 10$

$n(\overline{T \cup C \cup M}) = 0$

Here,



from venn-diagram

$n(T \cup C \cup M) = 25 + 10 + 10 + 15 + 15 + 5 + 5$

$= 85$

$\therefore$ 80 people were asked the question in a survey.

b. In an examination, out of 200 students, 70 succeed in English, 80 in mathematics, 60 in Nepali, 35 in English as well as in Mathematics, 25 in English as well as in Nepali, 35 in Nepali as well as in Mathematics and 10 succeeded in all three subjects.

i. Draw a venn-diagram showing the above information

ii. Find also the number of students who didn't succeed in all three subjects.

Soln,

Let the number of students who passed in ~~that~~ English, Mathematics and Nepali be $n(E)$, $n(M)$ and $n(N)$ respectively.

Given;

$n(U) = 200$

$n(E) = 70$

$n(M) = 80$

$n(N) = 60$

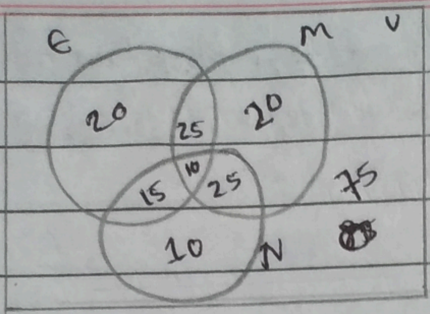
$n(E \cap M) = 35$

$n(E \cap N) = 25$

$n(N \cap M) = 35$

$n(E \cap M \cap N) = 10$

i.



Now,
From venn-diagram

ii. $n(\overline{E \cup M \cup N}) = 75$

$\therefore$ 75 ~~people~~ student didn't succeed in all three subjects.

c. ~~In~~ Out of the total candidates in an examination, 40% students passed in maths, 45% in science and 55% in Health, 10% students passed in both maths and science 20% in science and health and 15% in health and maths. If every student passed at least one subject

i. draw a venn-diagram to show the above information

ii. Calculate the percentage who passed in all three subjects

Solution:

Let the no. of student who passed in maths, science and health be n(M), n(s) and n(H) respectively.

Given;

$n(U) = 100\%$

$n(M) = 40\%$

$n(S) = 45\%$

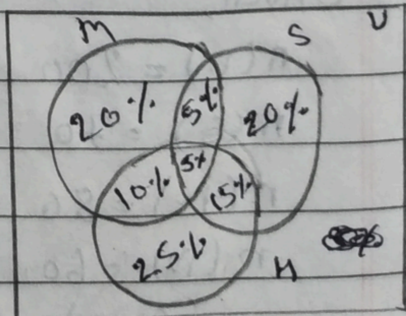
$n(H) = 55\%$

$n(M \cap S) = 10\%$

$n(S \cap H) = 20\%$

$n(H \cap M) = 15\%$

i.



We know,

$n(M \cup S \cup H) = n(M) + n(S) + n(H) - n(M \cap S) - n(S \cap H) - n(H \cap M) + n(M \cap S \cap H)$

or, $100\% = 40\% + 45\% + 55\% - 10\% - 20\% - 15\% + n(M \cap S \cap H)$

or, $n(M \cap S \cap H) = 100\% - 95\%$

$\therefore n(M \cap S \cap H) = 5\%$

$\therefore$ 5% students passed in all three subjects.

4.a. In a survey of 750 tourists who arrived in Nepal, 450 preferred to go trekking, 300 preferred rafting, 250 preferred forest safari and 30 prefered non of these activities. If 150 preferred trekking and rafting, 90 preferred trekking and safari, 75 preferred rafting and safari.

i. How many people of them preferred all of these activities.

ii. Show the above information in a venn-diagram.

Solution:

Let the no. of tourists who preferred trekking, rafting and forest safari be $n(T)$, $n(R)$ and $n(F)$ respectively.

Given,

$n(U) = 750$

$n(T) = 450$

$n(R) = 300$

$n(F) = 250$

$n(\overline{T \cup R \cup F}) = 30$

$n(T \cap R) = 150$

$n(T \cap F) = 90$

$n(R \cap F) = 75$

We know,

$n(\overline{T \cup R \cup F}) = n(U) - n(T \cup R \cup F)$

or, $30 = 750 - n(T \cup R \cup F)$

$\therefore n(T \cup R \cup F) = 720$

Also,

i. $n(T \cup R \cup F) = n(T) + n(R) + n(F) - n(T \cap R) - n(T \cap F) - n(R \cap F) + n(T \cap R \cap F)$

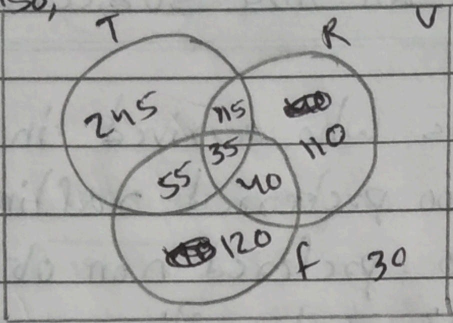
or, $720 = 450 + 300 + 250 - 150 - 90 - 75 + n(T \cap R \cap F)$

or, $n(T \cap R \cap F) = 720 - 685$

$\therefore n(T \cap R \cap F) = 35$

Also,

ii.



Venn-diagram

6b. In a survey of people who like different languages in films, 50 liked Nepali, 40 liked English, 30 liked Hindi, 24 liked Nepali and English, 19 liked Nepali and Hindi, 13 liked Hindi and English, 6 like all three and 21 people were found not interested in ~~movies~~ any languages. Find.

i. How many people did not like Hindi films.

ii. How many people did not like both Nepali and Hindi films.

Soln.

Let the no. of people who like Nepali, English and Hindi language be $n(N)$, $n(E)$ and $n(H)$ respectively.

Given;

$n(N) = 50$

$n(E) = 40$

$n(H) = 30$

$n(N \cap E) = 24$

$n(N \cap H) = 19$

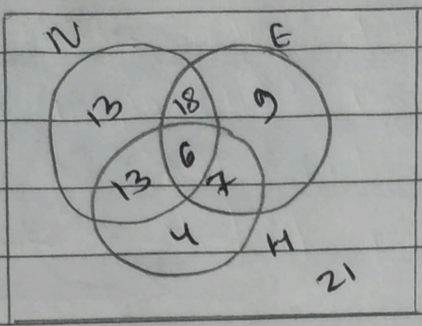
$n(H \cap E) = 13$

$n(H \cap E \cap N) = 6$

$n(\overline{H \cup E \cup N}) = 21$

Page:

Now,



Here,

from venn-diagram

i. No. of people who didn't like Hindi films = 13 + 18 + 9 + 21
= 61

ii. No. of people who didn't like Hindi and Nepali = 9 + 21 + 7 + 4 + 18 + 13
= ~~30~~ 72

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c. In a group of students, 20 study Economics, 18 study History, 21 study science, 21 study Economics only, 10 study science only, 6 study Economics and science only and 3 study science and History only.

i. Represent the above information in a venn-diagram.

ii. How many students study all the subjects.

iii. How many students are there altogether.

Solution:

Let the no. of ~~peopl~~ student who study Economics, History and Science be n(E), n(H) and n(S) respectively.

Given;

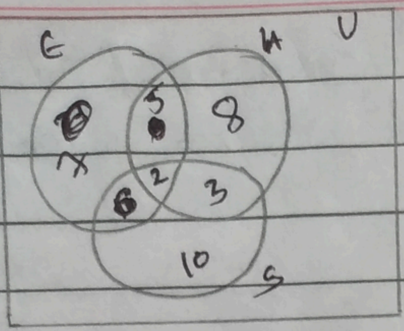
$n(E) = 20$ $n_o(E) = 7$

$n(H) = 18$ $n_o(S) = 10$

$n(S) = 21$ $n_o(E \cap S) = 6$

$n_o(S \cap H) = 3$

i.



Now from venn-diagram

ii. $n(E \cap H \cap S) = 2$

iii. $n(U) = 7 + 8 + 10 + 8 + 3 + 5$
$= 41$

d. In a group of students, 30 study English, 35 study Geography, 25 study Mathematics, 12 study English only, 15 study geography only, 10 study English and geography only and 6 students study geography and Mathematics only.

i. Draw a venn-diagram to illustrate the above information

ii. Find how many students study all the subjects.

iii. How many students are there altogether?

Solution:

Let the number of students who study geography, mathematics and Economics be $n(G)$, $n(M)$, and $n(E)$ respectively.

$n(E) = 30$

$n(M) = 25$

$n(G) = 35$

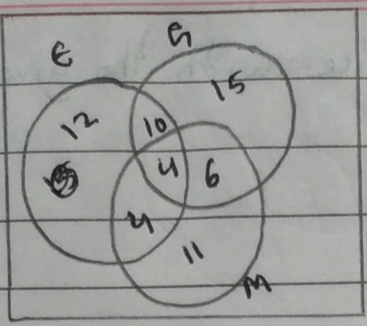
$n_o(E) = 12$

$n_o(G) = 15$

$n_o(E \cap G) = 10$

$n_o(G \cap M) = 6$

Page:

i. 

Now,

from venn-diagram

ii. $n(E \cap M \cap G) = 4$

iii. $n(U) = 12 + 15 + 11 + 10 + 4 + 4 + 6$

$= 62$

Unit-2

Tax and Money Exchange

Vat amount = Vat % of SP

SP with vat = SP + vat % of SP

$$\text{Vat \%} = \frac{\text{vat amount}}{SP} \times 100\%$$

Exercise - 2.1

General section

1.a. Write the formula to find amount of vat.

Soln,

vat amount = vat % of SP

b. Write the formula to calculate vat percent.

Soln,

$$\text{vat \%} = \frac{\text{vat amount}}{SP} \times 100\%$$