Date, 20/11/2022

ASSIGIMENT No. 1

DISCRETE STRUCTURES

NAME:- SAAD NISAR BUTT

REG. NO:- CS211246

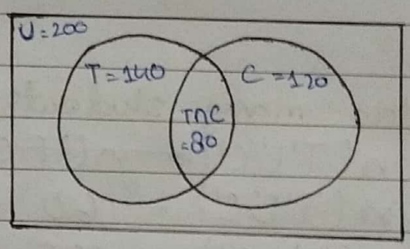
CLASS:- BSCS-3C

TOPIC:- PROBLEM INVOLVING TWO SETS (VENN DIAGRAMS)

QUESTION # 01

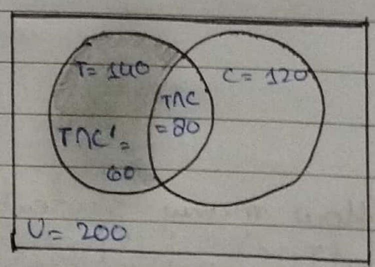
Q. In a college of 200 students are randomly selected. 140 like tea, 120 like coffee and 80 like both tea and coffee.

$n(U) = 200$
$n(T) = 140$
$n(C) = 120$
$n(T \cap C) = 80$



(a) How many students like only tea?

$n(T \cap C') = ?$
$n(T \cap C') = n(T) - n(T \cap C)$
$n(T \cap C') = 140 - 80$
$n(T \cap C') = 60.$



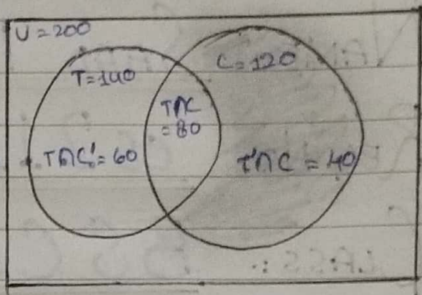
(b) How many students like only coffee?

$n(T' \cap C) = ?$

$n(T' \cap C) = n(C) - n(T \cap C)$

$n(T' \cap C) = 120 - 80$

$n(T' \cap C) = 40.$



(c) How many students like neither tea nor coffee?

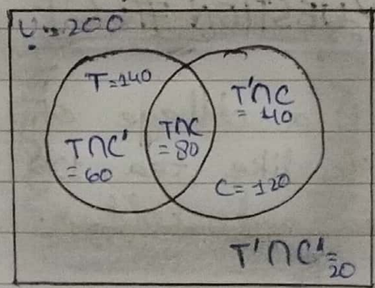
$n(T' \cap C') = ?$

$n(T' \cap C') = n(U) - [n(T' \cap C) + n(T \cap C') + n(T \cap C)].$

$n(T' \cap C') = 200 - [40 + 60 + 80].$

$n(T' \cap C') = 200 - 180$

$n(T' \cap C') = 20.$

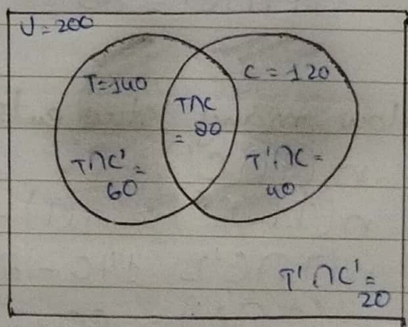


(d) How many students like only one of tea or coffee?

$n(T' \cup C') = n(T \cap C') + n(T' \cap C)$

$n(T' \cup C') = 60 + 40.$

$n(T' \cup C') = 100.$

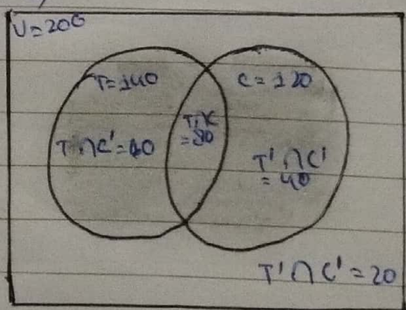


(e) How many students like atleast one of the bevarages?

$n(T \cup C) = n(T \cap C') + n(T' \cap C) + n(T \cap C)$

$n(T \cup C) = 60 + 40 + 80$

$n(T \cup C) = 180$



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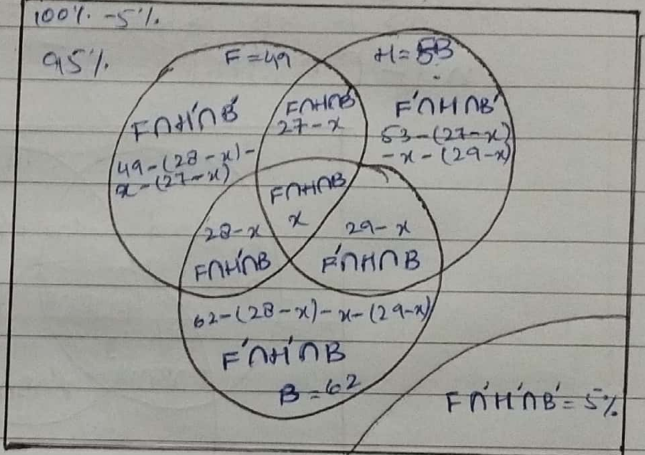
QUESTION # 02

In a survey of 500 students of a college, it was found that 49% liked watching football, 53% liked watching hockey and 62% liked watching basketball. Also, 27% liked watching football and hockey both, 29% liked watching basketball and hockey both and 28% liked watching football and basketball both. 5% liked watching none of these games.

$n(U) = 500 \rightarrow 100\%$
$n(F) = 49\%$
$n(H) = 53\%$
$n(B) = 62\%$
$n(F \cap H) = 27\%$
$n(B \cap H) = 29\%$
$n(F \cap B) = 28\%$
$n(F' \cap B' \cap H') = 5\%$



(a) How many students liked watching all three games?

$\because F \cap H' \cap B' = 49 - x - (27 - x) - (28 - x)$
$= 49 - \cancel{x} - 27 + \cancel{x} - 28 + x$
$= x - 6 \longrightarrow$ (i)

$F' \cap H \cap B' = 53 - (27 - x) - x - (29 - x)$
$= 53 - 27 + \cancel{x} - \cancel{x} - 29 + x$
$= x - 3 \longrightarrow$ (ii)

$F' \cap H' \cap B = 62 - (28 - x) - x - (29 - x)$
$= 62 - 28 + \cancel{x} - \cancel{x} - 29 + x$
$= x + 5 \longrightarrow$ (iii)

$F \cap H \cap B' = 27 - x \longrightarrow$ (iv)
$F \cap H' \cap B = 28 - x \longrightarrow$ (v)
$F' \cap H \cap B = 29 - x \longrightarrow$ (vi)
$F \cap H \cap B = x \longrightarrow$ (vii)

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Add all seven equations and equate to total no. of students.

$n(U) = x-6+\cancel{x}-3+\cancel{x}+5+27-\cancel{x}+28-\cancel{x}+29-\cancel{x}+\cancel{x}$

$100 = x + 80$

$x = 100 - 80$

$x = 20$

since 5% of students do not ~~play~~ like watching any sports.

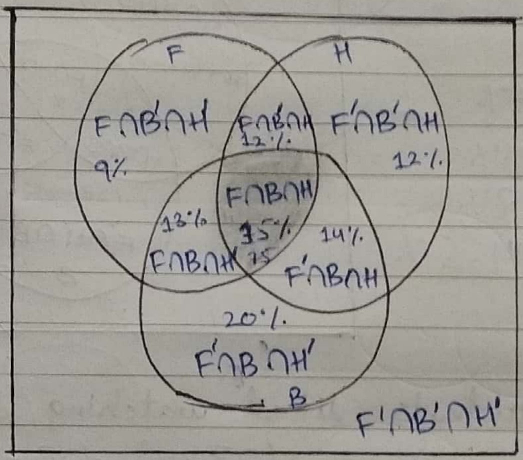
$x = 20 - 5$

$x = 15\%$

15% of students like watching all three games.

15% of 500 = 75

$n(F \cap B \cap H) = 75$



(b) Find the ratio of the number of students who like watching only football to those who like watching only hockey?

$n(F \cap B' \cap H') = ?$ $\qquad n(F' \cap B' \cap H) = ?$

$\because n(F \cap B \cap H) = 15 = x.$

from eq (i) (ii)

$n(F \cap B' \cap H') = x - 6$ & $n(F' \cap B' \cap H) = x - 3.$

put $x = 15$.

$n(F \cap B' \cap H') = 15 - 6$ $\qquad n(F' \cap B' \cap H) = 15 - 3$

$= 9$ $\qquad = 12$

So, $n(F \cap B' \cap H') : n(F' \cap B' \cap H)$

$9 : 12$

$3 : 4.$

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(c) Find the number of students who like watching only one of the three games?

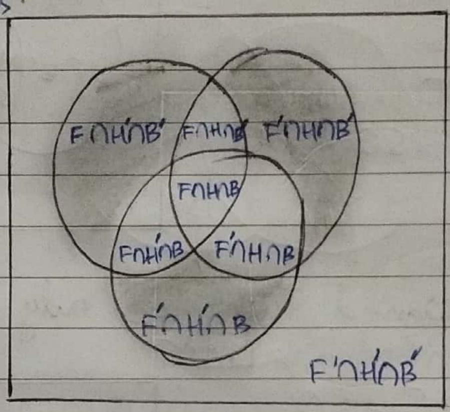
$= n(F\cap H'\cap B') + n(F'\cap H\cap B') + n(F'\cap H'\cap B)$

$= 9\% + 12\% + 20\%$

$= 41\%$.

41% of 500 = 205

205 students like watching only one of the three games.



(d) Find the number of students who like watching atleast two of the given games.

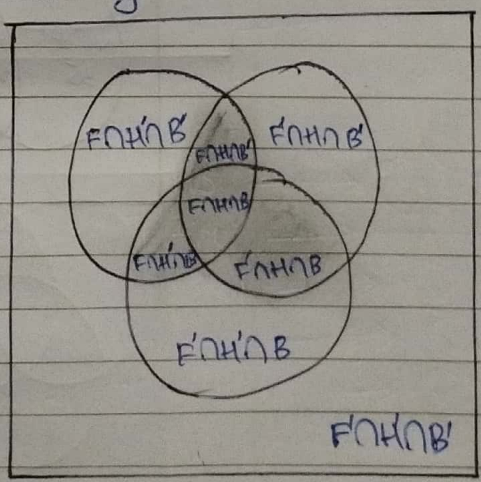
$= n(F\cap H'\cap B') + n(F\cap H'\cap B) + n(F'\cap H\cap B) + n(F\cap H\cap B)$

$= 12\% + 13\% + 14\% + 15\%$

$= 54\%$.

54% of 500 = 270.

270 students like watching atleast two of given games.



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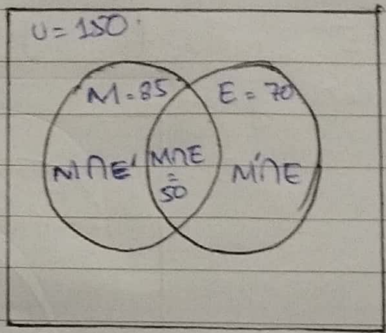
QUESTION # 03

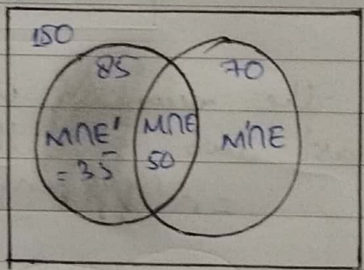
150 college freshmen are interviewed. 85 were registered for a Math class. 70 were registered for an English class. 50 were registered for both Math and English class.

$n(U) = 150$.
$n(M) = 85$
$n(E) = 70$
$n(M \cap E) = 50$.



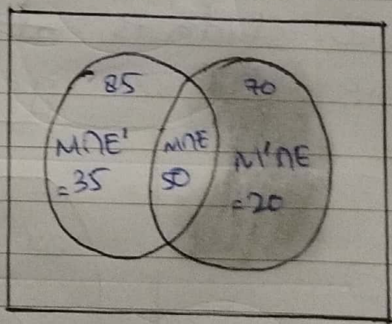
(a) How many signed up for only Math class?

$n(M \cap E') = n(M) - n(M \cap E)$
$n(M \cap E) = 85 - 50$
$n(M \cap E') = 35$



(b) How many students signed up for only English class?

$n(M' \cap E) = n(E) - n(M \cap E)$
$n(M' \cap E) = 70 - 50$
$n(M' \cap E) = 20$.



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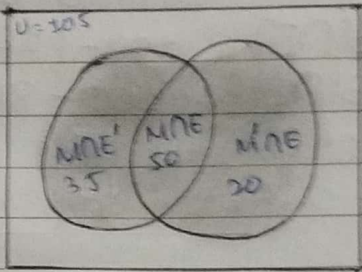
(c) How many students signed up for Math or English?

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

$n(M \cup E) = 35 + 20 + 50$

$n(M \cup E) = 105$

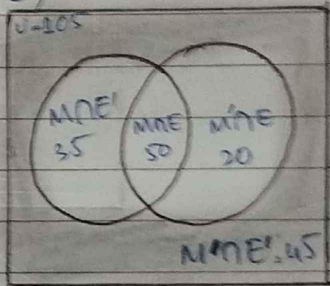


(d) How many signed up for neither English nor Maths?

$n(M' \cap E') = n(U) - n(M \cup E)$

$n(M' \cap E') = 150 - 105$

$n(M' \cap E') = 45$



QUESTION # 04

100 students were interviewed. 28 took PE, 31 took BIO, 42 took ENG, 9 took PE and BIO, 10 took PE and ENG, 6 took BIO and ENG, 4 took all three subjects

$n(U) = 100$

$n(P) = 28$

$n(B) = 31$

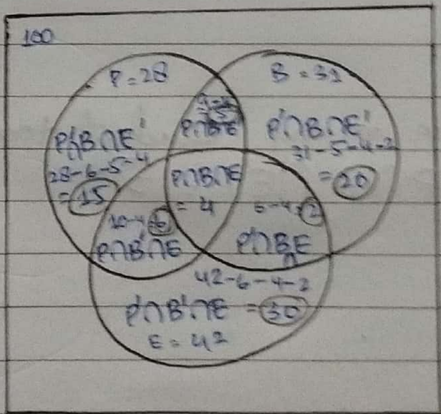
$n(E) = 42$

$n(P \cap B) = 9$

$n(P \cap E) = 10$

$n(B \cap E) = 6$

$n(P \cap B \cap E) = 4$



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(a) How many students took none of the three subjects?

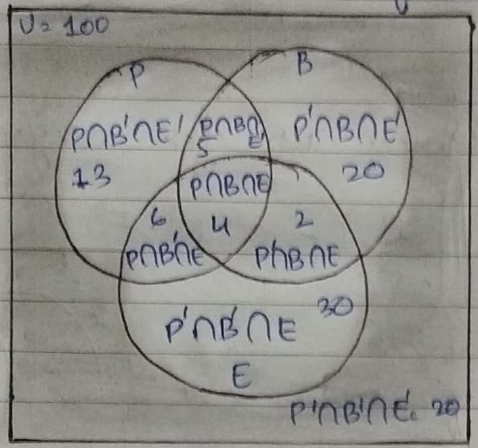
$n(P'\cap B'\cap E') = n(U) - [n(P\cap B'\cap E') + n(P'\cap B\cap E') + n(P'\cap B'\cap E) + n(P\cap B\cap E') + n(P\cap B'\cap E) + n(P'\cap B\cap E) + n(P\cap B\cap E)]$

$n(P'\cap B'\cap E') = 100 - (13+20+30+5+6+2+4)$

$n(P'\cap B'\cap E') = 100 - 80$

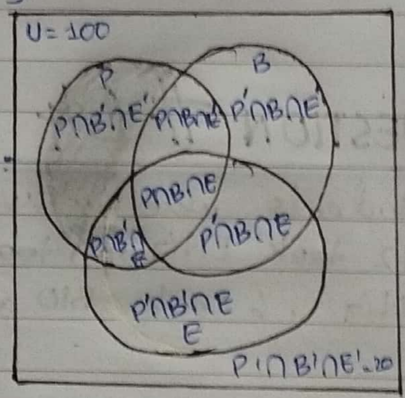
$n(P'\cap B'\cap E') = 20$

20 students took none of the three subjects.



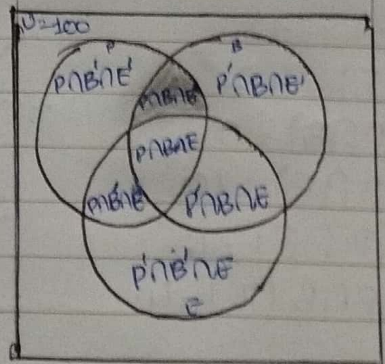
(b) How many students took PE but not BIO or ENG?

$n(P\cap B'\cap E') = 13.$



(c) How many student took BIO and PE but not ENG?

$n(P\cap B\cap E') = 5$



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