* Translate each of the following statement into ven diagram.

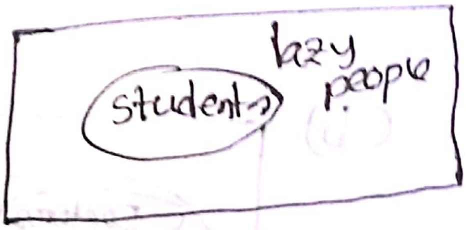
(a) All students are lazy.

(b) Some students are lazy.

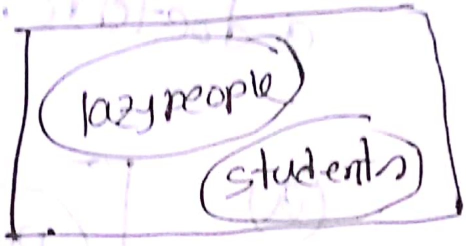
(c) No students is lazy.

(d) Not all students are lazy.

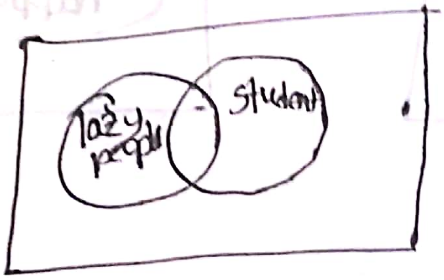
Ans: (a) The set of students are contain in the set of the lazy people.



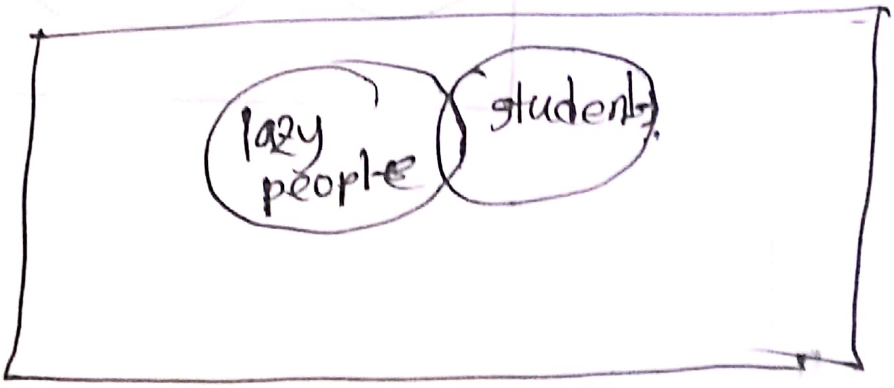
(c)



(b)



(d) Here the set of students is not contain in the set of lazy people.



* Consider the following assumption

S1: poets are happy people.

S2: Every doctor is wealthy.

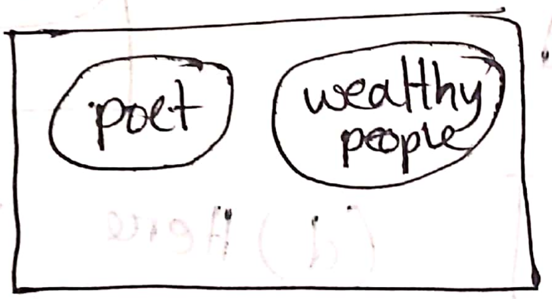
S3: No one who is happy also wealthy determine.

(a) No poet is wealthy.

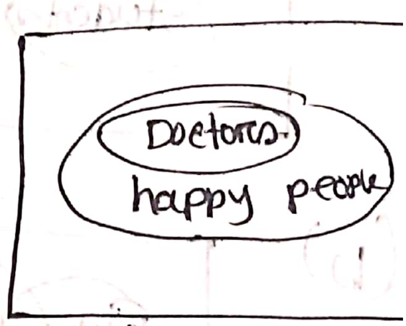
(b) Doctors are happy people.

(c) No one can be both a poet a doctor.

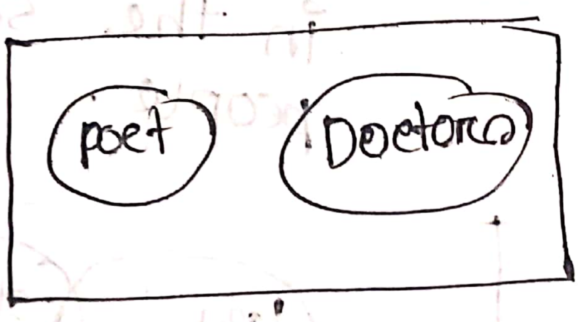
(a)



(b)



(c)



(a) $A = \{x : x \in N, 3 < x < 9\}$.

(a) A consist of all integers between 3 and 9. $A = \{4, 5, 6, 7, 8\}$.

(b) b consist of all positive integers satisfying the equation $x^2+1 = 10$.

If $x = 3$, $3^2+1=10$.

Hence $B = \{3\}$

(c) C consist of all positive odd integers between (-5 and 5

hence $C = \{1, 3\}$.

2. (a) $1 \notin A$ (d) $A \not\subseteq D$.

(e) $G \subseteq F$ or $F \supseteq G$.

(b) $5 \notin B$. (f) $E = F$.

(c) $A \subseteq C$.

Q| List all the subsets of A

there are $2^5 = 32$ of them.

$P(A) = [\phi, \{1\}, \{2\}, \{3\}, \{4\}, \{5\}, \{1,2\}, \{1,3\},$
$\{1,4\}, \{1,5\}, \{2,3\}, \{2,4\}, \{2,5\}, \{3,4\}, \{3,5\},$
$\{4,5\}, \{1,2,3\}, \{1,2,4\}, \{1,2,5\}, \{2,3,4\},$
$\{2,4,5\}, \{2,3,5\}, \{3,4,5\}, \{1,2,3,4\},$
$\{1,2,3,5\}, \{1,2,4,5\}, \{2,3,4,5\}, A]$

e, f)

$P(A) = [\{a,b\}, \{c\}, \{d\}]$.

$\therefore P(A) = [\phi, \{a,b\}, \{c\}, \{d,e,f\}, [\{a,b\},$
$\{c\}], [\{a,b\}, \{d,e,f\}], [\{c\}, \{d,e,f\}],$
A.

$n(A) = 4$

$n(B) = 50$

$n(C) = \{0\}$ C is finit because there are no positive integer $n(C) = 0$.

infinit.

① Given that $n(F \cup G \cup R) = 120 - 20$

$= 100.$

$n(F) = 65,$

$n(G) = 45,$

$n(R) = 42$

$n(F \cup G) = 20$

$n(F \cup R) = 25.$

$n(G \cup R) = 15.$

$n(F \cap G \cap R) = 2.$

We know,

$n(F \cup G \cup R) = n(F) + n(G) + n(R) - n(F \cup$

$- n(F \cup R) - n(G \cup R) + n(F \cap G \cap R$

$\Rightarrow 100 = 65 + 45 + 42 - 20 - 25 - 15 +$

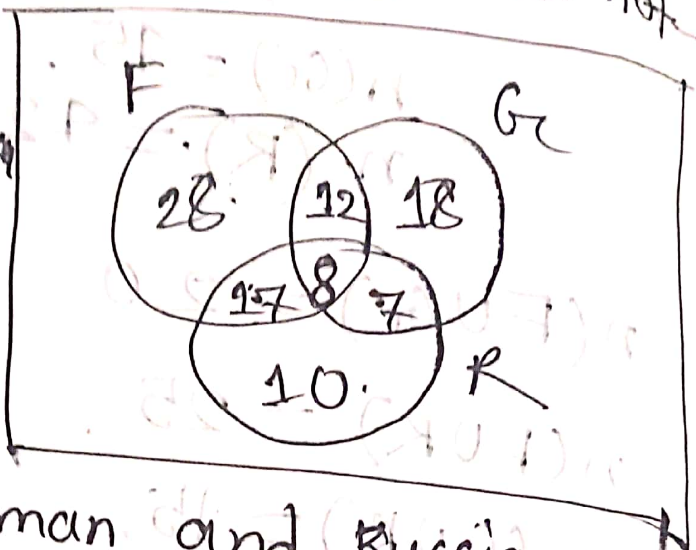
$n(F \cap G \cap R).$

$\Rightarrow n(F \cap G \cap R) = 8.$

so, 8 members learn all languages.

That is $n(F \cup G \cup R) = 100$ students.

$20-8=12$ study Frunch and German not Russian



$25-8=17$ study Frunch and Russian not German.

$15-8=7$ study German and Russian not frunch.

$65-12-8-17=28$ only frunch

$45-12-8-7=18$ only German

$42-17-8-7=10$ only Russian.

* 100 students, were asked whether they have

Sol: Given that,

$n(S) = 45$

$n(A) = 38$, $n(H) = 21$.

$n(S \cap A) = 18$

$n(S \cap H) = 9$.

$n(A \cap H) = 4$.

$n(S \cup H \cup A) = 100 - 23 = 77$.

$n(S \cap A \cap H) = ?$

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

$- n(S \cap H) - n(A \cap H) + n(S \cap A \cap H)$

$\Rightarrow 77 = 45 + 38 + 21 - 18 - 9 - 4 + n(S \cap A$

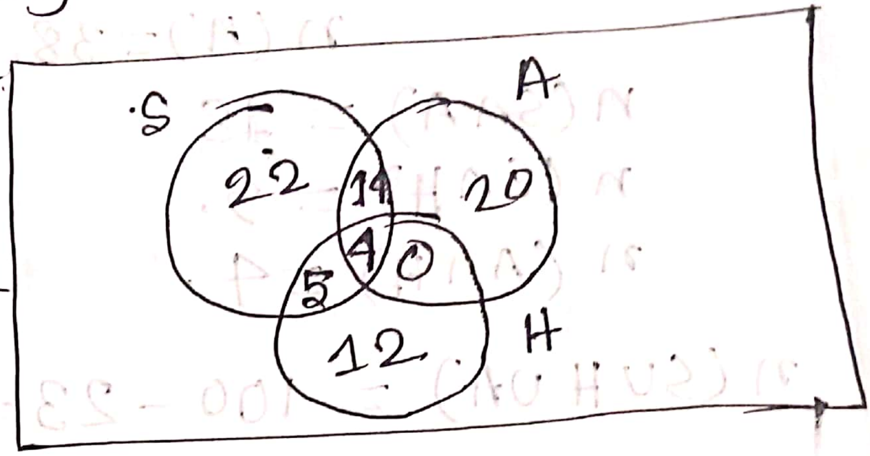
$\Rightarrow n(S \cap A \cap H) = 4$.

3 subjects had taken

→ $18 - 4 = 14$ sociology and Antropology not history.

→ $9 - 4 = 5$ sociology and History not Antropology.

$\rightarrow 4-4=0$ Antropology and History not History.



only socioloogy

$\rightarrow 45-14-4-5=22$

only Antropology.

$\Rightarrow 38-14-4-0=20$

only History. $= 21-0-4-5 = 12$

$\cdot 30$ nr

* (a) A consists of all the positive integers between 3 and 12

$A = \{4, 5, 6, 7, 8, 9, 10, 11\}$

(a) A is finite since there are four seasons in the year i,e $n(A) = 4$.

(b) B is finite beacuse there are 50 states in the Union $n(B) = 50$.

(c) There are no positive integer less than 1. $n(C) = 0$

(d) D is infinite.

(e) - $\{1, 3, 4, 6, 12\}$ $n(E) = 6$

(f) Although it may be difficult to find

(14) $n(N) = 25$

$n(T) = 26$

$n(F) = 26$

$n(N \cap F) = 9$

$n(N \cap T) = 11$, $n(T \cap F) = 8$

~~$n(N \cup T \cup F) = 38$~~ $n(N \cap T \cap F) = 3$

(a) Find the number of people who

read at least one of the three magazines.

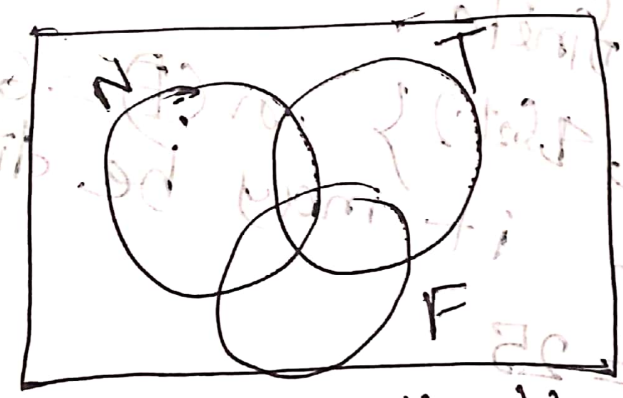
→ (a) $n(T \cup F \cup N) = ?$

$n(N \cup T \cup F) = n(N) + n(T) + n(F) - n(N \cap T) - n(N \cap F) - n(T \cap F) + n(N \cap T \cap F)$

$= 25 + 26 + 26 - 9 - 11 - 8 + 3$

$= \cancel{3}52$

(b).



3 reads all three magazine.

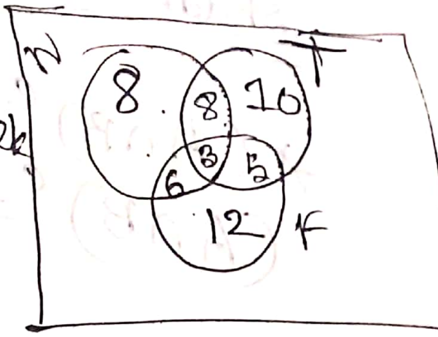
(b) n →

→ $9 - 3 = 6$ reads News~~paper~~week and fortune not Times.

→ $11 - 3 = 8$ reads ~~Newspaper~~ Newsweek and times not fortune.

→ $8 - 3 = 5$ reads times and fortune not ~~newspaper~~ Newsweek.

25a



→ $25 - 8 - 3 - 6$

$= 8$ read only newsweek

→ $26 - 8 - 3 - 5$

$= 10$ read only Time

→ $26 - 8 - 5 - 3 - 6 = 12$ read only fort

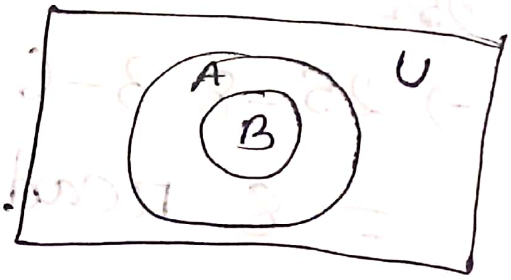
$60 - 52 = 8$ read no magazine at

(c) $8 + 10 + 12 = 30$ read only one

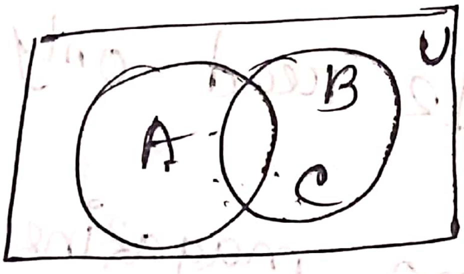
magazine.

Shade the set

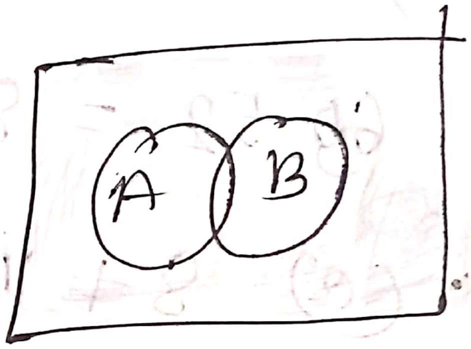
* $(A \cap B)^c = B^c$.
$(A \cap B)^c = A^c \cup B^c$.



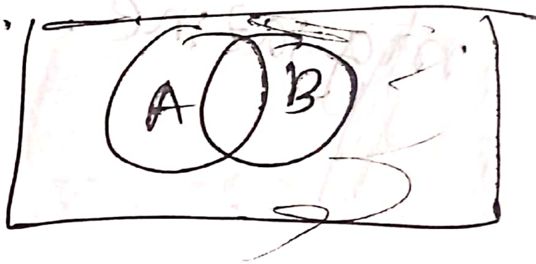
(e) $A \cap B = A \cap C$ and $A^c \cap B = A^c \cap C$.



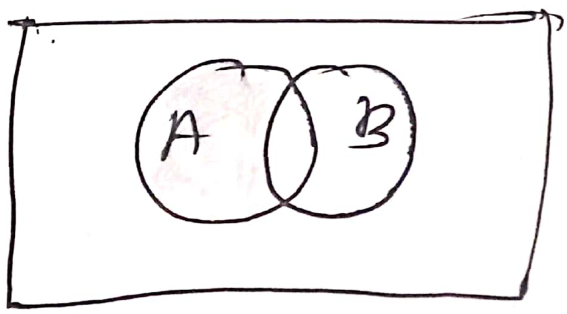
→ $(A \cup B)^c$ is shaded



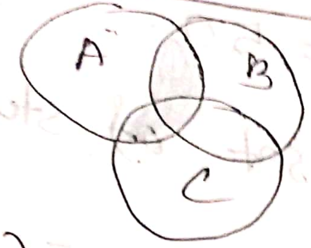
→ $A^c \cap B^c$ is shaded.



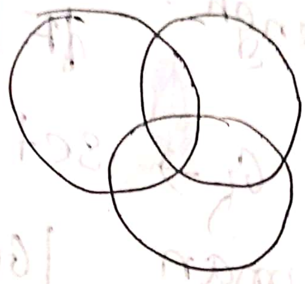
→ $A \cap B^c$ are shaded



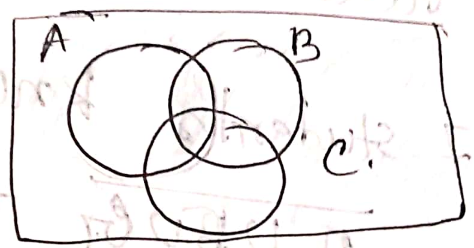
* $A \cap (B \cup C)$



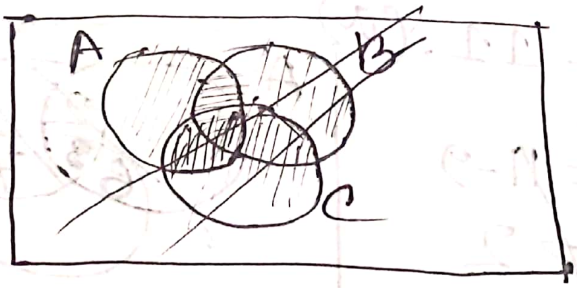
* $(A \cap B) \cup (A \cap C)$

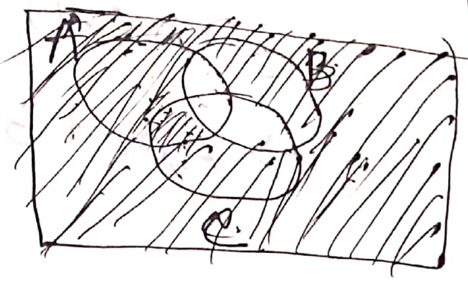


→ $A \cap B \cup C^{c}$



(Q-3) Shade the set $(A \cup B) \cap (A \cup C)$





Mid

(Q-4) $n(A) = 15$. $n(A \cap W) = 5$.

$n(B) = 12$. $n(A \cap B) = 9$.

$n(W) = ?$ $n(B \cap W) = 4$.

$n(A \cap B \cap W) = 3$.

$n(\overline{A \cup B \cup W}) = 2$.

$n(\bar{A} \cap \bar{B} \cap \bar{W}) = 2$.

$n(U) - n(A \cup B \cup W) = 2$

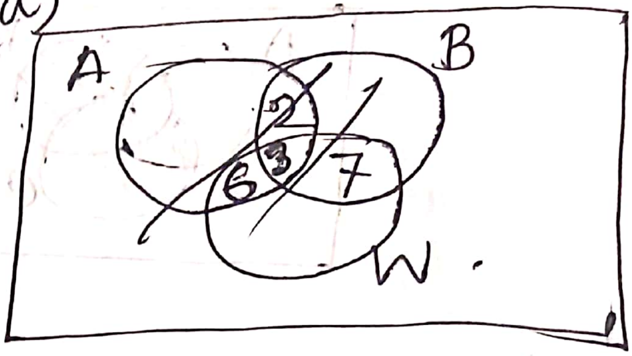
$\Rightarrow n(A \cup B \cup W) = 25 - 2 = 23$.

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

$\Rightarrow 23 = 15 + 12 + n(W) - 5 - 9 - \ldots 3$.

$\Rightarrow 23 - 12 = n(W)$

$\Rightarrow n(W) = 11$. (a)



$\rightarrow$ A and B $= 11 - 9$

$= 2$

$\rightarrow$ B and W $= 11 - 4$

$= 7$.

A and W $= 11 - 5 = 6$

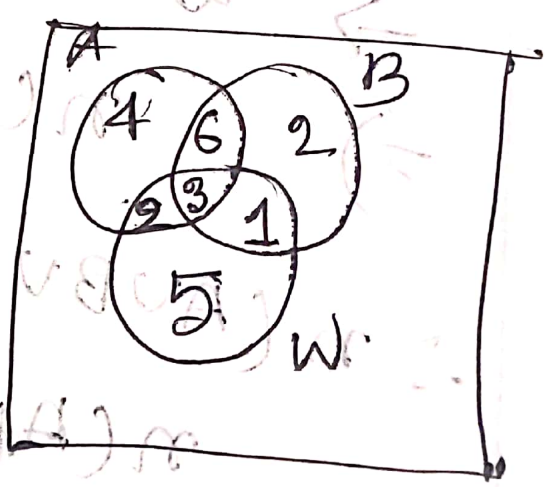
only A $= 15 - 2 - 3 - 6 =$

only B $= 12 - 2 - 3 - 7 =$

only windows $= 11 -$

$\rightarrow$ A and B $= 9 - 3$

$= 6$.



$\Rightarrow$ A and W $= 5 - 3$

$= 2$

$\rightarrow$ B and W $= 4 - 3$

$= 1$

only $A = 15 - 6 - 3 - 2 = 4$.

only $B = 12 - 6 - 3 - 1 = 2$

only $W = 11 - 2 - 3 - 1 = 5$.

(a) Only powerwindow $= 5$.

(b) only air $= 4$.

(c) only Radio $= 2$.

(d) Radio and powerwindow not air condind $= 1$.

(e) Air and Radio $= 6$.

(f) Only one of the option.

Composition of Relation :

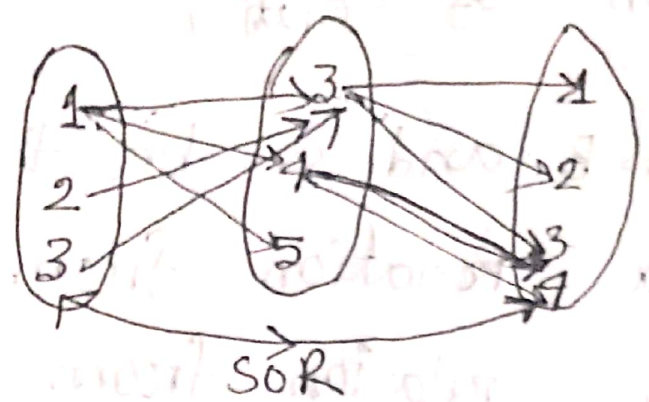
Let A, B, and C be three sets, suppose R is a Relation from A to B and S is a relation from B to C.

The composite of R and S, denoted by $S \circ R$, is a binary relation from A to C consisting of ordered pairs (a, c) : where $a \in A$ and $c \in C$. Also, $b \in B$ such that $(a, b) \in R$ and $(b, c) \in S$

Example: What is the composition of the relations R and S, where R is the relation from set $A = \{1, 2, 3\}$ to set $B = \{3, 4, 5\}$ with $R = \{(1,3), (1,4), (1,5), (2,3), (3,3)\}$

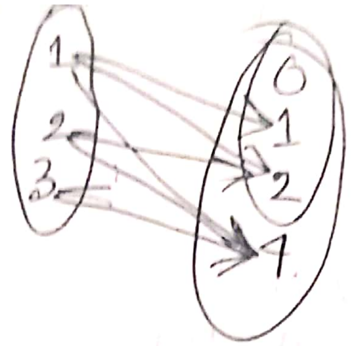
$S = \{(3,1), (3,2), (3,3), (4,3), (4,4)\}$

Solution:



$$SoR = \{(1,1), (1,2), (1,3), (1,4), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3)\}$$

Note: If R and S are relations from A to B and C to D respectively then SoR is not defined unless $B = C$.



2.1) The ordered ~~elements~~ of the elements in (a,b) does make difference., here a is designated as the first element and b as second element. Thus $(a,b) \neq (b,a)$ un $a=b$.. On the other hand $\{a,b\}$ and $\{$ represent the same set.

(2.2) if and only if the corresponding elements $a_1 = b_1$, $a_2 = b_2$ — $a_n = b$

2.6 (a) $A = \{1,2,3\}$ $B = \{a,b\}$

$A \times B = \{(1,a), (1,b), (2,a), (2,b), (3,$
$(3,b)\}$.

(b) $B \times A = \{(a,1), (a,2), (a,3), (b,1)$
$(b,2), (b,3)\}$.

// ~~2-1~~ (2.19) $n(A) = 4$ (a) $A \times B$.
$n(B) = 3$ $n(A \times B)$
$= 12$

(b) $n(B \times A) = 12$.

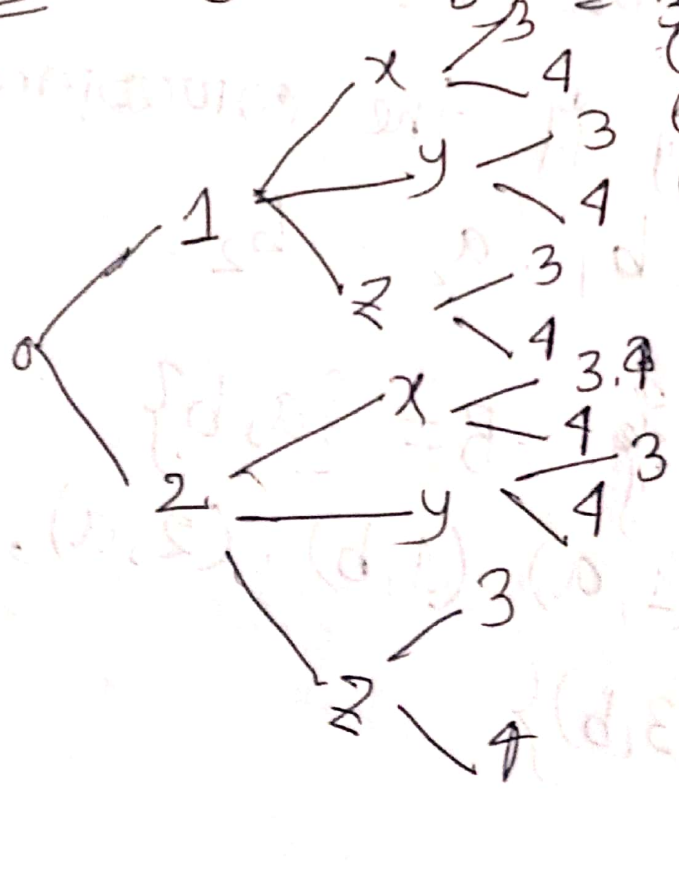
(c) $n(A^2) = 4.4 = 16$.

(d) $B^4 = n(B^4) = 3^4 = 81$.

(e) $n(A \times A \times B) = 4.4.3 = 48$.

(f) $n(B \times A \times B) = 3.4.3 = 36$

//



(1,x,3)
(1,x,4)
(1,y,3)
(1,y,4)
(1,z,3)
(1,z,4)
(2,x,3)
(2,x,4)
(2,y,3)
(2,y,4)
(2,z,3)
(2,z,4)

$A \times B \times C$ consists of all ordered triplets (a, b, c), where $a \in A$, $b \in B$, $c \in C$. These elements of $A \times B \times C$ can be systematically obtained by a so called tree diagram

$$n(A) = 2,\ n(B) = 3,\ n(C) = 2$$

$$n(A \times B \times C) = 2 \cdot 3 \cdot 2 = 12$$

$\Rightarrow (A \times B) \cap (A \times C)$

$= \{(x, y) : (x, y) \in (A \times B) \text{ and } (x, y) \in (A \times C)$

$= \{(x, y) : x \in A, y \in B \text{ and } x \in A, y \in C\}$

$= \{(x, y) : x \in A, y \in B \cap C\}$

$= A \times (B \cap C)$

22) $(A \times B) \cup (A \times C) = A \times (B \cap C)$

$= \{(x, y) : (x, y) \in A \times B \text{ or } (x, y) \in$

$= \{(x, y) : x \in A, y \in B \text{ or}, x \in A, y \in$

$= \{(x, y) : x \in A, \cancel{y \in B \cup C}$ And $y \in B$ or $y \in$

$= \{(x,y): x \in A \text{ and } y \in B \text{ or } y \in C\}$

$= \{(x,y): x \in A,\ y \in B \cup C\}$

$= \{A \times (B \cup C)\}$

32| 27| $A = \{a, b, c\}$, $B = \{1, 2\}$;

a) R They are all subset of $A \times B$

$A \times B = \{(a,1), (a,2), (b,1), (b,2), (c,1), (c,2)\}$

32| (a) The domain of R consists of the first elements of the ordered pair. and the range of R consists he second elements of the ordered air.

) R^{-1} is obtained by reversing he ordered pairs in R.

$R = \{(1,y), (1,z), (3,y), (4,x), (4,z)\}$

$R^{-1} = \{(y,1), (z,1), (y,3), (x,4), (z,4)\}$

31) let. $A = \{1, 2, 3\}$, $R = \{(1,1), (2,1), (3,2), (1,3)\}$.

(a) $1 R 1$. (b) $1 \not R 2$ (c) $2 R 3$ (d) $2 \not R 1$,

(e) $3 R 2$ (f) $3 \not R 1$.

(a) True, since $(1,1) \in R$.

(b) True, since $(1,2) \notin R$.

(c) False, $(2,3) \notin R$.

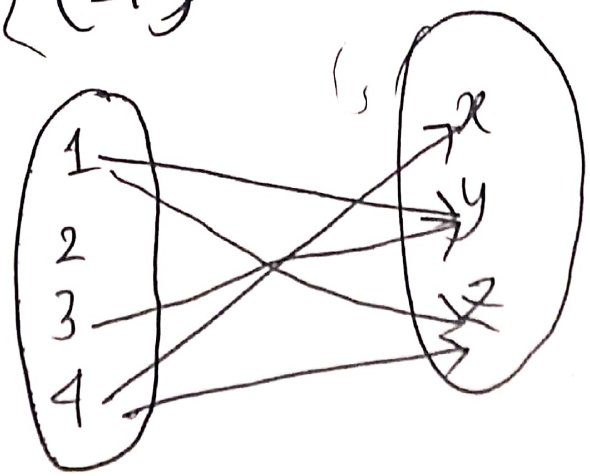
(d) False, $(2,1) \in R$.

(e) True, $(3,2) \in R$.

(f) True. $(3,1) \notin R$.

(61) $A = \{1, 2, 3, 4\}$, set $B = \{x, y, z$

$R = \{(1, y), (1, z), (3, y), (4, x), (4$



Write down the elements of A and the elements of B in two columns within two disjoint disks, and then draw an arrow from $a \in A$ to $b \in B$ whenever a is related to b.

" $(a, b) \in R$, as shown in fig 2 "

The figure is called the arrow diagram of R.

(62)

$$\begin{array}{c|ccc} & x & y & z \\ \hline 1 & & & \\ 2 & & & \\ 3 & & & \\ 4 & & & \end{array} \qquad \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{ccc} x & y & z \end{array} \\ \begin{pmatrix} 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix} \end{array}$$

From a rectu :