P(1)

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QNo1

(a) Definition

A biconditional statement is defined to be true whenever both parts have the same truth value. The biconditional operator is denoted by a double-headed arrow $\leftrightarrow$. The biconditional $p \leftrightarrow q$ represents "p if and only if q" where p is a hypothesis and q is a Conclusion. The following is truth table for biconditional $p \leftrightarrow p$.

| p | q | $p \leftrightarrow q$ |
|---|---|---|
| T | T | F |
| T | F | F |
| F | T | F |
| F | F | T |

in the truth table above $p \leftrightarrow q$ is true when p and q have the same truth values (i.e, when either both are true or both are false) Now that the biconditional has been defined.

(b)

**Ans** (i) Sam had pizza last night and Chris finished her homework $p \wedge q$

(ii) Pat watched the news this morning iff Sam did not have pizz last night

$r \Leftrightarrow \neg p$

(iii) Pat watched the news this morning if and only if Chris finished her homework and Sam did not have pizza last night

$r \Leftrightarrow (q \wedge \neg p)$

(iv) in order for pat to watch the news this morning it is necessary and sufficient that sam had

~~pizza~~ pizza last night and chris finished her homework

$r \Leftrightarrow (p \wedge q)$

**Q.No 2**

(a) lets p, q r represent the following statement

p:- it is hot today

q:- it is sunny

r:- it is raining

⇒ Express in words the statements using Biconditional statement represents by the following formuls.

(i) $q \longleftrightarrow p$

(ii) $p \longleftrightarrow (q \wedge r)$

(iii) $p \longleftrightarrow (q \vee r)$

(iv) $r \longleftrightarrow (p \vee q)$

**Ans**

(i) it is sunny if and only if, it is hot today

(ii) it is hot today if it is sunny and it is raining

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(iii) it is hot today iff it is Sunny or it is raining

(iv) it is raining iff it is hot today or it is Sunny

Q NO 3 P(5)

**Ans**

An argument form or argument for short is a sequence of statements all statements but the last one are called premises or hypotheses. An argument is valid if the Conclusion is true whenever all the permises are true

**Example**

$p \leftrightarrow q \vee \sim r \wedge p$ is Same a $p \leftrightarrow ((q \vee (\sim r)) \wedge p)$. However $p \leftrightarrow q \vee \sim r \wedge p$ would be Same as $p \leftrightarrow (q \vee ((\sim r) \wedge p))$ had we adopted higher precedence for $\wedge$ the for $\vee$

**valid** an argument is vald if and only if it is necessary that if all of the premises are true, then the Conclusion is true; if all the permises are true, then the Conclusion most be true.

**Example** Anyone who lives in

The city Honolulu HI also lives on the island of Oahu Knoe does not live on the island of Oahu.

## INvalid

An argument is valid if and only if it is necessary that if all of the premesson are true then the conclusion is true: if all the premises are true and seeing whether it is still possible for the conclusion to be false it. thus is possible, the argument is invalid.

## Exampl

Anyone who lives in the city Honolulu, HI also lives on the island of Oahu Knoe-live on the island of Ohau there fore Knoe lives in the city Honolulu. HI

(1) The validity of the following argument is conformed by the critical rows of the truth table as shown below

| p | q | r | p∨(q∧r) | p | q∧r |
|---|---|---|---|---|---|
| T | T | T | T | F | T |
| T | T | F | T | F | F |
| T | F | T | T | F | F |
| T | F | F | T | F | F |
| F | T | F | T | T | T |
| F | T | F | F | T | F |
| F | F | T | F | T | F |
| F | F | F | F | T | F |

(2) An invalid argument from can likewise be demonstrated by truth table.

| p | q | r | p∨(q∧r) | ~(p∧q) | r |
|---|---|---|---|---|---|
| T | T | T | T | F | T |
| T | T | F | T | F | F |
| T | F | T | T | T | T |
| T | F | F | T | T | T |
| F | T | T | T | T | T |
| F | T | F | F | T | F |
| F | F | T | F | T | T |
| F | F | F | F | F | [illegible] |

While rows 3, 4 and indicate valid (true premises the 4th row reveals a false

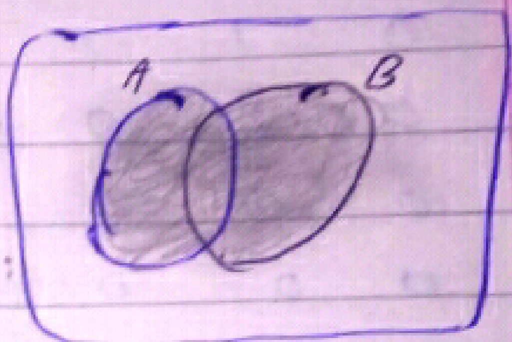
~~Conclusion~~ ~~[illegible] by~~

**QNO4**

(a)

The union of two sets is a Contains all elements that are in A or in B for example $\{1,2\} \cup \{2,3\} = \{1,2,3\}$ Thus we can write $x \in (A \cup B)$ if and only if $(x \in A)$ or $(x \in B)$ Note that

$$A \cup B = B \cup A$$




**Membership Tables.**

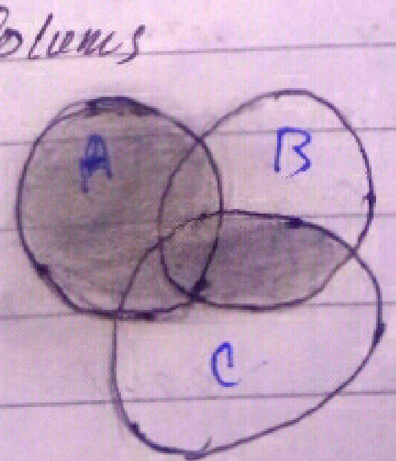
We Combine sets in much the Same way that we Combined proposition Asking if an element x is in the resulting set is like asking if a proposition is true Since the Colums Corresponding to the two sets match they are equal.

PX(10)

=) What does the set $A \cup (B \cap C)$ look like? we use 1 to denote the presents of some element x and 0 to deabe it absen-

| A | B | C | $B \cap C$ | $A \cup (B \cap C)$ |
|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |

=) This is a membership table. it Can be used to draw the venn diagram by shading in all regions that have a 1 in the final Column. The region are defied by the left-most Columns



QNO4 (b) INTERSETION

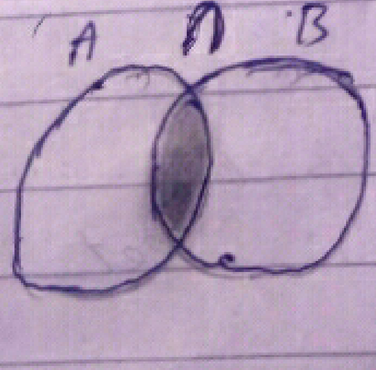
of Two given Sets is the largest Set which Contains all the element that are Common to bouth the sets. To Find the intersection of two given sets A and B is a Set Which Consists of all the elements which are Common to both A and B The Symbol for denoting intersection of sets is '∩'

for Exmple

$A = \{1\ 2\ 3\}$

$B = \{2\ 3\ 4\}$

$A \cap B = \{2, 3\}$



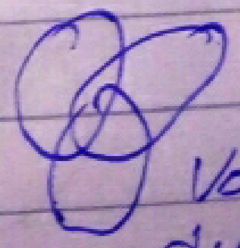
MEMBERSHIP Table for $A \cap B$

| A | B | $A \cap B$ |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 0 | 0 | 1 |

QNO5

(a) VENN diagram.

A venn diagram is a diagram that shows all possible logical relations between a finite Collection of different sets, These diagrams depict element as points in the plane and sets as regions inside colsed Curve. A venn diagram consists of multiple overlaping closed curves usually circles each represating a set



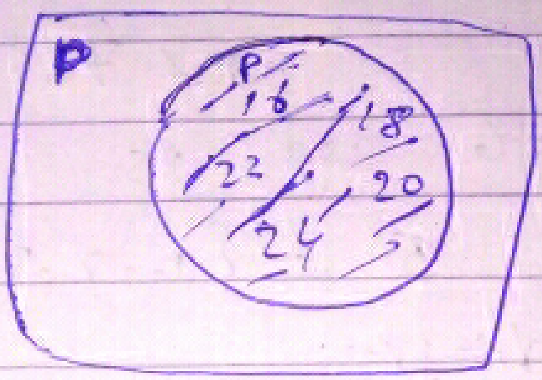
Vov dun

**QNo5 b**

Solution

let $P = \{16, 18, 20, 22, 24\}$

venn diagram of set P

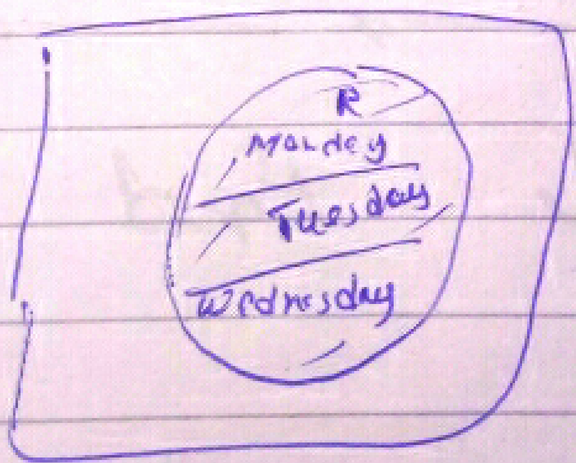



**QNO5(c)**

Solution

let ~~let R =~~

$R = \{$Monday, Tuesday, wednesday$\}$



QNO5 (d)

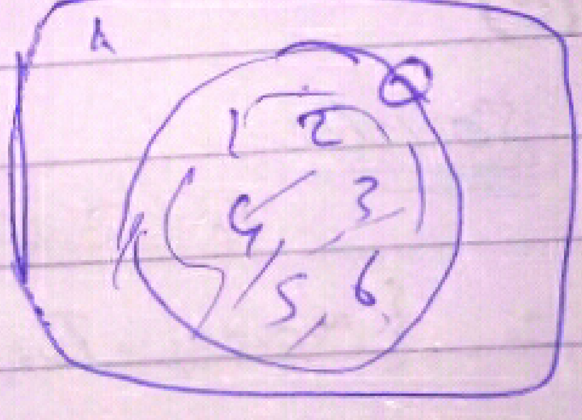
Solution

$$2x - 3 < 11$$
$$2x < 11 + 3$$
$$2x < 14$$
$$\frac{2x}{2} < \frac{14}{2}$$
$$x < 7$$

So the set is

$$Q = \{1, 2, 3, 4, 5, 6\}$$

Venn diagram

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