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# Exercise 5.1 (Solutions) Mathematics (Science Group): $\mathbf{1 0}^{\text {th }}$ 

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Q. 1 If $X=\{1,4,7,9\}$ and

$$
Y=\{2,4,5,9\} \text { then find: }
$$

## Solution:

(i) $X \cup Y$

$$
\begin{aligned}
X \cup Y & =\{1,4,7,9\} \cup\{2,4,5,9\} \\
& =\{1,2,4,5,7,9\}
\end{aligned}
$$

(ii) $X \cap Y$

$$
\begin{aligned}
X \cap Y & =\{1,4,7,9\} \cap\{2,4,5,9\} \\
& =\{4,9\}
\end{aligned}
$$

(iii) $Y \cup X$

$$
\begin{aligned}
Y \cup X & =\{2,4,5,9\} \cup\{1,4,7,9\} \\
& =\{1,2,4,5,7,9\}
\end{aligned}
$$

(iv) $Y \cap X$

$$
\begin{aligned}
Y \cap X & =\{2,4,5,9\} \cap\{1,4,7,9\} \\
& =\{4,9\}
\end{aligned}
$$

Q. 2 If $X=$ Set of Prime numbers less than or equal to 17.
$Y=$ Set of first 12 natural numbers, then find

## Solution:

$$
\begin{aligned}
& X=\{2,3,5,7,11,13,17\} \\
& Y=\{1,2,3,4, \ldots, 12\} \\
& \text { (i) } X \cup Y \\
& X \cup Y=\{2,3,5,7,11,13,17\} \cup\{1,2,3,4, \ldots, 12\}
\end{aligned}
$$

$=\{1,2,3,4,5,6,7,8,9,10,11,12,17\}$
(ii) $Y \cup X$

$$
\begin{aligned}
Y \cup X & =\{1,2,3,4, \ldots, 12\} \cup\{2,3,5,7,11,13,17\} \\
& =\{1,2,3,4,5,6,7,8,9,10,11,12,17\}
\end{aligned}
$$

(iii) $X \cap Y$

$$
\begin{aligned}
X \cap Y & =\{2,3,5,7,11,13,17\} \cap\{1,2,3,4, \ldots, 12\} \\
& =\{2,3,5,7,11\}
\end{aligned}
$$

(iv) $Y \cap X$

$$
\begin{aligned}
Y \cap X & =\{1,2,3,4, \ldots, 12\} \cap\{2,3,5,7,11,13,17\} \\
& =\{2,3,5,7,11\}
\end{aligned}
$$

Q.3If $X=\phi \quad Y=Z^{+} \quad T=O^{+}$then find
(i) $X \cup Y$
$X=\phi \quad Y=\{0,1,2,3 \ldots \ldots$.
$X \cup Y=\{ \} \cup\{0,1,2,3 \ldots . .$.
$X \cup Y=\{0,1,2,3 \ldots \ldots\}$
(ii) $X \cup T$
$X=\phi \quad T=\{1,3,5 \ldots$,
$X \cup T=\phi \cup\{1,3,5 \ldots\}$
$X \cup T=\{1,3,5 \ldots$.
(iii) $Y \cup T$
$Y=\{0,1,2,3 \ldots \ldots\} \quad T=.\{1,3,5,7 \ldots$.
$Y \cup T=\{0,1,2,3 \ldots \ldots.\} \cup\{1,3,5,7 \ldots$.
$Y \cup T=\{0,1,2,3,4,5 \ldots \ldots$.
(iv) $X \cap Y$
$X=\phi \quad Y=\{0,1,2,3 \ldots \ldots\}$
$X \cap Y=\{ \} \cap\{0,1,2,3 \ldots . .$.
$X \cap Y=\{ \}$
(v) $X \cap T$
$X=\phi \quad T=\{1,3,5,7 \ldots\}$
$X \cap T=\{ \} \cap\{1,3,5,7 \ldots\}$
$X \cap T=\{ \}$ or $\phi$
(vi) $Y \cap T$
$Y \cap T=Z^{+} \cap O^{+}$
$Y \cap T=\{1,2,3,4,5, \ldots ..\} \cap\{1,3,5,7 \ldots$.
$Y \cap T=\{1,3,5,7 \ldots$.
Q. 4 If $U=\left\{x \mid x \in N^{\wedge} 3<x \leq 25\right\}$

$$
\begin{aligned}
& X=\{x \mid x \text { is Prime } \wedge 8<x<25\} \\
& Y=\left\{x \mid x \in W^{\wedge} 4 \leq x \leq 17\right\}
\end{aligned}
$$

then find the value of:
Solution: $U=\{4,5,6,7, \ldots, 25\}$

$$
\begin{aligned}
& X=\{11,13,17,19,23\} \\
& Y=\{4,5,6,7, \ldots, 17\}
\end{aligned}
$$

(i) $(X \cup Y)^{\prime}$

$$
\begin{aligned}
& X \cup Y=\{11,13,17,19,23\} \cup\{4,5,6,7, \ldots, 17\} \\
& =\{4,5,6,7,8,9,10,11,12,13,14,15,16,17,19,23\} \\
& (X \cup Y)^{\prime}=U-(X \cup Y) \\
& =\{4,5,6,7, \ldots, 25\}-\{4,5,6,7,8,9,10,11,12,13,14,15,16,17,19,23\} \\
& =\{18,20,21,22,24,25\}
\end{aligned}
$$

(ii) $X^{\prime} \cap Y^{\prime}$

$$
X^{\prime}=U-X
$$

$$
\begin{aligned}
X^{\prime} & =\{4,5,6,7, \ldots, 25\}-\{11,13,17,19,23\} \\
& =\{4,5, \ldots . \ldots 10,12,14,15,16,18,20,21,22,24,25\} \\
Y^{\prime} & =U-Y \\
Y^{\prime} & =\{4,5,6,7, \ldots, 25\}-\{4,5,6,7, \ldots, 17\} \\
& =\{18,19,20,21,22,23,24,25\}
\end{aligned}
$$

$X^{\prime} \cap Y^{\prime}=\{4,5,6,7,8,9 \cdots \cdots \cdots . . .17,19,23\} \cap\{18,19,20,21,22,23,24,25\}$
$X^{\prime} \cap Y^{\prime}=\{18,20,21,22,24,25\}$
(iii) $(X \cap Y)^{\prime}$

$$
\begin{aligned}
(X \cap Y) & =\{11,13,17,19,23\} \cap\{4,5,6,7, \ldots, 17\} \\
& =\{11,13,17\} \\
(X \cap Y)^{\prime} & =U-(X \cap Y) \\
& =\{4,5,6,7, \ldots, 25\}-\{11,13,17\}
\end{aligned}
$$

$=\{4,5,6,7,8,9,10,12,14,15,16,18,19,20,21,22,23,24,25\}$
(iv) $X^{\prime} \cup Y^{\prime}$
$X^{\prime}=U-X=\{4,5,6,7, \ldots, 25\}-\{11,13,17,19,23\}$
$=\{4,5,6,7,8,9,10,12,14,15,16,18,20,21,22,24,25\}$
$Y^{\prime}=U-Y=\{4,5,6,7, \ldots, 25\}-\{4,5,6,7, \ldots, 17\}$

$$
=\{18,19,20,21,22,23,24,25\}
$$

$X^{\prime} \cup Y^{\prime}=\{4,5,6,7,8,9,10,12,14,15,16,18,20,21,22,24,25\}$ $\cup\{18,19,20,21,22,23,24,25\}$
$=\{4,5,6,7,8,9,10,12,14,15,16,18,19,20,21,22,23,24,25\}$
Q. 5 If $X=\{2,4,6, \ldots, 20\}$ and $Y=\{4,8,12, \ldots, 24\}$ then find the following

Solution: (i) $X-Y$
$X-Y=\{2,4,6,8,10,12,14,16,18,20\}-\{4,8,12,16,20,24\}$

$$
=\{2,6,10,14,18\}
$$

(ii) $Y-X$

$$
Y-X=\{4,8,12,16,20,24\}-\{2,4,6,8,10,12,14,16,18,20\}
$$

$$
=\{24\}
$$

Q. 6 If $A=N$ and $B=W$ then find the value of

Solution: (i) $A-B$

$$
\begin{aligned}
A-B & =N-W=\{1,2,3, \ldots\}-\{0,1,2,3, \ldots\} \\
& =\{ \}
\end{aligned}
$$

(ii) $B-A$

$$
B-A=W-N=\{0,1,2,3, \ldots\}-\{1,2,3, \ldots\}
$$

$$
=\{0\}
$$

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