Answer Key Unit Test Paper 1 -XI Mathematics(By Deepika Bhati)

SECTION A.

(1.) (c)

(2) (c)

(3) (a)

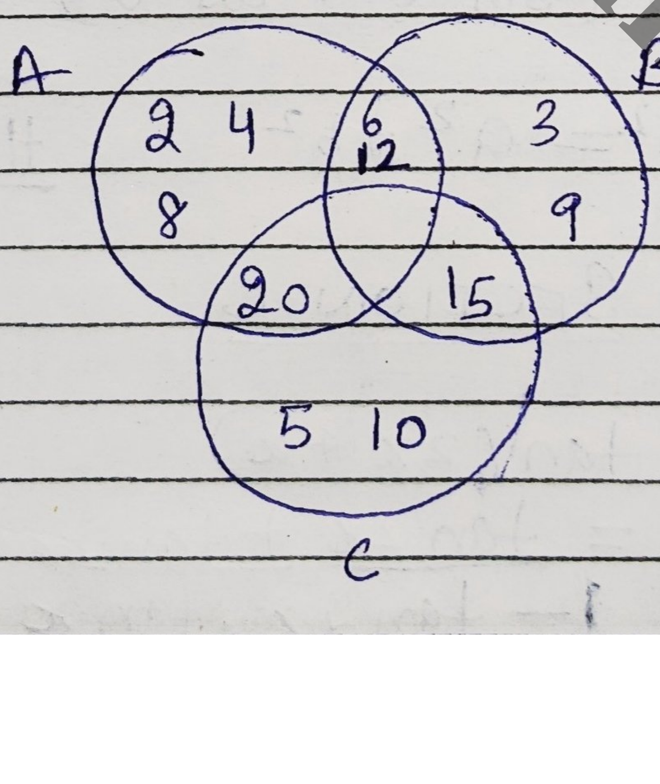
(4) (c)

(5) (c)

SECTION B

(6) $= \{(-14, 15), (0, -1), (1, 0), (4, 15)\}$

(7)



(8) Given that,

$$a \cos\theta + b \sin\theta = m \quad \text{(i)}$$

and $$a \sin\theta - b \cos\theta = n \quad \text{(ii)}$$

On squaring and adding of Eqs. (i) and (ii), we get

$$m^2 + n^2 = (a \cos\theta + b \sin\theta)^2 + (a \sin\theta - \cos\theta)^2$$

$$= a^2 \cos^2\theta + b^2 \sin^2\theta + 2ab \sin\theta . \cos\theta + a^2 \sin^2\theta + b^2 \cos^2\theta - 2ab \sin\theta . \cos\theta$$

$$\Rightarrow m^2 + n^2 = a^2(\cos^2\theta + \sin^2\theta) + b^2(\sin^2\theta + \cos^2\theta)$$

$$\Rightarrow m^2 + n^2 = a^2 + b^2 \quad \underline{\text{H.P}}$$

SECTION C

(9) $\tan 3x = \tan(2x + x)$

$$\Rightarrow \tan 3x = \frac{\tan 2x + \tan x}{1 - \tan 2x . \tan x}$$

$$\Rightarrow \tan 3x - \tan 3x \tan 2x \tan x = \tan 2x + \tan x$$

$$\Rightarrow \tan 3x - \tan 2x - \tan x = \tan 3x \tan 2x \tan x.$$

(10) Domain $= [-3, 3]$, Range $= [0, 3)$

(11) Let $y = \frac{\pi}{8} \Rightarrow 2y = \frac{\pi}{4}$

$$\tan 2y = \frac{2\tan y}{1-\tan^2 y}$$

$$\Rightarrow \tan \frac{\pi}{4} = \frac{2\tan \frac{\pi}{8}}{1-\tan^2 \frac{\pi}{8}}$$

$$\Rightarrow 1 - \tan^2 \frac{\pi}{8} = 2\tan \frac{\pi}{8}$$

$$\therefore \tan^2 \frac{\pi}{8} + 2\tan \frac{\pi}{8} - 1 = 0$$

$$\tan\frac{\pi}{8} = \frac{-2 \pm \sqrt{4-4(1)(-1)}}{2}$$

$$= \frac{-2 \pm 2\sqrt{2}}{2} = -1 \pm \sqrt{2}$$

But $\tan\frac{\pi}{8}$ is positive.

$$\therefore \tan\frac{\pi}{8} = \sqrt{2}-1$$

(12) Let $x \in A \cap (B \cup C)$

$\Rightarrow x \in A$ and $x \in (B \cup C)$

$\Rightarrow x \in A$ and $(x \in B$ or $x \in C)$

$\Rightarrow (x \in A$ and $x \in B)$ or $(x \in A$ and $x \in C)$

$\Rightarrow x \in A \cap B$ or $x \in A \cap C$

$x \in (A \cap B) \cup (A \cap C)$

$\Rightarrow A \cap (B \cup C) \subset (A \cap B) \cup (A \cap C) \quad \ldots (i)$

Again let $y \in (A \cap B) \cup (A \cap C)$

$\Rightarrow y \in (A \cap B)$ or $y \in (A \cap C)$

$\Rightarrow (y \in A$ and $y \in B)$ or $(y \in A$ and $y \in C)$

$\Rightarrow y \in A$ and $(y \in B$ or $y \in C)$

$\Rightarrow y \in A$ and $y \in (B \cup C)$

$\Rightarrow y \in A \cap (B \cup C)$

$\Rightarrow (A \cap B) \cup (A \cap C) \subset A \cap (B \cup C)$ .. (ii)

From Eqs (i) and (ii)

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

13. We have

$A - (A \cap B) = A \cap (A \cap B)'$ (since $A - B = A \cap B'$)

$= A \cap (A' \cup B')$ [by De Morgan's law]

$= (A \cap A') \cup (A \cap B')$ [by distributive law]

$= \phi \cup (A \cap B')$

$= A \cap B' = A - B$

SECTION D

14. $A = \{1, 2, 3, 4\}$

$B = \{0, 1, 2\}$

(i) $A \cup B = \{0, 1, 2, 3, 4\}$

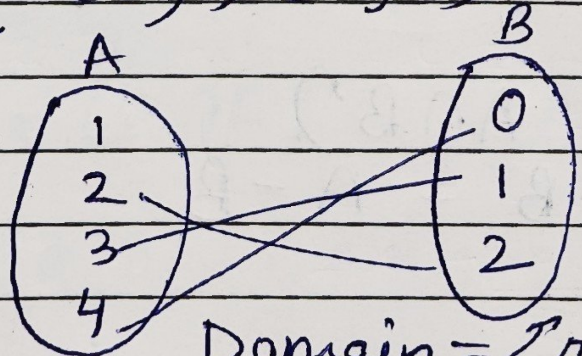
$A \cap B = \{1, 2\}$

$(A \cup B) \times (A \cap B) = \{(0,1)\ (0,2)\ (1,1)\ (1,2)\ (2,1)\ (3,1)\ (3,2)\ (4,1)\ (4,2)\}$

(ii) $n(A \times B) = 12$

no. of relation from A to B = 2^{12}

(iii) $R = \{(3,1)(2,2)(4,0)\}$



or

Domain = {0} Range {4}

SECTION E

15. $= \frac{1}{2}\left[1 + \cos 2x + 1 + \cos 2\left(x + \frac{\pi}{3}\right)\right.$

$\left. + 1 + \cos 2\left(x - \frac{\pi}{3}\right)\right]$

$= \frac{1}{2}\left[3 + \cos 2x + \cos 2\left(x + \frac{\pi}{3}\right) + \cos 2\left(x - \frac{\pi}{3}\right)\right]$

using $\cos x + \cos y = 2\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)$

Replace x by $\left(2x + \frac{2\pi}{3}\right)$ and y by $2x - \frac{2\pi}{3}$

$= \frac{1}{2}\left[3 + \cos 2x + 2\cos\left(\frac{2x + \frac{2\pi}{3} + 2x - \frac{2\pi}{3}}{2}\right.\right.$

$$\cos\left(\frac{2x+\frac{2\pi}{3}-\left(2x-\frac{2\pi}{3}\right)}{2}\right)\Bigg]$$

$$=\frac{1}{2}\left[1+\cos 2x+1+\cos 2\left(x+\frac{\pi}{3}\right)\right.$$

$$\left.+1+\cos 2\left(x-\frac{\pi}{3}\right)\right]$$

$$=\frac{1}{2}\left[3+\cos 2x+\cos 2\left(x+\frac{\pi}{3}\right)+\cos 2\left(x-\frac{\pi}{3}\right)\right]$$

Using $\cos x+\cos y = 2\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)$

Replace x by $\left(2x+\frac{2\pi}{3}\right)$ and

y by $2x-\frac{2\pi}{3}$

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$$= \frac{1}{2}\left[3 + \cos 2x + 2\cos\left(\frac{2x + \frac{2\pi}{3} + 2x - \frac{2\pi}{3}}{2}\right)\right.$$

$$\left.\cos\left(\frac{2x + \frac{2\pi}{3} - \left(2x - \frac{2\pi}{3}\right)}{2}\right)\right]$$

$$= \frac{1}{2}\left[3 + \cos 2x + \cos\left(\frac{4x}{2}\right)\cos\left(\frac{\frac{4\pi}{3}}{2}\right)\right]$$

$$= \frac{1}{2}\left[3 + \cos 2x + 2\cos 2x \cos\left(\frac{2\pi}{3}\right)\right]$$

$$= \frac{1}{2}\left[3 + \cos 2x + 2\cos 2x \cos\left(\pi - \frac{\pi}{3}\right)\right]$$

$$= \frac{1}{2}\left[3 + \cos 2x + 2\cos 2x\left(-\cos\left(\frac{\pi}{3}\right)\right)\right]$$

[using $\cos(\pi - \theta) = -\cos\theta$]

$$= \frac{1}{2}\left[3 + \cos 2x + 2\cos 2x\left(-\frac{1}{2}\right)\right]$$

$$\frac{1}{2}\left[3+\cos 2x-\cos 2x\right]$$

$$=\frac{3}{2}=RHS$$

16. Since, $|x-2| = -(x-2), x<2$
$x-2, x\geq 2$

and $|2+x| = -(2+x), x<-2$
$(2+x), x\geq -2$

$f(x) = |x-2|+|2+x|, -3\leq x\leq 3$

$$\begin{cases} -(x-2)-(2+x), & -3\leq x<-2 \\ -(x-2)+2+x, & -2\leq x<2 \\ x-2+2+x, & 2\leq x\leq 3 \end{cases}$$

$$= \begin{cases} -2x, & -3\leq x<-2 \\ 4, & -2\leq x<2 \\ 2x, & 2\leq x\leq 3. \end{cases}$$