Class XII
Core Mathematics
Marking Scheme

Note:- Any relevant solution not mentioned here in but Correct will be suitably awarded.

Q. No.	Value points / Key points	Value point	Total point
1 6(B)	(c) one-one onto	1	1
2 11(B)	(d) Symmetric	1	1
3.	(a) 1	1	1
4.	(d) [1, 2]	1	1
5 10(B)	(c) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	1	1
6 1(B)	(d) A is False but R is true	1	1
7 8(B)	(c) $5^2 \times 16^3$	1	1
8 5(B)	(b) $\frac{1}{6}$	1	1
9.	(c) 8	1	1
10 7(B)	(d) 4	1	1
11 3(B)	(b) $[\pi, 2\pi]$	1	1

Pencil   Eraser   Sharp...

Section B

12. $f : R \to R$

$f(x) = |x| + x$

$\forall\, y \in R$ (Co-domain)

s.t $f(x) = y$

$|x| + x = y$

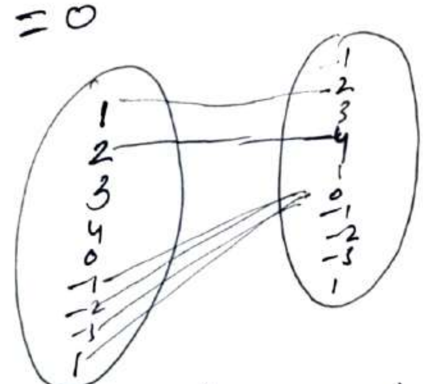
$x + x = y$ if $x \geq 0$

$2x = y$

$x = \frac{y}{2} \in R$(domain)

$-x + x = y$ if $x < 0$

$y = 0$ — 2



— 1

All -ve real no. have only one image i.e 0 $\therefore$ All -ve real no. of Co-domain does not pre image $\therefore$ f is not onto. — 1

13	$R = \{(x, y) : x \leq y^2\}$ $(1, 2) \in R \because 1 < 4$ but $(2, 1) \notin R \because 2 \nless 1$ $\therefore R$ is not symmetric $(10, 4) \in R \because 10 < 16$ $(4, 2) \in R \because 4 = (2)^2 = 4$ but $(10, 2) \notin R$ $\because 10 \nleq 4$ $\therefore R$ is not transitive	1 1	2
14	$\sec^2\left(\tan^{-1}\frac{1}{2}\right) + \operatorname{cosec}^2\left(\cot^{-1}\frac{1}{3}\right)$ $1 + \tan^2\left(\tan^{-1}\frac{1}{2}\right) + 1 + \cot^2\left(\cot^{-1}\frac{1}{3}\right)$ $1 + \left(\frac{1}{2}\right)^2 + 1 + \left(\frac{1}{3}\right)^2$ $1 + \frac{1}{4} + 1 + \frac{1}{9}$ $\frac{19}{9} + \frac{1}{4} = \frac{85}{36}$	1 1	2
15	$A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix} \quad I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $A^2 = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 12 \\ 4 & 7 \end{bmatrix}$	1/2+1/2	

18

$$\begin{bmatrix} 7 & 12 \\ 4 & 7 \end{bmatrix} = \begin{bmatrix} 2x & 3x \\ x & 2x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 0 & y \end{bmatrix}$$ $1\frac{1}{2} + \frac{1}{2}$

$2x + y = 7$ $\quad 3x = 12$ $\quad \frac{1}{2} + \frac{1}{2}$ $\quad \frac{2+1}{3}$

$8 + y = 7$ $\quad x = 4$

$y = -1$

$x = 4, y = 1$

$$\text{adj } A = \begin{bmatrix} 1 & k & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$$

$|\text{adj } A| = 1(0) - k(-2) + 3(-2)$ $\quad 1\frac{1}{2}$ $\quad 3$

$= 2k - 6$ $\quad 1/2$ $\quad \frac{2+1}{3}$

$|\text{adj } A| = |A|^{n-1}$

$2k - 6 = (4)^2$

$2k - 6 = 16$

$2k = 22$ $\quad 1$

$k = \frac{22}{2} = 11$

$f : A \to B$ $\quad A = R - \{3\}$ $\quad B = R - \{2\}$

let $x_1, x_2 \in A$ s.t $\quad f(x) = \frac{2x+3}{x-3}$

$f(x_1) = f(x_2)$

$$\frac{2x_1 + 3}{x_1 - 3} = \frac{2x_2 + 3}{x_2 - 3}$$

$\cancel{2x_1x_2} - 6x_2 + 3x_1 - \cancel{9} = \cancel{2x_1x_2} - 6x_1 + 3x_2 - \cancel{9}$

$-9x_2 = -9x_1$

$-bc(a+d)$

2

$x_1 = x_2$

$\therefore$ f is one-one $1\frac{1}{2}$

$\forall\ y \in B$

s.t $f(x) = y$

$$\frac{2x+3}{x-3} = \frac{y}{1}$$

3

$2x+3 = xy - 3y$

$2x - xy = -3y - 3$

$x(2-y) = -3(y+1)$

$x = \frac{3(y+1)}{y-2} \in A$

$\therefore$ f is onto $1\frac{1}{2}$

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18 $(a,b)\ R\ (c,d) \Leftrightarrow ad(b+c) = bc(a+d)$

$(a,b)\ R\ (a,b)$ $\forall (a,b) \in N \times N$

$\because\ ab(b+a) = ba(a+b)$

[Product and Addition is Commutative in N] 1

$\therefore$ R is Reflexive

If $(a,b)\ R\ (c,d)$

$\Rightarrow\ ad(b+c) = bc(a+d)$

$\therefore\ cb(d+a) = da(c+b)$ [//] $1\frac{1}{2}$

$\therefore\ (c,d)\ R\ (a,b)$ $\forall (a,b),(c,d) \in N \times N$

$\therefore$ R is Symmetric

If $(a, b) \; R \; (c, d)$

& $(c, d) \; R \; (e, f)$

then $ad(b+c) = bc(a+d)$ — (1) 1

$cf(d+e) = de(c+f)$ — (2)

from (1)

$$\frac{b+c}{bc} = \frac{a+d}{ad}$$

$$\therefore \frac{1}{c} + \frac{1}{b} = \frac{1}{d} + \frac{1}{a}$$

$$\Rightarrow \frac{1}{c} - \frac{1}{d} = \frac{1}{a} - \frac{1}{b}$$

from (2)

$$\frac{cf}{c+f} = \frac{de}{d+e}$$

$$\frac{c+f}{cf} = \frac{d+e}{de}$$ 5

$$\frac{1}{f} + \frac{1}{c} = \frac{1}{e} + \frac{1}{d}$$

$$\frac{1}{c} - \frac{1}{d} = \frac{1}{e} - \frac{1}{f}$$

$$\therefore \frac{1}{a} - \frac{1}{b} = \frac{1}{e} - \frac{1}{f}$$

$$\frac{b-a}{ab} = \frac{f-e}{ef}$$

$$\frac{1}{a} + \frac{1}{f} = \frac{1}{e} + \frac{1}{b}$$

$$\frac{f+a}{af} = \frac{b+e}{be}$$ $1\frac{1}{2}$

$$\Rightarrow af(b+e) = be(a+f)$$

$\therefore (a,b) R (e,f)$

$\forall (a,b),(c,d),(e,f) \in N \times N$

$\therefore$ R is ~~transitive~~

$\therefore$ R is an equivalence Relation

19 $$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} P \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} P = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix}^{-1}$$

$$\begin{vmatrix} -3 & 2 \\ 5 & -3 \end{vmatrix} = 9 - 10 = -1$$

$$\text{adj} \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} -3 & -5 \\ -2 & -3 \end{bmatrix}'$$

$$= \begin{bmatrix} -3 & -2 \\ -5 & -3 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} P = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} 3 & 2 \\ 5 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} 13 & 8 \\ 1 & 1 \end{bmatrix}$$

$$P = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}^{-1} \begin{bmatrix} 13 & 8 \\ 1 & 1 \end{bmatrix}$$

Eraser Sharpner

[ur] [2.50]

$$B = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$$

$$|B| = 4 - 3 = 1$$

$$\text{adj } B = \begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}' = \begin{bmatrix} 2 & -1 \\ -3 & 2 \end{bmatrix}$$

$$B^{-1} = \begin{bmatrix} 2 & -1 \\ -3 & 2 \end{bmatrix}$$

$$P = \begin{bmatrix} 2 & -1 \\ -3 & 2 \end{bmatrix} \begin{bmatrix} 13 & 8 \\ 1 & 1 \end{bmatrix}$$

$$P = \begin{bmatrix} 25 & 15 \\ -37 & -22 \end{bmatrix}$$

20

$$
\begin{array}{c} \\ A \\ B \end{array}
\begin{array}{ccc} \text{Pencil} & \text{Eraser} & \text{Sharpner} \end{array}
$$

$$
\begin{array}{c} A \\ B \end{array}
\begin{bmatrix} 10000 & 2000 & 18000 \\ 6000 & 20000 & 8000 \end{bmatrix}
\begin{bmatrix} 2.50 \\ 1.50 \\ 1.00 \end{bmatrix}
$$

$$
\begin{array}{c} A \\ B \end{array}
\begin{bmatrix} 25000 + 3000 + 18000 \\ 15000 + 30000 + 8000 \end{bmatrix}
$$

$$
\begin{bmatrix} 46000 \\ 53000 \end{bmatrix}
$$

(a) Total Revenue of market A = ₹46000 | 2

(b) " " " " B = ₹53000 | 4

$$
\begin{bmatrix} 10000 & 2000 & 18000 \\ 6000 & 20000 & 8000 \end{bmatrix}
\begin{bmatrix} 2.0 \\ 1.0 \\ 0.50 \end{bmatrix}
$$

$$
\begin{array}{c} A \\ B \end{array}
\begin{bmatrix} 20000 + 2000 + 9000 \\ 12000 + 20000 + 4000 \end{bmatrix}
$$

$$
\begin{bmatrix} 31000 \\ 36000 \end{bmatrix}
$$

(c) Cost incurred of Market A & B are ₹31000, ₹36000 | 2

or

Gross Profit :- 99000 − 67000 = 32000 | 2

Q. No.	Different Ques of Set B		
2	(d) $\frac{1}{\sqrt{3}}$	1	1
9	(d) $[1, 2]$	1	1
12	$R = \{(x, y) : x \le y^3\}$ $(1, 2) \in R \because 1 < 2^3$ but $(2, 1) \notin R \because 2 \nleq 1^3$ $\therefore R$ is not symmetric $(10, 3) \in R \because 10 < 3^3$ $(3, 2) \in R \because 3 < 2^3$ but $(10, 2) \notin R \because 10 \nleq 2^3$ $\therefore R$ is not transitive.	1 1	2
16	$f : A \to B \quad A = R - \{-\frac{4}{3}\}$ $B = R - \{\frac{4}{3}\}$ $f(x) = \frac{4x+3}{3x+4}$ Let $x_1, x_2 \in A$ s.t. $f(x_1) = f(x_2)$ $\frac{4x_1+3}{3x_1+4} = \frac{4x_2+3}{3x_2+4}$		

$12\cancel{x_1x_2} + 16x_1 + 3(3x_2) + \cancel{12}$
$= \cancel{12x_1x_2} + 9x_1 + 16x_2 + \cancel{12}$

$16x_1 - 9x_1 = 16x_2 - 9x_2$

$\cancel{7}x_1 = \cancel{7}x_2$ $1\frac{1}{2}$

$x_1 = x_2$

$\therefore f$ is one-one.

$\forall y \in B$ s.t

$f(x) = y$

$\frac{4x+3}{3x+4} = \frac{y}{1}$ 3

$4x+3 = 3xy + 4y$

$(4-3y)x = 4y-3$

$x = \frac{4y-3}{4-3y} \in A$ $1\frac{1}{2}$

$\therefore f$ is onto

8 $\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix} Q \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix}$

(let) $A \quad Q \quad B = \begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix}$

$$A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$$

$$|A| = 15 - 14 = 1$$

$$\text{adj } A = \begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix}' = \begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix}$$

$$B = \begin{bmatrix} -1 & +1 \\ -2 & 1 \end{bmatrix}$$

$$|B| = -1 + 2 = 1$$

$$\text{adj } B = \begin{bmatrix} 1 & +2 \\ -1 & -1 \end{bmatrix}' = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$$

$$B^{-1} = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$$

$$Q = \begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$$

$$Q = \begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix} \begin{bmatrix} 0 & -1 \\ 8 & -4 \end{bmatrix}$$

$$Q = \begin{bmatrix} -16 & 3 \\ 24 & -5 \end{bmatrix}$$