(1) Choose the correct answer from those given :

1) The domain of the function n : n (x) = $\frac{x}{x-1}$ is …….

a) R – { 0 } b) R – { 1 } c) R – { 0 , 1 } d) R – { – 1 }

2) The equation of the symmetric axis of the curve of the function f where $f(x) = x^2 - 4$ is ……..

a) $x = -4$ b) $x = 0$ c) y = 0 d) y = – 4

3) The S.S. of the two equations : $x = 3$, y = 4 in R × R is …….

a) { (3 , 4) } b) { (4 , 3) } c) R d) ∅

4) The domain of the multiplicative inverse of the function f : $f(x) = \frac{x+2}{x-3}$ is ……

a) R – { 3 } b) R – { – 2 , 3 } c) R – { – 3 } d) R

5) If $x \neq 0$, then $\frac{5x}{x^2+1} \div \frac{x}{x^2+1}$ = …….

a) – 5 b) – 1 c) 1 d) 5

6) The set of zeroes of the function f where $f(x) = x^2 + 4$ in R is ……

a) { 2 } b) { 2 , – 2 } c) R d) ∅

7) The two straight lines : $x + 2y = 1$ and $2x + 4y = 6$ are ……

a) parallel b) intersecting c) perpendicular d) coincide

8) The S.S. of the two equations : $x = 2$, x y = 6 is ……..

a) { (2 , 3) } b) { 2 , 3 } c) { (3 , 2) } d) { 3 }

9) If $(x + 2)^{zero} = 1$, then $x \in$ ……..

a) R – { 2 } b) R – { – 2 } c) R – { 1 } d) R

10) If $f(x) = a x^2 + b x + c$, $f(1) = 4$, $f(-1) = 4$, then a + c = …….

a) 8 b) 4 c) 2 d) zero

11) If the two straight lines representing the two equations : $x + 2y = 4$, $2x - ky = 1$ are parallel , then k = ……

a) 4 b) – 4 c) 2 d) – 2

12) The set of zeroes of the function f : $f(x) = -3x$ is ……..

a) { 0 } b) { 3 } c) { – 3 } d) R – { 3 }

13) If the two equations : $x + 4y = 7$ and $3x - ky = 21$ have infinite number of solutions , then k = ……

a) 4 b) – 4 c) – 12 d) 12

14) One of the solutions for the two equations : $x - y = 2$, $x^2 + y^2 = 20$ is …….

a) (– 4 , 2) b) (2 , – 4) c) (3 , 1) d) (4 , 2)

15) The two straight lines : $3x + 5y = 0$, $5x - 3y = 0$ are intersect in ……

a) first quadrant b) second quadrant

c) the origin point d) fourth quadrant

16) If P (A) = 0.6 , then P (A`) = …….

a) 0.4 b) 0.6 c) 0.5 d) 1

17) If A ⊂ S of random experiment and P (A`) = 2 P (A) , then P (A) = ……

a) $\frac{1}{3}$ b) $\frac{1}{2}$ c) $\frac{2}{3}$ d) 1

18) If A and B are two mutually exclusive events and P (A) = 0.5 , P (A ∪ B) = 0.8 , then P (B) = ……

a) zero b) 0.3 c) 0.5 d) 0.6

19) If a regular coin is tossed once , then the probability of getting head or tail is …….

a) 0 % b) 25 % c) 50 % d) 100 %

20) If A , B are two events in a random experiment and $A \subset B$, then P (A ∩ B) = …….

a) 0 b) P (A) c) P (B) d) ∅

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(2) Find *Algebraically* in R × R the S.S. of each pair of the following equations :

1. $x + y = 11$, $x - 2y = 2$
2. $2x - y = 3$, $x + 2y = 4$
3. $x + 2y = 8$, $3x + y = 9$
4. $3x + 4y = 24$, $x - 2y + 2 = 0$

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(3) Find the values of a and b knowing that (3 , 1) is the solution of the two equations : $ax + by - 5 = 0$, $3ax + by = 17$

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(4) A two digit number of sum of its digits is 5 , if the two digits are reversed , then the resulted number is 9 more than the original number .

What is the original number ??

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(5) Find in R the S.S. of each of the following equations using *the general formula* :

1. $x^2 - 4x = -2$, approximate to the nearest one decimal
2. $x^2 - 2x - 6 = 0$, rounding the result to three decimal digits

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(6) Find in R × R the S.S. of each pair of the following equations :

1. $x = 2y$, $x^2 + y^2 = 45$
2. $y - x = 2$, $x^2 + xy - 4 = 0$

(7) [a] Find the number which is formed from two digits , if the units digit is twice the tens digit and if the product of the two digits equals $\frac{1}{3}$ the original number

[b] A right – angled triangle of hypotenuse length 13 cm. and its perimeter is 30 cm. **Find the lengths of the other two sides**

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(8) If the domain of n : n (x) = $\frac{x^2 + 5}{a\,x^2 + x + 6}$ is R – { 3 , k }

Find the value of each of : a , k

---

(9) If f (x) = $x^3 - 2\,x^2 - 75$

Prove that the number 5 is the one of the zeroes of the function f

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(10) If n_1 (x) = $\frac{x^2 - x}{x^3 - 2\,x^2}$ and n_2 (x) = $\frac{x^2 - 3\,x + 2}{x^3 - 4\,x^2 + 4\,x}$, **prove that $n_1 = n_2$**

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(11) In each of the following , find n (x) in the simplest form showing the domain of n :

① n (x) = $\frac{x + 5}{x^2 + 7\,x + 10} - \frac{x - 1}{x^2 + 3\,x + 2}$, then **find** n (– 2) if possible

② n (x) = $\frac{x^2 + 2\,x + 4}{x^3 - 8} - \frac{9 - x^2}{x^2 + x - 6}$, then **find** n (2) if possible

③ n (x) = $\frac{x^2 + x - 6}{x^3 - 8} \times \frac{x^2 + 2\,x + 4}{x^2 + 3\,x}$ ④ n (x) = $\frac{x^2 - 3\,x}{2\,x^2 - x - 6} \div \frac{2\,x^2 - 3\,x}{4\,x^2 - 9}$

---

(12) If n (x) = $\frac{x^2 - 2\,x}{(x - 2)(x^2 + 2)}$

1. **Find :** n^{-1} (x) in the simplest form showing the domain of n^{-1}
2. If n^{-1} (x) = 3 , then **find** the value of x …..

(13) If A , B are two events of sample space of random experiment such that $p(A) = \frac{1}{4}$, $P(B) = \frac{2}{3}$ **, then find :** $P(A \cup B)$ if :

① $P(A \cap B) = \frac{1}{6}$ ② $A \subset B$

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(14) If A and B are two events from the sample space of a random experiment and $P(A) = 0.8$, $P(B) = 0.7$, $P(A \cap B) = 0.6$ **, find :**

① The probability of non - occurrence of the events A and B together

② The probability of non - occurrence of at least one of the events

③ The probability of occurrence of one of the events but not the other

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(15) A box contains 20 identical cards numbered from 1 to 20 , a card is drawn randomly .

Find the probability that the number on the card is :

① divisible by 5 ② an odd number and divisible by 5

Model Answer

(1) Choose :

1) b) R – { 1 }

2) b) $x = 0$

3) a) { (3 , 4) }

4) b) R – { – 2 , 3 }

5) d) 5

6) d) ∅

7) a) parallel

8) a) { (2 , 3) }

9) d) R – { – 2 }

10) b) 4

11) a) 4

12) a) { 0 }

13) c) – 12

14) d) (4 , 2)

15) c) the origin point

16) a) 0.4

17) a) $\frac{1}{3}$

18) b) 0.3

19) d) 100 %

20) b) P (A)

(2)

1 $x + y = 11 \rightarrow ①$

$x - 2y = 2 \rightarrow ②$ $\times (- 1)$

$x + y = 11$

$(+)$ $-x + 2y = -2 \rightarrow ③$

$\therefore 3y = 9 \Rightarrow \therefore y = 3$

• **Sub by y = 3 in ① :**

$\therefore x + 3 = 11 \Rightarrow \therefore x = 8$

$\therefore$ The S.S. = { (8 , 3) } ✓

2 $2x - y = 3 \rightarrow ①$

$x + 2y = 4 \rightarrow ②$ $\times (- 2)$

$2x - y = 3$

$(+)$ $-2x - 4y = -8 \rightarrow ③$

$\therefore -5y = -5 \Rightarrow \therefore y = 1$

• **Sub by y = 1 in ② :**

$\therefore x + 2 \times 1 = 4 \Rightarrow \therefore x = 2$

$\therefore$ The S.S. = { (2 , 1) } ✓

3 $\because\ x + 2y = 8 \rightarrow ①$

$\therefore\ x = 8 - 2y \rightarrow ②$, $3x + y = 9 \rightarrow ③$

- **Sub. by ② in ③ :**

$\therefore\ 3(8 - 2y) + y = 9 \Rightarrow \therefore\ 24 - 6y + y = 9$

$\therefore\ -5y = 9 - 24 \Rightarrow \therefore\ -5y = -15 \Rightarrow \therefore\ y = 3$

- **Sub by y = 3 in ② :**

$\therefore\ x = 8 - 2 \times 3 = 2$

$\therefore$ The S.S. = { (2 , – 3) } ✓

4 $3x + 4y = 24 \rightarrow ①$

$\because\ x - 2y + 2 = 0 \rightarrow ②$

$\therefore\ x = 2y - 2 \rightarrow ③$

- **Sub. by ③ in ① :**

$\therefore\ 3(2y - 2) + 4y = 24 \Rightarrow \therefore\ 6y - 6 + 4y = 24$

$\therefore\ 10y = 24 + 6 \Rightarrow \therefore\ 10y = 30 \Rightarrow \therefore\ y = 3$

- **Sub by y = 3 in ③ :**

$\therefore\ x = 2 \times 3 - 2 = 4$

$\therefore$ The S.S. = { (4 , 3) } ✓

(3) $\because$ (3 , 1) is the solution of the two equations

$\therefore$ $3a + b - 5 = 0$ ⇨ $\therefore$ $b = -3a + 5$ → ①

, $9a + b = 17$ → ②

- **Sub. by ① in ② :**

$\therefore$ $9a - 3a + 5 = 17$ ⇨ $\therefore$ $6a = 17 - 5$

$\therefore$ $6a = 12$ ⇨ $\therefore$ $\boxed{a = 2}$

- **Sub. by a = 2 in ① :**

$\therefore$ $b = -3 \times 2 + 5$ ⇨ $\therefore$ $\boxed{b = -1}$

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(4) Let the units digit be x and the tens digit be y

$\therefore$ $x + y = 5$

, $(y + 10x) - (x + 10y) = 9$ ⇨ $\therefore$ $9x - 9y = 9$

$\therefore$ $x - y = 1$

$x + y = 5$ → ①

(+)

$x - y = 1$ → ②

$\therefore$ $2x = 6$ ⇨ $\therefore$ $x = 3$

- **Sub. by x = 3 in ① :** $\therefore$ $y = 2$ ⇨ $\therefore$ The number is $\boxed{23}$

(5)

1 $\because x^2 - 4x = -2 \Rightarrow \therefore x^2 - 4x + 2 = 0$

$\therefore a = 1 , b = -4 , c = 2$

$\therefore x = \frac{4 \pm \sqrt{(-4)^2 - 4 \times 1 \times 2}}{2 \times 1} = \frac{4 \pm \sqrt{8}}{2}$

$\therefore x = \frac{4 + \sqrt{8}}{2} \cong 3.4$ **Or** $x = \frac{4 - \sqrt{8}}{2} \cong 0.6$

$\therefore$ The S.S. = { 3.4 , 0.6 } ✓

2 $\because x^2 - 2x - 6 = 0$

$\therefore a = 1 , b = -2 , c = -6$

$\therefore x = \frac{2 \pm \sqrt{(-2)^2 - 4 \times 1 \times (-6)}}{2 \times 1} = \frac{2 \pm \sqrt{28}}{2}$

$\therefore x = \frac{2 + \sqrt{28}}{2} \cong 3.646$

Or $x = \frac{2 - \sqrt{28}}{2} \cong -1.646$

$\therefore$ The S.S. = { 3.646 , – 1.646 } ✓

(6)

1 $\because x = 2y \rightarrow ① , x^2 + y^2 = 45 \rightarrow ②$

- **Sub. from ① in ② :**

$\therefore (2y)^2 + y^2 = 45 \Rightarrow \therefore 4y^2 + y^2 = 45$

$\therefore 5y^2 = 45 \Rightarrow \therefore y^2 = 9$

$\therefore y = 3$ **Or** -3

- **Sub. in ① :** $\therefore x = 6$ **Or** -6

$\therefore$ The S.S. = { (6 , 3) , (– 6 , – 3) } ✓

2 $\because y - x = 2 \Rightarrow \therefore y = 2 + x \rightarrow ①$

, $x^2 + xy - 4 = 0 \rightarrow ②$

- **Sub. from ① in ② :**

$\therefore x^2 + x(2 + x) - 4 = 0$

$\therefore x^2 + 2x + x^2 - 4 = 0$

$\therefore 2x^2 + 2x - 4 = 0 \Rightarrow \therefore x^2 + x - 2 = 0$

$\therefore (x + 2)(x - 1) = 0 \Rightarrow \therefore x = -2$ **Or** $x = 1$

- **Sub. in ① :** $\therefore y = 0$ **Or** 3

$\therefore$ The S.S. = { (– 2 , 0) , (1 , 3) } ✓

(7) [a] Let the units digit be x and the tens digit be y ⇨ $\therefore x = 2\,y$ → ①

, $x\,y = \frac{1}{3}(x + 10\,y)$ ⇨ $\therefore 3\,x\,y = x + 10\,y$ → ②

• **Sub. from ① in ② :** $\therefore 3 \times 2\,y \times y = 2\,y + 10\,y$ ⇨ $\therefore 6\,y^2 = 12\,y$

$\therefore 6\,y^2 - 12\,y = 0$ ⇨ $\therefore 6\,y\,(y - 2) = 0$

$\therefore y = 0$ **(refused)** **Or** $y = 2$

• **Sub. in ① :** $\therefore x = 4$ ⇨ $\therefore$ The number is $\boxed{24}$

[b] Let the lengths of the two sides of the right angle be x cm. , y cm.

$\therefore x + y + 13 = 30$ ⇨ $\therefore x + y = 17$

$\therefore x = 17 - y$ → ① , $x^2 + y^2 = 169$ → ②

• **Sub. from ① in ② :**

$\therefore (17 - y)^2 + y^2 = 169$ ⇨ $\therefore y^2 - 34\,y + 289 + y^2 - 169 = 0$

$\therefore 2\,y^2 - 34\,y + 120 = 0$ ⇨ $\therefore y^2 - 17\,y + 60 = 0$

$\therefore (y - 12)(y - 5) = 0$ ⇨ $\therefore y = 12$ **Or** $y = 5$

• **Sub. in ① :** $\therefore x = 5$ **Or** 12

$\therefore$ The side lengths of the right angle are : $\boxed{5\text{ cm.}}$, $\boxed{12\text{ cm.}}$

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(8) ∵ The domain of n is R – { 3 , k }

$\therefore a \times (3)^2 + 3 + 6 = 0$ ⇨ $\therefore 9\,a + 9 = 0$

$\therefore 9\,a = -9$ ⇨ $\therefore \boxed{a = -1}$ ✓

$\because -k^2 + k + 6 = 0 \quad \Rightarrow \quad \therefore k^2 - k - 6 = 0$

$\therefore (k - 3)(k + 2) = 0 \quad \Rightarrow \quad \therefore k = 3$ **(refused) Or** $\boxed{k = -2}$ ✓

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(9) $\because f(5) = (5)^3 - 2 \times (5)^2 - 75 = 125 - 50 - 75 = 0$

$\therefore$ The number 5 is the one of the zeroes of the function f

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(10) $\because n_1(x) = \dfrac{x^2 - x}{x^3 - 2x^2} = \dfrac{x(x-1)}{x^2(x-2)}$

$\therefore$ The domain of $n_1 = R - \{0, 2\}$, $n_1(x) = \boxed{\dfrac{x-1}{x(x-2)}} \rightarrow ①$

$\because n_2(x) = \dfrac{x^2 - 3x + 2}{x^3 - 4x^2 + 4x} = \dfrac{(x-2)(x-1)}{x(x^2 - 4x + 4)} = \dfrac{(x-2)(x-1)}{x(x-2)(x-2)}$

$\therefore$ The domain of $n_2 = R - \{0, 2\}$, $n_2(x) = \boxed{\dfrac{x-1}{x(x-2)}} \rightarrow ②$

- **From ① , ② :** $\therefore n_1(x) = n_2(x)$, for all values of $x \in R - \{0, 2\}$ ✓

---

(11)

① $n(x) = \dfrac{x+5}{x^2+7x+10} - \dfrac{x-1}{x^2+3x+2}$

$= \dfrac{x+5}{(x+2)(x+5)} - \dfrac{x-1}{(x+2)(x+1)}$

$\rightarrow$ Domain $= R - \{-2, -5, -1\}$

$n(x) = \dfrac{1}{x+2} - \dfrac{x-1}{(x+2)(x+1)} = \dfrac{x+1-(x-1)}{(x+2)(x+1)}$

$= \dfrac{x+1-x+1}{(x+2)(x+1)} = \boxed{\dfrac{2}{(x+2)(x+1)}}$

- It is not possible to find $n(-2)$

② $n(x) = \dfrac{x^2+2x+4}{x^3-8} - \dfrac{9-x^2}{x^2+x-6}$

$= \dfrac{x^2+2x+4}{(x-2)(x^2+2x+4)} + \dfrac{x^2-9}{(x+3)(x-2)}$

$= \dfrac{x^2+2x+4}{(x-2)(x^2+2x+4)} + \dfrac{(x-3)(x+3)}{(x+3)(x-2)}$

$\rightarrow$ Domain $= R - \{2, -3\}$

$n(x) = \dfrac{1}{x-2} + \dfrac{x-3}{x-2} = \dfrac{1+x-3}{x-2} = \dfrac{x-2}{x-2} = \boxed{1}$

- It is not possible to find $n(2)$

③ $n(x) = \frac{x^2 + x - 6}{x^3 - 8} \times \frac{x^2 + 2x + 4}{x^2 + 3x}$

$= \frac{(x+3)(x-2)}{(x-2)(x^2+2x+4)} \times \frac{x^2+2x+4}{x(x+3)}$

→ Domain = R – { 2 , 0 , – 3 }

$n(x) = \boxed{\frac{1}{x}}$

④ $n(x) = \frac{x^2 - 3x}{2x^2 - x - 6} \div \frac{2x^2 - 3x}{4x^2 - 9}$

$= \frac{x(x-3)}{(2x+3)(x-2)} \div \frac{x(2x-3)}{(2x-3)(2x+3)}$

$= \frac{x(x-3)}{(2x+3)(x-2)} \times \frac{(2x-3)(2x+3)}{x(2x-3)}$

→ Domain = $R - \left\{ \frac{-3}{2} , 2 , 0 , \frac{3}{2} \right\}$

$n(x) = \boxed{\frac{x-3}{x-2}}$

---

(12) ① $n(x) = \frac{x^2 - 2x}{(x-2)(x^2+2)} = \frac{x(x-2)}{(x-2)(x^2+2)}$

∴ The domain of n = R – { 2 } , $n(x) = \frac{x}{x^2+2}$

∴ $n^{-1}(x) = \boxed{\frac{x^2+2}{x}}$

∴ The domain of n^{-1} = R – { 2 , 0 }

② $\frac{x^2+2}{x} = 3$ ⇨ ∴ $x^2 + 2 = 3x$

∴ $x^2 - 3x + 2 = 0$ ⇨ ∴ $(x-1)(x-2) = 0$ ⇨ ∴ $x = \boxed{1}$ **Or** $\boxed{2}$

---

(13) ① $P(A \cup B) = P(A) + P(B) - P(A \cap B) = \frac{1}{4} + \frac{2}{3} - \frac{1}{6} = \boxed{\frac{3}{4}}$

② ∵ $A \subset B$

∴ $P(A \cup B) = P(B) = \boxed{\frac{2}{3}}$

(14) ① $P(A \cap B)' = 1 - P(A \cap B) = 1 - 0.6 = \boxed{0.4}$

② $\because P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.8 + 0.7 - 0.6 = 0.9$

$\therefore P(A \cup B)' = 1 - P(A \cup B) = 1 - 0.9 = \boxed{0.1}$

③ • $P(A - B) = P(A) - P(A \cap B) = 0.8 - 0.6 = 0.2$

• $P(B - A) = P(B) - P(A \cap B) = 0.7 - 0.6 = 0.1$

$\therefore$ The probability of occurrence of one of the events but not the other

$= P(A - B) + P(B - A) = 0.2 + 0.1 = \boxed{0.3}$

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(15) ① The probability that the number on the card is divisible by 5 $= \frac{4}{20} = \boxed{\frac{1}{5}}$

② The probability that the number on the card is an odd number divisible by 5

$= \frac{2}{20} = \boxed{\frac{1}{10}}$

Good Luck