FIRST MID TERM TEST - 2024

Standard X   Reg.No. ☐☐☐☐☐☐

MATHEMATICS

Time : 1.30 hrs   Part - I   Marks : 50

I. Choose the correct answer: $7 \times 1 = 7$

1. $A = \{a,b,p\}$, $B = \{2,3\}$, $C = \{p,q,r,s\}$, then $n[(A \cup C) \times B]$ is

   a) 8   b) 20   c) 12   d) 16

2. If $f : A \to B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is equal to

   a) 7   b) 49   c) 1   d) 14

3. $f(x) = (x + 1)^3 - (x - 1)^3$ represents a function which is

   a) linear   b) cubic   c) reciprocal   d) quadratic

4. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is

   a) 2025   b) 5220   c) 5025   d) 2520

5. Given $F_1 = 1$, $F_2 = 3$, $F_n = F_{n-1} + F_{n-2}$ then F_5 is

   a) 3   b) 5   c) 8   d) 11

6. The solution of the system $x + y - 3x = -6$, $-7y + 7z = 7$, $3z = 9$ is

   a) $x = 1, y = 2, z = 3$ b) $x = -1, y = 2, z = 3$

   c) $x = -1, y = -2, z = 3$ d) $x = -1, y = -2, z = -3$

7. In $\triangle LMN$, $\angle L = 60^\circ$, $\angle M = 50^\circ$, If $\triangle LMN \sim \triangle PQR$, then the value of $\angle R$ is

   a) 40° b) 70° c) 30° d) 110°

Part - II

II. Answer any 5 questions. (Q.No.14 is compulsory) $5 \times 2 = 10$

8. If $B \times A = \{(-2,3), (-2,4), (0,3), (0,4), (3,3), (3,4)\}$, find A and B.

9. A relation 'f' is defined by $f(x) = x^2 - 2$ where $x \in \{-2, -1, 0, 3\}$

   i) List the elements of f   ii) Is f a function?

10. 'a' and 'b' are two positive integers such that $a^b \times b^a = 800$. Find 'a' and 'b'.

11. Find the sum to infinity of $9 + 3 + 1 + \ldots$

12. Find a_6 and a_{13} of the sequence whose n^{th} term is given by $a_n = \dfrac{5n}{n + 2}$

13. If $\triangle ABC \sim \triangle DEF$ such that $BC = 3$ cm, $EF = 4$ cm and area of $\triangle ABC = 54 cm^2$, Find the area of $\triangle DEF$.

14. Find the sum of $1 + 8 + 27 + \ldots + 1000$

2

X Maths

Part - III

III. Answer any 5 questions. (Q.No.21 is compulsory)   **5 x 5 = 25**

15. Given $A = \{1,2,3\}$, $B = \{2,3,5\}$, $C = \{3,4\}$, $D = \{1,3,5\}$, check if
    $(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$ is true.

16. $f(x) = 2x + 3$, $g(x) = 1 - 2x$ and $h(x) = 3x$, prove that $fo(goh) = (fog)$ oh

17. Use Euclid's division algorithm to find the HCF of 84, 90 and 120

18. Find the sum to n terms of the series : $5 + 55 + 555 + \ldots\ldots$

19. Solve the following system of linear equations in three variables :

    $3x - 2y + z = 2$, $2x + 3y - z = 5$, $x + y + z = 6$

20. The sum of three consecutive terms that are in A.P is 27 and their product is 288. Find the three terms.

21. A function $f : [-5, 9] \to R$ is defined as follows : $f(x) = \begin{cases} 6x+1 & \text{if } -5 \le x < 2 \\ 5x^2 - 1 & \text{if } 2 \le x < 6 \\ 3x - 4 & \text{if } 6 \le x \le 9 \end{cases}$

    Find   i) $f(7) - f(1)$ ii) $\dfrac{2f(-2) - f(6)}{f(4) + f(-2)}$

Part - IV

IV. Answer the following question.   **1 x 8 = 8**

22. a) Construct a triangle similar to a given triangle PQR with its sides equal to $\dfrac{3}{5}$ of the

    corresponding sides of the triangle PQR (Scale factor $\dfrac{3}{5} < 1$).

    (OR)

    b) Construct a triangle similar to a given triangle PQR with its sides equal to $\dfrac{7}{3}$ of the

    corresponding sides of the triangle PQR (Scale factor $\dfrac{7}{3} > 1$).

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FIRST MID TERM TEST - 2024

STANDARD - X   MATHS - KEY

A K RAJADHURAI, MATHS TEACHER, GGHSS - PODATURPET

PART - I

1) c) 12   2) a) 7   3) d) quadratic polynomial

4) d) 2520   5) d) 11   6) a) $x=1, y=2, z=3$

7) b) 70°

$S_\alpha = \dfrac{a}{1-r} = \dfrac{9}{1-\frac{1}{3}} = \dfrac{9}{\frac{2}{3}}$

$S_\alpha = \dfrac{27}{2}$

PART - II

8) $A = \{3, 4\}$

$B = \{-2, 0, 3\}$

12) $a_n = \dfrac{5n}{n+2}$

$a_6 = \dfrac{5(6)}{6+2} = \dfrac{30}{8} = \dfrac{15}{4}$

$a_{13} = \dfrac{5(13)}{13+2} = \dfrac{5(13)}{15_3} = \dfrac{13}{3}$

9)
(i) $f = \{(-2, 2)(-1, -1)(0, -2)(3, 7)\}$

(ii) Each element in the domain of f has a unique image.

∴ f is a function.

f ன் எல்லைவாடு மற்றும் உறுப்புக்கும் ஒரு நிரல் 2 மாங்கி. எனவே f ஒரு சார்பாடு.

13)

$\dfrac{\text{Area of } \triangle ABC}{\text{Area of } \triangle DEF} = \dfrac{BC^2}{EF^2}$

$\dfrac{54}{\text{Area of } \triangle DEF} = \dfrac{3^2}{4^2} = \dfrac{9}{16}$

Area of $\triangle DEF = 54 \times \dfrac{16}{9} = 96 \text{ cm}^2$
(∆ DEF ன் பரப்பு)

10)

$800 = 2^5 \times 5^2$

$800 = a^b \times b^a$

∴ $a = 2, b = 5$

2	800
2	400
2	200
2	100
2	50
5	25
	5

(OR)

$800 = 5^2 \times 2^5 = a \times b$

∴ $a = 5, b = 2$

14)

$1 + 8 + 27 + \cdots + 1000$

$1^3 + 2^3 + 3^3 + \cdots + 10^3$

$1^3 + 2^3 + \cdots + n^3 = \left[\dfrac{n(n+1)}{2}\right]^2$

$1^3 + 2^3 + \cdots + 10^3 = \left[\dfrac{10(10+1)}{2}\right]^2$

$= (5 \times 11)^2 = 55^2$

$= 3025$

11) $9 + 3 + 1 + \cdots$

$a = 9, \quad r = \dfrac{3}{9} = \dfrac{1}{3}$

A K RAJADHURAI
B T ASST (MATHS)
GGHSS - PODATURPET
TIRUVALLUR DIST.

PART - III　　　　From ① & ②

CHS = RHS

15) LHS

$A \cap C = \{3\}$

$B \cap D = \{3, 5\}$

$(A \cap C) \times (B \cap D) = \{(3,3)(3,5)\}$ — ①

RHS

$A \times B = \{(1,2)(1,3)(1,5)$
　　　　$(2,2)(2,3)(2,5)$
　　　　$(3,2)(3,3)(3,5)\}$

$C \times D = \{(3,1)(3,3)(3,5)$
　　　　$(4,1)(4,3)(4,5)\}$

$(A \times B) \cap (C \times D) = \{(3,3)(3,5)\}$ — ②

From ① & ②

$(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$

17) HCF of 84, 90 and 120.

First we find the HCF of 84, 90

$90 = 84(1) + 6$

$84 = 6(14) + 0$

Remainder $= 0$　மீதி $= 0$

Last divisor $= 6$　கடைசி வகுத்தி $= 6$

∴ HCF of $84, 90 = 6$

84, 90 ன் மீ.பொ.வ $= 6$

HCF of 6, 120

6, 120 ன் மீ.பொ.வ

$120 = 6(20) + 0$

Last divisor $= 6$

HCF $= 6$

∴ HCF of 84, 90 and $120 = 6$

16) CHS

$g \circ h = g[h(x)]$

　　$= g(3x) = 1 - 2(3x)$

$g \circ h = 1 - 6x$

$f \circ (g \circ h) = f(1 - 6x)$

　　　　$= 2(1-6x) + 3$

　　　　$= 2 - 12x + 3$

　　　　$= 5 - 12x$ — ①

RHS

$f \circ g = f[g(x)] = f(1-2x)$

　　$= 2(1-2x) + 3$

　　$= 2 - 4x + 3 = 5 - 4x$

$(f \circ g) \circ h = (f \circ g)[3x]$

　　　　$= 5 - 4(3x)$

　　　　$= 5 - 12x$ — ②

18)

$5 + 55 + 555 + \ldots n$ terms

$= 5[1 + 11 + 111 + \ldots n$ terms$]$

$= \dfrac{5}{9}[9 + 99 + 999 + \ldots n$ terms$]$

$= \dfrac{5}{9}[(10-1) + (100-1) + \ldots n$ terms$]$

$= \dfrac{5}{9}[(10 + 100 + \ldots n$ terms$) - n]$

$= \dfrac{5}{9}\left[\dfrac{10(10^n - 1)}{9} - n\right]$

$= \dfrac{50}{81}(10^n - 1) - \dfrac{5n}{9}$

19) 　$3x - 2y + z = 2$ — ①

$2x + 3y - z = 5$ — ②

$x + y + z = 6$ — ③

① $\Rightarrow$ $3x - 2y + z = 2$

② $\Rightarrow$ $2x + 3y - z = 5$

_____

$5x + y = 7$ ——— ④

② $\Rightarrow$ $2x + 3y - z = 5$

③ $\Rightarrow$ $x + y + z = 6$

_____

$3x + 4y = 11$ ——— ⑤

④ $\times 4 \Rightarrow$ $20x + 4y = 28$

⑤ $3x + 4y = 11$

$(-) \quad (-) \quad (-)$

_____

$17x = 17$

$\boxed{x = 1}$

④ $\Rightarrow$ $5(1) + y = 7$

$\boxed{y = 2}$

③ $\Rightarrow$ $1 + 2 + z = 6$

$\boxed{z = 3}$

Solution தொகுப்பு

$x = 1, \ y = 2, \ z = 3.$

20)

Let three consecutive terms be

$a - d, \ a, \ a + d$

Given Sum $= 27$

$a - d + a + a + d = 27$

$3a = 27$

$\boxed{a = 9}$

Product $= 288$

பெருக்கற்பலன்

$(a - d) \ a \ (a + d) = 288$

$a (a^2 - d^2) = 288$

$9 (81 - d^2) = 288$

$81 - d^2 = 32$

$d^2 = 49 \Rightarrow \boxed{d = \pm 7}$

If $a = 9, \quad d = 7$

$a - d = 9 - 7 = 2$

$a = 9$

$a + d = 9 + 7 = 16$

If $a = 9, \quad d = -7$

$a - d = 9 - (-7) = 16$

$a = 9$

$a + d = 9 + (-7) = 2$

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$2, 9, 16 \quad (or) \quad 16, 9, 2$

21)

$f(x) = 3x - 4$

$f(7) = 3(7) - 4 = 21 - 4$

$f(7) = 17$

$f(x) = 6x + 1$

$f(1) = 6(1) + 1 = 7.$

(i) $f(7) - f(1) = 17 - 7 = 10$

$$f(x) = 6x + 1$$

$$f(-2) = 6(-2) + 1 = -11$$

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

$$f(6) = 3(6) - 4 = 18 - 4 = 14$$

$$f(x) = 5x^2 - 1$$

$$f(4) = 5(4)^2 - 1 = 80 - 1 = 79$$

(ii) $$\frac{2f(-2) - f(6)}{f(4) + f(-2)}$$

$$= \frac{2(-11) - 14}{79 - 11} = \frac{-36}{68}$$

$$= \frac{-9}{17}$$
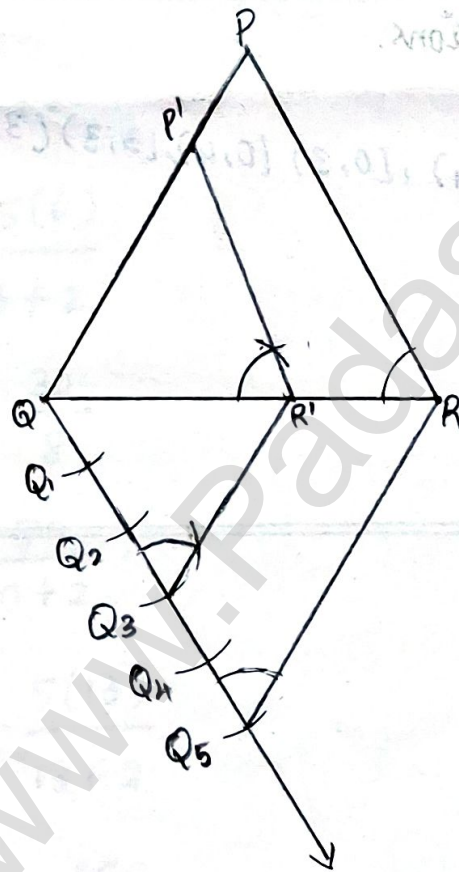
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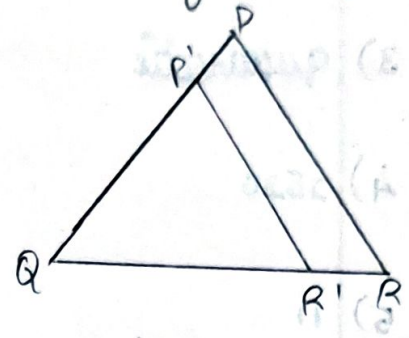
MATHS TEACHER

GGHSS - PODATURPET

Mobile: 9843938366

Ⅳ

22.   a) (Scale factor $\frac{3}{5} < 1$)

Rough diagram

13. Construct a triangle similar to a given triangle PQR with its equal to $\frac{7}{3}$ of the corresponding sides of the triangle PQR (scale factor $\frac{7}{3} > 1$).
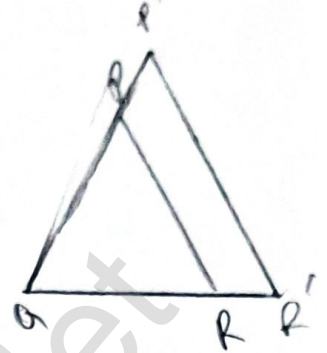
Rough diagram

diagram :