

UNIT TEST - I - 2022

Mathematics (Salem DT)

I. Choose the correct answer (one mark)

1. (b) 2
- (2) (c) one-to-one function
3. (c). 3
4. (b) $\frac{1}{27}$
5. (b) 0

2 Marks

II. Answer the following questions

6. Sol:
 $B = \{-2, 0, 3\}$
 $A = \{3, 4\}$

7. Solu:- Given
 $x = \{0, 1, 2, 3, 4, 5\}$
 $y = x + 3$
 $Y = \{3, 4, 5, 6, 7, 8\}$
 $d = \{0, 1, 2, 3, 4, 5\}$
 $R = \{3, 4, 5, 6, 7, 8\}$

8. Solu:- Given
 $x = \{-2, -1, 0, 3\}$
 $Y = f(x) = x^2 - 2$
 $f(-2) = (-2)^2 - 2 = 4 - 2 = 2$
 $f(-1) = (-1)^2 - 2 = 1 - 2 = -1$
 $f(0) = (0)^2 - 2 = 0 - 2 = -2$
 $f(3) = (3)^2 - 2 = 9 - 2 = 7$
 $f(-2, 2) (-1, -1) (0, -2) (3, 7)$

4. Solu:- $f(k) = 2k - 1$
 $f \circ f(k) = 5$
 $f f(k) = f(2k - 1) - 1$
 $= 4k - 2 - 1 = 4k - 3$
 $4k - 3 = 5 \quad 4k = 8 \quad \boxed{k = 2}$

10. Solu Given
 $89 \equiv (x+3) \pmod{4}$

$$= \frac{89 - (x+3)}{4} = \frac{89 - x - 3}{4}$$

$$= \frac{86 - x}{4} \quad \text{Put } \boxed{x = 2}$$

$$= \frac{86 - 2}{4} = \frac{84}{4} = 21$$

'x' is the least value of 2

11. Solu Given

$$a_n = 5n/n+2 ; a_6 \text{ and } a_{13}$$

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

$$a_{13} = \frac{5 \times 13}{13+2} = \frac{65}{15} = \frac{13}{3}$$

12. Solu $a = 102$
 $d = 97 - 102 = -5$ 20

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_{27} = \frac{27}{2} [204 + 26 \times -5]$$

$$= \frac{27}{2} [204 - 130]$$

$$= \frac{27}{2} \times 74 \quad \boxed{S_{27} = 999}$$

13. (i) $a = 5$ Given

$$d = 0$$

A.P term = $a, a+d, a+2d, a+3d, \dots$

$$= 5, 5+0, 5+0, 5+0$$

AP is 5, 5, 5, ...

(ii) $a = 5$

$$r = 1$$

G.P Term = a, ar, ar^2

$$= 5, 5 \times 1, 5 \times (1)^2$$

$$= 5, 5, 5$$

III. 5 MARKS

14. Solu:- Given

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

$$B = \{2, 5, 8, 11, 14\}$$

$$f(x) = 3x - 1$$

$$f(1) = 3(1) - 1 = 2$$

$$f(2) = 3(2) - 1 = 5$$

$$f(3) = 3(3) - 1 = 8$$

$$f(4) = 3(4) - 1 = 11$$

$$f = \{(1, 2), (2, 5), (3, 8), (4, 11)\}$$

18. $a = a$ $b = b$ $c = a + 2d$

$$x = x \quad y = xr \quad z = xr^2$$

$$\frac{b-c}{x} \times \frac{c-a}{y} \times \frac{a-b}{z}$$

$$= \frac{a+d-a-2d}{x} \times \frac{a+2d-a}{xr} \times \frac{a-a-2d}{xr^2}$$

$$= \frac{-d}{x} \times \frac{2d}{xr} \times \frac{-2d}{xr^2}$$

$$= \frac{-d}{x} \times \frac{2d}{xr} \times \frac{-2d}{xr^2}$$

$$= \frac{x^{2d}}{x^{2d}} \times \frac{r^{2d}}{r^{2d}} = 1 \quad \text{H. Proved.}$$

15. $f(x) = 2x - 3$

$$f(0) = 2(0) - 3 = -3$$

$$f(1) = 2 - 3 = -1$$

(ii) $f(x) = 2x - 3 = 0$

$$2x = 3$$

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

(iii) $f(x) = x$

$$2x - 3 = x$$

$$2x - x = 3$$

$$x = 3$$

19. $a = 3$ $r = 2$ $l = 1536$

$$tn = ar^{n-1}$$

$$1536 = 3 \times 2^{n-1}$$

$$n = 10$$

$$S_{10} = 3 \left[\frac{2^{10} - 1}{2 - 1} \right]$$

$$= 3(1024 - 1)$$

$$= 3 \times 1023$$

$$S_{10} = 3069$$

(i) $\frac{f(0) + f(1)}{2} = \frac{-3 + (-1)}{2} = \frac{-4}{2} = -2$

20. $10^2 + 11^2 + 12^2 + \dots + 24^2$

$$\frac{24(2+24)(2 \times 24 + 1)}{6} - \frac{9(9+1)(2 \times 9 + 1)}{6}$$

$$= 4900 - 285 = 4615 \text{ cm}^2$$

(iv) $f(x) = f(1-x)$

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

$$2x - 3 = 2 - 2x - 3$$

$$4x = 2$$

$$x = \frac{1}{2}$$

21. Solu

(i) $(A-B) \times (C-D)$

$$= \{4, 5\} \times \{0, 1\}$$

$$= \{(4, 0), (4, 1), (5, 0), (5, 1)\}$$

(ii) $(A \cup B) \times (C \cap D)$

$$A \cup B = \{4, 5, 6, 7, 8, 9\}$$

$$C \cap D = \{1, 3\}$$

$$\{4, 5, 6, 7, 8, 9\} \times \{1, 3\}$$

$$= \{(4, 1), (4, 3), (5, 1), (5, 3), (6, 1), (6, 3), (7, 1), (7, 3), (8, 1), (8, 3), (9, 1), (9, 3)\}$$

17. $a = b^2 + r$ (U.d.A. using)

$$636 = 504(1) + 132$$

$$504 = 132(3) + 108$$

$$132 = 108(1) + 24$$

$$108 = 24(4) + 12$$

$$24 = 12(2) + 0$$

\therefore HCF of 636 and 504 is 12

$$396 = 12(33) + 0$$

\therefore 396, 504, 636 HCF of 12

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(6) $f \circ g(x) = 3x + 1 - 1 = 3x$

$$(f \circ g) \circ h(x) = 3x^2 \text{ --- (1)}$$

$$g \circ h(x) = 3x^2 + 1$$

$$f \circ (g \circ h)(x) = 3x^2 + 1 - 1 = 3x^2 \text{ --- (2)}$$

(1) = (2)