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HALF YEARLY EXAMINATION - 2019.

STD: X — MATHEMATICS - ANSWER KEY. — MARKS: 100.

PART - I. ($14 \times 1 = 14$)

I. CHOOSE THE CORRECT ANSWER:

1. c → $\{4, 9, 25, 49, 121\}$
2. c → $\frac{2}{9x^2}$
3. b → 2
4. b → an Arithmetic Progression
5. c → $\frac{x^2-7x+40}{(x^2-25)(x+1)}$
6. b → $\begin{bmatrix} 2 & 2 \\ 2 & -1 \end{bmatrix}$
7. c → 4.
8. b → 25 sq. units
9. b → $x+y=3$; $3x+y=7$.
10. d → 1.
11. b → 4
12. c → 3π
13. b → 100
14. b → $\frac{7}{10}$.

PART - II.

II. ANSWER ANY 10.

15. (i) Range of $f = \{1, 8, 27, 64\}$ — 1

(ii) Type: one-one and into function. — 1

16. $800 = 2^5 \times 5^2$ — 1

$a = 2$, $b = 5$. — 1

17. $a_1 = \frac{1}{3} + \frac{1}{6} = \frac{3}{6}$

$a_2 = \frac{2}{3} + \frac{1}{6} = \frac{5}{6}$

$a_3 = \frac{3}{3} + \frac{1}{6} = \frac{7}{6}$

$a_4 = \frac{4}{3} + \frac{1}{6} = \frac{9}{6}$ — 1

$a_2 - a_1 = \frac{5}{6} - \frac{3}{6} = \frac{2}{6}$

$a_4 - a_3 = \frac{9}{6} - \frac{7}{6} = \frac{2}{6}$ — 1

∴ The sequence is an A.P.

18. $n = \frac{55-1}{2} + 1$

$n = 28$ — 1

$S_{28} = \frac{28}{2}\left[2 + 27(2)\right]$

$= 14 \times 56$

$S_{28} = 784$ — 1

19. $\alpha + \beta = -6$, and $\alpha\beta = -4$ — 1

$(\alpha - \beta)^2 = (\alpha + \beta)^2 - 4\alpha\beta$

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

$= 52$ — 1

20. $A^T = \begin{pmatrix} 5 & -\sqrt{17} & 8 \\ 2 & 0.7 & 3 \\ 2 & \frac{5}{2} & 1 \end{pmatrix}$ — 1

$(A^T)^T = \begin{pmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & 5/2 \\ 8 & 3 & 1 \end{pmatrix} = A$ — 1

21. $\frac{3-a}{9+2} = \frac{-1}{2}$ — 1

$6 - 2a = -11$

$2a = 17$

$a = \frac{17}{2}$ — 1

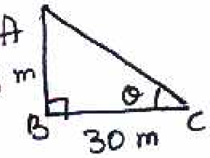
22. Area of the triangle

$= \frac{1}{2}\left\{\begin{matrix} 1 & -4 & -3 & 1 \\ -1 & 6 & -5 & -1 \end{matrix}\right\}$ — (1)

$= \frac{1}{2}\{(6+20+3)-(4-18-5)\}$

$= \frac{1}{2} \times 48 = 24$ Sq. units — (1)

23. $\tan\theta = \frac{10\sqrt{3}}{30}$ — (1)



$\tan\theta = \frac{1}{\sqrt{3}}$ $\quad \theta = 30°$ — (1)

24. Ratio of the surface area

$= 4\pi R^2 : 4\pi r^2$ (or)

$= 12^2 : 16^2$ — (1)

$= 9 : 16$. — (1)

25. $\frac{1}{3}\pi r^2 h = 11088$ — (1)

$\frac{1}{3} \times \frac{22}{7} \times r^2 \times 24 = 11088$

$r^2 = \frac{11088 \times 7}{22 \times 8}$

$r^2 = 441$, $\boxed{r = 21\text{ cm}}$ — (1)

26. $\pi r^2 h = \frac{4}{3}\pi r_1^3$

$10 \times 10 \times h = \frac{4}{3} \times 15 \times 15 \times 15$ — (1)

$h = \frac{4 \times 15 \times 15 \times 15}{10 \times 10}$

$\boxed{h = 45\text{ cm}}$ — (1)

27. $R = 36.8$, $S = 13.4$

$L = R + S$ — (1)

$= 36.8 + 13.4$

$\boxed{L = 50.2}$ — (1)

28. $S = \{HH, HT, TH, TT\}$ — (1)

$n(S) = 4$

$A = \{HT, TH\}$

$n(A) = 2$, $\quad P(A) = \frac{1}{2}$ — (1)

PART - III :

III. ANSWER ANY 10 $(10 \times 5 = 50)$.

29. $A = \{2, 3\}$ $B = \{0, 1\}$, $C = \{1, 2\}$ — (1)

$B \cap C = \{1\}$ — (1)

$A \times (B \cap C) = \{(2,1), (3,1)\}$ $\rightarrow$ L.H.S. — (1)

$A \times B = \{(2,0), (2,1), (3,0), (3,1)\}$ (or)

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

$(A \times B) \cap (A \times C) = \{(2,1), (3,1)\}$ (1) $\rightarrow$ R.H.S

L.H.S = R.H.S

30. $f(x) = 3x + 2$, $\quad g(x) = 6x - k$

$f[g(x)] = g[f(x)]$

$f(6x - k) = g(3x + 2)$

$3(6x - k) + 2 = 6(3x + 2) - k$ — (1) — (1)

$18x - 3k + 2 = 18x + 12 - k$ — (1)

(1) $-2k = 10$

$\boxed{k = -5}$ — (1)

31. $t_4 = 8$ $\quad t_8 = \frac{128}{625}$ — (1)

$ar^3 = 8$ $\quad ar^7 = \frac{128}{625}$

(or)

$\frac{ar^7}{ar^3} = \frac{128}{625} \times \frac{1}{8} \Rightarrow r^4 = \left(\frac{2}{5}\right)^4$ — (1)

$\boxed{r = \frac{2}{5}}$ — (1)

$a\left(\frac{2}{5}\right)^3 = 8 \Rightarrow \boxed{a = 125}$ (1)

G.P $= 125, 50, 20, \ldots$ — (1)

32. $10^2+11^2+12^2+ --- +24^2$ — 1

$(1^2+2^2+ --- +24^2)-(1^2+2^2+\cdots+9^2)$ — 1 — 1

$=\frac{24\times25\times49}{6}-\frac{9\times10\times19}{6}$ — 1

$= 4900-285 = 4615\, cm^2$ — 1

33. $x+y+z=5$ — ①, $2x-y+z=9$ — ②

$x-2y+3z=16$.

$4x-2y=16$ — ③ — 1

Sol eq ① & ②

$\Rightarrow -x+2y=-4$ — 1

Sol eq ③ & ④ — 1

$\Rightarrow 3x=12 \Rightarrow \boxed{x=4}$

from ③ $\boxed{y=0}$ — 1

from ① $4+0+z=5$

$\boxed{z=1}$ — 1

$x=4,\ y=0,\ z=1.$

(OR)

$x+y+z=5$ — ①, $2x-y+z=9$ — ②

$x-2y+3z=16$ — ③ — 1

from ① & ② $\Rightarrow 3x+2z=14$ — ④

Solve ② & ③ $\Rightarrow 3x-z=2$ — ⑤ — 1

from ④ & ⑤ $\Rightarrow 3z=12$ — 1

$\boxed{z=4}$

from ③ $3x+2(4)=14$, $\boxed{x=2}$ — 1

from ① $2+y+4=5$, $\boxed{y=-1}$

$\therefore x=2,\ y=-1,\ z=4$ — 1

34. Quotient: $3x^2+2x+4$

$3x^2 \,|\, 9x^4+12x^3+28x^2+ax+b$

$9x^4$ — 1

$6x^2+2x \,|\, 12x^3+28x^2$

$12x^3+4x^2$ — 1

$6x^2+4x+4 \,|\, 24x^2+ax+b$

$24x^2+16x+16$

0 — 1

$a=16$, — 1 $b=16$. — 1

35. $S=\{(1,1) --- (6,6)\}$

$n(S)=36$. — 1

$A=\{(1,1)(2,2)(3,3)(4,4)(5,5)(6,6)\}$

$n(A)=6$, $P(A)=\frac{6}{36}$ — 1

$B\Rightarrow\{(1,3)(2,2)(3,1)\}$

$n(B)=3$, $P(B)=\frac{3}{36}$ — 1

$A\cap B=\{(2,2)\}$

$p(A\cap B)=\frac{1}{36}$ — 1

$P(A\cup B)=\frac{6}{36}+\frac{3}{36}-\frac{1}{36}=\frac{2}{9}$. — 1

36. $A-B=\begin{bmatrix}-3 & 2\\ 0 & -2\end{bmatrix}$ — 1

$(A-B)^T=\begin{bmatrix}-3 & 0\\ 2 & -2\end{bmatrix}$ — 1

$A^T=\begin{bmatrix}1 & 1\\ 2 & 3\end{bmatrix}$ — 1 $B^T=\begin{bmatrix}4 & 1\\ 0 & 5\end{bmatrix}$ — 1

$A^T-B^T=\begin{bmatrix}-3 & 0\\ 2 & -2\end{bmatrix}$ — 1

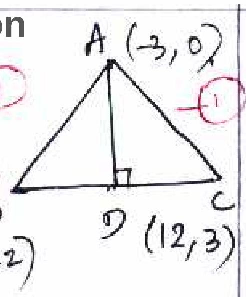
$\therefore (A-B)^T = A^T-B^T$.

37. Statement, Diagram } 1

Given, To prove, Construction } 1

Proof — 3

38. Slope of $BC = \frac{5}{2}$ — 1



Slope of $AD = -\frac{2}{5}$ — 1

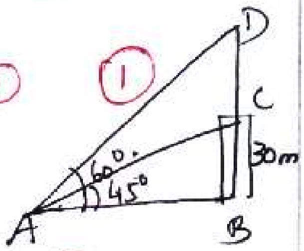
Eq. of AD

$y - 0 = \frac{-2}{5}(x+3)$ — 1

$5y = -2x - 6$

$\boxed{2x + 5y + 6 = 0}$ — 1

39. $\tan 45° = \frac{30}{AB}$ — 1   1



$\boxed{AB = 30\ m}$

$\tan 60° = \frac{30 + CD}{AB}$ — 1

$\sqrt{3} = \frac{30 + CD}{30}$

$CD = 30(\sqrt{3} - 1)$ — 1

$= 30(0.732)$

$\boxed{CD = 21.96\ m}$ → tower ht. — 1

40. Surface Area of the doll

$= 2\pi r^2 + \pi r l$ sq. unit — 1

$= \pi r(2r + l)$ — 1

$= \frac{22}{7} \times 7\ (14 + 11)$ — 1

$= 550\ cm^2$ — 1

41.

x	f	$d = x - 18$	d^2	fd	fd^2
10	3	−8	64	−24	192
15	2	−3	9	−6	18
18	5	0	0	0	0
20	8	2	4	16	32
25	2	7	49	14	98
	20 — 1			0 (or)	340 — 1

S.D, $\sigma = \sqrt{\frac{\Sigma fd^2}{n} - \left(\frac{\Sigma fd}{n}\right)^2}$

$= \sqrt{\frac{340}{20} - 0}$ — 2

$= \sqrt{17} = 4.123$ (approx). — 1

42. $(a-b)x^2 + (b-c)x + (c-a) = 0$

$B^2 - 4AC = 0$ — 1

(or)

$(b-c)^2 - 4(a-b)(c-a) = 0$ — 1

$b^2 + c^2 - 2bc - 4ac - 4a^2 + 4bc - 4ab = 0$ — 2

$(-2a + b + c)^2 = 0$

(or)

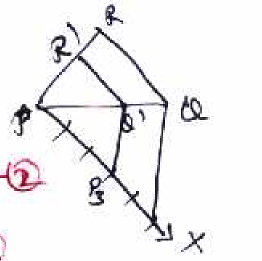
(or) $(2a - b - c)^2 = 0$ — 1

$\therefore\ 2a = b + c$ — 1

PART - IV $(2 \times 8 = 16)$.

IV ANSWER THE FOLLOWING :

43. a). Triangle — 1



→ Line Segment PX Divide into 5 parts — 2

→ Join QX and Dr. $P_3 Q' \parallel XQ$. — 2

→ Dr. $Q'R' \parallel QR$ — 2* steps — 1

$\therefore\ \Delta PQ'R' \sim \Delta PQR$.

b). → R.D. — 1

→ First circle with radius 3.6cm, — 1

→ line seg. with 7.2cm from centre. — 1

→ ⊥r bisector — 1

→ 2nd Circle. — 1

→ Intersecting points and a tangent — 1

→ ⊥r line OT or OT' — 1

→ Steps — 1

44 a) $x^2 - 9x + 20 = 0$.

points are.

$(-4,72)(-3,56)(-2,42),(-1,30)$
$(0,20)(1,12)(2,6)(3,2)(4,0)$
$(5,0)\ (6,2)$ ---

→ table —— 3 + 1
→ axes, scale —— 1
→ parabola —— 1
→ coordinates —— 1
→ Real and unequal —— 1

b) $y = x^2 + x - 2$

points : $(-4,10)(-3,4)(-2,0)$
$(-1,-2)\ (0,-2)\ (1,0)\ (2,4)$
$(3,10)\ (4,18)$

→ table : —— 2 + 1
→ $y = 0$ —— 1
→ axes, scale. —— 1
→ plot the points (parabola) —— 1
→ coordinates :
→ intersecting points on the x-axis —— 1
→ sol. $\{-2, 1\}$ —— 1

Subject Teachers.

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