X – Half Yearly Answer Maths Key – 2017

Section – I (Marks: 15)

1. $A \in B$
2. 1
3. an A.P with common difference 1
4. $11x^2y^4z^3|(l-m)|$
5. both a and b are correct.
6. 4×4
7. 3
8. 0°
9. 12 cm
10. 16 cm
11. All options correct
12. 60°
13. 4 : 3
14. 0
15. $\frac{11}{13}$

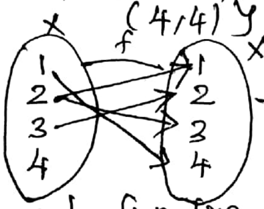
Section – II (Marks: 20)

16. $C \setminus B = \{1, 3, 5\}$ 1m

$A \setminus (C \setminus B) = \{4, 6, 7, 8, 9\}$ 1m

17. $X = \{1, 2, 3, 4\}$, $f : X \to X$

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



→ 1m

f is not function from X to X because 4 has no image in X → 1m

18. A.P $a = 24$ $d = -3/4$

$t_n = 3 \Rightarrow a + (n-1)d = 3$

$24 + (n-1)(-3/4) = 3$

$(n-1)(-3/4) = 3 - 24 = -21$

$n - 1 = -21 \times \frac{4}{-3} = 28$

$n = 28 + 1 = 29$

19. $x - 3 = 0 \Rightarrow x = 3$ is zero of given polynomial

3	1	1	−7	−3
	0	3	12	15
	1	4	5	$\boxed{12}$

Q → $x^2 + 4x + 5$, R = 12

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

Note: Question wrong point $(3x + 6x) \to (3x + 6)$

21. 3×3 scalar matrix

$A = \begin{pmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{pmatrix}$ (A takes different numbers)

leading diagonal same non-zero constant. But diagonal matrix leading diagonal take different numbers

example: $A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & -3 \end{pmatrix}$

22. $5x + 2 = 12 \Rightarrow 5x = 12 - 2$

$5x = 10 \Rightarrow x = 10/5 = 2$

$y - 4 = -8 \Rightarrow y = -8 + 4 = -4$

$4z + 6 = 2 \Rightarrow 4z = 2 - 6 = -4$

$4z = -4 \Rightarrow z = \frac{-4}{4} = -1$

$x = 2, y = -4, z = -1$

23. $6x + ay = 0 \to (1)$

(1) is passing through the point (0, 0) origin.

$6(0) + a(0) = 0$
$0 + a(0) = 0$
$a = \frac{0}{0} = \infty$ } a is undefined

a is not takes any values

24. Intercept form:

$\frac{x}{a} + y/b = 1$

$a \to 2/3$ $b \to 3/4$

$\frac{x}{2/3} + \frac{y}{3/4} = 1$

$\frac{3x}{2} + \frac{4y}{3} = 1$

$\frac{9x + 8y}{6} = 1$

$9x + 8y = 6$

$9x + 8y - 6 = 0$

25. ΔMNO, MP is the external bisector.

$\therefore \frac{MN}{MO} = \frac{NP}{NO}$

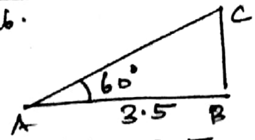
$\frac{10}{6} = \frac{12 + x}{x}$ $\frac{5}{3} = \frac{12 + x}{x}$

$5x = 36 + 3x$

$2x = 36$

$x = 36/12 = 18$ cm

26.



$\cos 60^\circ = \frac{3.5}{x}$

$\frac{1}{2} = \frac{3.5}{x} \Rightarrow x = 7$ m.

length of ladder = 7 m.

27. TSA = 675π

CSA = ?

$3\pi r^2 = 675\pi$

CSA = $2\pi r^2$

$\Rightarrow 3\cancel{\pi} r^2 = 675\cancel{\pi}$

$r^2 = \frac{675}{3} = 225$

$\therefore$ CSA $= 2 \times \pi (225)$

$= 450\pi$ sq.cm.

28. $\sigma = \sqrt{\frac{n^2 - 1}{12}}$, $n = 13$

$\sigma = \sqrt{\frac{13^2 - 1}{12}} = \sqrt{\frac{169 - 1}{12}}$

$= \sqrt{\frac{168}{12}} = \sqrt{14} = 3.47$.

29. $x \to$ blue balls

$n(S) = 5 + x$.

$P(B) = 3(P(R))$

$\frac{x}{5 + x} = 3\left(\frac{5}{5 + x}\right)$

$x = 15$

15 blue balls.

30. a) $\frac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$

$\frac{\sin\theta(\cos 2\theta)}{\cos\theta(\cos 2\theta)} = \frac{\sin\theta}{\cos\theta} = \cot\theta$

(or)

b) $66 \text{ cm} = 2\pi r$, $h = 12$ cm

$r = \frac{66}{2} \times \frac{7}{22} = \frac{21}{2}$

Volume cylinder $= \pi r^2 h$

$= \frac{22}{\cancel{7}} \times \frac{\cancel{21}^{3}}{\cancel{2}} \times \frac{21}{\cancel{2}} \times \cancel{12}^{3}$

$= 4158$ cm^3

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Section-III (Marks 45)

31. $U = \{-2,-1,0,1,2,3,\ldots 10\}$

$A=\{-2,2,3,4,5\}$ and $B=\{1,3,5,8,9\}$

De Morgan's laws of complementation

i) $(A\cup B)' = A'\cap B'$ ii) $(A\cap B)' = A'\cup B'$

$A\cup B=\{-2,1,2,3,4,5,8,9\}$

$(A\cup B)' = \{-1,0,6,7,10\}$

$A' = \{-1,0,1,6,7,8,9,10\}$

$B' = \{-2,-1,0,2,4,6,7,10\}$

$A'\cap B' = \{-1,0,6,7,10\}$

$(A\cap B) = \{3,5\}$

$(A\cap B)' = \{-2,-1,0,1,2,4,6,7,8,9,10\}$

$A'\cup B' = \{-2,-1,0,1,2,4,6,7,8,9,10\}$

Hence proved.

32. $A=\{4,6,8,10\}$, $B=\{3,4,5,6,7\}$

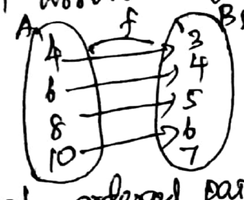
$f: A\to B$. $f(x)=\frac{1}{2}x+1$

$\frac{1}{2}x+1=f(x) \Rightarrow f(4)=\frac{1}{2}(4)+1=3$

$f(6)=\frac{1}{2}(6)+1=4$, $f(8)=\frac{1}{2}(8)+1=5$

$f(10)=\frac{1}{2}(10)+1=6$.

(i) an arrow diagram



Since all elements has unique image in B

∴ one-one function

ii) Set ordered pairs

$f=\{(4,3),(6,4),(8,5),(10,6)\}$

iii) a table

x	4	6	8	10
$f(x)$	3	4	5	6

33. The three terms are $\frac{a}{r}, a, ar$

$\frac{a}{r}+a+ar=\frac{39}{10}$

$a\left(\frac{1+r+r^2}{r}\right)=\frac{39}{10} \to ①$

$\frac{a}{\cancel{r}}\times a\times a\cancel{r}=1$

$a^3=1 \Rightarrow \boxed{a=1}$

$a=1$ in ①

$\frac{1+r+r^2}{r^2}=\frac{39}{10} \Rightarrow 10+10r+10r^2=39r$

$10r^2-39r+10r+10=0$

$10r^2-29r+10=0$

$\left(r-\frac{5}{2}\right)\left(r-\frac{2}{5}\right)=0$

$r=5/2$ $r=2/5$

100

$\frac{-25}{10}$ $\frac{-4}{10}$

-29

Case(i) $a=1$, $r=5/2$

$\frac{2}{5}, 1, 5/2$

Case ii $a=1$ $r=2/5$

∴ $5/2, 1, 2/5$

34. Square Method:

$9x^2-12x-17=0$

$\frac{12}{9}\times\frac{1}{2}=\frac{2}{3}$

$\frac{4}{9}$

$\div 9 \Rightarrow x^2-\frac{12}{9}x-\frac{17}{9}=0$

$\left(x-\frac{2}{3}\right)^2=\frac{17}{9}+\frac{4}{9}=\frac{21}{9}$

$x-\frac{2}{3}=\pm\sqrt{\frac{21}{9}}=\pm\frac{\sqrt{21}}{3}$

$x=\frac{2}{3}\pm\frac{\sqrt{21}}{3}=\frac{2\pm\sqrt{21}}{3}$

35.

$$\begin{array}{l|lllll}
 & 3 & 2 & 4 & & \\
3 & 9 & 12 & 28 & -n & m \\
 & 9 & & & & \\
\hline
6\ 2 & & 12 & 28 & & \\
 & & 12 & 4 & & \\
\hline
6\ 4\ 4 & & & 24 & -n & m \\
 & & & 24 & 16 & 16 \\
\hline
 & & & & 0 & \\
\end{array}$$

∴ $n=-16$, $m=16$

36. $A=\begin{pmatrix}1&-1\\2&3\end{pmatrix}$, $A^2=A\times A=\begin{pmatrix}1&-1\\2&3\end{pmatrix}\begin{pmatrix}1&-1\\2&3\end{pmatrix}$

$=\begin{pmatrix}-1&-4\\8&7\end{pmatrix}$

$-4A=-4\begin{pmatrix}1&-1\\2&3\end{pmatrix}=\begin{pmatrix}-4&4\\-8&-12\end{pmatrix}$, $5I_2=\begin{pmatrix}5&0\\0&5\end{pmatrix}$

$A^2-4A+5I_2=\begin{pmatrix}-1&-4\\8&7\end{pmatrix}+\begin{pmatrix}-4&4\\-8&-12\end{pmatrix}+\begin{pmatrix}5&0\\0&5\end{pmatrix}$

$=0$.

37. $x+2y=7 \to ①$

$2x+y=8 \to ②$

$①\times 2 \Rightarrow 2x+4y=14$

$② \Rightarrow 2x+y=8$

$3y=6$

$y=\frac{6}{3}=2$

$y=2$ in ①

∴ $x=7-4=3$

Radius $=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$

$=\sqrt{(3-0)^2+(2+2)^2}$

$=\sqrt{9+16}=\sqrt{25}$

$=5$ units

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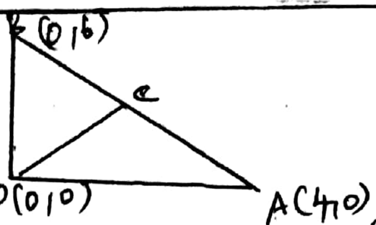
38)



mid pt of AB is $c = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$= \left(\frac{0+4}{2}, \frac{0+6}{2}\right) = (2,3)$

distance OC $= \sqrt{(0-2)^2+(0-3)^3} = \sqrt{16}$

distance CB $= \sqrt{(0-2)^2+(3-6)^2} = \sqrt{16}$

distance AC $= \sqrt{(4-2)^2+(0-3)^2} = \sqrt{16}$

∴ C is the equidistant from all the vertices of ΔOAB.

39. State and proove pythagoras theorem.

40. $\cot\alpha = \frac{a}{\tan\theta}$ $\quad \operatorname{cosec}\alpha = \frac{b}{\sin\theta}$.

$\operatorname{Cosec}^2\alpha - \cot^2\alpha = 1$

$\left(\frac{b}{\sin\theta}\right)^2 - \left(\frac{a}{\tan\theta}\right)^2 = 1$

$\frac{b^2}{\sin^2\theta} - \frac{a^2\cos^2\theta}{\sin^2\theta} = 1$

$\frac{b^2 - a^2\cos^2\theta}{\sin^2\theta} = 1$

$b^2 - a^2\cos^2\theta = \sin^2\theta$.

$b^2 - a^2\cos^2\theta = 1 - \cos^2\theta$.

$b^2 - 1 = a^2\cos^2\theta - \cos^2\theta$

$b^2 - 1 = (a^2-1)\cos^2\theta$.

$\frac{b^2-1}{a^2-1} = \cos^2\theta$.

$\therefore \sec^2\theta = \frac{a^2-1}{b^2-1}$

41. Cone: $d = 8cm \rightarrow r_1 = 4\,cm = 40mm$

$h = 12cm = 120mm$

Sphere: $r_2 = 4mm \rightarrow$

Total leads shot $= \frac{\text{Volume of Cone}}{\text{volume of Sphere}}$

$= \frac{\frac{1}{3}\pi r_1^2 h}{\frac{4}{3}\pi r_2^3}$

$= \frac{40\times40\times120}{4\times4\times4\times4} = 750$ leads shot

42. $2\pi R = 44$ and $2\pi r = 8.4\pi$, $h = 14cm$

$R = 44\times\frac{1}{2}\times\frac{7}{22} = 7cm$ $\quad r = \frac{8.4}{2} = 4.2\,cm$

Volume of frustum $= \frac{1}{3}\pi h(R^2+r^2+Rr)$

$= \frac{1}{3}\times\frac{22}{7}\times14\,(49+17.64+29.4)$

$= 1408.6\,cm^3$

43. $\Sigma x = 35$, $n = 5$, $\Sigma(x-9)^2 = 82$

$\bar{x} = \frac{35}{n} = 7$

$\Sigma x^2 \div \Sigma(x-9)^2 = 12$

$\Sigma(x^2 - 18x + 81) = 82$

$\Sigma x^2 - 18\Sigma x + \Sigma 81 = 82$

$\Sigma x^2 - 630 + 405 = 82$

$\Sigma x^2 = 307$

$\Sigma(x-\bar{x})^2 \Rightarrow \Sigma(x-7)^2$

$\Sigma(x^2 - 14x + 49) \Rightarrow \Sigma x^2 - \Sigma 14x + \Sigma 49$

$307 - 14\times35 + 49\times5 \Rightarrow 62$

44. $n(S) = 36$

$A \rightarrow$ frist fares even number

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

$P(A) = \frac{18}{36}$

$B \rightarrow$ total 8 $\quad B = \{(2,6), (3,5), (4,4), (5,3), (6,2)\}$

$P(B) = \frac{5}{36}$

$A\cap B \Rightarrow \{(2,6), (4,4), (6,2)\}$

$P(A\cap B) = \frac{3}{36}$

$P(A\cup B) = P(A) + P(B) - P(A\cap B) = \frac{20}{36} = \frac{5}{9}$

45)a) a, b, c, d are G.P

$\frac{b}{a} = \frac{c}{b} = \frac{d}{c} \Rightarrow b^2 = ac$, $c^2 = bd$, $bc = ad$

$(b-c)^2 = b^2 - 2bc + c^2$, $(c-a)^2 = c^2 + a^2 - 2ac$

$(d-b)^2 = d^2 + b^2 - 2bd$.

$\Rightarrow b^2 - 2bc + c^2 + c^2 + a^2 - 2ac + d^2 + b^2 - 2bd$

$\Rightarrow ac - 2ad + bd + bd + a^2 - 2ac + d^2 + ac - 2bd$

$\Rightarrow a^2 - 2ad + d^2 \Rightarrow (a-d)^2$.

(or)

b) Sum of roots $= \frac{-b}{a} = \frac{3}{1} = 3$, Product of roots $= \frac{c}{a} = \frac{-1}{1} = -1$

The required equation roots are $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$

Sum of roots $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$

$= \frac{\alpha^2+\beta^2}{(\alpha\beta)^2} = \frac{(3)^2 - 2(-1)}{(-1)^2}$

$= 9 + 2 = 11$

Product of roots $= \frac{1}{\alpha^2}\times\frac{1}{\beta^2} = \frac{1}{(\alpha\beta)^2} = \frac{1}{(-1)^2} = 1$

The eqn

$x^2 - (\text{sum of roots})x + \text{Product of roots} = 0$

$x^2 - 11x + 1 = 0$