MARCH

SSLC PUBLIC EXAM - 2024 (MATHS)

15 $A = \{3, 5\}$ $B = \{2, 4\}$

16 $f(x) = 3x-2$ $g(x) = 2x+k$

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

$g \circ f = g(3x-2) = 2(3x-2)+k = 6x-4+k$

$f \circ g = g \circ f \Rightarrow 6x+3k-2 = 6x-4+k$

$2k = -2$

$\boxed{k=-1}$

$10 \,|\, 800$

17 $a^b \times b^a = 800$ $a=5$ $b=2$ (or) $a=2$ $b=5$

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

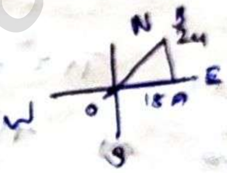
18 $\frac{4x^2y}{2z^2} \times \frac{6xz^3}{20y^4} = \frac{3x^3z}{5y^3}$

19 $x^2+8x-65=0$

Sum of the roots $= -b/a = -8$

prod of the roots $= c/a = -65$

20 $OB^2 = OA^2 + AB^2$



$OB^2 = 18^2+24^2$

$= 6^2(3^2+4^2) = 6^2 \times 5^2$

$OB = 30$ m

21 $m = -5/4$ $P(x_1, y_1) = (-1, 2)$

Eqn. of a st line $y - y_1 = m(x-x_1)$

$y-2 = -5/4\,(x+1)$

$4y-8 = -5x-5$

$5x+4y-3=0$

22 Given $A(3,9)$ $B(a,b)$ $C(4,-5)$ are collinear

$a+b=1$

Area of $\triangle ABC = 0$

$\frac{1}{2}\left\{\begin{matrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{matrix}\right\} = 0$

$\left\{\begin{matrix} -3 & a & 4 & -3 \\ 9 & b & -5 & 9 \end{matrix}\right\} = 0$

$(-3b-5a+36) - (9a+4b+15) = 0$

$-14a-7b+21=0$

$2a+b=3$ —①

2

$2a+b=3$
$a+b=1$
$a=2$ $\boxed{b=-1}$

23 $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$

$\sqrt{\frac{1+\cos\theta}{1-\cos\theta} \times \frac{1+\cos\theta}{1+\cos\theta}} = \sqrt{\frac{(1+\cos\theta)^2}{1-\cos^2\theta}} = \sqrt{\left(\frac{1+\cos\theta}{\sin\theta}\right)^2}$

$= \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta} = \operatorname{cosec}\theta + \cot\theta$

24 Base area $\pi r^2 = 1386$ sq units
T.S.A of hemisphere $= 3\pi r^2$
$= 3(1386)$
$= 4158$ sq units

25 $h = 2m$ $\pi r^2 = 250\ m^2$
Volume of the cylinder $= \pi r^2 h = 250(2)$
$= 500\ m^3$

26 25, 67, 48, 53, 18, 39, 44
$L = 67$ $S = 18$
Range $= L - S = 67 - 18 = 49$
Co-efficient of range $= \frac{L-S}{L+S} = \frac{49}{85}$

27 Leap year = 366 days = 52 weeks + 2 days
S = {Sun Mon, Mon Tue, Tue W, W Th, Th F, F Sa, Sa S}
n(S) = 7
Let A be event of getting a saturday
A = {F Sa, Sa S}
n(A) = 2
$\therefore P(A) = \frac{n(A)}{n(S)} = \frac{2}{7}$

28 $a = bq + r$
$23 = 12(1) + 11$
$12 = 11(1) + 1$
$11 = 1(11) + 0$ $r = 0$ $\therefore$ HCF is 1

③

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

$B \cup C = \{0, 1, 2\}$

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

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

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

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

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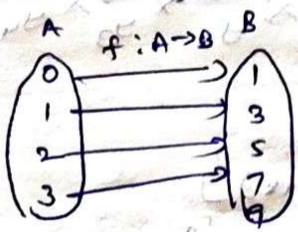
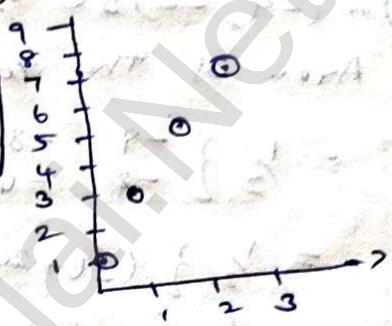
30. $A = \{0, 1, 2, 3\}$ $B = \{1, 3, 5, 7, 9\}$

$f(x) = 2x+1$

$f(0) = 1$, $f(1) = 3$, $f(2) = 5$, $f(3) = 7$



x	0	1	2	3
$f(x)$	1	3	5	7



$f = \{(0,1)\ (1,3)\ (2,5)\ (3,7)\}$

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31. $9^3 + 10^3 + \dots + 21^3$

$9^3 + 10^3 + \dots + 21^3 = (1^3+2^3+3^3 \dots 21^3) - (1^3+2^3+3^3 \dots 8^3)$

$= \left[\frac{21(22)}{2}\right]^2 - \left(\frac{8(9)}{2}\right)^2$

$= (21(11))^2 - (9 \times 4)^2$

$= 53361 - 1296 = 52065$

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32. $64x^4 - 16x^3 + 17x^2 - 2x + 1$

$$
\begin{array}{r|l}
 & 8x^2 - x + 1 \\
8x^2 & 64x^4 - 16x^3 + 17x^2 - 2x + 1 \\
 & 64x^4 \\
\hline
16x^2 - x & -16x^3 + 17x^2 \\
 & -16x^3 + x^2 \\
 & + \quad - \\
\hline
16x^2 - 2x + 1 & 16x^2 - 2x + 1 \\
 & 16x^2 - 2x + 1 \\
 & - \quad + \quad - \\
\hline
 & 0
\end{array}
$$

$|8x^2 - x + 1|$

33) $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$

$A^2 = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 9-1 & 3+2 \\ -3-2 & -1+4 \end{bmatrix}$

$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix}$

$-5A = \begin{bmatrix} -15 & -5 \\ 5 & -10 \end{bmatrix}$; $7I = \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$

$A^2 - 5A + 7I = \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} + \begin{bmatrix} -15 & -5 \\ 5 & -10 \end{bmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

35) A $(-9, -2)$ B $(-8, -4)$ C $(1, -3)$ D $(2, 2)$

Area of the quadrilateral $= \frac{1}{2}\left\{ \begin{matrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{matrix} \right\}$ sq. units

$= \frac{1}{2}\left\{ \begin{matrix} -9 & -8 & 1 & 2 & -9 \\ -2 & -4 & -3 & 2 & -2 \end{matrix} \right\}$

$= \frac{1}{2}\{(36+24+2-4) - (16-4-6-18)\}$

$= \frac{1}{2}\{58+12\} = \frac{70}{2} = 35$ sq. units

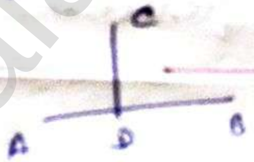
36. A $(-4, 2)$ B $(6, -4)$

CD ⊥r AB

D is midpt of AB

Midpt of AB is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\left(\frac{-4+6}{2}, \frac{2-4}{2}\right) = \left(\frac{2}{2}, \frac{-2}{2}\right) = D(1, -1)$



Slope of AB $= \frac{y_2-y_1}{x_2-x_1} = \frac{-4-2}{6+4} = \frac{-6}{10} = \frac{-3}{5}$

Slope of CD $= \frac{-1}{\text{slope of AB}} = \frac{5}{3}$

Eqn. of CD is $y - y_1 = m(x - x_1)$

D $(1, -1)$

$y + 1 = \frac{5}{3}(x - 1)$

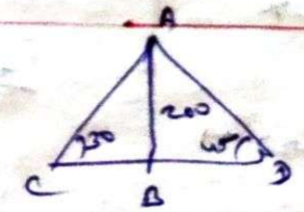
$3y + 3 = 5x - 5$

$5x - 3y - 8 = 0$

37) AB - height of light house

AB = 200 m

$\angle ACB = 30°$ $\quad \angle ADB = 45°$



$\tan 30° = \frac{200}{BC}$ $\quad \tan 45 = \frac{200}{BD}$

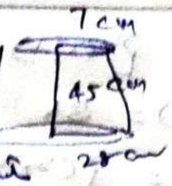
BD = 200 m

$BC = 200\sqrt{3}$ m

CD = BC + BD $= 200(\sqrt{3}+1) = 200(2.732)$

$= 546.4$ m

38 Given $R = 28\,cm$ $r = 7\,cm$
$h = 45\,cm$



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

$= \frac{1}{3} \times \frac{22}{7} \times 45 (28^2 + 28(7) + 7^2)$

$= \frac{22}{7} \times 15 (784 + 196 + 49)$

$= \frac{22}{7} \times 15 \times 1029 = \frac{339570}{7} = 48510\ cm^3$

39. cylinder
$h = 15\,cm$
$r = 6\,cm$

cone
$h_1 = 9\,cm$
$r_1 = 3\,cm$

hemisphere
$r_2 = 3\,cm$

Volume of 1 ice cream cone = Volume of conical portion + volume of hemispherical portion

$= \frac{1}{3}\pi r_1^2 h_1 + \frac{2}{3}\pi r_2^3$

$= \frac{\pi}{3}\left[3^2(9) + 2(3)^3\right]$

$= \frac{\pi}{3}(81 + 54) = \frac{135\pi}{3} = 45\pi\ cm^3$

Volume of cylindrical vessel $= \pi r^2 h = \pi (6)^2 (15)\ cm^3$

No. of ice cream cones $= \frac{\text{Volume of cylindrical vessel}}{\text{volume of 1 ice cream cone}}$

$= \frac{\pi \times 36 \times 15}{45\pi} = 12$ cones

40 24, 26, 33, 37, 29, 31

$\bar{x} = \frac{24+26+33+37+29+31}{6} = 30$

x	$d = x - \bar{x}$	d^2
24	-6	36
26	-4	16
33	3	9
37	7	49
29	-1	1
31	1	1
	Σd^2	112

$\sigma = \sqrt{\frac{\Sigma d^2}{n}} = \sqrt{\frac{112}{6}}$

$\sigma = \sqrt{18.67} = 4.32$

$C.V = \frac{\sigma}{\bar{x}} \times 100$

$= \frac{4.32 \times 100}{30}$

$= \frac{432}{30}$

$= 14.4\ \%$

41. $S = \{(1,1)\ (1,2)\ (1,3) \ldots (6,6)\}$

$n(S) = 36$

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

$n(A) = 18$

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

$n(B) = 5$

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

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

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

$n(A \cap B) = 3$

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

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{18}{36} + \frac{5}{36} - \frac{3}{36} = \frac{20}{36} = \frac{5}{9}$

42. $7 + 77 + 777 \ldots (+ \ldots n \text{ terms})$

$7(1 + 11 + 111 + \ldots \ldots n \text{ terms})$

$\frac{7}{9}(9 + 99 + 999 \ldots \ldots n \text{ terms})$

$\frac{7}{9}[(10-1) + (100-1) + (1000-1) \ldots n \text{ terms}]$

$\frac{7}{9}[(10 + 100 + 1000 \ldots n \text{ terms}) - n]$

$\frac{7}{9}\left[\frac{10(10^n - 1)}{10-1} - n\right]$

$\frac{7}{9}\left[\frac{10(10^n - 1)}{9} - n\right]$

$\frac{70(10^n - 1)}{81} - \frac{7n}{9}.$