CLASS	SUBJECT
ROLL NO.	DATE

SINDHI HIGH SCHOOL BENGALURU

I-PREBOARD EXAMINATION - 2023

MATHEMATICS - STANDARD - 041

CLASS : 10

SET : I

DURATION : 3hr 15mins.

DATE : 11.12.23.

SECTION - A

1. d) infinite 1
2. c) b^2-4ac, a perfect square 1
3. d) Not possible for any value of c 1
4. b) $2\sqrt{2}$ 1
5. c) $\frac{n(n+1)}{\sqrt{2}}$ 1
6. b) −4 1
7. b) 2:1 1
8. b) 7.2 cm 1
9. d) $4\sqrt{30}$. 1
10. d) 8 cm 1
11. c) 2 1
12. b) 4 1
13. d) 4 1
14. a) $\frac{r^2}{12}(2\pi-3\sqrt{3})$ 1
15. b) $\frac{60}{11}$ cm 1
16. c) $\frac{3}{5}$ 1
17. b) 9.70 1
18. c) 4 (4) 1
19. d) A is false R true 1
20. c) A true R false. 1

SECTION : B

21. Let $\sqrt{3}$ be rational $\sqrt{3}=p/q$ where $p, q \in Z$, $q \neq 0$

HCF (p, q) = 1. $\frac{1}{2}$

$$3=\frac{p^2}{q^2} \Rightarrow q^2=\frac{p^2}{3}$$ 1

Hence 3 divides p^2 but 3 is prime ∴ 3 divides p also. $\frac{1}{2}$

take $\frac{p}{3} = c$ for some c

$\Rightarrow p = 3c$

Sub in ①

$q^2 = \frac{(3c)^2}{3} = \frac{9c^2}{3} = 3c^2$ $\frac{1}{2}$

$c^2 = \frac{q^2}{3}$

$\Rightarrow$ 3 divides q^2 as 3 is prime 3 divides q also

∴ there is atleast one divisor for p & q

This contradicts assumption HCF(p,q) = 1. $\frac{1}{2}$

∴ √3 should be rational. [2]

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22. Since $\Delta ABC \sim \Delta DEF$

$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = k.$

Also $k = \frac{AB+BC+AC}{DE+EF+DF}$. 1

∴ $\frac{5.7}{13.6} = \frac{P(\Delta ABC)}{64}$

∴ $P(\Delta ABC) = \frac{5.1 \times 64}{13.6} = 24 cm^2$ 1

[2]

23. OLK is isosceles since OK = OK.

∴ ∠KLO = ∠OKL = 30°. 1

∠OKP = 90° (tgt & radius through pt of contact are ⊥) 1

∠30 + ∠PKL = 90°

∠PKL = 60°. [2]

24 $LHS = \frac{\sin^2\theta}{\cos^2\theta} - \sin^2\theta$

$\sin^2\theta\left[\frac{1}{\cos^2\theta} - 1\right]$ $\frac{1}{2}$

$\sin^2\theta\left[\sec^2\theta - 1\right]$ $\frac{1}{\cos\theta} = \sec\theta$

$\sin^2\theta \tan^2\theta$ $[1+\tan^2\theta] = \sec^2\theta$ $1\frac{1}{2}$

[2]

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OR

$\frac{4}{(\sqrt{3})^2} + \frac{1}{\left(\frac{\sqrt{3}}{2}\right)^2} - \left(\frac{1}{\sqrt{2}}\right)^2$ 1½

$\frac{4}{3} + \frac{4}{3} - \frac{1}{2}$

$= \frac{8}{3} - \frac{1}{2} = \frac{13}{6}.$ ½ [2]

25. $r = 42$ cm. $\theta = 120°$ ½

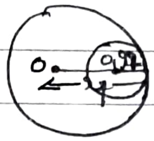
distance moved is arc length $= \frac{\theta}{360} \times 2\pi r$

$= \frac{120}{360} \times \frac{22}{7} \times 2 \times 42$ 1½

$= 88$ cm [2]

OR.

Let r_1 & r_2 be radii.



$r_1 - r_2 = 7$ cm. 1

$2\pi r_1 - 2\pi r_2$

$2\pi(r_1 - r_2)$

$2 \times \frac{22}{7}(7) = 44$ cm. 1

SECTION C [2]

26. Black marbles → Group of 13.
Purple marbles → group of 25.

LCM (13, 25) = 325.
least no of marbles she should have is 325. 2

No of groups in black $= \frac{325}{13} = 25$ ½

in purple $= \frac{325}{25} = 13$ ½ [3]

27. $3x^2 - 12x + k$ SECTION : D

$a = 3$ $b = -12$ $c = k$

$\alpha + \beta = \frac{-12}{3} = -4$

$\alpha + \beta = -4$

$\alpha - \beta = 2$

$2\alpha = -2$

$\alpha = -1$

~~$\beta = -1-2 = -3$.~~

~~Since $\alpha = -1$ is a zero~~

~~$3(-1)^2 - 12(-1) + k = 0$~~

~~$3 + 12 + k = 0$~~

~~$k = -15$~~

$x^2 + 3x + k$.

$a = 1 \quad b = 3 \quad c = k$

$\alpha + \beta = -3$ → 1

$\alpha - \beta = +7$ 1

$2\alpha = -10$

$\alpha = -5$ $\frac{1}{2}$

$\beta = -3+5 = 2$ $\frac{1}{2}$

Since $\alpha = -5$ is zero of $x^2 + 3x + k$

$(-5)^2 + 3(-5) + k = 0$ $\frac{1}{2}+\frac{1}{2}$

$25 - 15 + k = 0$

$k = -10$. [3]

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28. $px + qy = 1 \quad \times q$

$qx + py = 1 \quad \times p$ $\frac{1}{2}$

$qpx + q^2 y = q$

$pqx + p^2 y = p$

Subtract

$y(q^2 - p^2) = q - p$

$y = \frac{q-p}{q^2-p} = \frac{1}{p+q}$ $1\frac{1}{2}$

$px + qy = 1$

$px + q\left(\frac{1}{p+q}\right) = 1$

$px = 1 - \frac{q}{p+q} = \frac{p}{p+q}$ 1

$x = \frac{1}{p+q}$. [3]

(3)

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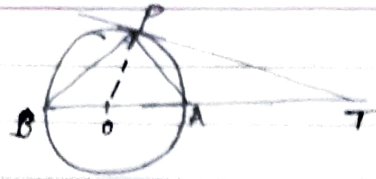
29. 

$\frac{1}{2}$

Let 'r' be the radius

AB = 2r (diameter.)

∠PBT = 30° (given)

∠APB = 90° (angle in semi)

In △ABP, ∠PAB = 180° − (90+30)

= 60° [ASP].

Join OP. — Proving PA = r

OP = OA (radii) ∴ △OPA is isosceles △.

with 60°. — [1½]

∴ ∠OPA = ∠OAP = 60°

From ASP in OPA, ∠POA = 60°

Hence it is an equi △,

∴ OP = OA = PA = 'r'. —— ①

∠OPT = 90° [radius & tgt thro' pt of contact 90°] — Proving PA = AT = r

OPA + ∠APT = 90°

60°

∠APT = 30° — (½+½ M)

∠PAT = 120° (LP)

∴ In △PAT, ∠T = 180° − (30+120)

= 30°

∴ PAT is isosceles.

⇒ PA = AT = r [from ①].

Now $\frac{AB}{AT} = \frac{2r}{r} = \frac{2}{1}$ — [3]

30. LHS = $\frac{\sin A}{1-\cos A} + \frac{\sin A}{\cos A(1+\cos A)}$

$= \sin A\left[\frac{\cos A(1+\cos A) + 1-\cos A}{\cos A(\sin^2 A)}\right]$ — 1

$= \sin A\left[\frac{\cos^2 A + 1}{\cos A(\sin^2 A)}\right]$ — 1

$= \frac{\sin A\cos^2 A}{\cos A\sin^2 A} + \frac{\sin A}{\cos A\sin^2 A}$ — 1

= cot A + cosec A sec A = RHS — [3]

31.

Class	f	x_i	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
10-30	5	20	-2	-10
30-50	8	40	-1	-8
50-70	f_1	(60)	0	0
70-90	20	80	1	20
90-110	f_2	100	2	$2f_2$
110-130	2	120	3	6

1

$\Sigma f_i u_i = 2f_2 + 8$. $\Sigma f_i = 35 + f_1 + f_2$

$\bar{u} = \frac{2f_2 + 8}{50}$. $50 = 35 + f_1 + f_2$

$f_1 + f_2 = 15$ ① $\frac{1}{2}$

$\bar{x} = \bar{u}h + a$

$65.6 = 60 + \left(\frac{2f_2 + 8}{5\not{0}}\right) \times 2\not{0}$

$5.6 = \frac{4f_2 + 16}{5}$ 1

$28.0 - 16 = 4f_2$

$12 = 4f_2$

$\boxed{f_2 = 3}$

$f_1 + 3 = 15$ from ①.

$\boxed{f_1 = 12}$ $\frac{1}{2}$

SECTION D

[3]

32. Let usual speed be x km/hr $\frac{1}{2}$

Distance = 2800 Km.

Time taken to fly 2800km at x km/hr = $\frac{2800\text{km}}{x}$. $\frac{1}{2}$

Time taken to fly 2800km at $(x-100)$ km/hr

$= \frac{2800\text{km}}{x-100}$ $\frac{1}{2}$

$\frac{2800\text{km}}{x} - \frac{2800}{x-100} = \frac{30}{60} = \frac{1}{2}$ 1

$2800\left[\frac{1}{x} - \frac{1}{x-100}\right] = \frac{1}{2}$

$2800\left[\frac{x - 100 - x}{x(x-100)}\right] = \frac{1}{2}$ 2

$x^2 - 100x = -56000$

$x^2 - 100x + 56000 = 0$ $x = -700$ rejected, sp can't be zero

$(x-800)(x+700) = 0$

$\therefore$ sp = 800 km/h $\frac{1}{2}$ [5]

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(7)

OR.

Total cash = 2360

Let the no. days of tour be 'x' $\frac{1}{2}$

~~Expense/day~~

cash spent / day when there are x days = $\frac{360}{x}$ $\frac{1}{2}$

cash spent / day when there are x+4 days

$= \frac{360}{x+4}$ $\frac{1}{2}$

$\frac{360}{x} - \frac{360}{x+4} = 3$ 1

$\overset{120}{\cancel{360}}\left[\frac{1}{x} - \frac{1}{x+4}\right] = 3$

$\frac{\cancel{x}+4-\cancel{x}}{x^2+4x} = \frac{1}{120}$

$x^2+4x-480=0$ 2

$x^2+24x-20x-480=0$

$(x+24)(x-20)=0$

$x=-24$ rejected $x=20$

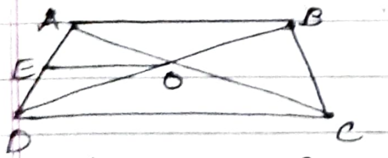
No of days 20 $\frac{1}{2}$

15

33. fig ($\frac{1}{2}$ M)

given, to prove, construction ($\frac{1}{2}$ M)

proof (2 M)



$\frac{1}{2}$

Draw OE ∥ AB

AB ∥ CD ∴ OE ∥ CD

In △ ADC,

$\frac{AE}{DE} = \frac{AO}{OC}$ ① (BPT) $\frac{1}{2}$

In ADB

$\frac{AE}{ED} = \frac{OB}{OD}$ ② BPT $\frac{1}{2}$

① & ② ⇒ $\frac{AO}{OC} = \frac{OB}{OD}$

$\Rightarrow \frac{AO}{OB} = \frac{CO}{DO}$ $\frac{1}{2}$

[5]

34. **Cylinder** | **Cone**

$2R = 20$ | $2r = 10$

$R = 10cm$ | $r = 5cm$ $\frac{1}{2}$

$H = 24cm$ | $h = 12cm.$

Vol. of recycled material used

= Vol of cylinder − Vol. of 2 cone

$= \pi R^2 H - 2\left(\frac{1}{3}\pi r^2 h\right)$ 2

$= \pi \left[R^2 H - \frac{2}{3} r^2 h\right]$

$= \frac{22}{7}\left[10^2 \times 24 - \frac{2 \times 5 \times 5 \times 12}{3}\right]$

$= \frac{22}{7}\left[2400 - 200\right]$

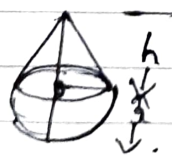
$= \frac{22}{7}\left[2200\right]$ 2½

$= \frac{48400}{7}$

$= 6914.28 cm^3$

[5]

OR



Hemisphere : Vol. wood used

$r = 3.5 cm.$

Let the ht of cone be 'h' cm.

ht of top $(h+r)$ cm. $\frac{1}{2}$

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[5]

Vol. of Toy = Vol. of hemisphere + Vol. of cone

$166\frac{5}{6} = \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$ 2

$\frac{\pi r^2}{3}[r + h]$

$\frac{1001}{6} = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{1}{3}[r+h]$ $1\frac{1}{2}$

$13 = r + h$

∴ Ht of toy = 13 cm

cost of painting hemispherical part = ₹100/cm²

CSA of hemisphere $= 2\pi r^2$ $\frac{1}{2}$

$= 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$

$= 77 \text{ cm}^2$

Total cost of painting = 77×100 $\frac{1}{2}$

= ₹7700

[5]

38

CLASS	f	x_i	$u_i = \frac{x_i - a}{h}$	$f_i u_i$	cf
0-20	20	10	-2	-40	20
20-40	35 f_0	30	-1	-35	55
40-60	52 f_1	(50)	0	0	107
[60-80]	44 f_2	70	1	44	151
80-100	38	90	2	76	189
100-120	31	110	3	93	220
	220			138	

$\bar{u} = \frac{138}{220} = \frac{27}{55}\ \frac{69}{110} = 0.62$

SURYA GOLD

$\bar{x} = \bar{u}h + a$

$= \frac{0.62}{\cancel{27}} \times 20 + 50$

$= \cancel{\frac{108}{11} + 50}$ $12.04 + 50$

$= 9.63 + 50$

$= \underline{62.54}$

Median class 60-70.

$l = 60$, $f = 44$, $cf = 107$.

Median $= l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h = 60 + \left(\frac{110 - 107}{44}\right) \times 20$

$= 60 + \frac{3 \times \cancel{20}\ 105}{\cancel{44}\ \cancel{22}\ 11}$

$= 60 + 1.36$

$= \underline{61.36}$

Mode $= l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) h$

$= 40 + \left(\frac{52 - 35}{104 - 35 - 44}\right) 20$

$= 40 + \frac{17 \times \cancel{20}^{4}}{\cancel{25}\ 5}$

$40 + 13.6$

$= \underline{53.6}$

SECTION B

36 $a_6 + a_{14} = -76 \Rightarrow a + 5d + a + 13d = -76$

$a_8 + a_{16} = -96 \Rightarrow a + 7d + a + 15d = -96$

$a + 9d = -38$ ①

$a + 11d = -48$ ②

$-2d = 10$

$\underline{d = -5}$

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(6)

$a = -38 - 9(-5)$

$= -38 + 45 = 7$

(i) $a_{10} = a + 9d = 7 + 9(-5)$

$= -38$ 1/2

$a_{12} = 7 + 11(-5) = -48$ 1/2

(ii) $d = -5$ 1

(iii) greatest -ve means first -ve card.

Let $a_n < 0$

$7 + (n-1) \times -5 < 0$

$7 - 5n + 5 < 0$ 1½

$-5n < -12$

$n > \frac{12}{5}$ (2.2)

3rd card is the first -ve card.) 1/2

[2]

OR

middle most $= \frac{51+1}{2} = 26^{th}$ card 1

$a_{26} = a + 25d = 7 + 25(-5)$

$= 7 - 125$ 1

$= -118$ [2]

37 (i) $L = (5, 10)$ $B = (0, 7)$

$LB = \sqrt{5^2 + 3^2} = \sqrt{34}$ U 1

(ii) $L = (5, 10)$ $N = (2, 6)$ $P = (8, 6)$ 1/2

$LN = \sqrt{3^2 + 4^2} = 5$ U

$NP = \sqrt{6^2 + 0} = 6$ U 1

$LP = \sqrt{3^2 + 4^2} = 5$ U 1/2 [2]

∴ LNP is isosceles

OR

Point $A(0, y)$ 1/2

$AL = AP$

$\sqrt{5^2 + (y-10)^2} = \sqrt{8^2 + (y-6)^2}$

$25 + y^2 - 20y + 100 = 64 + y^2 - 12y + 36$

$-8y = -25$

$y = \frac{25}{8}$ 1½

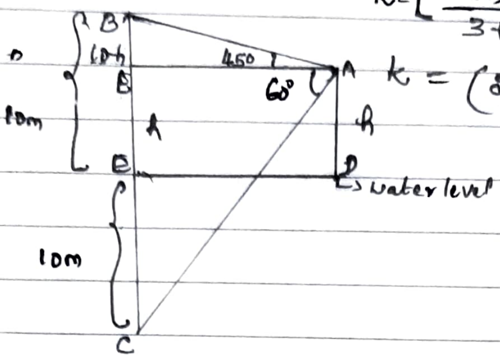
Point $\left(0, \frac{25}{8}\right)$

(ii) L(5,10) —3— K —2— (0,7)

$k = \left[\frac{2(0)+5(2)}{3+2}, \frac{3(7)+2(10)}{3+2}\right]$ ½ ½

$k = \left(2, \frac{41}{2}\right)$ ½ [1] 1

38. (i)



(i) Distance between B & C $= 10 + 10 = 20m$

(ii) In ΔABE

$\tan 45° = \frac{10-h}{AB}$

$AB = 10 - h$ ½

In Δ $\tan 60 = \frac{BC}{AB}$

$\sqrt{3} = \frac{10+h}{10-h}$

$10\sqrt{3} - \sqrt{3}h = 10 + h$

$10(\sqrt{3}-1) = h(\sqrt{3}+1)$ 1

$h = \frac{10(\sqrt{3}-1)}{\sqrt{3}+1} = \frac{10(3+1-2\sqrt{3})}{2}$

$\rightarrow = 5[4 - 3.43] = 2.7m$ ½ [2]

OR

In ΔABC

$\sin 60° = \frac{BC}{AC}$

$\frac{\sqrt{3}}{2} = \frac{10+h}{AC} = \frac{10+2.7}{AC}$ 1½

$AC = \frac{2 \times 12.7}{\sqrt{3}} = \frac{25.4\sqrt{3}}{3} m.$ ½ [2]

10A Meera K.M 28/11

B

C Venkatesh H 25.11.23

D (Vaishnavi)

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28 OR.

Let the investment @ 12% interest be ₹ x ½
& the investment @ 10% interest be ₹ y

$\frac{12x}{100} + \frac{10y}{100} = 130$ ½

$12x + 10y = 13000$

$6x + 5y = 6500$ (1)

$\frac{10}{100}x + \frac{12y}{100} = 134$ ½

$10x + 12y = 13400$

$5x + 6y = 6700$ (2)

(1)+(2) $11x + 11y = 13200$ (1)−(2) $x - y = -200$ (b)

÷11 $x + y = 1200$ (a)

(a) + (b)

$2x = 1000$ $500 - y = -200$ Getting

$x = \underline{500}$ $700 = y$ x & y

½ each

∴ Investments are ₹500 & 700 ½
respectively at 12% & 10% interest

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