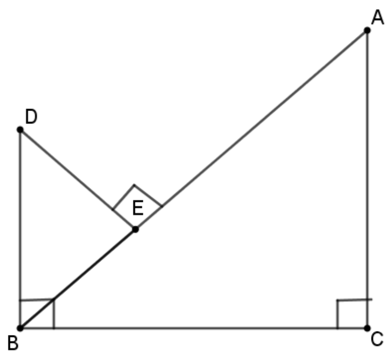
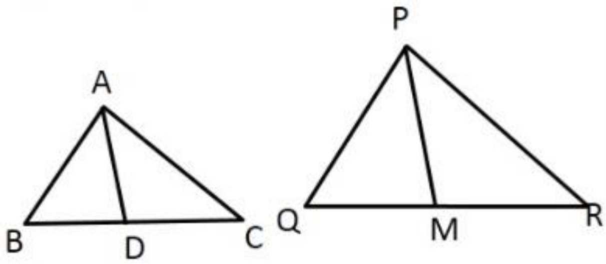
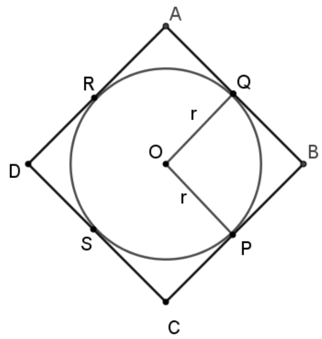
MARKING SCHEME

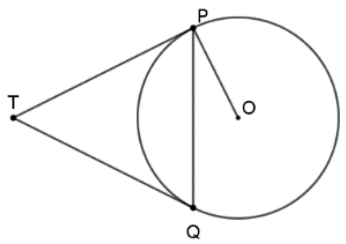
Additional Practice Question Paper

Class X Session 2023-24

TIME: 3 hours **MATHEMATICS STANDARD (Code No.041)** **MAX. MARKS: 80**

	SECTION A	
	Section A consists of 20 questions of 1 mark each.	
1.	(a) $x^2 - 16$	1
2.	(a) 45 minutes	1
3.	(d) parallel	1
4.	(b) $k \leq 16$	1
5.	(d) $\frac{n}{n+1}$	1
6.	(c) 7	1
7.	(b) $\frac{EF}{RP} = \frac{DE}{PQ}$	1
8.	(d) x = 3, y = 4	1
9.	(c) $2\sqrt{3}$ cm	1
10.	(c) 0	1
11.	(a) $\frac{r^2}{4}(\pi - 2)$	1
12.	(b) 360 cm^2	1
13.	(d) $4 : 1$	1
14.	(b) multiple of 3	1
15.	(d) $(3,5)$	1
16.	(b) I and IV	1
17.	(d) 7	1
18.	(a) $y = 3x$	1
19.	(d) (A) is false but (R) is true.	1
20.	(a) Both (A) and (R) are true and (R) is the correct explanation of (A).	1
	SECTION B	
	Section B consists of 5 questions of 2 marks each.	
21.	$66 = 2 \times 3 \times 11$ $88 = 2^3 \times 11$ $110 = 2 \times 5 \times 11$ HCF $= 2 \times 11 = 22$	} 1 ½

	Total Trees = 264 ∴ Total number of rows = $\frac{264}{22} = 12$	½
22.	Sum of zeroes = $\alpha + \beta = -(-1) = 1$ Product of zeroes = $\alpha\beta = -2$ Sum of other zeroes = $(2\alpha + 1) + (2\beta + 1) = 2(\alpha + \beta) + 2 = 4$ Product of other zeroes = $(2\alpha + 1) \times (2\beta + 1) = 2(\alpha + \beta) + 4\alpha\beta + 1 = -5$ ∴ Required polynomial is $k(x^2 - 4x - 5)$ **OR** $\alpha + \beta = -\frac{5}{2}, \alpha\beta = \frac{k}{2}$ $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4} \Longrightarrow (\alpha + \beta)^2 - \alpha\beta = \frac{21}{4}$ $\Longrightarrow \frac{25}{4} - \frac{k}{2} = \frac{21}{4} \Longrightarrow -\frac{k}{2} = -1$ ∴ $k = 2$	½ ½ ½ ½ ½ 1 ½
23.	$\angle DEB = \angle ACB = 90°$ $\angle ABC = 90° - \angle DBE$ Also, $\angle BDE = 90° - \angle DBE$ $\Longrightarrow \angle ABC = \angle BDE$ So, $\Delta BDE \sim \Delta ABC$  **OR** $\Delta ABC \sim \Delta PQR$ $\Longrightarrow \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$ $\frac{AB}{PQ} = \frac{2BD}{2QM} = \frac{AC}{PR} \Longrightarrow \frac{AB}{PQ} = \frac{BD}{QM}$ Also, $\angle B = \angle Q$ (as $\Delta ABC \sim \Delta PQR$) So, $\Delta ABD \sim \Delta PQM \Longrightarrow \frac{AB}{PQ} = \frac{AD}{PM}$ 	½ ½ ½ ½ ½ ½ ½ ½
24.	$DR = DS = 5\ cm$ $\Longrightarrow AR = AD - DR = 18\ cm$ $AQ = AR = 18\ cm$ $\Longrightarrow QB = 29 - 18 = 11\ cm$ In quad. $OQBP, \angle B = 90°$ and $\angle OQB = \angle OPB = 90°$ ∴ $OQBP$ is a square So, $r = 11\ cm$ 	½ ½ ½ ½
25.	$\sin A = \cos A \Longrightarrow A = 45°$ $2tan^2A + \frac{1}{cosec^2A} + 1 = 2tan^2A + sin^2A + 1$	½

	$= 2tan^2 45° + sin^2 45° + 1$ $= 2(1)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 + 1$ $= 2 + \frac{1}{2} + 1 = \frac{7}{2}$	1 ½
	SECTION C	
	Section C consists of 6 questions of 3 marks each	
26.	Let us assume that $5 + 6\sqrt{7}$ is rational Let $5 + 6\sqrt{7} = \frac{p}{q}; q \neq 0$ and p, q are integers $\Rightarrow \sqrt{7} = \frac{p-5q}{6q}$ p and q are integers, $\therefore p - 5q$ is an integer $\frac{p-5q}{6q}$ is a rational number $\Rightarrow \sqrt{7}$ is a rational number which is a contradiction. So, our assumption that $5 + 6\sqrt{7}$ is a rational number is wrong Hence $5 + 6\sqrt{7}$ is an irrational number.	½ 1 ½ ½ ½
27.	Let the length and breadth of rectangle be $x\ m$ and $y\ m$ respectively $\therefore (x+5)(y-4) = xy - 160$ and $(x-10)(y+2) = xy - 100$ $\Rightarrow 4x - 5y = 140$ and $2x - 10y = -80$ Solving, we get $x = 60$ and $y = 20$ So, length of rectangle = $60\ m$ Breadth of rectangle = $20\ m$ **OR** Let the two numbers be x and $y (x > y)$ $\therefore 2x - 16 = \frac{1}{2}y \Rightarrow 4x - y = 32 \ldots (1)$ and $\frac{1}{2}x - 1 = \frac{1}{2}y \Rightarrow x - y = 2 \ldots (1)$ Solving, we get $x = 10$ and $y = 8$ Hence the two numbers are 10 and 8	½+½ ½+½ 1 1 1 1
28.	$\angle PTQ = \theta$ Now, $TP = TQ \Rightarrow TPQ$ is an isosceles triangle $\angle TPQ = \angle TQP = \frac{1}{2}(180° - \theta) = 90° - \frac{1}{2}\theta$ $\angle OPT = 90° \Rightarrow \angle OPQ = \angle OPT - \angle TPQ$ $= 90° - \left(90° - \frac{1}{2}\theta\right) = \frac{1}{2}\theta$ $= \frac{1}{2}\angle PTQ$ So, $\angle PTQ = 2\angle OPQ$  	½ 1 1 ½
29.	LHS= $\left(sin^4\theta - cos^4\theta + 1\right) cosec^2\theta$ $= [(sin^2\theta - cos^2\theta)(sin^2\theta + cos^2\theta) + 1]cosec^2\theta$ $= (sin^2\theta - cos^2\theta + 1)cosec^2\theta$ $= 2\ sin^2\theta cosec^2\theta$ $= 2$ **OR** If $\sin x + cosec\ x = 2$, then find the value of $sin^{19}x + cosec^{20}x$ $\sin x + cosec\ x = 2$	1 1 1 1

	$\Rightarrow \sin x + \frac{1}{\sin x} = 2 \Rightarrow sin^2 x + 1 = 2\sin x$ $\Rightarrow (\sin x - 1)^2 = 0$ $\therefore \sin x = 1 \ \Rightarrow cosec\ x = 1$ So, $sin^{19} x + cosec^{20} x = 1 + 1 = 2$	1 ½ ½
30.	$\frac{\text{Curved surface area of cylinder}}{\text{curved surface area of cone}} = \frac{8}{5}$ $\Rightarrow \frac{2\pi rh}{\pi rl} = \frac{8}{5}$ $\frac{h}{l} = \frac{4}{5}$ $\frac{h}{\sqrt{h^2+r^2}} = \frac{4}{5}$ $\frac{h^2}{h^2+r^2} = \frac{16}{25}$ $\Rightarrow \frac{r^2}{h^2} = \frac{9}{16}$ $\therefore \frac{r}{h} = \frac{3}{4}$ Hence the ratio of radius and height is $3 : 4$	1 ½ ½ ½ ½
31.	(i) P (a face card or a black card)= $\frac{12}{52} + \frac{26}{52} - \frac{6}{52} = \frac{32}{52}$ or $\frac{8}{13}$ (ii) P (neither an ace nor a king)= $1 - \text{P(either an ace or a king)} = 1 - \left(\frac{4}{52} + \frac{4}{52}\right)$ $= 1 - \frac{8}{52} = \frac{44}{52}$ or $\frac{11}{13}$ (iii) P (a jack and a black card) = $\frac{2}{52}$ or $\frac{1}{26}$	1 1 1
	SECTION D	
	Section D consists of 4 questions of 5 marks each	
32.	(table below)	Correct table – 2

Marks	Number of students (Cumulative frequency)	Frequency	Cumulative frequency (less than type)
0 - 10	80	3	3
10 - 20	77	5	8
20 - 30	72	7	15
30 - 40	65	10	25
40 – 50	55	12	37
50 - 60	43	15	52
60 - 70	28	12	64
70 - 80	16	6	70
80 - 90	10	2	72
90 - 100	8	8	80

$n = 80 \Rightarrow \frac{n}{2} = 40$

$\therefore 50 - 60$ is the median class ½

Median $= 50 + \frac{40-37}{15} \times 10 = 52$ 1

$50 - 60$ is the modal class ½

Mode $= 50 + \frac{15-12}{2\times15-12-12} \times 10 = 55$ 1

OR

Classes	Frequencies (f_i)	x_i	f_ix_i
0-30	12	15	180
30-60	21	45	945
60-90	x	75	$75x$
90-120	52	105	5460
120-150	y	135	$135y$
150-180	11	165	1815
Total	150		$8400 + 75x + 135y$

Correct table – 2

$96 + x + y = 150 \Longrightarrow x + y = 54$ …(1) ½

Mean $= 91$

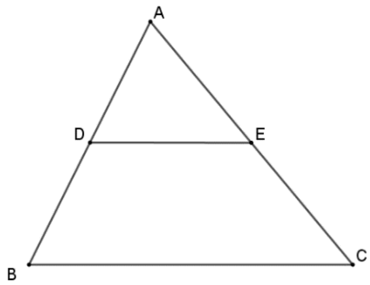
$\Longrightarrow \frac{8400+75x+135y}{150} = 91$ 1

$75x + 135y = 5250$ or $5x + 9y = 350$ …(2) ½

Solving (1) and (2), we get $x = 34$ and $y = 20$ 1

33. For correct statement, given, to prove, figure and construction 1

For correct proof 2½



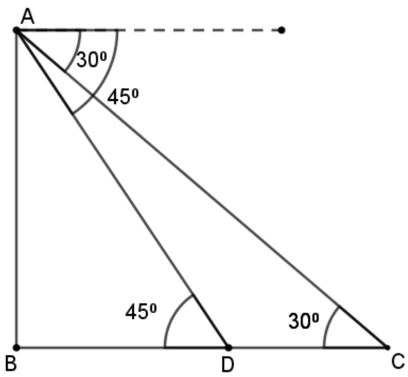
In ΔABC, DE ∥ BC

$\Longrightarrow \frac{AD}{DB} = \frac{AE}{EC}$ 1

$\Longrightarrow \frac{x}{x-2} = \frac{x+2}{x-1}$

Solving, we get $x = 4$ ½

34. Correct Figure 1



Let speed of car be x km/h

$\Longrightarrow DC = 12x$ m

In $\Delta ABC, \frac{AB}{BC} = \tan 30° = \frac{1}{\sqrt{3}}$ 1

$\Longrightarrow BC = \sqrt{3}AB$ … (1) ½

In $\Delta ABD, \frac{AB}{BD} = \tan 45° = 1$ 1

$\Longrightarrow BD = AB$ …(2)

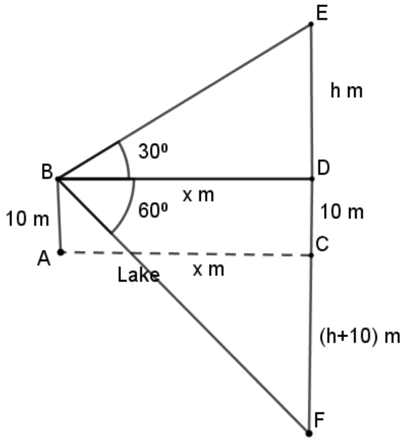
Now, $DC = BC - BD \Longrightarrow 12x = \sqrt{3}AB - AB = (\sqrt{3}-1)BD$ ½

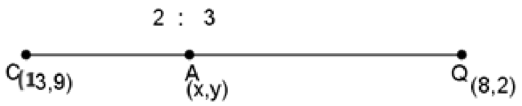
$BD = \frac{12x}{\sqrt{3}-1}$

∴ Time taken from D to B $\frac{12x}{\sqrt{3}-1} \times \frac{1}{x} = \frac{12}{\sqrt{3}-1} = 6(\sqrt{3}+1)$ ½

$=$ 16 minutes (approx.) ½

OR

	Correct Figure  Let the position of the cloud be E and F be the image of the cloud in the lake Let $ED = h\ m,\ BD = AC = x\ m$ In $\Delta BDE, \frac{h}{x} = \tan 30° = \frac{1}{\sqrt{3}}$ $\Rightarrow x = h\sqrt{3}$ … (1) In $\Delta BDF, \frac{FD}{BD} = \frac{10+(h+10)}{x} = \tan 60°$ $\Rightarrow \sqrt{3} = \frac{h+20}{\sqrt{3}h}$ (using (1)) $\Rightarrow 3h = h + 20$ $\therefore h = 10\ m$ So, the height of the cloud from the surface of the lake $= (10 + 10)\ m$ $= 20\ m$	1 1 ½ 1 ½ ½ ½
35.	Let the usual speed of the flight be x km/h $\therefore \frac{1500}{x} - \frac{1500}{x+250} = \frac{30}{60}$ $\Rightarrow x^2 + 250x - 750000 = 0$ $(x - 750)(x + 1000) = 0$ $\therefore x = 750$ (Rejecting negative value) Hence the usual speed of the flight = 750 km/h	2 1½ 1 ½
	SECTION E	
	Section E consists of 3 Case Studies of 4 marks each	
36.	(i) Let $\angle DOA = \theta$, then $\tan\theta = \frac{AD}{AO} = \frac{\sqrt{3}}{1} \Rightarrow \theta = 60°$ $\angle DOA = \angle COB = 60°$ $\angle DOC = 180° - (60° + 60°) = 60°$	½ ½
	(ii) Area of two wooden triangles $= 2 \times \frac{1}{2} \times 7 \times 7\sqrt{3} = 84.77\ cm^2$	1
	(iii) $\frac{AO}{DO} = \cos 60° \Rightarrow \frac{7}{DO} = \frac{1}{2}$ $\Rightarrow DO = 14\ cm$ Area of sector $DOC = \frac{60}{360} \times \pi \times 14^2 = 102.67\ cm^2$ **OR** $\frac{AO}{DO} = \cos 60° \Rightarrow \frac{7}{DO} = \frac{1}{2}$ $\Rightarrow DO = 14\ cm$ Length of tape required $= 2 \times 14 + \frac{60}{360} \times 2 \times \pi \times 14 = 42.67\ cm$	1 1 1 1
37.	(i) $a = 15, d = 5$ $a_{12} = 15 + 11 \times 5 = 70$	½ ½
	(ii) $n = 15$ Middle row = 8^{th} row $a_8 = 15 + 7 \times 5 = 50$	½ ½
	(iii) $1875 = \frac{n}{2}[2 \times 15 + (n - 1) \times 5]$ $\Rightarrow n^2 + 5n - 750 = 0$	½ 1

	$(n+30)(n-25)=0 \Rightarrow n=25$ ∴ Total number of rows required = 25 **OR** $1250 = \frac{n}{2}[2 \times 15 + (n-1) \times 5]$ $\Rightarrow n^2 + 5n - 500 = 0$ $(n+25)(n-20)=0 \Rightarrow n=20$ ∴ Number of rows left $= 30 - 20 = 10$	½ ½ ½ ½ ½
38.	(i) $P(3,3), Q(8,2), R(6,5)$ Coordinates of required point are $\left(\frac{3+8+6}{3}, \frac{3+2+5}{3}\right) = \left(\frac{17}{3}, \frac{10}{3}\right)$	1
	(ii) $PR = QR = \sqrt{13}$ $PQ = \sqrt{26}$ $PQ^2 = PR^2 + QR^2$ ∴ ΔPQR is an isosceles right triangle	 ½ ½
	(iii) Area of the plot to row seeds $= 13 \times 9 - \frac{1}{2} \times \sqrt{13} \times \sqrt{13}$ $= 110.5\ m^2$ **OR**  Coordinates of required point are $\left(\frac{2\times8+3\times13}{2+3}, \frac{2\times2+3\times9}{2+3}\right)$ $= \left(11, \frac{31}{5}\right)$	1 1 1 1