MATHEMATICS
MODEL TEST PAPER-I
Marking Scheme/Hints to Solutions

Note : Any other relevant answer, not given here in but given by the candidates, be suitably awarded.

Q.No.	Value points / key points	Marks alloted to each key point/Value point	Total Marks
	(Section-I)		
1.	(b) 30	1	1
2.	(b) $\frac{-4}{3}$	1	1
3.	(c) 4	1	1
4.	(a) 8	1	1
5.	(a) 5%	1	1
6.	(c) $x\ (x - 12)\ (x + 12)$	1	1
7.	(c) $(x + y)\ (x - z)$	1	1
8.	(c) 2	1	1
9.	(c) 36	1	1
10.	(b) 30	1	1
11.	(a) 20	1	1

12.	(c) 70	1	1
13.	(c) Diagonals of a rhombus are equal.	1	1
14.	(b) 1 : 9	1	1
15.	(d) 640	1	1
16.	(b) Frequency	1	1
17.	(b) $\frac{3}{8}$	1	1
18.	(b) 9 cm	1	1
19.	(c) Assertion (A) is true but Reason (R) is false.	1	1
20.	(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).	1	1
	(Section-II)		
21.	$\frac{10}{3} \times 3^x - 3^{x-1} = 81$		
	$\frac{10}{3} \times 3^x - \frac{3^x}{3} = 3^4$	½	
	$3^x \left(\frac{10}{3} - \frac{1}{3}\right) = 3^4$	½	

	$3^x \times \frac{\cancel{9}^{3}}{\cancel{3}} = 3^4$	½	
	$3^x = \frac{3^4}{3} = 3^3$		
	$\therefore \quad x = 3$	½	2
	OR		
	$81^{-2} \div (729)^{1-x} = 9^{2x}$		
	$(9^2)^{-2} \div (9^3)^{1-x} = 9^{2x}$	½	
	$9^{-4} \div 9^{3-3x} = 9^{2x}$		
	$9^{-4-3+3x} = 9^{2x}$	½	
	Since basis are same powers can be equated		
	$3x = 7 = 2x$	½	
	$x = 7$	½	2
22.	$(a^2 - b^2)(a^2 + b^2) - (a^2 - b^2)^2$		
	$(a^2)^2 - (b^2)^2 - (a^2 - b^2)^2$		
	[using $a^2 - b^2 = (a + b)(a - b)$]	½	
	$a^4 - b^4 - [(a^2)^2 + (b^2)^2 - 2a^2b^2]$	½	
	$\cancel{a^4} - b^4 - \cancel{a^4} - b^4 + 2a^2b^2$	½	
	$2a^2b^2 - 2b^4$	½	2
	OR		
	$a^2 + \frac{1}{a^2} = 23$		
	$\left(a + \frac{1}{a}\right)^2 = a^2 + \frac{1}{a^2} + 2 \times \cancel{a} \times \frac{1}{\cancel{a}}$	½	

	$= 23 + 2$	½	
	$\left(a + \frac{1}{a}\right)^2 = 25$	½	
	$a + \frac{1}{a} = \sqrt{25} = 5$	½	2
23.	In a rectangle the length of both dagonals are equal.		
	$\therefore \quad 2\,(3z - 23) = 64 - 4z$	½	
	$6z - 46 = 64 - 4z$	½	
	$10z = 110$		
	$z = 11$	½	
	$\therefore \quad AC = 2\,(3z - 23)$		
	$= 2\,(3 \times 11 - 23)$		
	$= 2\,(33 - 23)$		
	$= 2 \times 10$		
	$= 20$ cm	½	2
24.	Co-ordinates of point A : (3, 3)	½	
	B : (3, 1)	½	
	C : (6, 1)	½	
	Co-ordinates of D such that ABCD is a rectangle is (6, 3)	½	2

25.	The number of students who commute to school by bicycle are 25% of 3600	½	
	$= \frac{25}{100} \times 3600$		
	$= 900$	½	
	Let the angle be x		
	then $\frac{x}{360} = \frac{40}{100}$	½	
	$x = 4 \times 36 = 144$	½	2
	(Section-III)		
26.	$\sqrt[3]{\frac{x}{729}} + \sqrt[3]{\frac{8x}{729}} + \sqrt[3]{\frac{27x}{5832}} = 1$		
	$\frac{1}{9}\sqrt[3]{x} + \frac{2}{9}\sqrt[3]{x} + \frac{\overset{1}{\cancel{3}}}{\underset{6}{\cancel{18}}}\sqrt[3]{x} = 1$	1	
	$\sqrt[3]{x}\left(\frac{1}{9} + \frac{2}{9} + \frac{1}{6}\right) = 1$	½	
	$\sqrt[3]{x}\left(\frac{2+4+3}{18}\right) = 1$	½	
	$\sqrt[3]{x}\left(\frac{\cancel{9}}{\cancel{18}}\right) = 1$	½	
	$\sqrt[3]{x} = 2$		
	$x = 2^3 = 8$	½	3
	OR		

	$1372 = 2 \times 2 \times 7 \times 7 \times 7$	1	
	$\therefore$ We should multiply 1372 by 2 to make it a perfect cube.	1	
	Cube root of new number $= 2 \times 7$		
	$= 14$	1	3
27.	Let the number of days be x	½	
	New number of students in the camp = 90	½	
	Then we have		

Number of Men	120	90
Number of Days	195	x

	This is the case of inverse variation	½	
	$= 120 \times 195 = 90 \times 2$	½	
	so $x = \frac{\cancel{120}^{4} \times \cancel{195}^{65}}{\cancel{90}_{3}}$		
	$= 260$	1	3
	$\therefore$ Remaining food will last for 260 days.		
28.	Let one side be x cm		
	then second side is $x + 30$	1	
	ATQ : $2(x + x + 30) = 160$	1	
	$2x + 30 = 80$		
	$2x = 50$		
	$x = 25$ cm		
	$\therefore$ the four sides are		
	25 cm, 25 cm, 55 cm and 55 cm.	1	3

29.	Area of sheet required = Total surface area		
	$= 2\pi r\ (r + h)$		
	$= \cancel{2} \times \frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \frac{\overset{5}{\cancel{35}}}{\cancel{100}} \left(\frac{35}{100} + \frac{125}{100}\right)$	½	
	$= \frac{11}{\cancel{5}} \left(\frac{\overset{5}{\cancel{160}}}{100} \right)$	½	
	$= 3.52\ m^2$	½	
	Cost of material = ` 80 × 3.52		
	= ` 281.60	1	3
	OR		
	$r = {}^{84}/_{2} = 42$ cm		
	$h = 120$ cm	½	
	Area levelled in 1 revolution		
	$= 2\pi rh$		
	$= 2 \times \frac{22}{\cancel{7}} \times \overset{6}{\cancel{42}} \times 120$		
	$= 31680\ cm^2$	1	
	Total area levelled = $300 \times 31680\ cm^2$	½	
	Cost of levelling = $\cancel{5} \times \frac{\cancel{300} \times 31680}{\cancel{100} \times \cancel{100}}$		
	$= 3 \times 1584$		
	= ` 4752	1	3

30.

Class Intervals	Tally marks	Frequency
40-45	𝍸	5
45-50	𝍸 ||	7
50-55	𝍸 𝍸 |	11
55-60	𝍸 ||	7
60-65	𝍸	5

Maximum frequency is for class interval 50-55

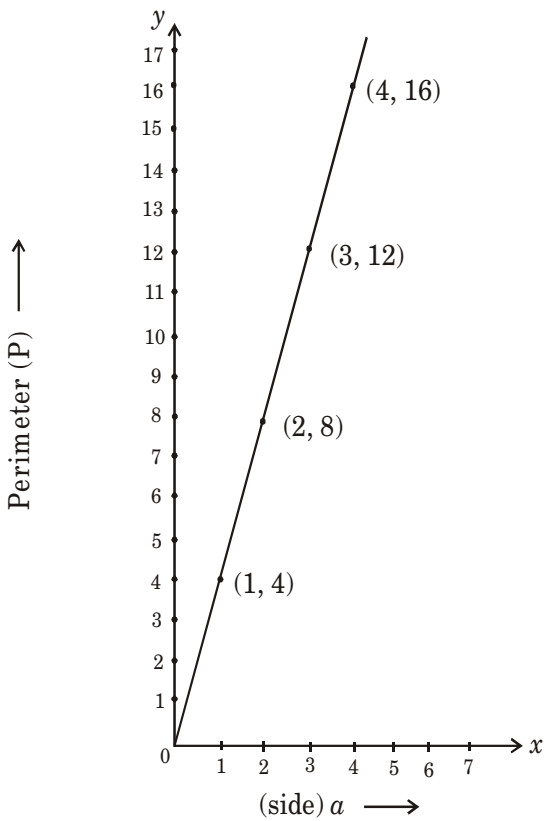
$\therefore$ Class mark is 52.5 — 3 — 3

31.

a	1	2	3	4
$P = 4a$	4	8	12	16

1

Scale : 1 Box = 1 unit along both axis



2 — 3

Alternative Question for Visually Challenged Students in lieu of Q. 31

Total students = 6250

Students left out = 9

Number of students to be arranged in square

= 6250 – 9 = 6241 ½

Let number of rows be x ½

then number of students in each row will be

ATQ

$x \times x = 6241$

$x^2 = 6241$

$x = \sqrt{6241}$

$x = 79$

	79
7	6241
	49 ↓
149	1341
	1341
	×

½

½

So, number of students in each row = 79 ½ 3

(Section-IV)

32. Area = 1156 m^2

$(side)^2 = 1156$

$side = \sqrt{1156} = \sqrt{2 \times 2 \times 17 \times 17}$

= 34 m 1

Perimeter of square = 4 × 34 = 136 m ½

Let the length of rectangle be x m

Breadth $= \frac{1}{3}x$ ½

Perimeter of rectangle = Perimeter of square

$2\left(x + \frac{1}{3}x\right) = 136$ 1

$2\left(\frac{3x + 1x}{3}\right) = 136$

$4x = \frac{136 \times 3}{2}$

$x = \frac{\overset{17}{\cancel{136}} \times 3}{\cancel{2} \times \cancel{4}} = 51$ 1

∴ Length of rectangular field is 51 m and breadth is $\frac{1}{3} \times 51 = 17$ m

∴ Area= 51 × 17 m^2

= 867 m^2 1 5

OR

	2.2360
2	5 . 00 00 00 00
	4
42	100
	84
443	1 6 0 0
	1 3 2 9
4466	2 7 1 0 0
	2 6 7 9 6
44720	3040000
	00000
	3040000

	$\sqrt{5} = 2.2360$ = 2.236 (correct to three places of decimal)	3½	
	$\sqrt{\frac{125}{36}} = \frac{\sqrt{5\times5\times5}}{\sqrt{6\times6}} = \frac{5\sqrt{5}}{6} = \frac{5\times2.236}{6}$ $= \frac{11.18}{6}$ = 1.86 (approx).	1½	5
33.	Let the sum be ` 100 S.I. at 10% p.a. for 2 yrs. $= \frac{100\times10\times2}{100}$ = ` 20	1	
	Amount (on C.I.) $= 100\left(1+\frac{\cancel{1}\cancel{0}}{\cancel{10}\cancel{0}}\right)^2$ $= 100\times\frac{11}{10}\times\frac{11}{10}$ = ` 121	1	
	∴ C.I. = ` 21	1	
	Difference = ` 21 – ` 20 = ` 1	½	
	Difference = ` 1 then sum = ` 100 of difference is ` 631, the sum = ` 631 × 100 = ` 63100	1½	5
	OR		
	Let the sum be ` P then $\frac{P\times12\times1}{100} = 1200$ ∴ $P = \frac{120000}{12}$ = ` 10,000	2	

On compound interest

$$\text{Amount} = 10000\left(1+\frac{6}{100}\right)^2$$

$$= 10000 \times \frac{106}{100} \times \frac{106}{100}$$

= ` 11236

∴ Compound Interest = ` 1236 — 3 — 5

34. $p(x) = 12x^4 + 6x^3 + 6x^2 + 6x - 8x^3 - 5x^2 - 2x + 5$

$= 12x^4 - 2x^3 + x^2 + 4x + 5$ — ½

$q(x) = 3x + 1$ — ½

$$\begin{array}{r|l} & 4x^3 - 2x^2 + 1x + 1 \\ \hline 3x+1 & 12x^4 - 2x^3 + x^2 + 4x + 5 \\ & 12x^4 + 4x^3 \\ \hline & -6x^3 + x^2 \\ & -6x^3 - 2x^2 \\ \hline & 3x^2 + 4x \\ & 3x^2 + x \\ \hline & 3x + 5 \\ & 3x + 1 \\ \hline & 4 \end{array}$$

3

Checking :

Quotient × Divisor + Remainder − Dividend

LHS $= (3x + 1)(4x^3 - 2x^2 + 1x + 1) + 4$

$= 12x^4 - 6x^3 + 3x^2 + 3x + 4x^3 - 2x^2 + x + 1 + 4$

$= 12x^4 - 2x^3 + x^2 + 4x + 5$ — 1 — 5

= Dividend

35. We know, sum of all interior angles of a quadrilateral is 360°

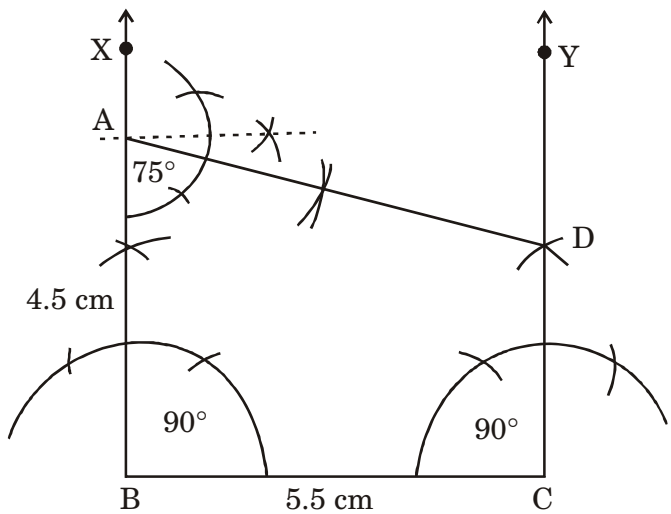
$\angle A + \angle B + \angle C + \angle D = 360°$

$75° + \angle B + 90° + 105° = 360°$

$\angle B + 270° = 360°$

$\angle B = 360° - 270°$

$\angle B = 90°$ ½



Draw BC = 5.5 cm ½

Construct $\angle B = 90°$ 1

Construct $\angle C = 90°$ 1

Finding point A such that B is = 4.5 cm ½

Constructing $\angle A = 75°$ 1

Finding point D ½ 5

Alternative Question for Visually Challenged Students in lieu of Q. 35

Let the speed of the faster motorist be x km/hr ½

Then speed of slower motorist is $(x - 10)$ km/hr ½

Distance covered in 3 hrs. = 230 – 20 = 210 km ½

Morotist	Speed (km/hr)	Time (hr)	Distance (km) = Speed × Time
Faster	2	3	$3x$
Slower	$x - 10$	3	$3(x - 10)$

1

ATQ :

$3x + 3(x - 10) = 210$ 1

$3x + 3x - 30 = 210$ ½

$6x = 240$ ½

$x = \frac{240}{6} = 40$ ½

∴ Speed of faster motorist = 40 km/hr
and speed of slower motorist is 30 km/hr 5

(Section-V)

36. 1. Dev needs 12 burgers. On paying for 8 he gets 2 extra. So he gets 10 burgers at cost of 8 burgers + he will have to buy 2 more to get total 12.

So he pays for 10 burgers to get 12.

∴ Dev pays ` 1000 (` 800 + ` 200) 1

2. Manu needs 23 burgers. On every 4 he gets 1 free. So he will pay for 16 burgers and get 20 and pay for 3 burgers more.

$\therefore$ Manu pays $16 \times 100 + 3 \times 100$

$= ` 1600 + ` 300 = ` 1900$ — 1

3. If they shop together they need 35 burgers.

He wll pay for 28 burgers and get 7 free.

So he'll pay ` 2800

$$\text{Discount} = \frac{\cancel{700}}{\cancel{3500}_{\cancel{5}}} \times \overset{20}{\cancel{100}} = 20\%$$ — 2

OR

CP of 35 burgers = 2100

SP of 35 burgers = 2900

$$P\% = \frac{8\cancel{0}\cancel{0}}{21\cancel{0}\cancel{0}} \times 100 = 38.1\% \text{ (approx)}$$ — 4

37. (1) Let speed of boat in still water be x km/hr

Speed of stream = 3 km/hr

Speed of boat downstream = $(x + 3)$ km/hr

Speed of boat upstream = $(x - 3)$ km/hr — 1

(2) Distance covered by boat while going downstream = $4(x + 3)$ km

$= (4x + 12)$ km — 1

(3) Distance covered by boat while going upstream = 5 $(x - 3)$ km

$= (5x - 15)$ km

Now, distance covered downstream

= Distance covered upstream — 1

$4x + 12 = 5x - 15$

$4x - 5x = -15 - 12$

$x = 27$

Speed of boat in still water = 27 km/hr — 1 — 4

OR

Distance covered in whole journey

$= 2 (4x + 12)$ (Put $x = 27$)

$= 2 (4 \times 27 + 12)$

$= 2 (108 + 12)$

$= 2 \times 120$

$= 240$ km

38. (1) Area of metallic sheet taken out to make holes

$= 10 \times \pi r^2$

$= 10 \times \frac{22}{7} \times 3.5 \times 3.5$

$= 385$ cm^2 — 1

(2) Volume of cuboidal pipe

$= l \times b \times h$

$= 200 \times 42 \times 42$

$= 352800$ cm^3

So, volume of sand filled in cuboidal pipe = 352800 cm^3. — 1

(3) Total surface area of cuboidal pipe

$= 2\ (lb + bh + hl)$

$= 2\ (200 \times 42 + 42 \times 42 + 42 \times 200)$

$= 2\ (8400 + 1764 + 8400)$

$= 2 \times 18564$

$= 37128\ \text{cm}^2$ 1

Surface area of cuboidal pipe after the circular pieces taken out

$= 37128\ \text{cm}^2 - 385\ \text{cm}^2$

$= 36{,}742\ \text{cm}^2$ 1

OR

Total surface area of cylndrical pipe = $2\pi rh$

$= 2 \times \frac{22}{\cancel{7}} \times \overset{3}{\cancel{21}} \times 200$

$= 26{,}400\ \text{cm}^2$ 1

Area of cylindrical pipe after the circular pieces taken out

$= 26{,}400\ \text{cm}^2 - 385\ \text{cm}^2$

$= 26{,}015\ \text{cm}^2$ 1 4