MATHEMATICS
SAMPLE PAPER-2
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.	(d) 10	1	1
2.	(a) 4	1	1
3.	(b) 256	1	1
4.	(a) Distance travelled and the taxi fare	1	1
5.	(c) Avi earns less profit than Bobby.	1	1
6.	(d) 50%	1	1
7.	(d) a compound interest of 10% compounded quarterly.	1	1
8.	(b) $(-x + 2y + 3z)^2$	1	1
9.	(b) 48	1	1
10.	(c) 10°	1	1
11.	(b) 230°	1	1
12.	(b) 15	1	1
13.	(c) y-axis	1	1

14.	(b) a line parallel to the x-axis	1	1
15.	(b) 12 m	1	1
16.	(d) 625 cm^3	1	1
17.	(c) $\frac{3}{26}$	1	1
18.	(b) 16.5	1	1
19.	(b) Both Assertion & Reason are true but Reason is not the correct explanation of assertion.	1	1
20.	(d) Assertion (A) s false but Reason (R) is true.	1	1
	(Section-II)		
21.	$\sqrt[3]{x-12} = 9$		
	$x - 12 = 9^3$	½	
	$x - 12 = 729$	½	
	$x = 729 + 12$	½	
	$x = 741$	½	
	OR		
	$\sqrt[3]{3 - \frac{17}{27}}$		
	$\sqrt[3]{\frac{81-17}{27}}$	½	
	$\sqrt[3]{\frac{64}{27}}$	½	
	$\frac{4}{3}$	1	2

22.	S.P. = ` 54		
	Let C.P. = ` x		
	Loss = ` $\frac{x}{10}$	½	
	C.P. – Loss = SP		
	$x - \frac{x}{10} = 54$	½	
	$\frac{10x - x}{10} = 54$		
	$\frac{9x}{10} = 54$	½	
	$x = \frac{54 \times 10}{9}$		
	x = 60		
	C.P. of pen = ` 60	½	2
23.	$\left(a - \frac{1}{a}\right)^2 = a^2 + \frac{1}{a^2} - 2 \times a \times \frac{1}{a}$		
	$\left(a - \frac{1}{a}\right)^2 = a^2 + \frac{1}{a^2} - 2$	½	
	$\left(a - \frac{1}{a}\right)^2 = 18 - 2$		
	$\left(a - \frac{1}{a}\right)^2 = 16$	½	
	$a - \frac{1}{a} = \sqrt{16}$	½	
	$a - \frac{1}{a} = 4$	½	
	OR		

$(10.1)^2 = (10 + 0.1)^2$ ½

By using the identity

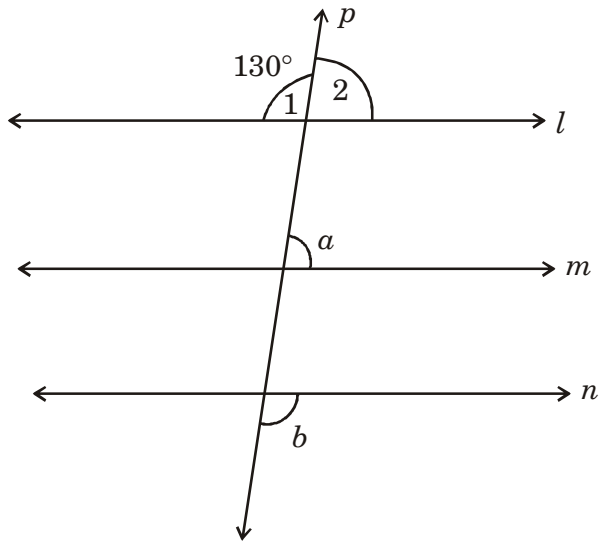
$(a + b)^2 = a^2 + 2ab + b^2$ ½

$(10 + 0.1)^2 = (10)^2 + 2 \times 10 \times 0.1 + (0.1)^2$ ½

$= 100 + 2 + 0.01$

$= 102.01$ ½ 2

24.



$\angle 1 + \angle 2 = 180°$ (linear pair)

$130° + \angle 2 = 180°$ ½

$\angle 2 = 50°$

$\angle a = \angle 2$ (corresponding angles)

$\therefore \quad \angle a = 50°$ ½

$\angle b = \angle 1$ (alternate exterior $\angle$s)

$\therefore \quad \angle b = 130°$ ½

$a : b = 50° : 130°$

$a : b = 5 : 13$ ½ 2

25. Let total no. of employees = x ½

15% of x = 75 ½

$$\frac{15}{100} \times x = 75$$

$$x = \frac{75 \times 100}{15}$$ ½

x = 500 ½ 2

(Section-III)

26. $2^{x-1} + 2^{x+1} = 320$

$$\frac{2^x}{21} + 2^x \ \ 2^1 = 320$$ ½

$$2^x \left(\frac{1}{2} + 2\right) = 320$$ ½

$$2^x \times \frac{5}{2} = 320$$ ½

$$2^x = \frac{320 \times 2}{5}$$

$2^x = 64 \times 2$ ½

$2^x = 128$

$2^x = 2^7$ ½

$\therefore \quad x = 7$ ½

OR

$$\frac{3^{-4} \times 216^{-1/3} \times 25^{½}}{125^{1/3} \times 16^{¼} \times 3^{-6}}$$

$$\frac{3^6 \times 25^{½}}{3^4 \times 16^{¼} \times 125^{1/3} \times 216^{1/3}}$$ ½

$$\frac{3^{6-4} \times \left(5^2\right)^{½}}{\left(2^4\right)^{¼} \times \left(5^3\right)^{1/3} \times \left(6^3\right)^{1/3}}$$ 1

$$\frac{3^2 \times 5}{2 \times 5 \times 6}$$ 1

$$= \frac{45}{60} = \frac{3}{4}$$ ½ 3

27. No. of students in the beginning = 500

No. of students after 12 days = 500 + 300 = 800 ½

For 500 students food will remain for 48 days. ½

Let for 800 students food will remain = x days

No. of students	500	800
No. of days	48	x

½

It is a case of inverse variation ½

$500 \times 48 = 800 \times x$

$\frac{500 \times 48}{800} = x$ ½

$x = 30$

The food will last for 30 days. ½

OR

Let length of the tunnel = x m

Length of the train = 270 m

Total distance = $(270 + x)$m 1

	Speed = 80 km/hr		
	$= \frac{80 \times 1000}{3600}$		
	$= \frac{200}{9}$ m/sec	1	
	$\frac{\text{Distance}}{\text{Speed}} = \text{Time}$		
	$\frac{270 + x}{200/9} = 18$		
	$270 + x = \cancel{18}^{2} \times \frac{200}{\cancel{9}}$		
	$270 + x = 400$		
	$x = 400 - 270$		
	$x = 130$	1	
	Length of the tunnel = 130 m		3
28.	$\frac{y^2 - 2y - 35}{y - 7}$	½	
	$\frac{y^2 - 7y + 5y - 35}{y - 7}$	1	
	$\frac{y(y-7) + 5(y-7)}{y - 7}$	½	
	$\frac{\cancel{(y-7)}(y+5)}{\cancel{(y-7)}}$	½	
	$= y + 5$	½	3
29.	Correct axes	½	
	Plotting of each point	½×4=2	
	Joining of points	½	3

	Alternative question for visually challenged students in lieu of Q. 29		
	Let Ravi's present age be $5x$ years and		
	Hema's present age be $7x$ years	½	
	4 years later		
	Ravi's age = $(5x + 4)$ years,		
	Hema's age = $(7x + 4)$ years	½	
	ATQ		
	$\frac{5x+4}{7x+4} = \frac{3}{4}$	½	
	$\Rightarrow$ $4(5x + 4) = 3(7x + 4)$		
	$\Rightarrow$ $20x + 16 = 21x + 12$		
	$\Rightarrow$ $20x - 21x = 12 - 16$		
	$\Rightarrow$ $-x = -4$		
	$\Rightarrow$ $x = 4$	1	
	$\therefore$ Ravi's age = $5 \times 4 = 20$ years		
	Hema's age = $7 \times 4 = 28$ years	½	3
30.	Let the lengths of the parallel sides be $4x$ and $5x$	½	
	height of the trapezium = 18 cm		
	area of the trapezium = 405 cm^2		
	$\frac{1}{2} \times h \times$ sum of parallel sides = Area of trapezium	½	

$\frac{1}{2} \times 18 \times (4x + 5x) = 405$ ½

$\frac{1}{\cancel{2}} \times \overset{9}{\cancel{18}} \times 9x = 405$

$81x = 405$

$x = \frac{405}{81}$

$x = 5$ 1

Length of parallel sides are 20 cm and 25 cm. ½ 3

31.

Height (in cm)	Tally marks	Number of students
125-130	𝍸	5
130-135	𝍸 II	7
135-140	𝍸 I	6
140-145	IIII	4
	Total	22

3 3

(Section-IV)

32. Area of square lawn = $\frac{\text{Total cost}}{\text{Cost per m}^2}$

$= \frac{\text{`}\ 10{,}935}{\text{`}\ 15}\ \text{m}^2$

$= 729\ \text{m}^2$ 1½

Also area of square lawn = $(\text{side})^2$

$\therefore \quad (\text{side})^2 = 729\ \text{m}^2$

side $= \sqrt{729\ m^2}$		
$= 27$ m	1½	
Perimeter of square lawn $= 4 \times$ side		
$= 4 \times 27$ m		
$= 108$ m	1	
Cost of fencing @ ` 25 per m		
$= 108 \times 25$		
= ` 2700	1	
OR		
Let no. of students in the class $= x$		
Amount of money donated by each student $= x$	1	
Money donated by whole class = money donated by class teacher	½	
∴ Money donated by whole class $= \frac{` 6272}{2}$		
$= 3136$	1	
∴ $x \times x = 3136$		
$x^2 = 3136$	½	
$x = \sqrt{3136}$		
$x = 56$	1	
No. of students in the class = 56	½	
Money donated by the class teacher = ` 3136	½	5

33. Standard form of polynomial

$3x\ (5x^2 + 3x^3 + 2) - (2x^2 + 8 - x)$

$15x^3 + 9x^4 + 6x - 2x^2 - 8 + x$

$9x^4 + 15x^3 - 2x^2 + 7x - 8$ ½

Standard form of divisor

$-2 + 3x = 3x - 2$ ½

$3x - 2 \overline{)\ 9x^4 + 15x^3 - 2x^2 + 7x - 8\ (\ 3x^3 + 7x^2 + 4x + 5}$

$9x^4 - 6x^3$ (+)

$21x^3 - 2x^2 + 7x - 8$

$21x^3 - 14x^2$ (−, +)

$12x^2 + 7x - 8$

$12x^2 - 8x$ (−, +)

$15x - 8$

$15x - 10$ (−, +)

2

2

$Q = 3x^3 + 7x^2 + 4x + 5, \quad R = 2$ ½

Check :

Dividend = Divisor × Quotient + Remainder

LHS $= 9x^4 + 15x^3 - 2x^2 + 7x - 8$

RHS $= (3x - 2)(3x^3 + 7x^2 + 4x + 5) + 2$

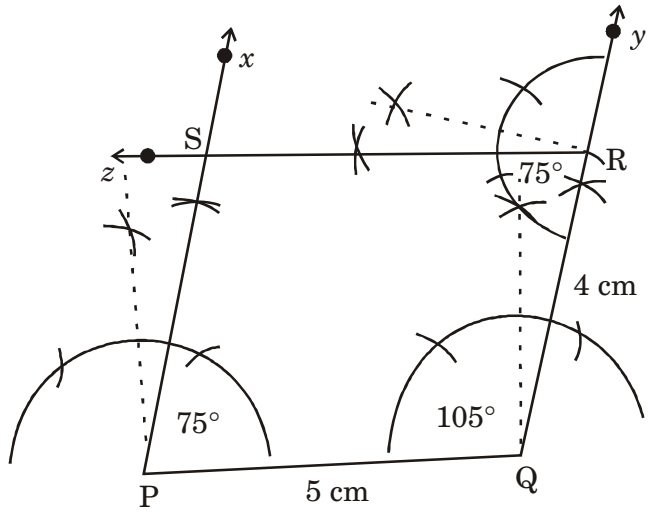
$= 3x\ (3x^3 + 7x^2 + 4x + 5) - 2\ (3x^3 + 7x^2 + 4x + 5) + 2$

$= 9x^4 + 21x^3 + 12x^2 + 15x - 6x^3 - 14x^2 - 8x - 10 + 2$

$= 9x^4 + 15x^3 - 2x^2 + 7x - 8$ 1½ 5

LHS = RHS

34.



Draw PQ = 5 cm	½	
Constructing ∠P = 75°	1	
Constructing ∠Q = 105°	1	
Finding point R such that QR = 4 cm	½	
Constructing ∠R = 75°	½	
Finding point S	½	
PQRS is a parallelogram	1	5

Alternative question for visually challenged students in lieu of Q. 34

Let the principal be ` x

S.I. = P × R × T

$$= \frac{x \times 10 \times 2}{10 \times 5}$$

$$= \frac{x}{5}$$ 1

	C.I. $= P\left[\left(1+\frac{R}{100}\right)^n - 1\right]$ $= x\left[\left(1+\frac{10}{100}\right)^2 - 1\right]$ $= \left[\left(\frac{11}{10}\right)^2 - 1\right]$ $= x\left[\frac{121}{100} - 1\right]$ $= \frac{21}{100}x$	2	
	CI SI = ` 65		
	$\frac{21}{100}x - \frac{x}{5} = 65$	1	
	$\frac{21x - 20x}{100} = 65$		
	$\frac{x}{100} = 65$		
	$x = 65 \times 10$		
	$x = 6500$		
	$\therefore$ Principal = ` 6500	1	5
35.	Length of wall = 15 m = 1500 cm		
	Breadth of wall = 30 cm		
	Height of wall = 4 m = 400 cm		
	Volume of wall = L × B × H		
	= 1500 × 30 × 400		
	= 1,80,00,000 cm^3	1	

Volume of mortar used = $\frac{1}{10} \times 18000000$

= 18,00,000 cm^3 ½

Volume of bricks used in the wall

= 18000000 – 1800000 = 16200000 cm^3 ½

Volume of 1 brick = (18 × 12.5 × 7.5) cm^3 1

$$\text{No. of bricks used} = \frac{\text{Volume of bricks used in the wall}}{\text{Volume of 1 brick}}$$

$$= \frac{16200000}{18 \times 12.5 \times 7.5}$$

= 9600 bricks 2

∴ 9600 bricks are there in the wall. 5

OR

External dimensions of closed wooden box

= 48 cm × 36 cm × 30 cm ½

Internal length of box = 48 – (1.5 + 1.5)

= 48 – 3 = 45 cm ½

Internal breadth of box = 36 – (1.5 + 1.5)

= 36 – 3 = 33 cm ½

Internal height of box = 30 – (1.5 + 1.5)

= 30 – 3 = 27 cm ½

No. of bricks which can be put in the box

$$= \frac{\text{Internal volume of the box}}{\text{Volume of a brick}}$$ 1

$$= \frac{45 \times 33 \times 27}{6 \times 3 \times 0.75}$$

$= 2970$

2970 bricks can be put in the box. 1 5

(Section-V)

36. (1) Rate of growth per annum = 60%

Rate of growth semi annually = $\frac{60\%}{2}$

$= 30\%$ ½

(2) Let two years ago population of rabbits = P

Rate of growth per annum = 60% ½

Let A be the present population = 5120

$$5120 = P\left(1 + \frac{6\cancel{0}}{10\cancel{0}}\right)^2$$ ½

$$5120 = P\left(\frac{\overset{8}{\cancel{16}}}{\underset{5}{\cancel{10}}}\right)^2$$

$$5120 = P\left(\frac{64}{25}\right)$$

$$P = \frac{5120 \times 25}{64}$$ ½

$P = 2000$ ½

OR

	Let present population be P = 5120	½	
	Let A be the population after 2 years		
	$A = P\left(1 + \frac{R}{100}\right)^n$		
	$= 5120\left(1 + \frac{6\cancel{0}}{10\cancel{0}}\right)^2$	½	
	$= 5120 \times \left(\frac{16}{10}\right)^2$		
	$= \frac{5120 \times 16 \times 16}{10 \times 10}$	½	
	= 13107.2 = 13107	½	
	(3) No. of rabbits in the beginning of 2020 = 5120		
	No. of rabbits die = 120		
	No. of rabbits left = 5120 – 120 = 5000	½	
	No. of rabbits increased in the next year = 60% of 5000		
	= 3000	½	4
37.	1. ` $(4x + 20)$	1	
	2. Neena's expenditure on day 1 = ` $(4x + 20)$		
	Neena's expenditure on day 2 = ` $(6x + 20)$	½	
	ATQ		

$$\frac{4x+20}{6x+20}=\frac{11}{16}$$ ½

$16\ (4x + 20) = 11\ (6x + 20)$

$64x + 320 = 66x + 220$

$64x - 66x = 220 - 320$

$-2x = -100$

$$x=\frac{100}{2}=50$$

$\therefore$ Cost of Neena's ride is ` 50 1

OR

Given that cost of Neena's ride is x

Cost of Arun's ride is $\frac{3}{2}x$

Neena's expenditure on day 1 = ` $(4x + 20)$

Arun's expenditure on day 1 = ` $\left(5\times\frac{3}{2}x+20\right)$

= ` $\left(\frac{15x}{2}+20\right)$ ½

ATQ

$$(4x + 20) + \left(\frac{15x}{2}+20\right) = 615$$ ½

$$\Rightarrow \quad 4x+\frac{15}{2}x+40=615$$

$$\Rightarrow \quad \frac{8x+15x}{2}=615-40$$

$$\Rightarrow \quad \frac{23x}{2}=575$$

$\Rightarrow \quad x = \frac{575 \times 2}{23}$

$\Rightarrow \quad x = 50$ ½

Cost of Neena's ride = ` 50

Cost of Arun's ride $= \frac{3}{\cancel{2}} \times \overset{25}{\cancel{50}}$

= ` 75 ½

3. Cost of each ride on day 3 = ` 50

Expenditure of Neena on day 3

= 5 × 50 + 20

= 250 + 20

= ` 270

Expenditure of Arun on day 3

= 5 × 50 + 20

= ` 270 ½

Total expenditure = 270 + 270

= ` 540 ½ 4

38. (1) Since opposite sides are equal and parallel

∴ It is a parallelogram. 1

(2) A parallelogram having a pair of adjacent sides equal, is called a rhombus. ½

∴ $a + b = c$ ½

(3) $a \parallel b$

$\therefore \quad \angle 1 = \angle 2$ (alternate interior angles) ½

$\therefore \quad \angle 2 = 40°$

$\angle 3 = 2\angle 2$ (given)

$\therefore \quad \angle 3 = 80°$ ½

$\angle 1 + \angle 3 + \angle 4 = 180°$

(By angle sum property of a Δ)

$40° + 80° + \angle 4 = 180°$

$\angle 4 = 180° - 120°$

$\angle 4 = 60°$ 1

OR

Let $a = 2x, \quad b = 3x$ ½

$a + b + 2c$ = Perimeter of trapezium

$2x + 3x + 2(10) = 40$ mm ½

$2x + 3x = 40 - 20$

$5x = 20$

$x = 4$ ½

$a = 8$ mm, $\quad b = 12$ mm ½ 4