B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

PRE BOARD 2 (2025-26)
MATHEMATICS-MARKING KEY

Class: XII | **Time: 3hrs**
Date: 11-12-25 | **Max Marks: 80**
Admission no: | **Roll no:**

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case-based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks have been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

1.	A	1M
2.	D	1M
3.	D	1M
4.	C	1M
5.	C	1M
6.	A	1M
7.	C	1M
8.	D	1M
9.	A	1M
10.	D	1M
11.	C	1M
12.	C	1M
13.	B	1M
14.	D	1M
15.	B	1M
16.	B	1M
17.	B	1M
18.	D	1M
19.	C	1M
20.	D	1M
21.	$x \equiv 23(mod\ 7)$ $x = 23 + 7$, $p \in Z$	1M

	$x = 23, 30, 47, \dots \dots$ $x = 30\ as\ 21 \le x < 31$	1M
22.	20. Length of course = 500 meters Time taken by B to cover by 60 meters = 12 seconds. ∴time taken by B to cover the course=(100 − 12) seconds = 88 seconds = 1 minute 28 seconds OR Calculations Ans 14 hrs	1M 1M 1M 1M
23.	DETERMINANT K = 5	1M 1M
24.	FORMULA A= 20%	1M 1M
25.	Let number of necklaces and bracelets produced by firm per day be x and y, respectively.Clearly, $x \ge 0,\ y \ge 0$ ∴ Total number of necklaces and bracelets that the firm can handle per day is at most 24. ∴ $x + y \le 24$ Since it takes one hour to make a bracelet and half an hour to make a necklace and maximum number of hours available per day is 16. ∴ $12x + y \le 16$ ⇒ $x + 2y \le 32$ Let Z be the profit function. Then, Z = 100x + 300y ∴ The given LPP reduces to Maximise Z = 100x + 300y subject to, $x + y \le 24$ $x + 2y \le 32$ and $x, y \ge 0$	1M 1M 1M
26.	Speed downstream=6 km/h, Speed upstream= 4 km/h , Total Time taken= 1 hour, Distance = 2.4 km OR Calculations the quantity of liquid P was 5 X4 = 20 litres and quantity of liquid Q was 7 X4 = 28 litres	2M 1M 2M 1M
27.	Calculations N = 9	2M 1M
28.	4.067 , 4 , 4.03, 4.40, 4.40, 3.73	3M
29.	Calculations $P = Rs\ 55120$	2M 1M
30.	Getting $f'(x) =$ $6x^2 + 18x + 12\ (x)$ $= 6\ (x + 1)(x + 2)$ For increasing $f'(x) > 0$ $\ for\ decreasing f'(x) < 0$ Increasing $(-\infty, -2) \cup (-1, \infty)$ and Decreasing $(-2, -1)$	2M 1M

31.	Given: $$\mu = 2 \text{ cm}, \bar{X} = 2.01 \text{ cm}, n = 10, s^2 = 0.004 \text{ cm}^2$$ **Step 1: Define Hypotheses** $$H_0: \mu = 2 \text{ cm}$$ $$H_1: \mu \neq 2 \text{ cm}$$ **Step 2: Calculate the Test Statistic** $$t = \frac{\bar{X} - \mu}{\sqrt{\frac{s^2}{n}}} = \frac{2.01 - 2}{\sqrt{\frac{0.004}{10}}} = 0.476$$ **Conclusion:** Since the calculated value of $t = 0.476$is less than the critical value at the chosen significance level, the difference between the sample mean and the population mean is **not significant**.	2M 1M
32.	Let the cost per kg of onion, wheat and rice be: x, y, z respectively The system of equations is: $$4x + 3y + 2z = 60$$ $$2x + 4y + 6z = 90$$ $$6x + 2y + 3z = 70$$ Determinant of the coefficient matrix: $$\det(A) = 50$$ Inverse of the matrix: $$A^{-1} = \frac{1}{50}(0 \quad -5 \quad 10)$$ Solving, we get: $$x = 5, y = 8, z = 8$$	3M 1M 1M
33.	Solving for the constants, we get: $$A = -\frac{5}{9}, B = \frac{5}{9}, C = \frac{4}{3}$$	3M 2M
34.	Initial investment: $$200 \times 100 = 20{,}000$$ Final value: $$30{,}000$$ CAGR formula: $$30000 = 20000(1 + 0.2247)^n$$ $$\frac{30000}{20000} = (1.2247)^n$$ $$1.5 = (1.2247)^n$$ Taking log: $$\log 1.5 = n \log 1.2247$$	3M

	$n = \frac{\log 1.5}{\log 1.2247}$ $n \approx \frac{0.1761}{0.0883} \approx 1.99 \approx 2$ years	2M
35.	Given: Defective rate $p = 0.05$, sample size $n = 100$ Mean of Poisson distribution: $\lambda = np = 100 \times 0.05 = 5$ --- **(1) Probability that none are defective** $P(X = 0) = \frac{e^{-5}5^0}{0!} = e^{-5}$ $P(X = 0) \approx 0.0067$ --- **(2) Probability that 5 are defective** $P(X = 5) = \frac{e^{-5}5^5}{5!}$ $= e^{-5} \times \frac{3125}{120}$ $= e^{-5} \times 26.0417$ $P(X = 5) \approx 0.175$	3M 2M
36.	Principal $P =$ □30,00,000 Rate = 7.5%p.a. compounded monthly $\rightarrow r = \frac{7.5}{12} = 0.625\% = 0.00625$ $n = 20 \times 12 = 240$ $(1.00625)^{240} = 4.4608$ --- **i) EMI Calculation** $EMI = \frac{P \cdot r(1+r)^n}{(1+r)^n - 1}$ $EMI = \frac{3000000 \times 0.00625 \times 4.4608}{4.4608 - 1} = \frac{83760}{3.4608} \approx$ □24,220 --- **ii) Interest Paid in 150th Payment** Outstanding balance formula: $B = P\frac{(1+r)^n - (1+r)^k}{(1+r)^n - 1}$ For 149 payments: $B_{149} = 3000000 \times \frac{4.4608 - (1.00625)^{149}}{3.4608} \approx$ □11,35,000 (approx) Interest in 150th month: Interest $= B_{149} \times r \approx 1135000 \times 0.00625 =$ □7093.75 --- **iii) Principal Paid in 150th Payment** Principal $= EMI -$ Interest $= 24220 - 7094 \approx$ □17,126	1M 1M 2M

37.	**Normal Distribution Case Study** Given: Mean $\mu = 160$ cm, SD $\sigma = 10$ cm --- **i) Percentage taller than 175 cm** $$z = \frac{175 - 160}{10} = 1.5$$ Using table: $P(Z > 1.5) = 0.0668 \Rightarrow 6.68\%$ --- **ii) Percentage between 150 cm and 170 cm** $$z_1 = \frac{150 - 160}{10} = -1, z_2 = \frac{170 - 160}{10} = 1$$ $$P(-1 < Z < 1) = 0.6826 \Rightarrow 68.26\%$$ --- **iii) Expected students shorter than 140 cm (out of 1000)** $$z = \frac{140 - 160}{10} = -2$$ $$P(Z < -2) = 0.0228 \Rightarrow 2.28\%$$ $$1000 \times 0.0228 \approx 23 \text{ students}$$ --- **OR: Height of Top 10% students** $$P(Z > z) = 0.10 \Rightarrow Z = 1.28$$ $$X = \mu + z\sigma = 160 + 1.28(10) = 172.8 \text{ cm}$$	1M 1M 2M
38.	Given: decay proportional to quantity → exponential decay. --- **i) Differential Equation** $$\frac{dN}{dt} = -kN$$ --- **ii) Order and Degree** Order = 1, Degree = 1 $$2p + 3q = 2(1) + 3(1) = 5$$ --- **iii) Expression for amount of radium** $$N = N_0 e^{-kt}$$ --- **OR: Find constant k** 1.1% decomposed → 98.9% remains after 25 years $$0.989 = e^{-25k}$$ $$k = -\frac{\ln(0.989)}{25} \approx 0.00044$$	1M 1M 2M

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