



MATHS

BOOKS - S CHAND MATHS (ENGLISH)

MODEL TEST PAPER - 20

Section A

1. Let $A = \{0, \{0, 1\}\}$. The cardinal number of $P(A)$ is : (i) 8 (ii) 2 (iii) 4 (iv) 16

A. 8

B. 2

C. 4

D. 16

Answer: C



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2. The domain of the function $f(x) = \frac{1}{\sqrt{4 + 3 \sin x}}$ is :

A. \mathbb{R}

B. $\left[-\frac{\pi}{2}, \frac{\pi}{2} \right]$

C. $\mathbb{R} - \{2n\pi, n \in \mathbb{I}\}$

D. $\left(0, \frac{\pi}{2} \right)$

Answer: A



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3. If $\theta = -1590^\circ$, then $\tan \theta$ is

A. $\sqrt{3}$

B. 1

C. ∞

D. $\frac{1}{\sqrt{3}}$

Answer: D



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4. $1 + 4 + 7 + 10 + \dots + x = 590$, then the value of x is

A. 55

B. 58

C. 61

D. None of these

Answer: B



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5. Maximum/Minimum value of $ax^2 + bx + c$ occurs at $x = -\frac{b}{2a}$, and its value is :

A. Δ

B. $\frac{\Delta}{a}$

C. $\frac{\Delta}{4a}$

D. $-\frac{\Delta}{4a}$

Answer: D



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6. If the middle term in the expansion of $(1+x)^{2n}$ is $\frac{1.3.5 \dots (2n-1)}{n!} k^n \cdot x^n$, the value of k is

A. 4

B. 1

C. 0

D. 2

Answer: D



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7. If $\left\{ i^{17} - \left(\frac{1}{i} \right)^{34} \right\}^2 = a + 2i$, then the value of a is

A. 0

B. 2

C. -1

D. 1

Answer: A



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8. The distance between the lines $3x + 4y = 9$ and $6x + 8y = 15$ is :

A. $\frac{10}{3}$

B. $\frac{3}{10}$

C. $\frac{1}{2}$

D. 2

Answer: B



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9. The radius of the circle : $2x^2 + 2y^2 = x$ is

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. 4

Answer: B



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10. $\lim_{x \rightarrow 1} \frac{x^{1/3} - 1}{x^{1/6} - 1}$ is equal to

A. 1

B. 4

C. 3

D. 2

Answer: D



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11. Differentiate w.r.t. 'x' : $f(x) = \log \left(\frac{a + b \sin x}{a - b \sin x} \right)$



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12. In a single throw of three dice, find the probability of getting a sum of at least 5.



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13. If $n(\xi) = 40$ and $n((A \cup B)) = 31$, then find $n(A' \cap B')$



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14. Find the number of non-zero integral solutions of the equation $|1 - i|^x = 2^x$.



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15. Examine whether or not there is any term containing x^9 in the expansion of $\left(2x^2 - \frac{1}{x}\right)^{20}$



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16. A function $f: R \rightarrow R$ defined by $f(x) = x^2$. Determine

(i) range of f

(ii). $\{x: f(x) = 4\}$

(iii). $\{y: f(y) = -1\}$



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17. A function $f: R \rightarrow$ defined by $f(x) = x^2$. Determine

$\{y: f(y) = -1\}$



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18. If $A = \{x \in R: 0 < x < 4\}$ and $B = \{x \in R: 1 \leq x \leq 7\}$ then find $A \Delta B$.



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19. Solve : $7 \sin^2 \theta + 3 \cos^2 \theta = 4$.



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20. Evaluate : $\sin \frac{8\pi}{3} \cos \frac{23\pi}{6} + \cos \frac{13\pi}{3} \sin \frac{35\pi}{6}$



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21. Prove that $\tan 70^\circ - \tan 20^\circ - 2 \tan 40^\circ = 4 \tan 10^\circ$.



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22. How many different selection of 4 books can be made from 10 different books, if

(i) Two particular books are always selected.

(ii) Two particular books are never selected.



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23. How many permutations of the letters of the word 'MADHUDANI' do not begin with M but end with I.



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24. Prove that:

$$\cos 2\alpha \cos 2\beta + \sin^2(\alpha - \beta) - \sin^2(\alpha + \beta) = \cos 2(\alpha + \beta).$$



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25. In any triangle ABC, prove that

$$a^3 \cos(B - C) + b^3 \cos(C - A) + c^3 \cos(A - B) = 3abc$$



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26. Describe the real valued function $f(x) = a^x$. Also draw its graph, when $0 < a < 1$.

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27. Using the principle of mathematical induction, prove that

$$1.3 + 2.3^2 + 3.3^2 + \dots + n.3^n = \frac{(2n-1)(3)^{n+1} + 3}{4} \text{ for all } n \in N.$$

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28. Differentiate, $f(x) = ax^2 + \frac{b}{x}$ with respect to 'x' using first principle.

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29. Let $f(x)$ be a function defined by $f(x) = \begin{cases} \frac{3x}{|x|+2x} & x \neq 0 \\ 0 & x = 0 \end{cases}$

Show that $\lim_{x \rightarrow 0} f(x)$ does not exist.

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30. If α, β are the roots of the equation $2x^2 - 3x - 6 = 0$, find the equation whose roots are $\alpha^2 + 2$ and $\beta^2 + 2$.



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31. If every pair from among the equations $x^2 + px + qr = 0$, and $x^2 + rx + pq = 0$ have a common root, then $\left(\frac{\text{sum of all distinct roots}}{\text{Product of all distinct roots}} \right)$ is



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32. Let x be the arithmetic mean and y, z be two geometric means between any two positive numbers. Then, prove that $\frac{y^3 + z^3}{xyz} = 2$.



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33. The circle $x^2 + y^2 - 6x - 10y + k = 0$ does not touch or intersect the coordinate axes, and the point $(1, 4)$ is inside the circle. Find the range of value of k .



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34. Reduce the lines $3x - 4y + 4 = 0$ and $4x - 3y + 12 = 0$ to the normal form and hence find which line is nearer to the origin.



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35. Calculate the mean and standard deviation using step deviation method for the following data :

Class marks(x_i)	15	30	45	60	75	90	105	120
Frequency(f_i)	12	14	65	107	157	202	222	230



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1. The centre of the ellipse whose foci are $(2, 3)$, $(-2, 3)$ is

A. $(1, 3)$

B. $(3, 0)$

C. $(0, 3)$

D. $(3, 1)$

Answer: C



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2. The locus of the point which is equidistant from the point $A(0, 2, 3)$ and $B(2, -2, 1)$ is

A. $x - 2y - z + 1 = 0$

B. $x + 2y - z - 1 = 0$

C. $x + 2y + z + 1 = 0$

D. None of these

Answer: A



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3. The parabola $y^2 = 4px$ passes through the point (3, -2). The length of the latus-rectum is



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4. Find the eccentricity of the hyperbola with centre at origin, the length of transverse axis 6 and one focus at (0, 4)



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5. Write the negative of the proposition : "If a number is divisible by 15, then it is divisible by 5 or 3".

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6. Consider the following statement :

p : I shall pass, q : I study, then write the verbal translation of the symbolic representation $p \Leftrightarrow q$.

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7. Using truth table, prove that $\sim(p \Leftrightarrow \sim q)$ is equivalent to $p \Leftrightarrow q$.

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8. Find the equation of the hyperbola whose eccentricity is $\sqrt{5}$ and the sum of whose semi-axes is 9.

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9. about to only mathematics



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10. Find the ratio in which the line segment joining the points $(2, -1, 3)$ and $(-1, 2, 1)$ is divided by the plane $x + y + z = 5$.



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Section C

1. The price index of a commodity is 240. Then, percentage increase in price of the commodity in current year as compared to the base year is

A. (a) 0.4

B. (b) 1.4

C. 2.4

D. 0.24

Answer: B



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2. Q_3 is always equal to

A. P_1

B. P_{25}

C. P_{75}

D. D_3

Answer: C



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3. Find the 20th percentile of the following data :

Height (in cm)	135	140	145	150	155	160	165	170
No. of students	7	20	32	48	36	28	24	4



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4. Given $n_1 = 50$, $n_2 = 40$, $\sigma_1 = 9$, $\sigma_2 = 6$, $d_1 = 4$, $d_2 = 5$

Find the combined standard deviation.



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5. Using simple average of price relatives method, the price index for 2001, taking 1991 as base year, was found to be 127. If $\sum p_0 = 263$, find x and y from the following data:

Commodities	A	B	C	D	E	F
Prices in 1991 (in ₹)	80	70	50	x	18	25
Prices in 2001 (in ₹)	100	87.50	61	22	y	32.50



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6. Find the median from the following frequency distribution :

x	3	4	5	6	7	8	9	10	11
f	13	90	81	117	66	27	6	2	2



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7. Compute the first quartile and third deciles from the following data :

Weekly Income (in Rs.)	58	59	60	61	62	63	64	65	66
No. of workers	2	3	6	15	10	5	4	3	1



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8. The mathematical aptitude score of 10 computer programmers with their job performance is given below :

Mathematics scores	7	5	1	4	3	0	2	6	8	9
Job performance ratings	8	16	8	9	5	4	3	8	17	12

Calculate the Spearman's coefficient of rank correlation and interpret the result.



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9. Calculate Kari Pearson's coefficient of correlation between the values of x and y for the following data :

$$n = 10, \sum x = 55, \sum y = 40, \sum x^2 = 385, \sum y^2 = 192 \text{ and } \sum (x +$$



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10. From the following data compute 3 yearly moving averages. Plot original and trend values on the same graph.

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Value	50	36.5	43.0	44.5	38.9	38.1	32.6	41.7	41.1	33.8



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