



MATHS

BOOKS - S CHAND MATHS (ENGLISH)

MODEL TEST PAPER -13

Section A

1. In set-builder form the null set is represented by

A. $\{\}$

B. ϕ

C. $\{x|x \neq x\}$

D. $\{x|x \neq x\}$

Answer: C

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2. Evaluate : $\tan \frac{\pi}{12} \cdot \tan \frac{\pi}{16} \cdot \tan \frac{5\pi}{12} \cdot \tan \frac{7\pi}{16}$

A. -1

B. 1

C. 0

D. None of these

Answer: B

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3. If $\cos 18^\circ - \sin 18^\circ = k \sin 27^\circ$, then $k =$

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

B. $\sqrt{2}$

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

D. $2\sqrt{2}$

Answer: B



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4. If A_1 and A_2 are two AMs between a and b then

$$(2A_1 - A_2)(2A_2 - A_1) =$$

A. $\frac{a}{b}$

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

C. ba

D. a^2b

Answer: C



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5. If $(1 + i)(1 + 2i)(1 + 3i)\dots(1 + ni) = x + iy$, then

$2, 5, 10, \dots (1 + n^2) = x^k + y^k$ The value of k is :

A. 1

B. 2

C. 4

D. None of these

Answer: A



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6. Constant term in the expansion of $\left(x - \frac{1}{x}\right)^{10}$ is

A. 152

B. - 152

C. - 252

D. 252

Answer: C



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7. Solution of $|3x - 2| \leq \frac{1}{2}$ is

A. $\left[\frac{1}{2}, \frac{5}{6}\right]$

B. $\left(\frac{1}{2}, \frac{5}{6}\right)$

C. $\left(\frac{5}{6}, \frac{1}{2}\right)$

D. $\left[\frac{5}{6}, \frac{1}{2}\right]$

Answer: A



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8. The angle between the lines

$2x - y + 3 = 0$ and $x + 2y + 3 = 0$ is

A. 90°

B. 60°

C. 45°

D. 180°

Answer: A



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9. If $(x, 3)$ and $(3, 5)$ are the extremities of a diameter of a circle with centre at $(2, y)$, then the values of x and y are

A. $x = 3, y = 1$

B. $x = 1, y = 4$

C. $x = 8, y = 2$

D. None of these

Answer: A



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10. If $\lim_{x \rightarrow a} \frac{x^5 - a^5}{x - a} = 405$, then possible values (s) of a:

A. 1

B. - 1

C. ± 3

D. 0

Answer: C



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11. If $f: R \rightarrow R$ defined by $f(x) = x^2 + 1$, then find $f^{-1}(-3)$

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12. A round table conference is to be held between 20 delegates. How many seating arrangements are possible if two particular delegates are always to sit together .

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13. If the middle term in the expansion of $\left(\frac{2}{3}x^2 - \frac{3}{2x}\right)^{20}$ is ${}^{20}C_{10}x^k$, then find the value of k .

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14. If $f(x) = \log_{x^2} x^3$ write the value of $f'(x)$



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15. about to only mathematics



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16. If $A \times B = \{(p, q), (p, r), (m, q), (m, r)\}$ find A and B .



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17. Two finite sets have m and n elements respectively . The total number of subsets of first set is 56 more than the total number of subsets of the second. Find the values of m and n .

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18. Solve : $\tan 3\theta \tan 2\theta = 1$

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19. In any triangle ABC ,prove that $\frac{a - b \cos C}{c - b \cos A} = \frac{\sin C}{\sin A}$

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20. Find the value of $\cos \left\{ n\pi + (-1)^n \frac{\pi}{3} \right\}$

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21. Find the modulus and amplitude of $\frac{2 + i}{4i + (1 + i)^2}$

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22. Form a quadratic equations defined over rational coefficients whose one root is $\sin 18^\circ$

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23. Find the domain of the functions

$$f(x) = \frac{1}{\sqrt{4x^2 - 1}} + \log_e(x(x^2 - 1))$$

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24. If $\cos \theta = \frac{\cos \phi - e}{1 - e \cos \phi}$, show that \tan

$$\frac{\theta}{2} = \pm \sqrt{\frac{1+e}{1-e}} \tan \frac{\phi}{2}$$

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25. Show that $\frac{\sin 5A + 2 \sin 8A + \sin 11A}{\sin 8A + 2 \sin 11A + \sin 14A} = \frac{\sin 8A}{\sin 11A}$

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26. Using principle of mathematical induction , prove that $n^3 - 7n + 3$ is divisible by 3 , for all n belongs to \mathbb{N} .

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27. Find the co-ordinates of the points on the curve

$$y = \frac{x}{1 - x^2} \quad \text{for which} \quad \frac{dy}{dx} = 1$$

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28. Evaluate $\lim_{x \rightarrow \pi} \frac{\sin 3x - 3 \sin x}{(\pi - x)^3}$

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29. Show that if A and G are A.M. and G.M. between two positive numbers, then the numbers are $A \pm \sqrt{A^2 - G^2}$

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30. If the sum to infinity of the series

$$1 - (1 + d)\frac{1}{3} + (1 + 2d)\frac{1}{9} - (1 + 3d)\frac{1}{27} + \dots \text{ is } \frac{9}{16}$$

, find d.

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31. For what values of a is the inequality $\frac{x^2 + ax - 2}{x^2 - x + 1} < 2$ satisfied for all real values of x?

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32. A line is drawn perpendicular to $5x = y + 7$. Find the equation of lines if the area of the triangle formed by this line with coordinate axes is 5sq. Units.

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33. Find the locus of the point of intersections of perpendicular tangents to the circle $x^2 + y^2 = a^2$

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34. The number of faults on the surface of each of 1000 tiles were distributed as follows:

Number of faults	0	1	2	3	4	5
Frequency	760	138	67	25	8	2

Calculate coefficient of variations:

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Section B

1. A line of length $a+b$ moves in such a way that its ends are always on two fixed perpendicular straight lines. Then the locus of point on this line which divides it into two portions of length a and b , is :

A. A. Parabola

B. B. Circle

C. C. Ellipse

D. D. Hyperbola

Answer: C



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2. The parabola $y^2 = 2ax$ passes through the point $(-2, 1)$. The length of its latus rectum is

A. A. 2 units

B. B. $\frac{1}{2}$ units

C. C. 4 units

D. D. $\frac{1}{4}$ units

Answer: B



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3. Verify , whether the line $y = 2x + 1$ is a tangent to the ellipse $3x^2 + 2y^2 = 6$.



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4. What is the locus of a point for which $z=c$?



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5. Re-write the statement with 'If and only if' " If a rectangle is a square , then all its four sides are equal "



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6. Let p : "X can type ," and let q : " X takes shorthand ." Write the following statement in symbolic form :

(i) X can neither type nor take shorthand

(ii) It is not true that X can type and take shorthand.



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7. Write the converse and contrapositive for the statement

$$p \Rightarrow q.$$



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8. Find the equation of the parabola whose vertex is (3,4) and focus is (5,4)

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9. Find the equation to the hyperbola whose foci, are (6,4) and (-4,4) and eccentricity is 2.

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10. If A,B are the points $(-2,2,3), (13,-3,13)$ respectively , find the locus of P such that $3|PA| = 2|PB|$

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Section C

1. If $\sigma_x = 10$, $\sigma_y = 10$, then the value of $Cov(x, y)$ is

A. 100

B. $\sqrt{10}$

C. 10

D. 0

Answer: A



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2. If $u = \frac{x - 3}{2}$ and $v = \frac{y - 2}{3}$, then $cov(u, v) = k cov(x, y)$.

The value of k is

A. 6

B. $\frac{1}{6}$

C. 5

D. $\frac{1}{5}$

Answer: B



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3. Find the Spearman 's rank correlation coefficient ,given :

$$n = 10, \sum |d_x - d_y|^2 = 30$$



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4. If $\sum p_1\omega = 344$ and $\sum p_2\omega = 408$, then find the price index number.

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5. If $\sum I\omega = 3510$, $\sum \omega = 23 + x$ and index number is 135, find the value of x.

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6. Find $r(x,y)$ if $\text{Cov}(x,y) = -165$, $\text{Var}(x) = 2.25$ and $\text{Var}(y) = 144$.

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7. The Spearman's rank correlation coefficient $= \frac{9}{11}$, given

$\sum d^2 = 30$. Find the number of observation.

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8. Find the median

Saving in ₹ (less than)	10	20	30	40	50	60	70	80
Cumulative frequency	15	35	64	84	96	120	192	256

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9. The following table gives frequency distribution of Maze - Running Times (recorded in nearest second) for 100 " Maze - Dull " rats.

Time	61 – 67	63 – 74	75 – 81	82 – 88	89 – 95	96 – 102
Frequency	23	38	17	12	6	4

Calculate the mode.

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10. The following table gives the numbers of failures of commercial industries in a country during the years 2000 to 2015.

Year	2000	2001	2002	2003	2004	
Number of failures	23	26	28	32	20	
Year	2005	2006	2007	2008	2009	
Number of failures	12	12	10	9	13	
Year	2010	2011	2012	2013	2014	2015
Number of failures	11	14	12	9	3	1

Draw a graph illustrating these figure.

Calculate the 4 yearly moving averages and plot them on the same graph.

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