



MATHS

BOOKS - S CHAND MATHS (ENGLISH)

MODEL TEST PAPER -4

Section A

1. If a finite set S contains n elements, then the number of non empty proper subsets of S is

A. $2 \cdot 2^{n-1}$

B. $2(2^n - 1)$

C. $2^{n-1} - 1$

D. $2(2^{n-1} - 1)$

Answer: D

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2.

$$\sin(270^\circ - \theta) \cdot \sin(90^\circ - \theta) - \cos(270^\circ - \theta) \cdot \cos(90^\circ + \theta) =$$

A. -1

B. 1

C. 0

D. 2

Answer: A

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3. If $\frac{\cos A}{1 - \sin A} = \tan\left(k + \frac{A}{2}\right)$, then $k =$

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

B. $-\frac{\pi}{4}$

C. $\frac{\pi}{4}$

D. $-\frac{\pi}{2}$

Answer: C



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4. For the quadratic equation $(k - 1)x^2 = kx - 1$, $k \neq 1$ the roots are numerically equal but opposite sign, then k is greater than

A. -1

B. 1

C. 0

D. 2

Answer: C



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5. The first term of a G.P. which is 2 more than the second term and the sum of infinity is 50. The first term of G.P. is

A. 10

B. -10

C. ± 10

D. 100

Answer: C



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6. In the binomial expansion of $(1 + x)^{43}$, the coefficients of the $(2r + 1)$ th and $(r + 2)$ th terms are equal. Then $r =$

A. 14

B. 41

C. 1

D. 42

Answer: A



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7. The argument of -1 is: (i) π (ii) $-\pi$ (iii) $-\frac{\pi}{2}$ (iv) $\frac{\pi}{2}$

A. π

B. $-\pi$

C. $-\frac{\pi}{2}$

D. $\frac{\pi}{2}$

Answer: C



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8. The equation of the line which $p = 3$, $\alpha = 120^\circ$ is

A. $x + \sqrt{3}y = 6$

B. $x - \sqrt{3}y + 6 = 0$

C. $x + \sqrt{3}y + 6 = 0$

D. $-x + \sqrt{3}y + 6 = 0$

Answer: B



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9. If $4x + 3y + k = 0$ touch the circle $2x^2 + 2y^2 = 5x$ then $k =$

A. $\frac{5}{4}$ or $\frac{-45}{4}$

B. $\frac{-5}{4}$ or $\frac{-45}{4}$

C. $-\frac{5}{4}$ or $\frac{45}{4}$

D. $\frac{5}{4}$ or $\frac{45}{4}$

Answer: A



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10. If $f(x) = mx + c$ and $f(0) = 1 = f'(0)$ then $f(-2) =$
(i) 1 (ii) -1 (iii) 3 (iv) ± 1

A. 1

B. -1

C. 3

D. ± 1

Answer: B



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11. Let f be a function whose domain is the set of all real number. If $f(x) = |x| - x$, what is the range of f ?



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12. How many number greater than 3,00,000 can be formed by using all the digits of the number 1112223?



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13. Find the modulus of $8 - 6i^7$?



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14. Evaluate : $\lim_{x \rightarrow 5^-} \frac{x + 5}{|x + 5|}$



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15. In a single throws of two dice, what is the probability of getting a total of at most 9?



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16. If $X = \{2, 3, 5, 7, 9\}$ be the universal set
 $A = \{3, 7\}$, $B = \{2, 5, 7, 9\}$ then prove that
 $(A \cup B)' = A' \cap B'$



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17. Define greatest integer function. Write its domain and range.



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18. Find the radius of a circle in which a central angle of 45° intercepts an arc of 187 cm.



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19. If $\cot \alpha = \frac{1}{2}, \alpha \in \left(\pi, \frac{3\pi}{2}\right)$ and $\sec \beta = \frac{-5}{3}, \beta \in \left(\frac{\pi}{2}, \pi\right)$ find $\tan(\alpha + \beta)$



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20. Prove that $\cos \frac{\pi}{9} \cdot \cos \frac{2\pi}{9} \cdot \cos \frac{3\pi}{9} \cdot \cos \frac{4\pi}{9} = \frac{1}{2^4}$



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21. Find the number of words which can be formed by taking two alike and two different letters from the word COMBINATION.



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22. Find the total number of ways of selecting five different letters of which 3 are alike from the word INDEPENDENT.



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23. Let f be a function defined by $f: x \rightarrow 5x^2 + 2, x \in R$

(i) Express f as a set of ordered pairs using set builder notation.

(ii) Is f a one-one function

(iii) Find the image of 3 under f

(iv) Find x such that $f(x) = 2$



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24. Prove that

$$\cos^3 x + \cos^3\left(\frac{2\pi}{3} + x\right) + \cos^3\left(\frac{2\pi}{3} - x\right) = \frac{3}{4}\cos 3x$$



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25. IN any ΔABC prove that if a^2, b^2 and c^2 are in AP, the $\cot A, \cot B$ and $\cot C$ are also in AP.

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26. Using Mathematical induction prove that

$$3 \cdot 2^2 + 3^2 \cdot 2^3 + 3^3 \cdot 2^4 + \dots + 3^n \cdot 2^{n+1} = \frac{12}{6} (6^n - 1)$$

, for all $n \in \mathbb{N}$

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27. Evaluate $\lim_{x \rightarrow \frac{\pi}{2}} \frac{(1 - \sin x)^2}{\left(\frac{\pi}{2} - x\right)^2}$

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28. Differentiate $f(x) = e^{2-3x}$ by using 1st principle.

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29. The sum of three numbers in G.P. is 56. If we subtract 1,7,21 from these numbers in that order, we obtain an A.P. Find the numbers.

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30. Find the sum of series $1 + 5 + 14 + 30 + 55 + \dots$ upto n terms.

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31. If x is real show that the value of $\frac{x^2 + 2x + 3}{x^2 + 2x + 4}$ always lies between $\frac{2}{3}$ and 1.

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32. Find the equations of the tangents to the circle $x^2 + y^2 - 22x - 4y + 25 = 0$ and perpendicular to the line $5x + 12y + 9 = 0$

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33. Find the equation of two straight lines drawn through the point $(0,1)$ on which the perpendicular dropped from the point $(2,2)$ are each of unit length.

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34. Estimate standard deviation for the following frequency distribution.

Size	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14
Frequency	1	3	6	8	11	13	13	14	10	12	8	5	2



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Section B

1. The vertex of the parabola $y^2 - 2x + 8x - 23 = 0$ is

A. (3,1)

B. (-3,)

C. (1,3)

D. $(-3,-1)$

Answer: A

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2. The ratio in which the line joining the points $(2,5,4)$ and $(3,5,4)$ is divided by the YZ plane is

- A. (a) 3:2 internally
- B. (b) 2:3 internally
- C. (c) 3:2 externally
- D. (d) 2:3 externally

Answer: D

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3. Find the equation of ellipse whose distance between foci is 8 units and distance between the directrices is 18 units.



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4. A tangent to the parabola $y^2 = 16x$ makes an angle of 60° with the x-axis. Find its point of contact.



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5. Let p: I will marry her, and let q: she is beautiful.

Translate into symbolic form: If she is beautiful then I will not marry her.



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6. Construct the truth table for $[(\sim p) \wedge q] \Rightarrow (p \vee q)$



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7. Write the converse and contrapositive of the following statement:

A positive integer is prime only if it has no divisors other than 1 and itself.



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8. The tangents from P to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are mutually perpendicular show that the locus of P is the circle $x^2 + y^2 = a^2 - b^2$



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9. The axis of a parabola is $3x + 4y + 6 = 0$, its vertex is $(-2, 0)$ and latus rectum is 4 in length. Find its equation.



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10. Determine the point on ZX plane which is equidistance from points

$(1, -1, 0)$, $(2, 1, 2)$, $(3, 2, -1)$



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1. Pearson's coefficient of correlation r always follow: (a) $r \leq 1$
(b) $r < -1$ (c) $|r| \leq 1$ (d) $|r| \geq 1$

A. $r \leq 1$

B. $r < -1$

C. $|r| \leq 1$

D. $|r| \geq 1$

Answer: C



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2. The weight of the commodity milk given that Price in base year = Rs. 1.50 Price in current year = Rs. 1.75, Quantity consumed in base year = 10 litres

A. 40

B. 15

C. 17.5

D. 11.5

Answer: B



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3. Sum of the squares of deviation from the mean of x series is 136 and that of y series is 13. Sum of the product of the deviations of x and y series from their respective means is 122. Find the Pearson's coefficient of correlation.



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4. Find the rank of 55 from the following data:

90, 85, 80, 80, 80, 80, 78, 72, 69, 69, 55, 54



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5. Construct the index numbers for 2014 taking 2010 as the base year from the following data by simple average of price relative method:

Commodities	A	B	C	D	E
Price in 2010 (in ₹)	100	80	160	220	40
Price in 2014 (in ₹)	140	120	180	240	40



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6. For the given data the calculation corresponding to all values of series (x,y) is as following

$$\sum (x - \bar{x})^2 = 35, \sum (y - \bar{y})^2 = 25, \sum (x - \bar{x})(y - \bar{y}) = 20$$

Find Karl Pearson's correlation coefficient.

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7. Find $r(x,y)$ if $\text{cov}(x,y) = -16.5$, $\text{var}(x) = 2.25$ and $\sigma_y = 12$

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8. Find the value of f_1 , f_2 and f_3 from the following data:

Marks	10-20	20-30	30-40	40-50	50-60	Total
No. of candidates	5	f_1	15	f_2	7	47

given that mode = 37

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9. A sample of 35 observations has mean 80 and standard deviation 4. A second sample of 65 observations has mean 70 and standard deviation =3. Find the combined mean and standard deviation.

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10. The following table gives the number of failures of commercial industries in a country during the year 1975 to 1990

Year	1975	1976	1977	1978	1979	1980	1981	1982
Number of failures	23	26	28	32	20	12	12	10
Year	1983	1984	1985	1986	1987	1988	1989	1990
Number of failures	9	13	11	14	12	9	3	1

Draw a graph illustrating these figures. Calculate the 4 yearly moving averages and plot them on the same graph.

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