



MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER-20 (MOCK TEST PAPER)

Part I

1. The relation R defined on a set $A = \{0, -1, 1, 2\}$ by xRy if $|x^2 + y^2| \leq 2$, then which one of the following is true?

A.

$$R = \{(0, 0), (0, -1), (0, 1), (-1, 0), (-1, 1), (1, 2), (1, 0)\}$$

B. $R^{-1} = \{(0, 0), (0, -1), (0, 1), (-1, 0), (1, 0)\}$

C. Domain of R is $\{0, -1, 1, 2\}$

D. Range of R is $\{0, -1, 1\}$

Answer: D



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2. If $\frac{1 - 2x}{3 + 2x - x^2} = \frac{A}{3 - x} + \frac{B}{x + 1}$ then the value of A+B is

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

B. $-\frac{2}{3}$

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

D. $\frac{2}{3}$

Answer: A



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3. The value of $\log_{125} 625$ is

A. $\frac{4}{3}$

B. $\frac{3}{4}$

C. 5

D. 25

Answer: A



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4. The value of $(16)^{-3/4}$ is

A. $1/8$

B. -8

C. $1/4$

D. 4

Answer: A

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5. $\frac{1}{\cos 80^\circ} - \frac{\sqrt{3}}{\sin 80^\circ} =$

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 2

D. 4

Answer: D

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6. If ${}^{2n}C_3 : {}^nC_3 = 11 : 1$ then n is

A. 5

B. 6

C. 7

D. 8

Answer: B



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7. If ${}^{n-1}C_4, {}^{n-1}C_5, {}^{n-1}C_6$ are in AP then value of n is

A. 14

B. 11

C. 9

D. 5

Answer: A

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8. The sum to first 25 terms of the series $1 + 2 + 3 + \dots$ is

A. 305

B. 315

C. 325

D. 335

Answer: D

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9. The length of perpendicular from the origin to the line

$$\frac{x}{3} - \frac{y}{4} = 1 \text{ is}$$

A. $\frac{11}{5}$

B. $\frac{5}{12}$

C. $\frac{12}{5}$

D. $\frac{-5}{12}$

Answer: C



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10. A is a matrix of order 3×3 and if $|A| = 2$, then $|3A| =$

A. 54

B. 6

C. 27

D. - 54

Answer: A



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11. If $h^2 = ab$ then the angle between the pair of straight lines given by $ax^2 + 2hxy + by^2 = 0$ is

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

B. 0

C. $\frac{\pi}{6}$

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

Answer:



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12. If $[2 \quad x \quad -1] \begin{bmatrix} 0 \\ x \\ 3 \end{bmatrix} = [13]$, then the value of x is

A. 2

B. 5

C. ± 3

D. ± 4

Answer: D



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13. If $|\vec{a}| = 13$, $|\vec{b}| = 5$ and $\vec{a} \cdot \vec{b} = 60^\circ$ then $|\vec{a} \times \vec{b}| =$

A. 15

B. 35

C. 45

D. 25

Answer: D



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14. If $f(x) = \begin{cases} kx^2 & \text{for } x \leq 2 \\ 4 & \text{for } x > 2 \end{cases}$ is continuous at $x=2$ then the

value of k is

A. $\frac{3}{4}$

B. 0

C. 1

D. $\frac{4}{3}$

Answer: C

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15. $\lim_{n \rightarrow \infty} \left(\frac{1}{n^2} + \frac{2}{n^2} + \frac{3}{n^2} + \dots + \frac{n}{n^2} \right)$ is

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

B. 0

C. 1

D. ∞

Answer: A

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16. The remainder when 38^{15} is divided by 13 is

A. 12

B. 1

C. 11

D. 5

Answer: D



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17. If $y = f(x^2 + 2)$ and $f'(6) = 5$ then $\frac{dy}{dx}$ at $x=2$ is

A. 5

B. 20

C. 15

D. 10

Answer: D

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18. $\frac{d}{dx} \left(\frac{2}{\pi} \sin x^\circ \right)$ is

A. $\frac{\pi}{180^\circ} \cos x^\circ$

B. $\frac{1}{90} \cos x^\circ$

C. $\frac{\pi}{90} \cos x^\circ$

D. $\frac{2}{\pi} \cos x^\circ$

Answer: B

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19. If two events A and B are such that

$$P(\bar{A}) = \frac{3}{10} \text{ and } P(A \cap \bar{B}) = \frac{1}{2} \text{ then } P(A \cap B) =$$

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

B. $\frac{1}{3}$

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

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

Answer: D



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20. If a and b are chosen randomly from the set {1,2,3,4} with replacement, then the probability of the real roots of the equation $x^2 + ax + b = 0$ is

A. $\frac{3}{16}$

B. $\frac{5}{16}$

C. $\frac{7}{16}$

D. $\frac{11}{16}$

Answer: C

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Part II

1. Solve $|3x - 16| < -5$

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2. If ${}^{20}P_r = 13 \times {}^{20}P_{r-1}$ find r.



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3. If O is origin and R is a variable point on $y^2 = 2x$, then find the equation of the locus of the mid-point of the line segment OR.



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4. Determine the value of

$$x + y \text{ if } \begin{bmatrix} 2x + y & 4x \\ 5x - 7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y - 13 \\ y & x + 6 \end{bmatrix}.$$



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5. If

$$\vec{a} = 2\hat{i} + 3\hat{j} - 4\hat{k}, \vec{b} = 3\hat{i} - 4\hat{j} - 5\hat{k} \text{ and } \vec{c} = -3\hat{i} + 2\hat{j} + 3\hat{k}$$

, find the magnitude and direction cosines of $\vec{a} + \vec{b} + \vec{c}$.



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6. Evaluate $\lim_{x \rightarrow \frac{\pi}{2}} (1 + \sin x)^{2\operatorname{cosec} x}$

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7. Find $\frac{d^2y}{dx^2}$ if $x^2 + y^2 = 4$.

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8. A train started from Madurai junction towards Coimbatore at 3pm (time $t=0$) with velocity $v(t) = 20t + 50$ kilometre per hour, where t is measured in hours. Find the distance covered by the train at 5pm.

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9. If A and B are two independent events such that $P(A) = 0.4$ and $P(A \cup B) = 0.9$, find $P(B)$.

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10. Prove that $\sin 4\alpha = 4 \tan \alpha \frac{1 - \tan^2 \alpha}{(1 + \tan^2 \alpha)^2}$

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Part Iii

1. Solve $2x^2 + x - 15 \leq 0$

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2. Find the number of strings that can be made using all letters of the word THING. If these words are written as in a dictionary, what will be the 85th string?

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3. Prove that $\sqrt[3]{x^3 + 6} - \sqrt[3]{x^3 + 3}$ is approximately equal to $\frac{1}{x^2}$ when x is sufficiently large.

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4. Prove that
$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a - b)(b - c)(c - a).$$

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5. Three vectors \vec{a} , \vec{b} and \vec{c} are such that $|\vec{a}| = 2$, $|\vec{b}| = 3$, $|\vec{c}| = 4$ and $\vec{a} + \vec{b} + \vec{c} = 0$ find $4\vec{a} \cdot \vec{b} + 3\vec{b} \cdot \vec{c} + 3\vec{c} \cdot \vec{a}$.

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6. Use the graph to find the limit (if it exists) $\lim_{x \rightarrow 3} (4 - x)$

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7. If $y = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$ find $\frac{dy}{dx}$.

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8. If $f'(x) = 3x^2 - 4x + 5$ and $f(1) = 3$, then find $f(x)$.



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9. If A and B are two events such that $P(A \cup B) = \frac{5}{6}$, $P(A \cap B) = \frac{1}{3}$, $P(\overline{B}) = \frac{1}{2}$ show that A and B are independent.

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Part Iv

1. Resolve into partial fractions: $\frac{x^2}{(x-1)^3}$

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2. There are 11 points in a plane. No three of these lies in the same straight line except 4 points, which are collinear. Find,

(i) the number of straight lines that can be obtained from the pairs of these points?

(ii) the number of triangles that can be formed for which the points are their vertices?

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3. Population of a city in the years 2005 and 2010 are 1,35,000 and 1,45,000 respectively. Find the approximate population in the year 2015. (assuming that the growth of population is constant).

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4. By using vectors prove that a quadrilateral is a parallelogram if and only if the diagonals bisect each other.

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5. If $y = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$ show that $(1-x^2)y_2 - 3xy_1 - y = 0$.



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