MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 20

Paper 2 Mathematics

1. 5 boys and 5 girls are sitting in a row randomly . The probability that boys and girls sits alternatively , is

A. $\frac{5}{126}$

B. $\frac{1}{42}$

C. $\frac{4}{126}$

D. $\frac{1}{126}$

Answer: D

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2. The pairs of straight lines $x^2 - 3xy + 2y^2 = 0$ and $x^2 - 3xy + 2y^2 + x - 1$ form a

A. square but not rhombus

B. rhombus

C. parallelogram

D. rectangle but not a square

Answer: C

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3. Obtain the differential equation of the family of circles passing through the point (a,0) and (-a,0).

A. $y_1\left(y^2-x^2\right)+2xy+a^2=0$

B. $y_1y^2+xy+a^2x^2=0$

C. $y_1\left(y^2 - x^2 + a^2\right) + 2xy = 0$

D. $y_1\left(y^2 + x^2\right) - 2xy + a^2 = 0$

Answer: C

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4. The equation of a line passing through the point (-3 ,2 ,-4) and equally inclined to the axis are

A. x-3=y+2=z-4

B. x+3=y-2=z+4

C. $\frac{x+3}{2} = \frac{y-2}{2} = \frac{z-4}{3}$

D. None of these

Answer: B

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5. $\int\left(\frac{\log\left(x+\sqrt{1+x^2}\right)}{\sqrt{1+x^2}}\right)dx$

A. $\left[\log\left(x+\sqrt{1+x^2}\right)\right]^2+c$

B. $x\log\left(x+\sqrt{1+x^2}\right)+c$

C. $\frac{1}{2}\log\left(x+\sqrt{1+x^2}+c\right.$

D. $\frac{1}{2}\left[\log\left(x+\sqrt{1+x^2}\right)\right]^2+c$

Answer: D

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6. The solution of $\tan^{-1} 2\theta + \tan^{-1} 3\theta = \frac{\pi}{4}$ is

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

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

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

D. $\frac{1}{\sqrt{6}}$

Answer: C

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7. The set of values of θ satisfying the inequatioin $2\sin^2\theta - 5\sin\theta + 2 > 0$, where $o < \theta < 2\pi$, is

A. $\left[0, \frac{\pi}{6}\right] \cup \left[\frac{5\pi}{6}, 2\pi\right]$

B. $\left[0, \frac{\pi}{6}\right] \cup \left[\frac{5\pi}{6}, 2\pi\right]$

C. $\left[0, \frac{\pi}{3}\right] \cup \left[\frac{2\pi}{3}, 2\pi\right]$

D. None of these

Answer: A

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8. The most general value of θ which satisfy both the equation $\cos\theta = -\frac{1}{\sqrt{2}}$ and $\tan\theta = 1$, is

A. $2n\pi + \frac{5\pi}{4}, n \in 1$

B. $2n\pi + \frac{\pi}{4}, n \in 1$

C. $2n\pi + \frac{3\pi}{4}, n \in 1$

D. None of these

Answer: A

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9. If in a $\Delta ABC, a = 6cm, b = 8cm$ and $c = 10cm$, then the value of sin 2A is

A. $6/25$

B. $8/25$

C. $10/25$

D. $24/25$

Answer: D

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10. The any ΔABC under usual notation , $a(b\cos C - c\cos B)$ is equal to

A. $b^2 - c^2$

B. $c^2 - b^2$

C. $\frac{b^2 - c^2}{2}$

D. $\frac{c^2 - b^2}{2}$

Answer: A

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11. The area bounded by the hyperbola $x^2 - y^2 = 4$ between the lines $x = 2$ and $x = 4$ is

A. $4\sqrt{3} - 2\log\left(2 + \sqrt{3}\right)$

B. $8\sqrt{3} - 4\log\left(2 - \sqrt{3}\right)$

C. $8\sqrt{3} - 4\log\left(2 + \sqrt{3}\right)$

D. $4\sqrt{3} - 2\log\left(2 - \sqrt{3}\right)$

Answer: C

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12. The value of the integral $\int_0^{\pi/2} \log|\tan x| dx$ is

A. $\pi \log 2$

B. 0

C. $-\pi \log 2$

D. None of these

Answer: B

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13. Find the point on the line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ at a distance of $3\sqrt{2}$

from the point $(1, 2, 3)$.

A. (56,43,111)

B. $\left(\frac{56}{17}, \frac{43}{17}, \frac{111}{17}\right)$

C. $(2, 1, 3)$

D. $(-2, -1, -3)$

Answer: B

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14. The value of $\int_{-\pi/2}^{\pi/2} \log\left(\frac{2-\sin\theta}{2+\sin\theta}\right) d\theta$ is

A. 0

B. 1

C. 2

D. None of these

Answer: A

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15. The equation of the line bisecting perpendicularly the semgent joining the points (-4,6) and (8,8) is

A. $6x + y - 19 = 0$

B. $y = 7$

C. $6x + 2y - 19 = 0$

D. $x + 2y - 7 = 0$

Answer: A

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16. 14. A line passes through the point of intersection of the lines 100x +50y-1 = 0 and

75x+25y+ 3 = 0 and makes equal intercept on the axes. Its equation is ..

A. 25x+25y-4=0

B. 5x-5y+3=0

C. 25x+25y-4=0

D. 25x-25y+6=0

Answer: C

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17. If A, B and C are three sets such that $A \cap B = A \cap C$ and $A \cup B = A \cup C$, then

A. $A = C$

B. $B = C$

C. $A \cap B = \phi$

D. A=B

Answer: B

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18. Let $R = \{(1, 3), (4, 2), (2, 4), (2, 3), (3, 1)\}$ be a relation the set $A = \{1, 2, 3, 4\}$. The relation R is

A. a function

B. transitive

C. not symmetric

D. reflexive

Answer: C

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19. A man saves Rs. 200 in each of the first three months of his service. In each of the subsequent months his saving increases by Rs. 40 more than the saving of immediately previous month. His total saving from the start of service will be Rs. 11040 after : (1) 18months (2) 19months (3) 20months (4) 21months

A. 19 months

B. 20 months

C. 21 months

D. 18 months

Answer: C

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20. If

$$I_1 = \int_0^{\pi/2} x \sin x dx \text{ and } I_2 = \int_0^{\pi/2} x \cos x dx$$

,then which one of the following is true ?

A. $I_1 + I_2 = \frac{\pi}{2}$

B. $I_2 - I_1 = \frac{\pi}{2}$

C. $I_1 + I_2 = 0$

D. $I_1 = I_2$

Answer: A

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21. $\lim_{x \to 1} (\log ex)^{1/\log x}$ is equal to

A. e^{-1}

B. e

C. e^2

D. 0

Answer: B

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22. The function $f(x) = [x]\cos\left(\frac{2x-1}{2}\right)\pi$ where [ ] denotes the greatest integer function, is discontinuous

A. all x

B. no x

C. all integer points

D. x which is not an integer

Answer: C

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23. The derivative of $\cos^3 x$ w.r.t. $\sin^3 x$ is

A. $-\cot x$

B. cotx

C. tan x

D. $-\tan x$

Answer: A

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24. The equation of the tangent to the curve $x = 2\cos^3\theta$ and $y = 3\sin^3\theta$ at the point, $\theta = \pi/4$ is

A. $2x + 3y = 3\sqrt{2}$

B. $2x - 3y = 3\sqrt{2}$

C. $3x + 2y = 3\sqrt{2}$

D. $3x - 2y = 3\sqrt{2}$

Answer: C

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25. The maximum value of Z = 4x + 2y subject to the constraints $2x + 3y \leq 18, x + y \geq 10, x, y \geq 0$ is

A. 20

B. 36

C. 40

D. None of these

Answer: D

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26. If $f(x) = \sin x l e^x$ in $[0, \pi]$ then $f(x)$

A. satisfies Rolle's Theorem and c $= \frac{\pi}{4}$, so that $f'\left(\frac{\pi}{4}\right) = 4$

B. does not satisfy Rolle's Theorem but $f'\left(\frac{\pi}{4}\right) > 0$

C. Satisfies Rolle's Theorem and $f'\left(\frac{\pi}{4}\right) = 0$

D. satisfies Lagrange's Mean Value Theorem but $f'\left(\frac{\pi}{4}\right) \neq 0$

Answer: C

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27. Force of magnitudes 3 and 4 units acting along $6\hat{i}+2\hat{j}+3\hat{k}$ and $3\hat{j}-2\hat{j}+6\hat{k}$ respectively act on a particle and displace it from (2,2,-1) to (4,3,1) . The work done is

A. 124/7

B. 120/7

C. 125/7

D. 121/7

Answer: A

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28. The point of intersaction of the line $\frac{x-1}{2}=\frac{y-2}{-3}=\frac{z+3}{4}$ and the plane $2x=4y-z+1=0$is

A. $\left(-\frac{10}{3},\frac{3}{2},-\frac{5}{3}\right)$

B. $\left(-\frac{10}{3},-\frac{3}{2},\frac{5}{3}\right)$

C. $\left(\frac{10}{3},\frac{3}{2},-\frac{5}{3}\right)$

D. $\left(\frac{10}{3},-\frac{3}{2},\frac{5}{3}\right)$

Answer: D

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29. The equation of curve whose tangent at any point on it different form origin has slope $y + \frac{y}{x}$, is

A. $y = e^x$

B. $y = kxe^x$

C. $y = kx$

D. $y = ex^{x^2}$

Answer: B

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30. If the plane $3x - 2y - z - 18 = 0$ meets the coordinate axes in A,B,C then, the centroid of ΔABC is

A. (2,3,-6)

B. (2,-3,6)

C. (-2,-3,6)

D. (2,-3,-6)

Answer: D

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31. The locus of the point $P(x, y)$ satisfying the relation

$$\sqrt{(x-3)^2+(y-1)^2}+\sqrt{(x+3)^2+(y-1)^2}=6$$

, is

A. straight line

B. pair of straight lines

C. circle

D. ellipse

Answer: A

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32. The contrapositive of $p \Rightarrow \sim q$ is

A. $\sim p \Rightarrow q$

B. $\sim q \Rightarrow p$

C. $q \Rightarrow \sim p$

D. None of these

Answer: C

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33. The point at which the tangent to the curve $y = 2x^2 - x + 1$ is parallel to y=3x+9 will be

A. (2,1)

B. (1,2)

C. (3,9)

D. (-2,1)

Answer: B

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34. Solution of the differential equation $\frac{dy}{dx}\tan y = \sin(x+y) + \sin(x-y)$ is

A. $\sec y + 2\cos x = c$

B. $\sec y - 2\cos x = c$

C. $\cos y - 2\sin x = c$

D. $\tan y - 2\sec y = c$

Answer: A

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35. $\lim_{x \to \infty} \left(\frac{x + a}{x + b} \right)^{x + b}$ is equal to

A. 1

B. $e^{b - a}$

C. $e^{a - b}$

D. e^{b}

Answer: C

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36. If the distance of the point (1,1,1) from the origin is half its distance from the plane $x + y + z + k = 0$, then k is equal to

A. ± 3

B. ± 6

C. $-3, 9$

D. $3, \ -9$

Answer: D

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37. Forces acting on a particle have magnitude 5,3 and 1 unit and act in the direction of the vectors $6\hat{i}+2\hat{j}+3\hat{k}, 3\hat{i}-2\hat{j}+6\hat{k}$ and $2\hat{i}-3\hat{j}-6\hat{k}$, respectively . Then, remain constant while the particle is displaced from the points A(2,-1,-3) to (5,-1,1) . The work done is

A. 11 unit

B. 33 unit

C. 10 unit

D. 30 unit

Answer: B

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38. If $a^2x^4 + b^2y^4 = c^6$, then maximum value of xy is

A. $\frac{c^2}{\sqrt{ab}}$

B. $\frac{c^3}{ab}$

C. $\frac{c^3}{\sqrt{2ab}}$

D. $\frac{c^3}{2ab}$

Answer: C

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39. If $4x^2 + py^2 = 45$ and $x^2 - 4y^2 = 5$ cut orthogonally, then the value of p is

A. $\frac{1}{9}$

B. 9

C. 3

D. 18

Answer: B

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40. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 125$ then the value of $\alpha$is

A. ± 1

B. ± 2

C. ± 3

D. ± 5

Answer: C

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41. The equation of the plane passing through the intersection of $x + 2y + 3x + 4 = 0$ and $4x + 3y + 2z + 1 = 0$ and the origin $(0.0, 0)$ is

A. $3x + 2y + 2z + 1 = 0$

B. $3x + 2y + z = 0$

C. $2x + 3y + z = 0$

D. $x + y + z = 0$

Answer: B

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42. Consider an infinite geometric series with first term a and common ratio r. if the sum is 4 and the sencond term is 3/4 ,then

A. $(4/7, 3/7)$

B. $(2, 3/8)$

C. $(3/2, 1/2)$

D. $(3, 1/4)$

Answer: D

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43. The length of the transverse axis of a hyperbola, 2 cos0. the foci of the hyperbola are the same as that of the ellips `9x^(2)+16y^(2)=144. the equation of the hypperbola is

A. $\frac{x^2}{\cos^2\alpha} - \frac{y^2}{7-\cos^2\alpha} = 1$

B. $\frac{x^2}{\cos^2\alpha} - \frac{y^2}{7+\cos^2\alpha} = 1$

C. $\frac{x^2}{1+\cos^2\alpha} - \frac{y^2}{7-\cos^2\alpha} = 1$

D. $\frac{x^2}{1+\cos^2\alpha} - \frac{y^2}{7+\cos^2\alpha} = 1$

Answer: A

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44. The equation to the hyperbola having its eccentricity 2 and the distance between its foci is 8 is

A. $\frac{x^2}{12} - \frac{y^2}{4} = 1$

B. $\frac{x^2}{4} - \frac{y^2}{12} = 1$

C. $\frac{x^2}{8} - \frac{y^2}{2} = 1$

D. $\frac{x^2}{16} - \frac{y^2}{9} = 1$

Answer: B

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45. $\sin 47^\circ + \sin 61^\circ - \sin 11^\circ - \sin 25^\circ =$

A. $\sin 7^\circ$

B. $\cos 7^\circ$

C. $\sin 14^\circ$

D. None of these

Answer: C

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46. Let C be the circle with centre (0, 0) and radius 3 units. The equation of the locus of the mid

points of the chords of the circle C that subtend an angle of $\frac{2\pi}{3}$ at its center is (A) $x^2 + y^2 = \frac{3}{2}$ (B) $x^2 + y^2 = 1$ (C) $x^2 + y^2 = \frac{27}{4}$ (D) $x^2 + y^2 = \frac{9}{4}$

A. $x^2 + y^2 = 1$

B. $x^2 + y^2 = \frac{27}{2}$

C. $x^2 + y^2 = \frac{9}{4}$

D. $x^2 + y^2 = \frac{3}{2}$

Answer: C

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47. Let

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \text{ and } BA = \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}, a, b \in N$$

Then,

A. there exist more then one but finite number of B's such that AB=BA

B. there exists exactly one B such that AB=BA

C. there exists infinitely many B's such that AB=BA

D. There cannot exist any B such that AB=BA

Answer: C

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48. The position of a point in time t is given by $x = a + bt - ct^2, y = at + bt^2$. Its acceleration at time t is

A. b-c

B. b+c

C. 2b-2c

D. $2\sqrt{b^2 + C^2}$

Answer: D

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49. If $y = \left(1 + x^2\right)\tan^{-1} x - x$, then $\frac{dy}{dx}$ is equal to

A. $\tan^{-1} x$

B. $2x \tan^{-1} x$

C. $2x \tan^{-1} x - 1$

D. $\frac{2x}{\tan^{-1} x}$

Answer: B

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