MATHS

BOOKS - BITSAT GUIDE

QUESTION-PAPERS-2014

Mathematics

1. The set $(A - B) \cup (B - A)$ is equal to

A. $[A - (A \cap B] \cap [B - (A \cap B)]$

B. $(A \cup B) - (A \cap B)$

C. $A - (A \cap B)$

D. $\overline{A \cap B} - A \cup B$

Answer: B

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2. The domain of definition of $f(x) = \log_2\left(- \log_{1/2}\left(1 + \frac{1}{x^{1/4}}\right) - 1\right)$ is :

A. $(0, 1)$

B. $(0, 1]$

C. $[1, \infty)$

D. $(1, \infty)$

Answer: A

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3. $\cos^2\left(\frac{\pi}{6}+\theta\right)-\sin^2\left(\frac{\pi}{6}-\theta\right)=$

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

B. 0

C. $-\frac{1}{2}\cos 2\theta$

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

Answer: A

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4. The solution of (2 cos x – 1) (3 + 2 cos x) = 0 in the interval $0 \leq x \leq 2\pi$ is

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

B. $\frac{\pi}{3}, \frac{5\pi}{3}$

C. $\frac{\pi}{3}, \frac{5\pi}{3}, \cos^{-1}\left(-\frac{3}{2}\right)$

D. none of these

Answer: B

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5. $2^{3n} - 7n - 1$ is divisible by

A. 64

B. 36

C. 49

D. 25

Answer: C

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6. The greatest positive integer, which divides n(n+1)(n+2)(n+3) for all $n \in N$, is

A. 2

B. 6

C. 24

D. 120

Answer: C

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7. $z = x + iy, z^{\frac{1}{3}} = a - ib, \frac{x}{a} - \frac{y}{b} = k\left(a^2 - b^2\right)$ then k is :

A. 1

B. 2

C. 3

D. 4

Answer: D

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8. $i^{57} + 1/i^{125}$, when simplified has the value

A. 0

B. 2i

C. $-2i$

D. 2

Answer: A

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9. The complex number z =x+iy which satisfies the equation $\left|\frac{z-3i}{z+3i}\right| = 1$, then on

A. the X-axis

B. the straight line y = 3

C. a circle passing through origin

D. None of the above

Answer: A

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10. The number of all three elements subsets of the set $\{a_1, a_2, a_3 \ldots . a_n\}$ which contain a_3 is

A. ${}^{n}C_{3}$

B. ${}^{n-1}C_{3}$

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

D. none of these

Answer: C

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11. In how many ways can a committee of 5 made out 6 men and 4 women containing atleast one woman?

A. 246

B. 222

C. 186

D. none of these

Answer: A

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12. Find the coefficient of x^4 in the expansion of $\left(1+x+x^2+x^3\right)^{11}$.

A. 440

B. 770

C. 990

D. 1001

Answer: C

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13. If $t_0, t_1, t_2, \ldots, t_n$ are the terms in the expansion of $(x+a)^n$ then prove that $(t_0 - t_2 + t_4 - \ldots)^2 + (t_1 - t_3 + t_5 - \ldots)^2 = (x^2 + a^2)^n$.

A. $(x^2 + a^2)$

B. $(x^2 + a^2)^n$

C. $(x^2 + a^2)^{1/n}$

D. $(x^2 + a^2)^{-1/n}$

Answer: B

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14. If the $(2p)^{th}$ term of a H.P. is q and the $(2q)^{th}$ term is p, then the $2(p+q)^{th}$ term is-

A. $\frac{pq}{2(P+q)}$

B. $\frac{2pq}{p+q}$

C. $\frac{pq}{p+q}$

D. $\frac{p+q}{pq}$

Answer:

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15. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P., the $\left(\frac{1}{a}+\frac{1}{b}-\frac{1}{c}\right)\left(\frac{1}{b}+\frac{1}{c}-\frac{1}{a}\right)$ is equal to

A. $\frac{4}{ac}-\frac{3}{b^2}$

B. $\frac{b^2-ac}{a^2b^2c^2}$

C. $\frac{4}{ac}-\frac{1}{b^2}$

D. none of these

Answer: A

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16. The product of n positive numbers is unity. Then their sum is:

A. a positive integer

B. divisible by n

C. equal to $n + \frac{1}{n}$

D. never less than n

Answer: D

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17. If p_1 and p_2 are the lengths of the perpendicular form the orgin to the line

$x \sec\theta + y \operatorname{cosec}\theta = a$ and $x\cos\theta - y\sin\theta = a\cos 2\theta$

respectively then prove that $4p_1^2 + p_2^2 = a^2$

A. a^2

B. $2a^2$

C. $a^2/2$

D. $3a^2$

Answer: A

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18. The angle of intersection of the two circles $x^2 + y^2 - 2x - 2y = 0$ and $x^2 + y^2 = 4$, is

A. 30°

B. 60°

C. 90°

D. 45°

Answer: D

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19. In a model, it is shown that an arc of a bridge in semi-elliptical with major axis horizontal. If the length of the base is 9 m and the highest part of the bridge is 3 m from the horizontal, the best approximation of the height of the arch at 2 m from the centre of the base is

A. 11/4m

B. 8/3m

C. 7/2m

D. 2m

Answer: B

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20. $\lim_{x \to 0} (\cos ecx)^{1/\log x}$ is equal to

A. 0

B. 1

C. 1/e

D. none of these

Answer: C

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21. If M. D. is 12, the value of S.D. will be

A. 15

B. 12

C. 24

D. none of these

Answer: A

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22. A bag contains 5 brown and 4 white socks. A man pulls out 2 socks. Find the probability that they are of the same colour.

A. $\frac{4}{9}$

B. $\frac{2}{9}$

C. $\frac{5}{9}$

D. $\frac{7}{9}$

Answer: A

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23. Let R= {(3, 3),(6,6), (9,9), (12, 12),(6, 12),(3,9), (3, 12), (3, 6)} be a relation on the set A={3,6,9,12}. The relation is:

A. an equivalence relation

B. reflexive and symmetric

C. reflexive and transitive

D. only reflexive

Answer: C

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24. Let f : R - {n} $\rightarrow$ R be a function defined by $f(x) = \frac{x - m}{x - n}$, where $m \neq n$. Then,

A. f is one-one onto

B. f is one-one into

C. f is many-one onto

D. f is many-one into

Answer: B

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25. The value of $\tan\left(2\tan^{-1}\frac{1}{5}-\frac{\pi}{4}\right)$ is

A. $-1/3$

B. $-7/17$

C. $-1/2$

D. $-1/4$

Answer: B

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26. If $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is to be square root of the two rowed unit matrix, then α, β and γ satisfy the relation

A. $1 + \alpha^2 + \beta\gamma = 0$

B. $1 + \alpha^2 - \beta\gamma = 0$ s

C. $1 - \alpha^2 + \beta\gamma = 0$

D. $1 - \alpha^2 - \beta\gamma = 0$

Answer: D

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27. Find the value of λ , if the line $3x - 4y - 13 = 0, 8x - 11y - 33 = 0 and 2x - 3y + \lambda = 0$ are concurrent.

A. -1

B. -7

C. $\frac{1}{7}$

D. 9

Answer: B

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Let $f(x) = \begin{cases} (x-1)\sin\dfrac{1}{x-1} & \text{if } x \neq 1 \\ 0 & \text{if } x = 1 \end{cases}$

28.

Then which one of the following is true?

A. f is differentiable at x = 0 and x =1

B. f is differentiable at x = 0 but not at x = 1

C. f is differentiable at x = 1 but not at x = 0

D. f is neither differentiable at x = 0 nor at x =1

Answer: B

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29. The interval in which the function $2x^3 + 15$ increases less rapidly than the function $9x^2 - 12x,$ is –

A. $(-\infty, 1)$

B. $(1, 2)$

C. $(2, \infty)$

D. none of these

Answer: B

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30. The fuel charges for running a train are proportional to the square of the speed generated in miles per hour

and costs 48 per hour at 16 miles per hour. The most economical speed if the fixed charges i.e. salaries etc. amount to 300 per hour is

A. 10

B. 20

C. 30

D. 40

Answer: D

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31. Evaluate: $\int \frac{1}{1+3\sin^2 x+8\cos^2 x}dx$

A. $\frac{1}{6}\tan^{-1}(2\tan x)+C$

B. $\tan^{-1}(2\tan x)+C$

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

D. $\frac{1}{6}\tan^{-1}\left(\frac{2\tan x}{3}\right)+C$

Answer: C

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32. $\int_0^{10}\frac{x^{10}}{(10-x)^{10}+x^{10}}$ dx is equal to

A. 10

B. 5

C. 2

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

Answer: B

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33. The area bounded by the x-axis, the curve y=f(x) and the lines x =1, x =b, is equal to $\sqrt{b^2+1}-\sqrt{2}$ for all $b>1$, then f(x) is

A. $\sqrt{x-1}$

B. $\sqrt{x-1}$

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

D. $\frac{x}{\sqrt{1+x^2}}$

Answer: D

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34. Solution of differential equation

$$x^2 = 1 + \left(\frac{x}{y}\right)^{-1}\frac{dy}{dx} + \frac{\left(\frac{x}{y}\right)^{-2}\left(\frac{dy}{dx}\right)^2}{2!} + \frac{\left(\frac{x}{y}\right)^{-3}\left(\frac{dy}{dx}\right)^3}{3!} + \ldots$$

A. $y^2 = x^2\left(\ln^2 - 1\right) + C$

B. $y = x^2(\ln x - 1) + C$

C. $y^2 = x(\ln x - 1) + C$

D. $y = x^2 e^{x^2} + C$

Answer: A

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35. If the middle points of sides BC, CA and AB of triangle ABC are respectively D,E ,F then position vector of centre of triangle DEF, when position vector of A, B , C are respectively $\hat{i}+\hat{j}, \hat{j}+\hat{k}, \hat{k}+\hat{i}$ is

A. $\frac{1}{3}\left(\hat{i}+\hat{j}+\hat{k}\right)$

B. $\left(\hat{i}+\hat{j}+\hat{k}\right)$

C. $2\left(\hat{i}+\hat{j}+\hat{k}\right)$

D. $\frac{2}{3}\left(\hat{i}+\hat{j}+\hat{k}\right)$

Answer: D

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36. Find the angel between any two diagonals of a cube.

A. 45°

B. 60°

C. 30°

D. $\cos^{-1}\left(\frac{1}{3}\right)$

Answer: D

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37. Find the angle between the line $\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$ and the plane

$10x + 2y - 11z = 3.$

A. $\sin^{-1}\left(\frac{8}{21}\right)$

B. $\sin^{-1}\left(\frac{5}{21}\right)$

C. $\sin^{-1}\left(\frac{7}{21}\right)$

D. $\sin^{-1}\left(\frac{1}{21}\right)$

Answer: A

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38. The equation of the right bisector plane of the segment joining (2, 3, 4) and (6, 7, 8) is

A. x + y + z + 15 = 0

B. $x + y + z - 15 = 0$

C. $x - y + z - 15 = 0$

D. None of these

Answer: B

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39. A bag contains $n + 1$ coins. If is known that one of these coins shows heads on both sides, whereas the other coins are fair. One coin is selected at random and tossed. If the probability that toss results in heads is 7/12, then find the value of n.

A. 3

B. 4

C. 5

D. none of these

Answer: C

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40. A coin is tossed 7 times.Each time a man calls head.The probability that he wins the toss on more occasions is

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

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

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

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

Answer: B

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41. Consider $\frac{x}{2}+\frac{y}{4} \geq 1$ and $\frac{x}{3}+\frac{y}{2} \leq 1, x, y \geq 0$ number of possible solutions are :

A. zero

B. unique

C. infinite

D. none of these

Answer: C

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42. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$,then A^{100} is equal to

A. $2^{100}A$

B. $2^{99}A$

C. $2^{101}A$

D. None of the above

Answer: B

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43. If $\begin{vmatrix} p & q-y & r-z \\ p-x & q & r-z \\ p-x & q-y & r \end{vmatrix} = 0$ then the value of $\frac{p}{x}+\frac{q}{y}+\frac{r}{z}$ is

A. 0

B. 1

C. 2

D. 4pqr

Answer: C

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44. Through the vertex O of a parabola $y^2 = 4x$ chords OP and OQ are drawn at right angles to one-another. Then for all positions of P, PQ cuts the axis of the parabola at a fixed point and the locus of the middle point of PQ is

A. $y^2 = 2x + 8$

B. $y^2 = x + 8$

C. $y^2 = 2x - 8$

D. $y^2 = x - 8$

Answer: C

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45.

$$\text{Let } f(x) = \begin{cases} \dfrac{1-\sin^3 x}{3\cos^2 x}, & x < \dfrac{\pi}{2} \\ p, & x = \dfrac{\pi}{2} \\ \dfrac{q(1-\sin x)}{(\pi-2x)^2}, & x > \dfrac{\pi}{2} \end{cases}$$

If f(x) is continous at $x = \frac{\pi}{2}$, $(p, q) =$

A. $(1, 4)$

B. $\left(\frac{1}{2}, 0\right)$

C. $\left(\frac{1}{2}, 4\right)$

D. none of these

Answer: C

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