MATHS

BOOKS - BITSAT GUIDE

QUESTION-PAPERS-2017

Mathematics

1. Let f g be functions from R to R defined as

$$f(x)=\begin{cases}7x^2+x-8, x\leq 1\\ 4x+5, 1<x\leq 7\\ 78x+3, x>7\end{cases}, g(x)=\begin{cases}|x|, x<-3\\ 0, -3\leq x<2\\ x^2+4, x\geq 2\end{cases}$$ Then

A. $(fog)(-3)=8$

B. $(fog)(9)=683$

C. $(gof)(0)=-8$

D. $(\text{gof})\ (6) = 427$

Answer: B

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2. How many different nine digit numbers can be formed from the number 223355888 by rearranging its digits so that the odd digits occupy even positions?

A. 16

B. 36

C. 60

D. 180

Answer: C

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3. If $\sum_{k=1}^{n} k(k+1)(k-1) = pn^4 + qn^3 + tn^2 + sn,$ where p, q, t and s are constants, then the value of s is equal to

A. $-\frac{1}{4}$

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

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

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

Answer: B

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4. the length of the latusrectum of an ellipse is one thrid of its major axis , its eccentricity would be

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

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

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

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

Answer: C

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5. If α and β are the roots of the equation $x^2 + px + \frac{3p}{4} = 0$ such that $|\alpha - \beta| = \sqrt{10}$ then p belongs to the set

A. $\{2, -5\}$

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

C. $\{-2, 5\}$

D. $\{3, -5\}$

Answer: C

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6. Equation of the straight line which belongs to the system of straight lines $a(2x+y-3)+b(3x+2y-5)=0$ and is farthest from the pint $(4,\ -3)$ is

A. $4x+11y-15=0$

B. $7x+y-8=0$

C. $4x+3y-7=0$

D. $3x-4y+1=0$

Answer: D

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7. One mapping is selected at random from all mappings of the set $S=\{1,2,3,n\}$ into itself. If the probability that the mapping is one-one is 3/32, then the value of n is 2 b. 3 c. 4 d. none of these

A. 3

B. 4

C. 5

D. 6

Answer: B

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8. Prove by induction that the integer next greater than $\left(3+\sqrt{5}\right)^n$ is divisible by 2^n for all $n \in N$.

A. 2^{n-1}

B. 2^{n+1}

C. 2^{n+2}

D. Not divisible by 2

Answer: B

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9. The domain of the function $f(x) = \sin^{-1}\left\{\log_2\left(\frac{1}{2}x^2\right)\right\} is$

A. $[-2, 1) \cup [1, 2]$

B. $(-2, 1] \cup [1, 2]$

C. $[-2, -1] \cup [1, 2]$

D. $(-2, -1) \cup (1, 2)$

Answer: C

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10. The marks obtained by 60 students in a certain test are given below :

Marks	No. of students	Marks	No. of students
10 - 20	2	60 - 70	12
20 - 30	3	70 - 80	14
30 - 40	4	80 - 90	10
40 - 50	5	90 - 100	4
50 - 60	6		

Median of the above data is

A. 68.33

B. 70

C. 68.11

D. None of these

Answer: A

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11. Given that e^{iA}, e^{iB}, e^{iC} are in A.P., where A, B, C are angles of a triangle then the triangle is

A. right angled

B. isosceles

C. equilateral

D. None of these

Answer: D

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12. An observer on the top of a tree ,finds the angle of depression of a car moving towards the tree to be 30° .After 3 minutes this angle becomes 60°.After how much more time , the car will reach the tree ?

A. 4 min

B. 4.5 min

C. 1.5 min

D. 2 min

Answer:

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13. After striking a floor a certain ball rebounds $\left(\frac{4}{5}\right)^{th}$ of the height from which it has fallen. Find the total distance that it travels before coming to rest, if it is gently dropped from a height of $120 metres$.

A. 960 m

B. 1000 m

C. 1080 m

D. Infinite

Answer: B

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14. An equilateral triangle is inscribed in the circle $x^2 + y^2 = a^2$ with one of the vertices at (a,0). What is the equation of the side opposite to this vertex ?

A. $2x - a = 0$

B. $x + a = 0$

C. $2x + a = 0$

D. $3x - 2a = 0$

Answer:

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15. The function $f(x) = x - |x - x^2|, \ -1 \leq x \leq 1$ is continuous on the interval

A. $[-1, 1]$

B. $(-1, 1)$

C. $\{-1, 1] - \{0\}$

D. $(-1, 1) - \{0\}$

Answer: D

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16. If $\frac{4^n}{n+1} < \frac{(2n)!}{(n!)^2}$, then P(n) is true for

A. $n \geq 1$

B. $n > 0$

C. $n < 0$

D. $n \geq 2$

Answer: D

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17. If a system of equation $-ax + y + z = 0$

$x - by + z = 0$

$x + y - cz = 0 (a, b, c \neq -1)$ has a non-zero solution then $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c} =$

A. 0

B. 1

C. 2

D. 3

Answer: A

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18. If $f(x) = x^x$, then f (x) is increasing in interval :

A. $[0, e]$

B. $\left[0, \frac{1}{e}\right]$

C. $[0, 1]$

D. None of these

Answer:

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19. If x is real number, then $\frac{x}{x^2 - 5x + 9}$ must lies between

A. $\frac{1}{11}$ and 1

B. -1 and $\frac{1}{11}$

C. -11 and 1

D. $-\frac{1}{11}$ and 1

Answer:

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20. Evaluate: $\lim_{x \to \infty} \left\{ \frac{(a_1)^{\frac{1}{x}} + (a_2)^{\frac{1}{x}} + ... + (a_n)^{\frac{1}{x}}}{n} \right\}^{nx}$

A. $a_1 + a_2 + ... + a_n$

B. $e^{a_1 + a_2 + ... a_n}$

C. $\frac{a_1 + a_2 + ... + a_n}{n}$

D. $a_1 a_2 a_3 ..... a_n$

Answer:

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21. The value of $\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18$ is

A. π

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

C. $\cot^{-1} 5$

D. $\cot^{-1} 3$

Answer: B

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22. If $\int \frac{\cos x - 1}{\sin x + 1} e^x$ dx is equal to :

A. $\frac{e^x \cos x}{1+\sin x}$

B. $C - \frac{e^x \sin x}{1+\sin x}$

C. $C - \frac{e^x}{1+\sin x}$

D. $C - \frac{e^x \cos x}{1+\sin x}$

Answer: D

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23. A random variable X has the probability distribution

X	1	2	3	4	5	6	7	8
p(X)	0.15	0.23	0.12	0.10	0.20	0.08	0.07	0.05

For the events E = { X is prime number} and $F = \{x < 4\}$ then $P(E \cup F)$ is

A. 0.50

B. 0.77

C. 0.35

D. 0.87

Answer: C

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24. The number of roots of equation $\cos x + \cos 2x + \cos 3x = 0$ is $(0 \leq x \leq 2\pi)$

A. 4

B. 5

C. 6

D. 8

Answer: A

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25. The area under the curve $y = |\cos x - \sin x|, 0 \leq c \leq \frac{\pi}{2},$ and above x-axis is :

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

B. $2\sqrt{2} - 2$

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

D. 0

Answer: D

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26. If $f(x) = \begin{cases} \frac{x \log \cos x}{\log(1+x^2)}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ then f(x) is

A. continuous as well as differentiable at x = 0

B. continuous but not differentiable at x = 0

C. continuous but not differentiable at x = 0

D. neither continuous nor differentiable a x =0

Answer: C

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27. The maximum value of z = 3x + 2y subject to $x + 2y \geq 2, x + 2y < 8, x, y \geq 0$ is :

A. 32

B. 24

C. 40

D. None of these

Answer: B

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28. A cylindrical gas container is closed at the top and open at the bottom. If the iron plate of the top is 5/4 times as thick as the plate forming the cylindrical sides, the ratio of the radius to the height of the cylinder using minimum material for the same capacity is 3:4 (b) 5:6 (c) 4:5 (d) none of these

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

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

C. $\frac{4}{5}$

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

Answer: A

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29. Let A, B , C be finite sets. Suppose that n $(A) = 10, n(B) = 15, n(C) = 20, n(A \cap B) = 8$ and $n(B \cap C) = 9.$ Then the possible value of a $(A \cup B \cup C)$ is

A. 26

B. 27

C. 28

D. Any of the three values 26, 27, 28 is possible

Answer: C

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30. If $f(z) = \frac{7 - z}{1 - z^2}$, where $z = 1 + 2i$, then $|f(z)|$ is

A. $\frac{|z|}{2}$

B. $|z|$

C. $2|z|$

D. None of these

Answer: D

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31. If $f(x) = \cos^{-1}\left[\frac{1-(\log x)^2}{1+(\log x)^2}\right]$, then the value of $f'(e)$ is equal to.....

A. 1

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

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

D. $\frac{2}{e^2}$

Answer: C

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32. Statement 1 : A five digit number divisible by 3 is to be formed using the digits 0, 1, 2, 3, 4 and 5 with repetition. The total number formed are 216.

Statement 2 : If sum of digits of any number is divisible by 3 then the number must be divisible by 3

A. Statement-1 is true, Statement-2 is true, Statement-2 is a correct explanation for Statement -1

B. Statement -1 is true, Statement-2 is true , Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is true, Statement-2 is false

D. Statement-1 is true, Statement-2 is false

Answer: C

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33. The equation of one of the common tangent to the parabola $y^2 = 8x$ and $x^2 + y^2 - 12x + 4 = 0$ is

A. $y = 0x + 2$

B. $y = x - 2$

C. $y = x + 2$

D. None of these

Answer: C

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34. The matrix R(t) is defined by $R(t) = \begin{bmatrix} \cos t & \sin t \\ -\sin t & \cos t \end{bmatrix}$. Show that $R(s)R(t) = R(s+t)$.

A. $R(s+t)$

B. $R(s-t)$

C. $R(s) + R(t)$

D. None of these

Answer: C

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35. If

$$= \int x \log\left(1 + \frac{1}{x}\right) dx = f(x)\log(x+1) + g(x)x^2 + Lx + C,$$

then

A. $f(x) = \frac{1}{2}x^2$

B. $g(x) = \log x$

C. $L = 1$

D. None of these

Answer: C

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36. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be non coplanar unit vectors equally inclined to one another at an acute angle θ. Then $\left|\left[\vec{a}\ \vec{b}\ \vec{c}\right]\right|$ in terms of θ is equal to

A. $(1+\cos\theta)\sqrt{\cos 2\theta}$

B. $(1+\cos\theta)\sqrt{1-2\cos\theta}$

C. $(1-\cos\theta)\sqrt{1+2\cos\theta}$

D. None of these

Answer: A

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37. $2^{1/4}.4^{1/8}.8^{1/16}.16^{1/32}\ldots$ is equal to

A. 1

B. 2

C. $3/2$

D. $5/2$

Answer: B

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38. If $\sum_{r=0}^{n}(-1)^r \frac{{}^nC_r}{{}^{r+3}C_r} = \frac{3}{a+3}$, then a - n is equal to

A. 0

B. 1

C. 2

D. None of these

Answer: C

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39. 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: D

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40. . An urn contains five balls. Two balls are drawn and found to be white. The probability that all the balls are white is

A. $\frac{1}{10}$

B. $\frac{3}{10}$

C. $\frac{3}{5}$

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

Answer: A

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41. The ratio in which the joining of $(2, 1, 5)$ and $(3, 4, 3)$ is divded by the plane $(x + y - z) = \frac{1}{2}$ is :

A. $3:5$

B. $5:7$

C. $1:3$

D. $4:5$

Answer: B

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42. $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}} dx =$

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

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

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

D. None of these

Answer: C

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43. The dot product of a vector with the vectors $\hat{i}+\hat{j}-3\hat{k}, \hat{i}+3\hat{j}-2\hat{k}$ and $2\hat{i}+\hat{j}+4\hat{k} are 0, 5$ and 8

respectively. The vector is

A. $\hat{i} + 2\hat{j} + \hat{k}$

B. $-\hat{i} + 3\hat{j} - 2\hat{k}$

C. $\hat{i} + 2\hat{j} + 3\hat{k}$

D. $\hat{i} - 3\hat{j} - 3\hat{k}$

Answer: A

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44. The angle between the lines whose intercepts on the axes are a, –b and b, –a respectively , is

A. $\tan^{-1}\frac{a^2 - b^2}{ab}$

B. $\tan^{-1}\frac{b^2 - a^2}{2}$

C. $\tan^{-1}\frac{b^2 - a^2}{2ab}$

D. None of these

Answer: C

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45. If the line through the points $A(k, 1, -1)$ and $B(2k, 0, 2)$ is perpendicular to the line through the points B and $C(2 + 2k, k, 1)$, then what is the value of k?

A. -1

B. 1

C. -3

D. 3

Answer: D

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