1.Sets, RelationsandFunctions

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Choose the correct or the most suitable answer.

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?

(1) $R = \{(0,0), (0,-1), (0,1), (-1,0), (-1,1), (1,2), (1,0)\}$
(2) $R^{-1} = \{(0,0), (0,-1), (0,1), (-1,0), (1,0)\}$
(3) Domain of R is $\{0, -1, 1, 2\}$
(4) Range of R is $\{0, -1, 1\}$

2.

Let R be the universal relation on a set X with more than one element. Then R is

(1) not reflexive (2) not symmetric (3) transitive (4) none of the above

3.

The number of constant functions from a set containing m elements to a set containing n elements is

(1) mn (2) m (3) n (4) $m + n$

4.

The range of the function $\frac{1}{1-2\sin x}$ is

(1) $(-\infty, -1) \cup (\frac{1}{3}, \infty)$ (2) $(-1, \frac{1}{3})$ (3) $[-1, \frac{1}{3}]$ (4) $(-\infty, -1] \cup [\frac{1}{3}, \infty)$.

5.

For non-empty sets A and B, if $A \subset B$ then $(A \times B) \cap (B \times A)$ is equal to

(1) $A \cap B$ (2) $A \times A$ (3) $B \times B$ (4) none of these.

6.

The range of the function $f(x) = |\lfloor x \rfloor - x|, x \in \mathbb{R}$ is

(1) $[0, 1]$ (2) $[0, \infty)$ (3) $[0, 1)$ (4) $(0, 1)$

7.

If $n(A) = 2$ and $n(B \cup C) = 3$, then $n[(A \times B) \cup (A \times C)]$ is

(1) 2^3 (2) 3^2 (3) 6 (4) 5

8.

The number of relations on a set containing 3 elements is

(1) 9 (2) 81 (3) 512 (4) 1024

9.

If $n((A \times B) \cap (A \times C)) = 8$ and $n(B \cap C) = 2$, then $n(A)$ is

(1) 6 (2) 4 (3) 8 (4) 16

10.

Let $X = \{1, 2, 3, 4\}$ and $R = \{(1,1), (1,2), (1,3), (2,2), (3,3), (2,1), (3,1), (1,4), (4,1)\}$. Then R is

(1) reflexive (2) symmetric (3) transitive (4) equivalence

11.

If two sets A and B have 17 elements in common, then the number of elements common to the set $A \times B$ and $B \times A$ is

(1) 2^{17} (2) 17^2 (3) 34 (4) insufficient data

12.

The number of students who take both the subjects Mathematics and Chemistry is 70. This represents 10% of the enrollment in Mathematics and 14% of the enrollment in Chemistry. The number of students take at least one of these two subjects, is

(1) 1120 (2) 1130 (3) 1100 (4) insufficient data

13.

If $f(x) = |x-2| + |x+2|, x \in \mathbb{R}$, then

(1) $f(x) = \begin{cases} -2x & \text{if} \quad x \in (-\infty, -2] \\ 4 & \text{if} \quad x \in (-2, 2] \\ 2x & \text{if} \quad x \in (2, \infty) \end{cases}$

(2) $f(x) = \begin{cases} 2x & \text{if} \quad x \in (-\infty, -2] \\ 4x & \text{if} \quad x \in (-2, 2] \\ -2x & \text{if} \quad x \in (2, \infty) \end{cases}$

(3) $f(x) = \begin{cases} -2x & \text{if} \quad x \in (-\infty, -2] \\ -4x & \text{if} \quad x \in (-2, 2] \\ 2x & \text{if} \quad x \in (2, \infty) \end{cases}$

(4) $f(x) = \begin{cases} -2x & \text{if} \quad x \in (-\infty, -2] \\ 2x & \text{if} \quad x \in (-2, 2] \\ 2x & \text{if} \quad x \in (2, \infty) \end{cases}$

14.

If $A = \{(x,y) : y = e^x, x \in R\}$ and $B = \{(x,y) : y = e^{-x}, x \in R\}$ then $n(A \cap B)$ is

(1) Infinity (2) 0 (3) 1 (4) 2

15.

Let $\mathbb{R}$ be the set of all real numbers. Consider the following subsets of the plane $\mathbb{R} \times \mathbb{R}$:

$S = \{(x,y) : y = x + 1 \text{ and } 0 < x < 2\}$ and $T = \{(x,y) : x - y \text{ is an integer }\}$

Then which of the following is true?

(1) T is an equivalence relation but S is not an equivalence relation.
(2) Neither S nor T is an equivalence relation
(3) Both S and T are equivalence relation
(4) S is an equivalence relation but T is not an equivalence relation.

16.

Let A and B be subsets of the universal set $\mathbb{N}$, the set of natural numbers. Then $A' \cup [(A \cap B) \cup B']$ is

(1) A (2) A' (3) B (4) $\mathbb{N}$

17.

If $A = \{(x,y) : y = \sin x, x \in R\}$ and $B = \{(x,y) : y = \cos x, x \in R\}$ then $A \cap B$ contains

(1) no element (2) infinitely many elements
(3) only one element (4) cannot be determined.

18.

The rule $f(x) = x^2$ is a bijection if the domain and the co-domain are given by

(1) $\mathbb{R}, \mathbb{R}$ (2) $\mathbb{R}, (0, \infty)$ (3) $(0, \infty), \mathbb{R}$ (4) $[0, \infty), [0, \infty)$

19.

Let $X = \{1, 2, 3, 4\}, Y = \{a, b, c, d\}$ and $f = \{(1, a), (4, b), (2, c), (3, d), (2, d)\}$. Then f is

(1) an one-to-one function (2) an onto function
(3) a function which is not one-to-one (4) not a function

20.

The function $f : [0, 2\pi] \to [-1, 1]$ defined by $f(x) = \sin x$ is

(1) one-to-one (2) onto (3) bijection (4) cannot be defined

21.

Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = 1 - |x|$. Then the range of f is

(1) $\mathbb{R}$ (2) $(1, \infty)$ (3) $(-1, \infty)$ (4) $(-\infty, 1]$

22.

The function $f : \mathbb{R} \to \mathbb{R}$ is defined by

$$f(x) = \frac{(x^2 + \cos x)(1 + x^4)}{(x - \sin x)(2x - x^3)} + e^{-|x|}$$

is (1) an odd function (2) neither an odd function nor an even function
(3) an even function (4) both odd function and even function.

23

The inverse of $f(x) = \begin{cases} x & \text{if } x < 1 \\ x^2 & \text{if } 1 \le x \le 4 \\ 8\sqrt{x} & \text{if } x > 4 \end{cases}$ is

(1) $f^{-1}(x) = \begin{cases} x & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \le x \le 16 \\ \frac{x^2}{64} & \text{if } x > 16 \end{cases}$

(2) $f^{-1}(x) = \begin{cases} -x & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \le x \le 16 \\ \frac{x^2}{64} & \text{if } x > 16 \end{cases}$

(3) $f^{-1}(x) = \begin{cases} x^2 & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \le x \le 16 \\ \frac{x^2}{64} & \text{if } x > 16 \end{cases}$

(4) $f^{-1}(x) = \begin{cases} 2x & \text{if } x < 1 \\ \sqrt{x} & \text{if } 1 \le x \le 16 \\ \frac{x^2}{8} & \text{if } x > 16 \end{cases}$

24.

If the function $f : [-3, 3] \to S$ defined by $f(x) = x^2$ is onto, then S is

(1) $[-9, 9]$ (2) $\mathbb{R}$ (3) $[-3, 3]$ (4) $[0, 9]$

25.

The function $f : \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = \sin x + \cos x$ is

(1) an odd function
(2) neither an odd function nor an even function
(3) an even function
(4) both odd function and even function.

2Basic Algebra

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Choose the correct or the most suitable answer.

1.

If $|x+2| \leq 9$, then x belongs to

(1) $(-\infty, -7)$ (2) $[-11, 7]$ (3) $(-\infty, -7) \cup [11, \infty)$ (4) $(-11, 7)$

2.

The value of $\log_a b \log_b c \log_c a$ is

(1) 2 (2) 1 (3) 3 (4) 4

3.

Find a so that the sum and product of the roots of the equation $2x^2 + (a-3)x + 3a - 5 = 0$ are equal is

(1) 1 (2) 2 (3) 0 (4) 4

4.

The solution set of the following inequality $|x-1| \geq |x-3|$ is

(1) $[0, 2]$ (2) $[2, \infty)$ (3) $(0, 2)$ (4) $(-\infty, 2)$

5.

Given that x, y and b are real numbers $x < y, b > 0$, then

(1) $xb < yb$ (2) $xb > yb$ (3) $xb \leq yb$ (4) $\frac{x}{b} \geq \frac{y}{b}$

6.

If $\log_{\sqrt{x}} 0.25 = 4$, then the value of x is

(1) 0.5 (2) 2.5 (3) 1.5 (4) 1.25

7.

The equation whose roots are numerically equal but opposite in sign to the roots of $3x^2 - 5x - 7 = 0$ is

(1) $3x^2 - 5x - 7 = 0$ (2) $3x^2 + 5x - 7 = 0$ (3) $3x^2 - 5x + 7 = 0$ (4) $3x^2 + x - 7$

8.

If $\dfrac{|x-2|}{x-2} \geq 0$, then x belongs to

(1) $[2, \infty)$ (2) $(2, \infty)$ (3) $(-\infty, 2)$ (4) $(-2, \infty)$

9.

If 3 is the logarithm of 343, then the base is

(1) 5 (2) 7 (3) 6 (4) 9

10

The number of solutions of $x^2 + |x-1| = 1$ is

(1) 1 (2) 0 (3) 2 (4) 3

11.

The solution of $5x - 1 < 24$ and $5x + 1 > -24$ is

(1) $(4, 5)$ (2) $(-5, -4)$ (3) $(-5, 5)$ (4) $(-5, 4)$

12.

The value of $\log_3 11 \cdot \log_{11} 13 \cdot \log_{13} 15 \cdot \log_{15} 27 \cdot \log_{27} 81$ is

(1) 1 (2) 2 (3) 3 (4) 4

13.

If $\dfrac{kx}{(x+2)(x-1)} = \dfrac{2}{x+2} + \dfrac{1}{x-1}$, then the value of k is

(1) 1 (2) 2 (3) 3 (4) 4

14.

If a and b are the roots of the equation $x^2 - kx + 16 = 0$ and satisfy $a^2 + b^2 = 32$, then the value of k is

(1) 10 (2) -8 (3) $-8, 8$ (4) 6

15.

If 8 and 2 are the roots of $x^2 + ax + c = 0$ and $3, 3$ are the roots of $x^2 + dx + b = 0$, then the roots of the equation $x^2 + ax + b = 0$ are

(1) $1, 2$ (2) $-1, 1$ (3) $9, 1$ (4) $-1, 2$

16.

The number of roots of $(x+3)^4 + (x+5)^4 = 16$ is

(1) 4 (2) 2 (3) 3 (4) 0

17.

If a and b are the real roots of the equation $x^2 - kx + c = 0$, then the distance between the points $(a, 0)$ and $(b, 0)$ is

(1) $\sqrt{k^2 - 4c}$ (2) $\sqrt{4k^2 - c}$ (3) $\sqrt{4c - k^2}$ (4) $\sqrt{k - 8c}$

18.

The value of $\log_{\sqrt{2}} 512$ is

(1) 16 (2) 18 (3) 9 (4) 12

19.

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

(1) $\frac{-1}{2}$ (2) $\frac{-2}{3}$ (3) $\frac{1}{2}$ (4) $\frac{2}{3}$

20.`

The value of $\log_3 \frac{1}{81}$ is

(1) -2 (2) -8 (3) -4 (4) -9

3.Trigonometry

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Choose the correct or the most suitable answer.

1.
$\dfrac{\sin(A-B)}{\cos A\cos B}+\dfrac{\sin(B-C)}{\cos B\cos C}+\dfrac{\sin(C-A)}{\cos C\cos A}$ is

(1) $\sin A+\sin B+\sin C$ (2) 1 (3) 0 (4) $\cos A+\cos B+\cos C$

2.
The triangle of maximum area with constant perimeter $12m$

(1) is an equilateral triangle with side $4m$ (2) is an isosceles triangle with sides $2m, 5m, 5m$
(3) is a triangle with sides $3m, 4m, 5m$ (4) Does not exist.

3.
$\cos 1^\circ+\cos 2^\circ+\cos 3^\circ+\ldots+\cos 179^\circ=$

(1) 0 (2) 1 (3) -1 (4) 89

4.
If $\cos p\theta+\cos q\theta=0$ and if $p\neq q$, then θ is equal to (n is any integer)

(1) $\dfrac{\pi(3n+1)}{p-q}$ (2) $\dfrac{\pi(2n+1)}{p\pm q}$ (3) $\dfrac{\pi(n\pm 1)}{p\pm q}$ (4) $\dfrac{\pi(n+2)}{p+q}$

5.
Let $f_k(x)=\dfrac{1}{k}\left[\sin^k x+\cos^k x\right]$ where $x\in R$ and $k\geq 1$. Then $f_4(x)-f_6(x)=$

(1) $\dfrac{1}{4}$ (2) $\dfrac{1}{12}$ (3) $\dfrac{1}{6}$ (4) $\dfrac{1}{3}$

6.
$\dfrac{1}{\cos 80^\circ}-\dfrac{\sqrt{3}}{\sin 80^\circ}=$

(1) $\sqrt{2}$ (2) $\sqrt{3}$ (3) 2 (4) 4

7.
If $\pi<2\theta<\dfrac{3\pi}{2}$, then $\sqrt{2+\sqrt{2+2\cos 4\theta}}$ equals to

(1) $-2\cos\theta$ (2) $-2\sin\theta$ (3) $2\cos\theta$ (4) $2\sin\theta$

8.
Which of the following is not true?

(1) $\sin\theta=-\dfrac{3}{4}$ (2) $\cos\theta=-1$ (3) $\tan\theta=25$ (4) $\sec\theta=\dfrac{1}{4}$

9.
If $\tan\alpha$ and $\tan\beta$ are the roots of $x^2+ax+b=0$, then $\dfrac{\sin(\alpha+\beta)}{\sin\alpha\sin\beta}$ is equal to

(1) $\dfrac{b}{a}$ (2) $\dfrac{a}{b}$ (3) $-\dfrac{a}{b}$ (4) $-\dfrac{b}{a}$

10.

In a $\triangle ABC$, if

(i) $\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2} > 0$

(ii) $\sin A\sin B\sin C > 0$ then

(1) Both (i) and (ii) are true (2) Only (i) is true

(3) Only (ii) is true (4) Neither (i) nor (ii) is true.

11.

In a triangle ABC, $\sin^2 A + \sin^2 B + \sin^2 C = 2$, then the triangle is

(1) equilateral triangle (2) isosceles triangle (3) right triangle (4) scalene triangle.

12.

If $\sin\alpha + \cos\alpha = b$, then $\sin 2\alpha$ is equal to

(1) $b^2 - 1$, if $b \le \sqrt{2}$ (2) $b^2 - 1$, if $b > \sqrt{2}$ (3) $b^2 - 1$, if $b \ge 1$ (4) $b^2 - 1$, if $b \ge \sqrt{2}$

13.

$\dfrac{\cos 6x + 6\cos 4x + 15\cos 2x + 10}{\cos 5x + 5\cos 3x + 10\cos x}$ is equal to

(1) $cos2x$ (2) $\cos x$ (3) $\cos 3x$ (4) $2\cos x$

14.

A wheel is spinning at 2 radians/second. How many seconds will it take to make 10 complete rotations?

(1) 10π seconds (2) 20π seconds (3) 5π seconds (4) 15π seconds

15.

If $f(\theta) = |\sin\theta| + |\cos\theta|$, $\theta \in R$, then $f(\theta)$ is in the interval

(1) $[0, 2]$ (2) $\left[1, \sqrt{2}\right]$ (3) $[1, 2]$ (4) $[0, 1]$

16.

$\cos 2\theta\cos 2\phi + \sin^2(\theta - \phi) - \sin^2(\theta + \phi)$ is equal to

(1) $\sin 2(\theta + \phi)$ (2) $\cos 2(\theta + \phi)$ (3) $\sin 2(\theta - \phi)$ (4) $\cos 2(\theta - \phi)$

17.

If $\cos 28^\circ + \sin 28^\circ = k^3$, then $\cos 17^\circ$ is equal to

(1) $\frac{k^3}{\sqrt{2}}$ (2) $-\frac{k^3}{\sqrt{2}}$ (3) $\pm\frac{k^3}{\sqrt{2}}$ (4) $-\frac{k^3}{\sqrt{3}}$

18.

$\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right) =$

(1) $\frac{1}{8}$ (2) $\frac{1}{2}$ (3) $\frac{1}{\sqrt{3}}$ (4) $\frac{1}{\sqrt{2}}$

19.

If $\tan 40^\circ = \lambda$, then $\dfrac{\tan 140^\circ - \tan 130^\circ}{1 + \tan 140^\circ\tan 130^\circ} =$

(1) $\frac{1-\lambda^2}{\lambda}$ (2) $\frac{1+\lambda^2}{\lambda}$ (3) $\frac{1+\lambda^2}{2\lambda}$ (4) $\frac{1-\lambda^2}{2\lambda}$

20.

The maximum value of $4\sin^2 x + 3\cos^2 x + \sin\frac{x}{2} + \cos\frac{x}{2}$ is

(1) $4+\sqrt{2}$ (2) $3+\sqrt{2}$ (3) 9 (4) 4

4.Combinatorics andMathematicalInduction

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Choose the correct or the most suitable answer.

1.
The sum of the digits at the 10^{th} place of all numbers formed with the help of 2, 4, 5, 7 taken all at a time is

(1) 432 (2) 108 (3) 36 (4) 18

2.
The product of r consecutive positive integers is divisible by

(1) $r!$ (2) $(r-1)!$ (3) $(r+1)!$ (4) r^r.

3.
The number of 5 digit numbers all digits of which are odd is

(1) 25 (2) 5^5 (3) 5^6 (4) 625.

4.
There are 10 points in a plane and 4 of them are collinear. The number of straight lines joining any two points is

(1) 45 (2) 40 (3) 39 (4) 38.

5.
In an examination there are three multiple choice questions and each question has 5 choices Number of ways in which a student can fail to get all answer correct is

(1) 125 (2) 124 (3) 64 (4) 63

6.
If ${}^{(n+5)}P_{(n+1)} = (\frac{11(n-1)}{2})^{(n+3)}P_n$, then the value of n are

(1) 7 and 11 (2) 6 and 7 (3) 2 and 11 (4) 2 and 6.

7.
The number of ways in which a host lady invite 8 people for a party of 8 out of 12 people of whom two do not want to attend the party together is

(1) $2 \times^{11} C_7 +^{10} C_8$ (2) ${}^{11}C_7 +^{10} C_8$ (3) ${}^{12}C_8 -^{10} C_6$ (4) ${}^{10}C_6 + 2!$.

8.
The number of ways in which the following prize be given to a class of 30 boys first and second in mathematics, first and second in physics, first in chemistry and first in English is

(1) $30^4 \times 29^2$ (2) $30^3 \times 29^3$ (3) $30^2 \times 29^4$ (4) 30×29^5.

9.
The number of five digit telephone numbers having at least one of their digits repeated is

(1) 90000 (2) 10000 (3) 30240 (4) 69760.

10.
The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of three parallel lines.

(1) 6 (2) 9 (3) 12 (4) 18

11.
In 3 fingers, the number of ways four rings can be worn is $\cdots\cdots\cdots$ ways.

(1) $4^3 - 1$ (2) 3^4 (3) 68 (4) 64

12.
If $^{a^2-a}C_2 = ^{a^2-a}C_4$ then the value of 'a' is

(1) 2 (2) 3 (3) 4 (4) 5

13.
Everybody in a room shakes hands with everybody else. The total number of shake hands is 66. The number of persons in the room is $\cdots\cdots\cdots\cdots$

(1) 11 (2) 12 (3) 10 (4) 6

14.
The number of rectangles that a chessboard has $\cdots$

(1) 81 (2) 9^9 (3)1296 (4) 6561

15.
In $^{2n}C_3 : ^{n}C_3 = 11 : 1$ then n is

(1) 5 (2) 6 (3)11 (4)7

16.
Number of sides of a polygon having 44 diagonals is $\cdots\cdots$

(1) 4 (2) 4! (3) 11 (4) 22

17.
The number of ways of choosing 5 cards out of a deck of 52 cards which include at least one king is

(1) $^{52}C_5$ (2) $^{48}C_5$ (3)$^{52}C_5 + ^{48}C_5$ (4)$^{52}C_5 - ^{48}C_5$.

18.
In a plane there are 10 points are there out of which 4 points are collinear, then the number of triangles formed is

(1) 110 (2) $^{10}C_3$ (3) 120 (4) 116

19.
The number of 10 digit number that can be written by using the digits 2 and 3 is

(1) $^{10}C_2 + ^{9}C_2$ (2) 2^{10} (3)$2^{10} - 2$ (4) 10!

20.
If 10 lines are drawn in a plane such that no two of them are parallel and no three are concurrent, then the total number of points of intersection are

(1) 45 (2) 40 (3)10! (4) 2^{10}

21.
The product of first n odd natural numbers equals

(1) $^{2n}C_n \times ^{n}P_n$ (2) $(\frac{1}{2})^n \times ^{2n}C_n \times ^{n}P_n$ (3)$(\frac{1}{4})^n \times ^{2n}C_n \times ^{2n}P_n$ (4)$^{n}C_n \times ^{n}P_n$

22.
$^{(n-1)}C_r + ^{(n-1)}C_{(r-1)}$ is

(1) $^{(n+1)}C_r$ (2) $^{(n-1)}C_r$ (3) $^{n}C_r$ (4)$^{n}C_{r-1}$.

23.
$1 + 3 + 5 + 7 + \cdots + 17$ is equal to

(1) 101 (2) 81 (3) 71 (4) 61

24.
If P_r stands for $^{r}P_r$ then the sum of the series $1 + P_1 + 2P_2 + 3P_3 + \cdots + nP_n$ is

(1) P_{n+1} (2) $P_{n+1} - 1$ (3) $P_{n-1} + 1$ (4)$^{(n+1)}P_{(n-1)}$

25.

If ${}^{n}C_4$, ${}^{n}C_5$, ${}^{n}C_6$ are in AP the value of n can be

(1) 14 (2) 11 (3)9 (4)5

5.Binomial Theorem,SequencesandSeries

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Choose the correct or the most suitable answer.

1.

The value of $2+4+6+\cdots+2n$ is

(1) $\frac{n(n-1)}{2}$ (2) $\frac{n(n+1)}{2}$ (3) $\frac{2n(2n+1)}{2}$ (4) $n(n+1)$

2.

The sequence $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}+\sqrt{2}}, \frac{1}{\sqrt{3}+2\sqrt{2}}, \cdots$ form an

(1) AP (2) GP (3) HP (4) AGP.

3.

If ${}^{n}C_{10} > {}^{n}C_{r}$ for all possible r, then a value of n is

(1) 10 (2) 21 (3) 19 (4) 20.

4.

The HM of two positive numbers whose AM and GM are 16, 8 respectively is

(1) 10 (2) 6 (3) 5 (4) 4.

5.

The coefficient of x^6 in $(2+2x)^{10}$ is

(1) ${}^{10}C_6$ (2) 2^6 (3) ${}^{10}C_6\, 2^6$ (4) ${}^{10}C_6\, 2^{10}$.

6.

If $a, 8, b$ are in AP, $a, 4, b$ are in GP, and if a, x, b are in HP then x is

(1) 2 (2) 1 (3) 4 (4) 16.

7.

If S_n denotes the sum of n terms of an AP whose common difference is d, the value of $S_n - 2S_{n-1} + S_{n-2}$ is

(1) d (2) 2d (3) 4d (4) d^2.

8.

The coefficient of x^8y^{12} in the expansion of $(2x+3y)^{20}$ is

(1) 0 (2) 2^83^{12} (3) $2^83^{12}+2^{12}3^8$ (4) ${}^{20}C_8\, 2^83^{12}$.

9.

The sum up to n terms of the series $\frac{1}{\sqrt{1}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{7}} + \cdots$ is

(1) $\sqrt{2n+1}$ (2) $\frac{\sqrt{2n+1}}{2}$ (3) $\sqrt{2n+1}-1$ (4) $\frac{\sqrt{2n+1}-1}{2}$.

10.

If $(1+x^2)^2(1+x)^n = a_0 + a_1x + a_2x^2 + \cdots + x^{n+4}$ and if a_0, a_1, a_2 are in AP, then n is

(1) 1 (2) 5 (3) 2 (4) 4.

11.

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

(1) 12 (2) 1 (3) 11 (4) 5.

12.

If a is the arithmetic mean and g is the geometric mean of two numbers, then

(1) $a \leq g$ (2) $a \geq g$ (3) $a = g$ (4) $a > g$.

13.

The n^{th} term of the sequence $1, 2, 4, 7, 11, \cdots$ is

(1) $n^3 + 3n^2 + 2n$ (2) $n^3 - 3n^2 + 3n$ (3) $\frac{n(n+1)(n+2)}{3}$ (4) $\frac{n^2-n+2}{2}$.

14.
The sum up to n terms of the series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + \cdots$ is

(1) $\frac{n(n+1)}{2}$ (2) $2n(n+1)$ (3) $\frac{n(n+1)}{\sqrt{2}}$ (4) 1.

15.
The value of $\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \cdots$ is

(1) $\frac{e^2+1}{2e}$ (2) $\frac{(e+1)^2}{2e}$ (3) $\frac{(e-1)^2}{2e}$ (4) $\frac{e^2-1}{2e}$.

16.
The sum of an infinite GP is 18. If the first term is 6, the common ratio is

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $\frac{1}{6}$ (4) $\frac{3}{4}$.

17.
The n^{th} term of the sequence $\frac{1}{2}, \frac{3}{4}, \frac{7}{8}, \frac{15}{16}, \cdots$ is

(1) $2^n - n - 1$ (2) $1 - 2^{-n}$ (3) $2^{-n} + n - 1$ (4) 2^{n-1}.

18.
The value of $1 - \frac{1}{2}\left(\frac{2}{3}\right) + \frac{1}{3}\left(\frac{2}{3}\right)^2 - \frac{1}{4}\left(\frac{2}{3}\right)^3 + \cdots$ is

(1) $\log\left(\frac{5}{3}\right)$ (2) $\frac{3}{2}\log\left(\frac{5}{3}\right)$ (3) $\frac{5}{3}\log\left(\frac{5}{3}\right)$ (4) $\frac{2}{3}\log\left(\frac{2}{3}\right)$

19.
The value of the series $\frac{1}{2} + \frac{7}{4} + \frac{13}{8} + \frac{19}{16} + \cdots$ is

(1) 14 (2) 7 (3) 4 (4) 6.

20.
The coefficient of x^5 in the series e^{-2x} is

(1) $\frac{2}{3}$ (2) $\frac{3}{2}$ (3) $\frac{-4}{15}$ (4) $\frac{4}{15}$.

6.TwoDimensionalAnalyticalGeometry

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Choose the correct or the most suitable answer.

1.
The equation of the locus of the point whose distance from y-axis is half the distance from origin is

(1) $x^2+3y^2=0$ (2) $x^2-3y^2=0$ (3) $3x^2+y^2=0$ (4) $3x^2-y^2=0$

2.
Straight line joining the points $(2,3)$ and $(-1,4)$ passes through the point (α,β) if

(1) $\alpha+2\beta=7$ (2) $3\alpha+\beta=9$ (3) $\alpha+3\beta=11$ (4) $3\alpha+\beta=11$

3.
Which of the following equation is the locus of $(at^2, 2at)$

(1) $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ (2) $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ (3) $x^2+y^2=a^2$ (4) $y^2=4ax$

4.
The slope of the line which makes an angle 45° with the line $3x-y=-5$ are

(1) $1,-1$ (2) $\frac{1}{2},-2$ (3) $1,\frac{1}{2}$ (4) $2,-\frac{1}{2}$

5.
Which of the following point lie on the locus of $3x^2+3y^2-8x-12y+17=0$

(1) $(0,0)$ (2) $(-2,3)$ (3) $(1,2)$ (4) $(0,-1)$

6.
Equation of the straight line that forms an isosceles triangle with coordinate axes in the I-quadrant with perimeter $4+2\sqrt{2}$ is

(1) $x+y+2=0$ (2) $x+y-2=0$ (3) $x+y-\sqrt{2}=0$ (4) $x+y+\sqrt{2}=0$

7.
If the point (8,–5) lies on the locus $\frac{x^2}{16}-\frac{y^2}{25}=k$, then the value of k is

(1) 0 (2) 1 (3) 2 (4) 3

8.
The line $(p+2q)x+(p-3q)y=p-q$ for different values of p and q passes through the point

(1) $\left(\frac{3}{2},\frac{5}{2}\right)$ (2) $\left(\frac{2}{5},\frac{2}{5}\right)$ (3) $\left(\frac{3}{5},\frac{3}{5}\right)$ (4) $\left(\frac{2}{5},\frac{3}{5}\right)$

9.
The coordinates of the four vertices of a quadrilateral are (–2,4), (–1,2), (1,2) and (2,4) taken in order.The equation of the line passing through the vertex (–1,2) and dividing the quadrilateral in the equal areas is

(1) $x+1=0$ (2) $x+y=1$ (3) $x+y+3=0$ (4) $x-y+3=0$

10.
Equation of the straight line perpendicular to the line$x-y+5=0$, through the point of intersection the y-axis and the given line

(1) $x-y-5=0$ (2) $x+y-5=0$ (3) $x+y+5=0$ (4) $x+y+10=0$

11.

The intercepts of the perpendicular bisector of the line segment joining (1, 2) and (3,4) with coordinate axes are

(1) 5, −5 (2) 5, 5 (3) 5, 3 (4) 5, −4

12.

A line perpendicular to the line $5x - y = 0$ forms a triangle with the coordinate axes. If the area of the triangle is 5 sq. units, then its equation is

(1) $x + 5y \pm 5\sqrt{2} = 0$ (2) $x - 5y \pm 5\sqrt{2} = 0$ (3) $5x + y \pm 5\sqrt{2} = 0$ (4) $5x - y \pm 5\sqrt{2} = 0$

13.

The image of the point (2, 3) in the line $y = -x$ is

(1) (−3, −2) (2) (−3, 2) (3) (−2, −3) (4) (3, 2)

14.

The equation of the line with slope 2 and the length of the perpendicular from the origin equal to $\sqrt{5}$ is

(1) $x - 2y = \sqrt{5}$ (2) $2x - y = \sqrt{5}$ (3) $2x - y = 5$ (4) $x - 2y - 5 = 0$

15.

If the equation of the base opposite to the vertex (2, 3) of an equilateral triangle is $x + y = 2$, then the length of a side is

(1) $\sqrt{\frac{3}{2}}$ (2) 6 (3) $\sqrt{6}$ (4) $3\sqrt{2}$

16

The y-intercept of the straight line passing through (1,3) and perpendicular to $2x - 3y + 1 = 0$ is

(1) $\frac{3}{2}$ (2) $\frac{9}{2}$ (3) $\frac{2}{3}$ (4) $\frac{2}{9}$

17.

The point on the line $2x - 3y = 5$ is equidistance from (1,2) and $(3, 4)$ is

(1) $(7, 3)$ (2) $(4, 1)$ (3) $(1, -1)$ (4) $(-2, 3)$

18.

The length of $\perp$ from the origin to the line $\frac{x}{3} - \frac{y}{4} = 1$, is

(1) $\frac{11}{5}$ (2) $\frac{5}{12}$ (3) $\frac{12}{5}$ (4) $-\frac{5}{12}$

19.

One of the equation of the lines given by $x^2 + 2xy\cot\theta - y^2 = 0$ is

(1) $x - y\cot\theta = 0$ (2) $x + y\tan\theta = 0$ (3) $x\cos\theta + y(\sin\theta + 1) = 0$

(4) $x\sin\theta + y(\cos\theta + 1) = 0$

20.

If the two straight lines $x + (2k - 7)y + 3 = 0$ and $3kx + 9y - 5 = 0$ are perpendicular then the value of k is

(1) $k = 3$ (2) $k = \frac{1}{3}$ (3) $k = \frac{2}{3}$ (4) $k = \frac{3}{2}$

21.

The area of the triangle formed by the lines $x^2 - 4y^2 = 0$ and $x = a$ is

(1) $2a^2$ (2) $\frac{\sqrt{3}}{2}a^2$ (3) $\frac{1}{2}a^2$ (4) $\frac{2}{\sqrt{3}}a^2$

22.

θ is acute angle between the lines $x^2 - xy - 6y^2 = 0$, then $\dfrac{2\cos\theta + 3\sin\theta}{4\sin\theta + 5\cos\theta}$ is

(1) 1 (2) $-\dfrac{1}{9}$ (3) $\dfrac{5}{9}$ (4) $\dfrac{1}{9}$

23.

If a vertex of a square is at the origin and its one side lies along the line $4x + 3y - 20 = 0$, then the area of the square is

(1) 20 sq. units (2) 16 sq. units (3) 25 sq. units (4) 4 sq.units

24.

If one of the lines given by $6x^2 - xy + 4cy^2 = 0$ is $3x + 4y = 0$,, then c equals to

(1) -3 (2) -1 (3) 3 (4) 1

25.

If the lines represented by the equation $6x^2 + 41xy - 7y^2 = 0$ make angles α and β with x- axis, then $\tan\alpha\tan\beta =$

(1) $-\dfrac{6}{7}$ (2) $\dfrac{6}{7}$ (3) $-\dfrac{7}{6}$ (4) $\dfrac{7}{6}$

7.Matrices and Determinants

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Choose the correct or the most suitable answer.

1.

What must be the matrix X, if $2X+\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}=\begin{bmatrix}3 & 8\\ 7 & 2\end{bmatrix}$?

(1) $\begin{bmatrix}1 & 3\\ 2 & -1\end{bmatrix}$ (2) $\begin{bmatrix}1 & -3\\ 2 & -1\end{bmatrix}$ (3) $\begin{bmatrix}2 & 6\\ 4 & -2\end{bmatrix}$ (4) $\begin{bmatrix}2 & -6\\ 4 & -2\end{bmatrix}$

2.

If $A=\begin{bmatrix}\lambda & 1\\ -1 & -\lambda\end{bmatrix}$, then for what value of λ, $A^2=O$?

(1) 0 (2) ± 1 (3) -1 (4) 1

3.

Which one of the following is not true about the matrix $\begin{bmatrix}1 & 0 & 0\\ 0 & 0 & 0\\ 0 & 0 & 5\end{bmatrix}$?

(1) a scalar matrix (2) a diagonal matrix

(3) an upper triangular matrix (4) a lower triangular matrix

4.

If $a_{ij}=\frac{1}{2}(3i-2j)$ and $A=[a_{ij}]_{2\times 2}$ is

(1) $\begin{bmatrix}\frac{1}{2} & 2\\ -\frac{1}{2} & 1\end{bmatrix}$ (2) $\begin{bmatrix}\frac{1}{2} & -\frac{1}{2}\\ 2 & 1\end{bmatrix}$ (3) $\begin{bmatrix}2 & 2\\ \frac{1}{2} & -\frac{1}{2}\end{bmatrix}$ (4) $\begin{bmatrix}-\frac{1}{2} & \frac{1}{2}\\ 1 & 2\end{bmatrix}$

5.

If A and B are two matrices such that $A+B$ and AB are both defined, then

(1) A and B are two matrices not necessarily of same order

(2) A and B are square matrices of same order

(3) Number of columns of A is equal to the number of rows of B

(4) $A=B$.

6.

If the points $(x,-2)$, $(5,2)$, $(8,8)$ are collinear, then x is equal to

(1) -3 (2) $\frac{1}{3}$ (3) 1 (4) 3

7.

If A is a square matrix, then which of the following is not symmetric?

(1) $A+A^T$ (2) AA^T (3) A^TA (4) $A-A^T$

8.

If the square of the matrix $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is the unit matrix of order 2, then α, β and γ should satisfy the relation.

(1) $1+\alpha^2+\beta\gamma=0$ (2) $1-\alpha^2-\beta\gamma=0$

(3) $1-\alpha^2+\beta\gamma=0$ (4) $1+\alpha^2-\beta\gamma=0$

9.

The value of the determinant of $A = \begin{bmatrix} 0 & a & -b \\ -a & 0 & c \\ b & -c & 0 \end{bmatrix}$ is

(1) $-2abc$ (2) abc (3) 0 (4) $a^2+b^2+c^2$

10.

If $A+I = \begin{bmatrix} 3 & -2 \\ 4 & 1 \end{bmatrix}$, then $(A+I)(A-I)$ is equal to

(1) $\begin{bmatrix} -5 & -4 \\ 8 & -9 \end{bmatrix}$ (2) $\begin{bmatrix} -5 & 4 \\ -8 & 9 \end{bmatrix}$ (3) $\begin{bmatrix} 5 & 4 \\ 8 & 9 \end{bmatrix}$ (4) $\begin{bmatrix} -5 & -4 \\ -8 & -9 \end{bmatrix}$

11.

If $A = \begin{vmatrix} -1 & 2 & 4 \\ 3 & 1 & 0 \\ -2 & 4 & 2 \end{vmatrix}$ and $B = \begin{vmatrix} -2 & 4 & 2 \\ 6 & 2 & 0 \\ -2 & 4 & 8 \end{vmatrix}$, then B is given by

(1) $B=4A$ (2) $B=-4A$ (3) $B=-A$ (4) $B=6A$

12.

If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$, $B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A+B)^2 = A^2+B^2$, then the values of a and b are

(1) $a=4, b=1$ (2) $a=1, b=4$ (3) $a=0, b=4$ (4) $a=2, b=4$

13.

If A and B are symmetric matrices of order n, where $(A \neq B)$, then

(1) $A+B$ is skew-symmetric (2) $A+B$ is symmetric

(3) $A+B$ is a diagonal matrix (4) $A+B$ is a zero matrix

14.

If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying the equation $AA^T = 9I$, where I is 3×3 identity matrix, then the ordered pair (a, b) is equal to

(1) $(2, -1)$ (2) $(-2, 1)$ (3) $(2, 1)$ (4) $(-2, -1)$

15

If $\begin{vmatrix} 2a & x_1 & y_1 \\ 2b & x_2 & y_2 \\ 2c & x_3 & y_3 \end{vmatrix} = \frac{abc}{2} \neq 0$, then the area of the triangle whose vertices are $\left(\frac{x_1}{a}, \frac{y_1}{a}\right), \left(\frac{x_2}{b}, \frac{y_2}{b}\right), \left(\frac{x_3}{c}, \frac{y_3}{c}\right)$ is

(1) $\frac{1}{4}$ (2) $\frac{1}{4}abc$ (3) $\frac{1}{8}$ (4) $\frac{1}{8}abc$

16.

If $A = \begin{bmatrix} a & x \\ y & a \end{bmatrix}$ and if $xy = 1$, then det $(A A^T)$ is equal to

(1) $(a-1)^2$ (2) $(a^2+1)^2$ (3) a^2-1 (4) $(a^2-1)^2$

17

If $\Delta = \begin{vmatrix} a & b & c \\ x & y & z \\ p & q & r \end{vmatrix}$, then $\begin{vmatrix} ka & kb & kc \\ kx & ky & kz \\ kp & kq & kr \end{vmatrix}$ is

(1) Δ (2) $k\Delta$ (3) $3k\Delta$ (4) $k^3\Delta$

18.

The value of x, for which the matrix $A = \begin{bmatrix} e^{x-2} & e^{7+x} \\ e^{2+x} & e^{2x+3} \end{bmatrix}$ is singular

(1) 9 (2) 8 (3) 7 (4) 6

19.

A root of the equation $\begin{vmatrix} 3-x & -6 & 3 \\ -6 & 3-x & 3 \\ 3 & 3 & -6-x \end{vmatrix} = 0$ is

(1) 6 (2) 3 (3) 0 (4) – 6

20.

If $a \neq b, b, c$ satisfy $\begin{vmatrix} a & 2b & 2c \\ 3 & b & c \\ 4 & a & b \end{vmatrix} = 0$, then $abc =$

(1) $a+b+c$ (2) 0 (3) b^3 (4) $ab+bc$

21.

If x_1, x_2, x_3 as well as y_1, y_2, y_3 are in geometric progression with the same common ratio, then the points (x_1, y_1), (x_2, y_2), (x_3, y_3) are

(1) vertices of an equilateral triangle

(2) vertices of a right angled triangle

(3) vertices of a right angled isosceles triangle

(4) collinear

22.

Let A and B be two symmetric matrices of same order. Then which one of the following statement is not true?

(1) $A + B$ is a symmetric matrix (2) AB is a symmetric matrix

(3) $AB = (BA)^T$ (4) $A^T B = AB^T$

23.

If A is skew-symmetric of order n and C is a column matrix of order $n \times 1$, then $C^T AC$ is

(1) an identity matrix of order n (2) an identity matrix of order 1

(3) a zero matrix of order 1 (4) an identity matrix of order 2

24.

If $\lfloor . \rfloor$ denotes the greatest integer less than or equal to the real number under consideration and $-1 \le x < 0$, $0 \le y < 1$, $1 \le z < 2$, then the value of the determinant $\begin{vmatrix} \lfloor x \rfloor + 1 & \lfloor y \rfloor & \lfloor z \rfloor \\ \lfloor x \rfloor & \lfloor y \rfloor + 1 & \lfloor z \rfloor \\ \lfloor x \rfloor & \lfloor y \rfloor & \lfloor z \rfloor + 1 \end{vmatrix}$ is

(1) $\lfloor z \rfloor$ (2) $\lfloor y \rfloor$ (3) $\lfloor x \rfloor$ (4) $\lfloor x \rfloor + 1$

25.

The matrix A satisfying the equation $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} A = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$ is

(1) $\begin{bmatrix} 1 & 4 \\ -1 & 0 \end{bmatrix}$ (2) $\begin{bmatrix} 1 & -4 \\ 1 & 0 \end{bmatrix}$ (3) $\begin{bmatrix} 1 & 4 \\ 0 & -1 \end{bmatrix}$ (4) $\begin{bmatrix} 1 & -4 \\ 1 & 1 \end{bmatrix}$

8.Vector Algebra

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Choose the correct or the most suitable answer.

1.
The value of $\overrightarrow{AB}+\overrightarrow{BC}+\overrightarrow{DA}+\overrightarrow{CD}$ is

(1) $\overrightarrow{AD}$ (2) $\overrightarrow{CA}$ (3) $\vec{0}$ (4) $-\overrightarrow{AD}$

2.
A vector makes equal angle with the positive direction of the coordinate axes. Then each angle is equal to

(1) $\cos^{-1}\left(\frac{1}{3}\right)$ (2) $\cos^{-1}\left(\frac{2}{3}\right)$ (3) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ (4) $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$

3.
If $\vec{a}+2\vec{b}$ and $3\vec{a}+m\vec{b}$ are parallel, then the value of m is

(1) 3 (2) $\frac{1}{3}$ (3) 6 (4) $\frac{1}{6}$

4.
If $ABCD$ is a parallelogram, then $\overrightarrow{AB}+\overrightarrow{AD}+\overrightarrow{CB}+\overrightarrow{CD}$ is equal to

(1) $2(\overrightarrow{AB}+\overrightarrow{AD})$ (2) $4\overrightarrow{AC}$ (3) $4\overrightarrow{BD}$ (4) $\vec{0}$

5.
A vector $\overrightarrow{OP}$ makes 60° and 45° with the positive direction of the x and y axes respectively. Then the angle between $\overrightarrow{OP}$ and the z-axis is

(1) 45° (2) 60° (3) 90° (4) 30°

6.
If $\lambda\hat{i}+2\lambda\hat{j}+2\lambda\hat{k}$ is a unit vector, then the value of λ is

(1) $\frac{1}{3}$ (2) $\frac{1}{4}$ (3) $\frac{1}{9}$ (4) $\frac{1}{2}$

7.
If $\vec{a},\vec{b}$ are the position vectors A and B, then which one of the following points whose position vector lies on AB, is

(1) $\vec{a}+\vec{b}$ (2) $\frac{2\vec{a}-\vec{b}}{2}$ (3) $\frac{2\vec{a}+\vec{b}}{3}$ (4) $\frac{\vec{a}-\vec{b}}{3}$

8.
The unit vector parallel to the resultant of the vectors $\hat{i}+\hat{j}-\hat{k}$ and $\hat{i}-2\hat{j}+\hat{k}$ is

(1) $\frac{\hat{i}-\hat{j}+\hat{k}}{\sqrt{5}}$ (2) $\frac{2\hat{i}+\hat{j}}{\sqrt{5}}$ (3) $\frac{2\hat{i}-\hat{j}+\hat{k}}{\sqrt{5}}$ (4) $\frac{2\hat{i}-\hat{j}}{\sqrt{5}}$

9.
If $|\vec{a}|=13, |\vec{b}|=5$ and $\vec{a}\cdot\vec{b}=60^\circ$ then $|\vec{a}\times\vec{b}|$ is

(1) 15 (2) 35 (3) 45 (4) 25

10.

If the projection of $5\hat{i}-\hat{j}-3\hat{k}$ on the vector $\hat{i}+3\hat{j}+\lambda\hat{k}$ is same as the projection of $\hat{i}+3\hat{j}+\lambda\hat{k}$ on $5\hat{i}-\hat{j}-3\hat{k}$, then λ is equal to

(1) ± 4 (2) ± 3 (3) ± 5 (4) ± 1

11.

If $\vec{a}=\hat{i}+2\hat{j}+2\hat{k}, |\vec{b}|=5$ and the angle between $\vec{a}$ and $\vec{b}$ is $\frac{\pi}{6}$, then the area of the triangle formed by these two vectors as two sides, is

(1) $\frac{7}{4}$ (2) $\frac{15}{4}$ (3) $\frac{3}{4}$ (4) $\frac{17}{4}$

12.

Vectors $\vec{a}$ and $\vec{b}$ are inclined at an angle $\theta=120°$. If $|\vec{a}|=1, |\vec{b}|=2$, then $[(\vec{a}+3\vec{b})\times(3\vec{a}-\vec{b})]^2$ is equal to

(1) 225 (2) 275 (3) 325 (4) 300

13.

If $\vec{r}=\frac{9\vec{a}+7\vec{b}}{16}$, then the point P whose position vector $\vec{r}$ divides the line joining the points with position vectors $\vec{a}$ and $\vec{b}$ in the ratio

(1) 7 : 9 internally (2) 9 : 7 internally

(3) 9 : 7 externally (4) 7 : 9 externally

14.

If $\vec{a}=\hat{i}+\hat{j}+\hat{k}$, $\vec{b}=2\hat{i}+x\hat{j}+\hat{k}$, $\vec{c}=\hat{i}-\hat{j}+4\hat{k}$ and $\vec{a}\cdot(\vec{b}\times\vec{c})=70$, then x is equal to

(1) 5 (2) 7 (3) 26 (4) 10

15.

If $\vec{a}$ and $\vec{b}$ are two vectors of magnitude 2 and inclined at an angle $60°$, then the angle between $\vec{a}$ and $\vec{a}+\vec{b}$ is

(1) 30° (2) 60° (3) 45° (4) 90°

16.

If (1, 2, 4) and (2, -3λ -3) are the initial and terminal points of the vector $\hat{i}+5\hat{j}-7\hat{k}$, then the value of λ is equal to

(1) $\frac{7}{3}$ (2) $-\frac{7}{3}$ (3) $-\frac{5}{3}$ (4) $\frac{5}{3}$

17.

If $\overrightarrow{BA}=3\hat{i}+2\hat{j}+\hat{k}$ and the position vector of B is $\hat{i}+3\hat{j}-\hat{k}$, then the position vector A is

(1) $4\hat{i}+2\hat{j}+\hat{k}$ (2) $4\hat{i}+5\hat{j}$ (3) $4\hat{i}$ (4) $-4\hat{i}$

18.

If $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of three collinear points, then which of the following is true?

(1) $\vec{a}=\vec{b}+\vec{c}$ (2) $2\vec{a}=\vec{b}+\vec{c}$ (3) $\vec{b}=\vec{c}+\vec{a}$ (4) $4\vec{a}+\vec{b}+\vec{c}=\vec{0}$

19.

The vectors $\vec{a}-\vec{b}$, $\vec{b}-\vec{c}$, $\vec{c}-\vec{a}$ are

(1) parallel to each other (2) unit vectors

(3) mutually perpendicular vectors (4) coplanar vectors.

20.

If $|\vec{a}+\vec{b}|=60$, $|\vec{a}-\vec{b}|=40$ and $|\vec{b}|=46$, then $|\vec{a}|$ is

(1) 42 (2) 12 (3) 22 (4) 32

21.
One of the diagonals of parallelogram $ABCD$ with $\vec{a}$ and $\vec{b}$ as adjacent sides is $\vec{a}+\vec{b}$. The other diagonal $\overline{BD}$ is

(1) $\vec{a}-\vec{b}$ (2) $\vec{b}-\vec{a}$ (3) $\vec{a}+\vec{b}$ (4) $\frac{\vec{a}+\vec{b}}{2}$

22.
The value of $\theta \in \left(0, \frac{\pi}{2}\right)$ for which the vectors $\vec{a}=(\sin\theta)\hat{i}+(\cos\theta)\hat{j}$ and $\vec{b}=\hat{i}-\sqrt{3}\hat{j}+2\hat{k}$ are perpendicular, is equal to

(1) $\frac{\pi}{3}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{2}$

23.
Two vertices of a triangle have position vectors $3\hat{i}+4\hat{j}-4\hat{k}$ and $2\hat{i}+3\hat{j}+4\hat{k}$. If the position vector of the centroid is $\hat{i}+2\hat{j}+3\hat{k}$, then the position vector of the third vertex is

(1) $-2\hat{i}-\hat{j}+9\hat{k}$ (2) $-2\hat{i}-\hat{j}-6\hat{k}$ (3) $2\hat{i}-\hat{j}+6\hat{k}$ (4) $-2\hat{i}+\hat{j}+6\hat{k}$

24.
If the points whose position vectors $10\hat{i}+3\hat{j}$, $12\hat{i}-5\hat{j}$ and $a\hat{i}+11\hat{j}$ are collinear then a is equal to

(1) 6 (2) 3 (3) 5 (4) 8

25.
If $\vec{a}$ and $\vec{b}$ having same magnitude and angle between them is $60°$ and their scalar product is $\frac{1}{2}$ then $|\vec{a}|$ is

(1) 2 (2) 3 (3) 7 (4) 1

9.Limits and Continuity

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Choose the correct or the most suitable answer.

1.

$$\lim_{\theta \to 0} \frac{\sin\sqrt{\theta}}{\sqrt{\sin\theta}}$$

(1) 1 (2) – 1 (3) 0 (4) 2

2.

$$\lim_{x \to \infty} \frac{\sin x}{x}$$

(1) 1 (2) 0 (3) ∞ (4) $-\infty$

3.

$$\lim_{x \to \infty} \left(\frac{x^2+5x+3}{x^2+x+3}\right)^x \text{ is}$$

(1) e^4 (2) e^2 (3) e^3 (4) 1

4.

$$\lim_{x \to \pi/2} \frac{2x-\pi}{\cos x}$$

(1) 2 (2) 1 (3) -2 (4) 0

5.

$$\lim_{x \to 0} \frac{a^x - b^x}{x} =$$

(1) $\log ab$ (2) $\log\left(\frac{a}{b}\right)$ (3) $\log\left(\frac{b}{a}\right)$ (4) $\frac{a}{b}$

6.

$$\lim_{x \to 3} \lfloor x \rfloor =$$

(1) 2 (2) 3 (3) does not exist (4) 0

7.

$$\lim_{x \to 0} \frac{\sqrt{1-\cos 2x}}{x}$$

(1) 0 (2) 1 (3) $\sqrt{2}$ (4) does not exist

8.

Let $f:\mathbb{R} \to \mathbb{R}$ be defined by $f(x) = \begin{cases} x & x \text{ is irrational} \\ 1-x & x \text{ is rational} \end{cases}$ then f is

(1) discontinuous at $x = \frac{1}{2}$ (2) continuous at $x = \frac{1}{2}$

(3) continuous everywhere (4) discontinuous everywhere

9.

The value of $\lim_{x \to 0} \frac{\sin x}{\sqrt{x^2}}$ is

(1) 1 (2) – 1 (3) 0 (4) limit does not exist

10.

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

(1) $\frac{1}{2}$ (2) 0 (3) 1 (4) ∞

11.

Let the function f be defined by $f(x) = \begin{cases} 3x & 0 \le x \le 1 \\ -3x+5 & 1 < x \le 2 \end{cases}$, then

(1) $\lim_{x \to 1} f(x) = 1$ (2) $\lim_{x \to 1} f(x) = 3$

(3) $\lim_{x \to 1} f(x) = 2$ (4) $\lim_{x \to 1} f(x)$ does not exist

12.

If $f(x) = x(-1)^{\left\lfloor \frac{1}{x} \right\rfloor}$, $x \le 0$, then the value of $\lim_{x \to 0} f(x)$ is equal to

(1) – 1 (2) 0 (3) 2 (4) 4

13.

$\lim_{x \to \infty} \frac{\sqrt{x^2 - 1}}{2x+1} =$

(1) 1 (2) 0 (3) – 1 (4) $\frac{1}{2}$

14.

$\lim_{x \to 0} \frac{8^x - 4^x - 2^x + 1^x}{x^2} =$

(1) 2 log 2 (2) $2(\log 2)^2$ (3) log 2 (4) 3 log 2

15.

If $f : \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = \lfloor x-3 \rfloor + |x-4|$ for $x \in \mathbb{R}$, then $\lim_{x \to 3^-} f(x)$ is equal to

(1) – 2 (2) – 1 (3) 0 (4) 1

16.

$\lim_{x \to 0} \frac{e^{\sin x} - 1}{x} =$ (1) 1 (2) e (3) $\frac{1}{e}$ (4) 0

17.

The function $f(x) = \begin{cases} \frac{x^2 - 1}{x^3 + 1} & x \ne -1 \\ P & x = -1 \end{cases}$ is not defined for $x = -1$. The value of $f(-1)$ so that the function extended by this value is continuous is

(1) $\frac{2}{3}$ (2) $-\frac{2}{3}$ (3) 1 (4) 0

18.

Let a function f be defined by $f(x)=\frac{x-|x|}{x}$ for $x\neq 0$ and $f(0)=2$. Then f is

(1) continuous nowhere (2) continuous everywhere

(3) continuous for all x except $x = 1$ (4) continuous for all x except $x = 0$

19

The value of $\lim_{x\to k^-} x-\lfloor x\rfloor$, where k is an integer is

(1) – 1 (2) 1 (3) 0 (4) 2

20

) $\lim_{x\to 0}\frac{xe^x-\sin x}{x}$ is

(1) 1 (2) 2 (3) 3 (4) 0

21.

Let f be a continuous function on [2, 5]. If f takes only rational values for all x and $f(3)=12$ then $f(4.5)$ is equal to

(1) $\frac{f(3)+f(4.5)}{7.5}$ (2) 12 (3) 17.5 (4) $\frac{f(4.5)-f(3)}{1.5}$

22.

At $x=\frac{3}{2}$ the function $f(x)=\frac{|2x-3|}{2x-3}$ is

(1) continuous (2) discontinuous (3) differentiable (4) non-zero

23.

If $\lim_{x\to 0}\frac{\sin px}{\tan 3x}=4$, then the value of p is

(1) 6 (2) 9 (3) 12 (4) 4

24.

$\lim_{x\to 0}\frac{e^{\tan x}-e^x}{\tan x-x}=$

(1) 1 (2) e (3) $\frac{1}{2}$ (4) 0

25.

$\lim_{\alpha\to\pi/4}\frac{\sin\alpha-\cos\alpha}{\alpha-\frac{\pi}{4}}$ is

(1) $\sqrt{2}$ (2) $\frac{1}{\sqrt{2}}$ (3) 1 (4) 2

10.Differentiability and Methods of Differentiation

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Choose the correct or the most suitable answer.

1.
$\frac{d}{dx}\left(\frac{2}{\pi}\sin x^{\circ}\right)$ is

(1) $\frac{\pi}{180}\cos x^{\circ}$ (2) $\frac{1}{90}\cos x^{\circ}$ (3) $\frac{\pi}{90}\cos x^{\circ}$ (4) $\frac{2}{\pi}\cos x^{\circ}$

2.
If $y = mx + c$ and $f(0) = f'(0) = 1$, then $f(2)$ is

(1) 1 (2) 2 (3) 3 (4) -3

3.
If $y = f(x^2 + 2)$ and $f'(3) = 5$, then $\frac{dy}{dx}$ at $x = 1$ is

(1) 5 (2) 25 (3) 15 (4) 10

4.
If the derivative of $(ax - 5)e^{3x}$ at $x = 0$ is -13, then the value of a is

(1) 8 (2) -2 (3) 5 (4) 2

5.
If $y = \frac{(1-x)^2}{x^2}$, then $\frac{dy}{dx}$ is

(1) $\frac{2}{x^2} + \frac{2}{x^3}$ (2) $-\frac{2}{x^2} + \frac{2}{x^3}$ (3) $-\frac{2}{x^2} - \frac{2}{x^3}$ (4) $-\frac{2}{x^3} + \frac{2}{x^2}$

6.
$x = \frac{1-t^2}{1+t^2}, y = \frac{2t}{1+t^2}$ then $\frac{dy}{dx}$ is

(1) $-\frac{y}{x}$ (2) $\frac{y}{x}$ (3) $-\frac{x}{y}$ (4) $\frac{x}{y}$

7.
If $f(x) = x\tan^{-1}x$, then $f'(1)$ is

(1) $1+\frac{\pi}{4}$ (2) $\frac{1}{2}+\frac{\pi}{4}$ (3) $\frac{1}{2}-\frac{\pi}{4}$ (4) 2

8.
The differential coefficient of $\log_{10} x$ with respect to $\log_x 10$ is

(1) 1 (2) $-(\log_{10} x)^2$ (3) $(\log_x 10)^2$ (4) $\frac{x^2}{100}$

9.

If $y = \frac{1}{4}u^4$, $u = \frac{2}{3}x^3 + 5$, then $\frac{dy}{dx}$ is

(1) $\frac{1}{27}x^2(2x^3+15)^3$ (2) $\frac{2}{27}x(2x^3+5)^3$

(3) $\frac{2}{27}x^2(2x^3+15)^3$ (4) $-\frac{2}{27}x(2x^3+5)^3$

10.

$\frac{d}{dx}(e^{x+5\log x})$ is

(1) $e^x.x^4(x+5)$ (2) $e^x.x(x+5)$ (3) $e^x + \frac{5}{x}$ (4) $e^x - \frac{5}{x}$

11.

If $f(x) = x+2$, then $f'(f(x))$ at $x=4$ is

(1) 8 (2) 1 (3) 4 (4) 5

12.

If $f(x) = x^2 - 3x$, then the points at which $f(x) = f'(x)$ are

(1) both positive integers (2) both negative integers

(3) both irrational (4) one rational and another irrational

13.

If $pv = 81$, then $\frac{dp}{dv}$ at $v = 9$ is

(1) 1 (2) – 1 (3) 2 (4) -2

14.

If $y = \frac{1}{a-z}$, then $\frac{dz}{dy}$ is

(1) $(a-z)^2$ (2) $-(z-a)^2$ (3) $(z+a)^2$ (4) $-(z+a)^2$

15.

If $x = a\sin\theta$ and $y = b\cos\theta$, then $\frac{d^2y}{dx^2}$ is

(1) $\frac{a}{b^2}\sec^2\theta$ (2) $-\frac{b}{a}\sec^2\theta$ (3) $-\frac{b}{a^2}\sec^3\theta$ (4) $-\frac{b^2}{a^2}\sec^3\theta$

16.

If $y = \cos(\sin x^2)$, then $\frac{dy}{dx}$ at $x = \sqrt{\frac{\pi}{2}}$ is

(1) – 2 (2) 2 (3) $-2\sqrt{\frac{\pi}{2}}$ (4) 0

17.

It is given that $f'(a)$ exists, then $\lim_{x\to a}\frac{xf(a)-af(x)}{x-a}$ is

(1) $f(a) - af'(a)$ (2) $f'(a)$ (3) $-f'(a)$ (4) $f(a) + af'(a)$

18.

If $g(x) = (x^2 + 2x + 1)\ f(x)$ and $f(0) = 5$ and $\lim\limits_{x \to 0} \dfrac{f(x) - 5}{x} = 4$, then $g'(0)$ is

(1) 20 (2) 14 (3) 18 (4) 12

19.

If $f(x) = \begin{cases} 2a - x, & \text{for } -a < x < a \\ 3x - 2a & \text{for } x \geq a \end{cases}$, then which one of the following is true?

(1) $f(x)$ is not differentiable at $x = a$ (2) $f(x)$ is discontinuous at $x = a$

(3) $f(x)$ is continuous for all x in $\mathbb{R}$ (4) $f(x)$ is differentiable for all $x \geq a$

20.

If $f(x) = \begin{cases} x + 2, & -1 < x < 3 \\ 5 & x = 3 \\ 8 - x & x > 3 \end{cases}$, then at $x = 3$, $f'(x)$ is

(1) 1 (2) – 1 (3) 0 (4) does not exist

21.

The number of points in $\mathbb{R}$ in which the function $f(x) = |x-1| + |x-3| + \sin x$ is not differentiable, is

(1) 3 (2) 2 (3) 1 (4) 4

22.

If $f(x) = \begin{cases} x + 1, & \text{when } x < 2 \\ 2x - 1 & \text{when } x \geq 2 \end{cases}$, then $f'(2)$ is

(1) 0 (2) 1 (3) 2 (4) does not exist

23

The derivative of $f(x) = x|x|$ at $x = -3$ is

(1) 6 (2) – 6 (3) does not exist (4) 0

24.

If $f(x) = \begin{cases} x - 5 & \text{if } x \leq 1 \\ 4x^2 - 9 & \text{if } 1 < x < 2 \\ 3x + 4 & \text{if } x \geq 2 \end{cases}$, then the right hand derivative of $f(x)$ at $x = 2$ is

(1) 0 (2) 2 (3) 3 (4) 4

25.

If $f(x) = \begin{cases} ax^2 - b, & -1 < x < 1 \\ \dfrac{1}{|x|}, & \text{elsewhere} \end{cases}$ is differentiable at $x = 1$, then

(1) $a = \frac{1}{2},\ b = \frac{-3}{2}$ (2) $a = \frac{-1}{2},\ b = \frac{3}{2}$ (3) $a = -\frac{1}{2},\ b = -\frac{3}{2}$ (4) $a = \frac{1}{2},\ b = \frac{3}{2}$

11.Integral Calculus

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Choose the correct or the most suitable answer.

1.

If $\int f(x)dx = g(x) + c$, then $\int f(x)g'(x)dx$

(1) $\int (f(x))^2\,dx$ (2) $\int f(x)g(x)dx$ (3) $\int f'(x)g(x)dx$ (4) $\int (g(x))^2\,dx$

2.

$\int \frac{e^{6\log x} - e^{5\log x}}{e^{4\log x} - e^{3\log x}}\,dx$ is

(1) $x + c$ (2) $\frac{x^3}{3} + c$ (3) $\frac{3}{x^3} + c$ (4) $\frac{1}{x^2} + c$

3.

$\int 2^{3x+5}\,dx$ is

(1) $\frac{3(2^{3x+5})}{\log 2} + c$ (2) $\frac{2^{3x+5}}{2\log(3x+5)} + c$ (3) $\frac{2^{3x+5}}{2\log 3} + c$ (4) $\frac{2^{3x+5}}{3\log 2} + c$

4.

$\int \frac{e^x(x^2\tan^{-1}x + \tan^{-1}x + 1)}{x^2 + 1}\,dx$ is

(1) $e^x\tan^{-1}(x+1) + c$ (2) $\tan^{-1}(e^x) + c$ (3) $e^x\frac{(\tan^{-1}x)^2}{2} + c$ (4) $e^x\tan^{-1}x + c$

5

If $\int \frac{3^{\frac{1}{x}}}{x^2}\,dx = k\,(3^{\frac{1}{x}}) + c$, then the value of k is

(1) $\log 3$ (2) $-\log 3$ (3) $-\frac{1}{\log 3}$ (4) $\frac{1}{\log 3}$

6.

$\int \frac{e^x(1+x)}{\cos^2(xe^x)}\,dx$ is

(1) $\cot(xe^x) + c$ (2) $\sec(xe^x) + c$ (3) $\tan(xe^x) + c$ (4) $\cos(xe^x) + c$

7.

$\int \frac{\sec x}{\sqrt{\cos 2x}}\,dx$ is

(1) $\tan^{-1}(\sin x) + c$ (2) $2\sin^{-1}(\tan x) + c$ (3) $\tan^{-1}(\cos x) + c$ (4) $\sin^{-1}(\tan x) + c$

8.

If $\int f'(x)e^{x^2}\,dx = (x-1)e^{x^2} + c$, then $f(x)$ is

(1) $2x^3 - \frac{x^2}{2} + x + c$ (2) $\frac{x^3}{2} + 3x^2 + 4x + c$ (3) $x^3 + 4x^2 + 6x + c$ (4) $\frac{2x^3}{3} - x^2 + x + c$

9.

$\int \sin^3 x dx$ is

(1) $\frac{-3}{4}\cos x - \frac{\cos 3x}{12} + c$ (2) $\frac{3}{4}\cos x + \frac{\cos 3x}{12} + c$

(3) $\frac{-3}{4}\cos x + \frac{\cos 3x}{12} + c$ (4) $\frac{-3}{4}\sin x - \frac{\sin 3x}{12} + c$

10

$\int \frac{\sin^8 x - \cos^8 x}{1 - 2\sin^2 x \cos^2 x} dx$ is

(1) $\frac{1}{2}\sin 2x + c$ (2) $-\frac{1}{2}\sin 2x + c$ (3) $\frac{1}{2}\cos 2x + c$ (4) $-\frac{1}{2}\cos 2x + c$

11.

The gradient (slope) of a curve at any point (x, y) is $\frac{x^2-4}{x^2}$. If the curve passes through the point $(2, 7)$, then the equation of the curve is

(1) $y = x + \frac{4}{x} + 3$ (2) $y = x + \frac{4}{x} + 4$ (3) $y = x^2 + 3x + 4$ (4) $y = x^2 - 3x + 6$

12

$\int \tan^{-1}\sqrt{\frac{1-\cos 2x}{1+\cos 2x}}\, dx$ is

(1) $x^2 + c$ (2) $2x^2 + c$ (3) $\frac{x^2}{2} + c$ (4) $-\frac{x^2}{2} + c$

13.

$\int \frac{\sqrt{\tan x}}{\sin 2x} dx$ is

(1) $\sqrt{\tan x} + c$ (2) $2\sqrt{\tan x} + c$ (3) $\frac{1}{2}\sqrt{\tan x} + c$ (4) $\frac{1}{4}\sqrt{\tan x} + c$

14.

$\int \frac{dx}{e^x - 1}$ is

(1) $\log|e^x| - \log|e^x - 1| + c$ (2) $\log|e^x| + \log|e^x - 1| + c$

(3) $\log|e^x - 1| - \log|e^x| + c$ (4) $\log|e^x + 1| - \log|e^x| + c$

15.

$\int e^{-7x}\sin 5x\, dx$ is

(1) $\frac{e^{-7x}}{74}[-7\sin 5x - 5\cos 5x] + c$ (2) $\frac{e^{-7x}}{74}[7\sin 5x + 5\cos 5x] + c$

(3) $\frac{e^{-7x}}{74}[7\sin 5x - 5\cos 5x] + c$ (4) $\frac{e^{-7x}}{74}[-7\sin 5x + 5\cos 5x] + c$

16.

$\int \frac{x^2+\cos^2 x}{x^2+1}\operatorname{cosec}^2 x dx$ is

(1) $\cot x+\sin^{-1} x+c$ (2) $-\cot x+\tan^{-1} x+c$

(3) $-\tan x+\cot^{-1} x+c$ (4) $-\cot x-\tan^{-1} x+c$

17.

$\int e^{\sqrt{x}} dx$ is

(1) $2\sqrt{x}(1-e^{\sqrt{x}})+c$ (2) $2\sqrt{x}(e^{\sqrt{x}}-1)+c$

(3) $2e^{\sqrt{x}}(1-\sqrt{x})+c$ (4) $2e^{\sqrt{x}}(\sqrt{x}-1)+c$

18.

$\int \frac{x+2}{\sqrt{x^2-1}} dx$ is

(1) $\sqrt{x^2-1}-2\log\left|x+\sqrt{x^2-1}\right|+c$ (2) $\sin^{-1}x-2\log\left|x+\sqrt{x^2-1}\right|+c$

(3) $2\log\left|x+\sqrt{x^2-1}\right|-\sin^{-1}x+c$ (4) $\sqrt{x^2-1}+2\log\left|x+\sqrt{x^2-1}\right|+c$

19

$\int \sin\sqrt{x}dx$ is

(1) $2\left(-\sqrt{x}\cos\sqrt{x}+\sin\sqrt{x}\right)+c$ (2) $2\left(-\sqrt{x}\cos\sqrt{x}-\sin\sqrt{x}\right)+c$

(3) $2\left(-\sqrt{x}\sin\sqrt{x}-\cos\sqrt{x}\right)+c$ (4) $2\left(-\sqrt{x}\sin\sqrt{x}+\cos\sqrt{x}\right)+c$

20.

$\int x^2 e^{\frac{x}{2}} dx$ is

(1) $x^2e^{\frac{x}{2}}-4xe^{\frac{x}{2}}-8e^{\frac{x}{2}}+c$ (2) $2x^2e^{\frac{x}{2}}-8xe^{\frac{x}{2}}-16e^{\frac{x}{2}}+c$

(3) $2x^2e^{\frac{x}{2}}-8xe^{\frac{x}{2}}+16e^{\frac{x}{2}}+c$ (4) $x^2\frac{e^{\frac{x}{2}}}{2}-\frac{xe^{\frac{x}{2}}}{4}+\frac{e^{\frac{x}{2}}}{8}+c$

21

$\int \sqrt{\frac{1-x}{1+x}}dx$ is

(1) $\sqrt{1-x^2}+\sin^{-1}x+c$ (2) $\sin^{-1}x-\sqrt{1-x^2}+c$

(3) $\log\left|x+\sqrt{1-x^2}\right|-\sqrt{1-x^2}+c$ (4) $\sqrt{1-x^2}+\log\left|x+\sqrt{1-x^2}\right|+c$

22.

$\int \frac{\sec^2 x}{\tan^2 x-1}dx$

(1) $2\log\left|\frac{1-\tan x}{1+\tan x}\right|+c$ (2) $\log\left|\frac{1+\tan x}{1-\tan x}\right|+c$

(3) $\frac{1}{2}\log\left|\frac{\tan x+1}{\tan x-1}\right|+c$ (4) $\frac{1}{2}\log\left|\frac{\tan x-1}{\tan x+1}\right|+c$

23.

$\int x^2 \cos x \, dx$ is

(1) $x^2 \sin x + 2x\cos x - 2\sin x + c$ (2) $x^2 \sin x - 2x\cos x - 2\sin x + c$

(3) $-x^2 \sin x + 2x\cos x + 2\sin x + c$ (4) $-x^2 \sin x - 2x\cos x + 2\sin x + c$

24.

$\int \frac{1}{x\sqrt{(\log x)^2 - 5}} dx$ is

(1) $\log\left|x + \sqrt{x^2 - 5}\right| + c$ (2) $\log\left|\log x + \sqrt{\log x - 5}\right| + c$

(3) $\log\left|\log x + \sqrt{(\log x)^2 - 5}\right| + c$ (4) $\log\left|\log x - \sqrt{(\log x)^2 - 5}\right| + c$

25.

$\int e^{-4x} \cos x \, dx$ is

(1) $\frac{e^{-4x}}{17}[4\cos x - \sin x] + c$ (2) $\frac{e^{-4x}}{17}[-4\cos x + \sin x] + c$

(3) $\frac{e^{-4x}}{17}[4\cos x + \sin x] + c$ (4) $\frac{e^{-4x}}{17}[-4\cos x - \sin x] + c$

12.Introduction to Probability Theory

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Choose the correct or the most suitable answer.

1.

If A and B are any two events, then the probability that exactly one of them occur is

(1) $P(A\cup\overline{B})+P(\overline{A}\cup B)$ (2) $P(A\cap\overline{B})+P(\overline{A}\cap B)$

(3) $P(A)+P(B)-P(A\cap B)$ (4) $P(A)+P(B)+2P(A\cap B)$

2.

A man has 3 fifty rupee notes, 4 hundred rupees notes and 6 five hundred rupees notes in his pocket. If 2 notes are taken at random, what are the odds in favour of both notes being of hundred rupee denomination?

(1) 1:12 (2) 12:1 (3) 13:1 (4) 1:13

3.

Four persons are selected at random from a group of 3 men, 2 women and 4 children. The probability that exactly two of them are children is

(1) $\frac{3}{4}$ (2) $\frac{10}{23}$ (3) $\frac{1}{2}$ (4) $\frac{10}{21}$

4.

Two items are chosen from a lot containing twelve items of which four are defective, then the probability that at least one of the item is defective

(1) $\frac{19}{33}$ (2) $\frac{17}{33}$ (3) $\frac{23}{33}$ (4) $\frac{13}{33}$

5.

A number is selected from the set $\{1,2,3,\ldots,20\}$. The probability that the selected number is divisible by 3 or 4 is

(1) $\frac{2}{5}$ (2) $\frac{1}{8}$ (3) $\frac{1}{2}$ (4) $\frac{2}{3}$

6.

A matrix is chosen at random from a set of all matrices of order 2, with elements 0 or 1 only. The probability that the determinant of the matrix chosen is non zero will be

(1) $\frac{3}{16}$ (2) $\frac{3}{8}$ (3) $\frac{1}{4}$ (4) $\frac{5}{8}$

7.

A, B, and C try to hit a target simultaneously but independently. Their respective probabilities of hitting the target are $\frac{3}{4},\frac{1}{2},\frac{5}{8}$. The probability that the target is hit by A or B but not by C is

(1) $\frac{21}{64}$ (2) $\frac{7}{32}$ (3) $\frac{9}{64}$ (4) $\frac{7}{8}$

8.

A letter is taken at random from the letters of the word 'ASSISTANT' and another letter is taken at random from the letters of the word 'STATISTICS'. The probability that the selected letters are the same is

(1) $\frac{7}{45}$ (2) $\frac{17}{90}$ (3) $\frac{29}{90}$ (4) $\frac{19}{90}$

9.

Let A and B be two events such that $P(\overline{A \cup B}) = \frac{1}{6}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{1}{4}$. Then the events A and B are

(1) Equally likely but not independent (2) Independent but not equally likely

(3) Independent and equally likely (4) Mutually inclusive and dependent

10.

There are three events A, B and C of which one and only one can happen. If the odds are 7 to 4 against A and 5 to 3 against B, then odds against C is

(1) 23: 65 (2) 65: 23 (3) 23: 88 (4) 88: 23

11.

If m is a number such that $m \leq 5$, then the probability that quadratic equation $2x^2 + 2mx + m + 1 = 0$ has real roots is

(1) $\frac{1}{5}$ (2) $\frac{2}{5}$ (3) $\frac{3}{5}$ (4) $\frac{4}{5}$

12.

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

(1) $\frac{3}{16}$ (2) $\frac{5}{16}$ (3) $\frac{7}{16}$ (4) $\frac{11}{16}$

13.

If two events A and B are independent such that $P(A) = 0.35$ and $P(A \cup B) = 0.6$, then $P(B)$ is

(1) $\frac{5}{13}$ (2) $\frac{1}{13}$ (3) $\frac{4}{13}$ (4) $\frac{7}{13}$

14

If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct?

(1) $P(A/B) = \frac{P(A)}{P(B)}$ (2) $P(A/B) < P(A)$

(3) $P(A/B) \geq P(A)$ (4) $P(A/B) > P(B)$

15.

A bag contains 5 white and 3 black balls. Five balls are drawn successively without replacement. The probability that they are alternately of different colours is

(1) $\frac{3}{14}$ (2) $\frac{5}{14}$ (3) $\frac{1}{14}$ (4) $\frac{9}{14}$

16.

A number x is chosen at random from the first 100 natural numbers. Let A be the event of numbers which satisfies $\frac{(x-10)(x-50)}{x-30} \geq 0$, then $P(A)$ is

(1) 0.20 (2) 0.51 (3) 0.71 (4) 0.70

17

If A and B are two events such that $P(A)=0.4, P(B)=0.8$ and $P(B/A)=0.6$, then $P(\overline{A} \cap B)$ is

(1) 0.96 (2) 0.24 (3) 0.56 (4) 0.66

18.

A bag contains 6 green, 2 white, and 7 black balls. If two balls are drawn simultaneously, then the probability that both are different colours is

(1) $\frac{68}{105}$ (2) $\frac{71}{105}$ (3) $\frac{64}{105}$ (4) $\frac{73}{105}$

19.

If two events A and B are such that $P(\overline{A})=\frac{3}{10}$ and $P(A \cap \overline{B})=\frac{1}{2}$, then $P(A \cap B)$ is

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$ (3) $\frac{1}{4}$ (4) $\frac{1}{5}$

20.

If X and Y be two events such that $P(X/Y)=\frac{1}{2}$, $P(Y/X)=\frac{1}{3}$ and $P(X \cap Y)=\frac{1}{6}$, then $P(X \cup Y)$ is

(1) $\frac{1}{3}$ (2) $\frac{2}{5}$ (3) $\frac{1}{6}$ (4) $\frac{2}{3}$

21.

It is given that the events A and B are such that $P(A)=\frac{1}{4}$, $P(A/B)=\frac{1}{2}$ and $P(B/A)=\frac{2}{3}$. Then $P(B)$ is

(1) $\frac{1}{6}$ (2) $\frac{1}{3}$ (3) $\frac{2}{3}$ (4) $\frac{1}{2}$

22.

The probability of two events A and B are 0.3 and 0.6 respectively. The probability that both A and B occur simultaneously is 0.18. The probability that neither A nor B occurs is

(1) 0.1 (2) 0.72 (3) 0.42 (4) 0.28

23

An urn contains 5 red and 5 black balls. A ball is drawn at random, its colour is noted and is returned to the urn. Moreover, 2 additional balls of the colour drawn are put in the urn and then a ball is drawn at random. The probability that the second ball drawn is red will be

(1) $\frac{5}{12}$ (2) $\frac{1}{2}$ (3) $\frac{7}{12}$ (4) $\frac{1}{4}$

24

Ten coins are tossed. The probability of getting at least 8 heads is

(1) $\frac{7}{64}$ (2) $\frac{7}{32}$ (3) $\frac{7}{16}$ (4) $\frac{7}{128}$

25

In a certain college 4% of the boys and 1% of the girls are taller than 1.8 meter. Further 60% of the students are girls. If a student is selected at random and is taller than 1.8 meters, then the probability that the student is a girl is

(1) $\frac{2}{11}$ (2) $\frac{3}{11}$ (3) $\frac{5}{11}$ (4) $\frac{7}{11}$

Answer keys

06 November 2021 18:18

Answer keys - Spreadsheet

11th standard Maths Oeward Shuffeled

unit;1

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	4	3	3	4	2	3	3	3	2	2	2	2	1
Q No	14	15	16	17	18	19	20	21	22	23	24	25	
Answer No	3	1	4	2	4	4	2	4	3	1	4	2	

unit;2

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	2	2	2	2	1	1	2	2	2	3	3	4	3
Q No	14	15	16	17	18	19	20						
Answer No	3	3	1	1	2	1	3						

unit;3

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	3	1	1	2	2	4	4	4	3	1	3	1	4
Q No	14	15	16	17	18	19	20						
Answer No	1	2	2	1	1	4	1						

unit;4

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	2	1	2	2		2	3	1	4	4	4	2	2
Q No	14	15	16	17	18	19	20	21	22	23	24	25	
Answer No	3	2	3	4	4	2	1	2	3	2	2	1	

unit;5

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	4	3	4	4	4	1	1	4	4	3	1	2	4
Q No	14	15	16	17	18	19	20						
Answer No	3	3	2	2	2	2	3						

unit;6

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	4	3	4	2	3	2	4	4	4	2	2	1	1
Q No	14	15	16	17	18	19	20	221	22	23	24	25	
Answer No	3	3	2	2	3	4	1	3	3	2	1	1	

unit;7

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	1	2	1	2	2	2	4	2	3	1	2	2	2
Q No	14	15	16	17	18	19	20	221	22	23	24	25	
Answer No	4	3	4	4	2	3	3	4	2	3	1	3	

unit;8

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	3	3	3	4	2	1	3	4	4	3	2	4	1
Q No	14	15	16	17	18	19	20	21	22	23	24	25	
Answer No	3	1	2	2	2	4	3	2	1	1	4	4	

unit;9

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	1	2	1	3	2	3	4	2	4	1	4	2	4
Q No	14	15	16	17	18	19	20	21	22	23	24	25	
Answer No	2	3	1	2	4	2	4	2	2	3	1	1	

unit;10

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	2	3	4	4	4	3	2	2	3	1	2	2	1
Q No	14	15	16	17	18	19	20	21	22	23	24	25	
Answer No	1	3	4	1	2	1	4	2	4	1	3	3	

unit;11

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	1	2	4	4	3	3	4	4	3	2	1	3	1
Q No	14	15	16	17	18	19	20	221	22	23	24	25	
Answer No	3	1	4	4	4	1	3	1	4	1	3	2	

unit;12

Q No	14	15	16	17	18	19	20	221	22	23	24	25	
Answer No	3	1	4	4	4	1	3	1	4	1	3	2	

unit;12

Q No	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer No	2	1	4	1	3	2	1	4	2	2	3	3	1
Q No	14	15	16	17	18	19	20	221	22	23	24	25	
Answer No	3	3	3	3	1	4	4	2	4	2	4	2	