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HIGHER SECONDARY FIRST YEAR

MATHEMATICS

Volume - 1 & 2

1 Mark

Questions & Answers

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Volume - 1

1. Sets Relations and Functions

Textual Questions

Choose the correct or the most suitable answer.

1. 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 *[First Mid-2018]*

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

Hint : $n(A \cap B) = 1$ **[Ans :** (3) 1]

2. 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 *[GMQP-2018]*

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

[Ans : (2) infinitely many elements]

3. 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 $\{0, -1, 1\}$

Hint : Since $|x^2 + y^2| \leq 2$, x, y must be 0 or 1

[Ans : (4) Range of R is $\{0, -1, 1\}$]

In-text Question & Answers

1. Which one of the following is a finite set?

(1) $\{x: x \in \mathbb{Z}, x < 5\}$ (2) $\{x: x \in \mathbb{W}, x \geq 5\}$

(3) $\{x: x \in \mathbb{N}, x > 10\}$ (4) $\{x: x$ is an even prime number$\}$

[Ans : (4) $\{x: x$ is an even prime number$\}$**]**

2. Given A = {5, 6, 7, 8}. Which one of the following is incorrect?

(1) $\varnothing \subseteq A$ (2) $A \subseteq A$

(3) $\{7, 8, 9\} \subseteq A$ (4) $\{5\} \subset A$

[Ans : (3) $\{7, 8, 9\} \subseteq A$**]**

3. Let R be a relation on the set N given by $R = \{(a, b): a = b - 2, b > 6\}$. Then

(1) $(2, 4) \in R$ (2) $(3, 8) \in R$

(3) $(6, 8) \in R$ (4) $(8, 7) \in R$

[Ans : (3) $(6, 8) \in R$**]**

4. If $f(x) = 2x - 3$ and $g(x) = x^2 + x - 2$ then $gof\,(x)$ is

(1) $2(2x^2 - 5x + 2)$ (2) $(2x^2 - 5x - 2)$

(3) $2(2x^2 + 5x + 2)$ (4) $2x^2 + 5x - 2$

[Ans : (1) $2(2x^2 - 5x + 2)$**]**

5. Let A = {–2, –1, 0, 1, 2} and f : A→Z be given by $f(x) = x^2 - 2x - 3$ then preimage of 5 is

(1) –2 (2) –1 (3) 0 (4) 1 **[Ans :** (1) – 2**]**

Board Expected Question & Answers

1. If $A \subseteq B$, then $A \backslash B$ is

(1) B (2) A (3) $\varnothing$ (4) $\frac{B}{A}$

[Ans : (3) $\varnothing$**]**

2. If A = {1, 2, 3}, B = {1, 4, 6, 9} and R is a relation from A to B defined by "x is greater than y". The range of R is

(1) {1, 4, 6, 9} (2) {4, 6, 9}

(3) {1} (4) none of these **[Ans :** (3) {1}**]**

3. Let R be the relation over the set of all straight lines in a plane such that $l_1 R l_2 \Leftrightarrow l_1 \perp l_2$. Then R is

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

[Ans : (1) symmetric**]**

4. Which of the following is not an equivalence relation on z?

(1) $aRb \Leftrightarrow a + b$ is an even integer
(2) $aRb \Leftrightarrow a - b$ is an even integer
(3) $aRb \Leftrightarrow a < b$ (4) $aRb \Leftrightarrow a = b$

[Ans : (3) $aRb \Leftrightarrow a < b$ **]**

5. If f: R → R is given by $f(x) = 3x - 5$, then $f^{-1}(x)$ is

(1) $\frac{1}{3x-5}$ (2) $\frac{x+5}{3}$
(3) does not exist since f is not one-one
(4) does not exists since f is not onto **[Ans :** (2) $\frac{x+5}{3}$ **]**

6. Let f : R→ R be defined as $f(x) = x^4$, choose the correct answer

(1) f is one - one onto (2) f is onto
(3) f is one - one but not onto
(4) f is neither one - one nor onto

[Ans : (1) f is one - one onto**]**

7. Let f: R→ R be given $f(x) = (3 - x^3)^{1/3}$ then $fof(x)$ is

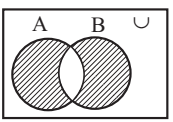
(1) $x^{1/3}$ (2) x^3 (3) x (4) $3 - x^4$

[Ans : (3) x**]**

Reasoning Question & Answers (Hots)

1. The shaded region in the adjoining diagram represents.

(1) A\B (2) B\A (3) A Δ B (4) A′



[Ans : (3) A Δ B**]**

2. Basic Algebra

Textual Questions

Choose the correct or the most suitable answer.

1. If $|x + 2| \leq 9$, then x belongs to *[GMQP-2018]*

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

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

Hint : $|x + 2| \leq 9 \Rightarrow -9 \leq x + 2 \leq 9 \Rightarrow -11 \leq x \leq 7$

x belongs to $[-11,7]$ **[Ans :** (2)$[-11, 7]$**]**

2. 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) $\frac{x}{b} \geq \frac{y}{b}$

Hint : $x < y, b \geq 0 \Rightarrow xb < yb$ **[Ans :** (1) $xb < yb$**]**

3. If $\frac{|x-2|}{x-2} \geq 0$, then x belongs to

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

Hint : In $(-\infty, 2)$ $\frac{|x-2|}{x-2}$ is negative

In $(2,\infty)$, $\frac{|x-2|}{x-2} > 0$ **[Ans :** (2) $(2, \infty)$**]**

4. The solution of $5x - 1 < 24$ and $5x + 1 > -24$ is *[First Mid-2018]*

(1) (4, 5) (2) (–5,–4) (3) (–5, 5) (4) (–5, 4)

Hint :

$5x - 1 < 24$	$5x + 1 > -24$
$5x < 25$	$5x > -25$
$x < 5$	$x > -5$

$-5 < x < 5$ **[Ans :** (3) (–5, 5)**]**

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

(1) [0, 2] (2) $[2,\infty)$ (3) (0, 2) (4) $(-\infty,2)$ *[Qy-2018]*

Hint : When $x = 0, |-1| \geq |-3|$ not true $\therefore$ cannot be (1)

When $x = 1, |0| \geq |-2|$ not true $\therefore$ cannot be (3)

When $x = -4, |-5| \geq |-7|$ not true $\therefore$ cannot be (4)

[Ans : (2) $[2,\infty)$**]**

In-text Question & Answers

1. **If $x < 7$, then**

(1) $-x < -7$ (2) $-x \leq -7$ (3) $-x > -7$ (4) $-x \geq -7$

[Ans : (3) $-x > -7$]

2. **If x is a real number and $|x| < 5$, then**

(1) $x \geq 5$ (2) $-5 < x < 5$ (3) $x \leq -5$ (4) $-5 \leq x \leq 5$

[Ans : (2) $-5 < x < 5$]

3. **$(\sqrt{5}-2)(\sqrt{5}+2)$ is equal to**

(1) 1 (2) 3 (3) 23 (4) 21 **[Ans : (1) 1]**

4. **The value of $(16)^{\frac{-3}{4}}$ is**

(1) 8 (2) –8 (3) $\frac{1}{8}$ (4) $\frac{-1}{8}$ **[Ans : (3) $\frac{1}{8}$]**

Board Expected Question & Answers

1. **If $-3x + 17 < -13$, then**

(1) $x \in (10, \infty)$ (2) $x \in [10, \infty)$

(3) $x \in (-\infty, 10]$ (4) $x \in [-\infty, 10)$

[Ans : (1) $x \in (10, \infty)$]

2. **$\sqrt[4]{11}$ is equal to**

(1) $\sqrt[8]{11^2}$ (2) $\sqrt[8]{11^4}$ (3) $\sqrt[8]{11^8}$ (4) $\sqrt[8]{11^6}$

[Ans : (1) $\sqrt[8]{11^2}$]

3. **The rationalising factor of $\frac{5}{\sqrt[3]{3}}$ is**

(1) $\sqrt[3]{6}$ (2) $\sqrt[3]{3}$ (3) $\sqrt[3]{9}$ (4) $\sqrt[3]{27}$

[Ans : (3) $\sqrt[3]{9}$]

4. **The number of real solutions of $|2x - x^2 - 3| = 1$ is**

(1) 0 (2) 2 (3) 3 (4) 4 **[Ans : (2) 2]**

5. **The logarithmic form of $5^2 = 25$ is**

(1) $\log_5 2 = 25$ (2) $\log_2 5 = 25$

(3) $\log_5 25 = 2$ (4) $\log_{25} 5 = 2$ **[Ans : (3) $\log_5 25 = 2$]**

6. **The value of $\log_{\frac{3}{4}}\left(\frac{4}{3}\right)$ is**

(1) –2 (2) 1 (3) 2 (4) –1 **[Ans : (4) –1]**

3. **If the roots of $x^2 - bx + c = 0$ are two consecutive integers, then $b^2 - 4c$ is**

(1) 0 (2) 1 (3) 2 (4) none of these

[Ans : (2) 1**]**

4. **The factors of the polynomial $6\sqrt{3}x^2 - 47x + 5\sqrt{3}$ are**

(1) $(2x - 5\sqrt{3})(3\sqrt{3}x - 1)$ (2) $(2x - 5\sqrt{3})(3\sqrt{3}x + 1)$

(3) $(2x + 5\sqrt{3})(3\sqrt{3}x + 1)$ (4) $(2x + 5\sqrt{3})(3\sqrt{3}x - 1)$

[Ans : (1) $(2x - 5\sqrt{3})(3\sqrt{3}x - 1)$**]**

5. **If $\sqrt{x+14} < 2$, then x belongs to**

(1) $[-14, -10)$ (2) $(-14, -10)$ (3) $(-\infty, -10)$ (4) $[-14, -10]$

[Ans : (1) $[-14, -10)$**]**

3. TRIGONOMETRY

Textual Questions

CHOOSE THE CORRECT OR THE MOST SUITABLE ANSWER.

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

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

Hint : $\dfrac{1}{\cos 80^\circ} - \dfrac{\sqrt{3}}{\sin 80^\circ} = \dfrac{\sin 80^\circ - \sqrt{3}\cos 80^\circ}{\sin 80^\circ \cos 80^\circ}$

$= \dfrac{\frac{1}{2}\sin 80^\circ - \frac{\sqrt{3}}{2}\cos 80^\circ}{\frac{1}{2}\sin 80^\circ \cos 80^\circ} = \dfrac{\sin 80^\circ \cos 60^\circ - \cos 80^\circ \sin 60^\circ}{\frac{1}{2}\sin 80^\circ \cos 80^\circ}$

$= \dfrac{\sin 20^\circ}{\frac{1}{2}\sin 80^\circ \cos 80^\circ} = \dfrac{\sin 160^\circ}{\frac{1}{2}\sin 80^\circ \cos 80^\circ} = \dfrac{2\sin\cos 80^\circ}{\frac{1}{2}\sin 80^\circ \cos 80^\circ} = 4$

[Ans : (4) 4**]**

20. In a ΔABC, 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.

Hint :

We know that in ΔABC $\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2} > 0$

And also sin A sin B sin C > 0. Both are true.

Since sine is positive in I and II quadrant.

[Ans : (1) Both (i) and (ii) are true**]**

In-text Question & Answers

1. If the angles of a triangle are in A.P., then the measure of one of the angles in radians is

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{2}$ (4) $\frac{2\pi}{3}$ **[Ans :** (2) $\frac{\pi}{3}$**]**

2. The angle between the minute and hour hands of a clock at 8.30 is

(1) 80° (2) 75° (3) 60° (4) 105°

[Ans : (2) 75°**]**

3. If $\tan A = \frac{a}{a+1}$ and $\tan B = \frac{1}{2a+1}$ then the value of A + B is

(1) 0 (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{4}$ **[Ans :** (4) $\frac{\pi}{4}$**]**

4. The value of $\sin^2\frac{5\pi}{12} - \sin^2\frac{\pi}{12}$ is

(1) $\frac{1}{2}$ (2) $\frac{\sqrt{3}}{2}$ (3) 1 (4) 0 **[Ans :** (2) $\frac{\sqrt{3}}{2}$**]**

5. $2 \sin 5x \cos x =$

(1) $\sin 6x + \cos 4x$ (2) $\sin 6x + \sin 4x$

(3) $\cos 6x + \sin 4x$ (4) $\cos 6x + \cos 4x$

[Ans : (1) $\sin 6x + \cos 4x$**]**

6. $\cos 6x - \cos 8x =$

(1) $2 \sin 7x \sin x$ (2) $\sin 7x \sin x$

(3) $\frac{1}{2} \sin 7x + \sin x$ (4) $\sqrt{2} \sin 7x \sin x$

[Ans : (1) $2 \sin 7x \sin x$**]**

7. $\frac{\cos 3x}{2\cos 2x - 1}$ **is**

(1) $\cos x$ (2) $\sin x$ (3) $\tan x$ (4) $\cot x$

[Ans : (1) $\cos x$**]**

8. $\frac{\sin 10^\circ - \cos 10^\circ}{\cos 10^\circ + \sin 10^\circ}$ **is**

(1) $\tan 35^\circ$ (2) $\sqrt{3}$ (3) $\tan 75^\circ$ (4) 1 **[Ans:**(1) $\tan 35^\circ$**]**

Board Expected Question & Answers

1. **If** $\tan x = \frac{-1}{\sqrt{5}}$ **and** x **lies in the IV quadrant, then the value of** $\cos x$ **is**

(1) $\sqrt{\frac{5}{6}}$ (2) $\frac{2}{\sqrt{6}}$ (3) $\frac{1}{2}$ (4) $\frac{1}{\sqrt{6}}$ **[Ans:**(1) $\sqrt{\frac{5}{6}}$**]**

2. **Which of the following is incorrect?**

(1) $\sin x = \frac{-1}{5}$ (2) $\cos x = 1$

(3) $\sec x = \frac{1}{2}$ (4) $\tan x = 20$ **[Ans :** (3) $\sec x = \frac{1}{2}$**]**

3. **In any** ΔABC, $a\ (b \cos C - c \cos B) =$

(1) a^2 (2) $b^2 - c^2$ (3) 0 (4) $b^2 + c^2$ **[Ans:**(3) 0**]**

4. **Which one of the following is not true for any** θ?

(1) $\sin \theta = -\frac{3}{4}$ (2) $\cos \theta = -1$

(3) $\tan \theta = 25$ (4) $\sec \theta = \frac{1}{4}$ **[Ans:** (4) $\sec \theta = \frac{1}{4}$**]**

4. Combinatorics and Mathematical Induction

Textual Questions

Choose the correct or the most suitable answer.

1. The sum of the digits at the 10th 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

Hint : □□□□ (Without repetition) Number of numbers formed = $4 \times 3 \times 2 \times 1 = 24$

∴ There will be 2's, 4's, 5's, 7's in unit place, tenth place etc.

∴ Six each in tenth place.

Sum of all integers in tenth place = $6 (2 + 4 + 5 + 7) = 108$

[Ans : (2) 108**]**

2. 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

Hint : No. of ways of answering = $5^3 = 125$

Correct answer = 1

∴ Number of ways of incorrect answer = $125 - 1 = 124$

[Ans : (2) 124**]**

3. 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

Hint : First in maths ⇒ 30 ways. Second in maths: 29ways similarly for other subject

$30 \times 29 \times 30 \times 29 \times 30 \times 30 = 30^4 \times 29^2$ **[Ans :** (1) $30^4 \times 29^2$**]**

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

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

Hint : □□□□□ The odd numbers are 1, 3, 5, 7, 9

∴ Number of odd numbers in which all the places are odd

$= 5 \times 5 \times 5 \times 5 \times 5 = 5^5$ **[Ans :** (2) 5^5**]**

In-text Question & Answers

1. The number of different signals which can be give from 6 flags of different colours taking one or more at a time is

(1) 1958 (2) 1956 (3) 16 (4) 64

[Ans : (2) 1956**]**

2. $^5C_1 + {}^5C_2 + {}^5C_3 + {}^5C_4 + {}^5C_5$ **is equal to**

(1) 30 (2) 31 (3) 32 (4) 33 **[Ans :** (2) 31**]**

3. Among the players 5 are bowlers. In how many ways a team of 11 may be formed with atleast 4 bowlers?

(1) 265 (2) 263 (3) 264 (4) 275

[Ans : (3) 264**]**

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

(1) 45 (2) 40 (3) 39 (4) 38 **[Ans :** (2) 40**]**

5. The sum of the digits in the unit's place of all the 4-digit numbers formed by 3, 4, 5 and 6, without repetition is

(1) 432 (2) 108 (3) 36 (4) 72 **[Ans :** (2) 108**]**

6. Value of $\frac{7!}{2!}$

(1) 2520 (2) 2250 (3) 2205 (4) 2052

[Ans : (1) 2520**]**

Board Expected Question & Answers

1. The number of permutations of *n* different things taking *r* at a time when 3 particular things are to be included is

(1) $^{n-3}P_{r-3}$ (2) $^{n-3}P_r$ (3) $^nP_{r-3}$ (4) $r!\ ^{n-3}C_{r-3}$

[Ans : (4) $r!\ ^{n-3}C_{r-3}$**]**

2. The number of ways to arrange the letters of the word CHEESE are

(1) 120 (2) 240 (3) 720 (4) 6 **[Ans :** (1) 120**]**

3. The product of *r* consecutive positive integers is divisible by

(1) $r!$ (2) $r! + 1$ (3) $(r + 1)$ (4) none of these

[Ans : (1) $r!$**]**

4. If ${}^{15}C_{3r} = {}^{15}C_{r+3}$, then r is equal to

(1) 5 (2) 4 (3) 3 (4) 2 **[Ans :** (3) 3**]**

5. If ${}^{m}C_{1} = {}^{n}C_{2}$, then

(1) $2m = n$ (2) $2m = n(n + 1)$

(3) $2m = n(n - 1)$ (4) $2n = m\,(m - 1)$

[Ans : (3) $2m = n(n - 1)$**]**

6. If ${}^{(a^2-a)}C_{2} = {}^{(a^2-a)}C_{4}$, then a =

(1) 2 (2) 3 (3) 4 (4) none of these

[Ans : (2) 3**]**

7. For all $n \in N$, $3 \times 5^{2n+1} + 2^{3n+1}$ is divisible by

(1) 19 (2) 17 (3) 23 (4) 25 **[Ans :** (2) 17**]**

8. The number of words that can be formed out the letters of the word "COMMITTEE" is

(1) $\frac{9!}{(2!)^3}$ (2) $\frac{9!}{(2!)^2}$ (3) $\frac{9!}{2!}$ (4) 9! **[Ans:**(1) $\frac{9!}{(2!)^3}$ **]**

9. Rank of the word "MOTHER" is

(1) 310 (2) 300 (3) 308 (4) 309

[Ans : (4) 309**]**

Reasoning Question & Answers (Hots)

1. Number of all four digit numbers having different digits formed of the digits 1, 2, 3, 4 and 5 and divisible by 4 is

(1) 24 (2) 30 (3) 125 (4) 100

[Ans : (1) 24**]**

2. If ${}^{n+1}C_{3} = 2.\,{}^{n}C_{21}$ then n =

(1) 3 (2) 4 (3) 5 (4) 6 **[Ans :** (3) 5**]**

3. If $10^n + 3 \times 4^{n+2} + \lambda$ is divisible by 9 for all $n \in N$, then the least positive integral value of λ is

(1) 5 (2) 3 (3) 7 (4) 1 **[Ans :** (1) 5**]**

4. If $p(n)$: $49^n + 16^n + \lambda$ is divisible by 64 for $n \in N$ is true, then the least negative integral value of λ is

(1) –3 (2) –2 (3) –1 (4) –4 **[Ans :** (3) –1**]**

5. BINOMIAL THEOREM, SEQUENCES AND SERIES

Textual Questions

CHOOSE THE CORRECT OR THE MOST SUITABLE ANSWER.

1. The value of $2 + 4 + 6 + ...+ 2n$ is

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

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

Hint :

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

[Ans : (4) $n(n + 1)$**]**

2. The coefficient of x^6 in $(2 + 2x)^{10}$ is *[Qy-2018]*

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

Hint :

In $(2 + 2x)^{10}$, the term containing x^6 is

${}^{10}C_6\, (2)^{10-6}\, (2x)^6 = {}^{10}C_6\, 2^4 2^6 x^6$

Coefficient is ${}^{10}C_6\, 2^{10}$ **[Ans :** (4) ${}^{10}C_6\, 2^{10}$**]**

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

(1) 0 (2) $2^8 3^{12}$ *[GMQP-2018]*

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

Hint : In $(2x + 3y)^{20}$ Term term containing $x^8 y^{12}$ is

${}^{20}C_{12}\, (2x)^{20-12}\, (3y)^{12} = {}^{20}C_{12}\, 2^8 3^{12} x^8 y^{12}$

Coefficient is ${}^{20}C_{12}\, 2^8 3^{12} = {}^{20}C_8\, 2^8 3^{12} (\because {}^{20}C_{12} = {}^{20}C_8)$

[Ans : (4) ${}^{20}C_8\, 2^8 3^{12}$**]**

4. If ${}^nC_{10} > {}^nC_r$ for all possible r, then a value of n is

(1) 10 (2) 21 (3) 19 (4) 20 *[Qy-2018]*

Hint : ${}^{20}C_{10} > {}^{20}C_r$ for all possible value of r.

[Ans : (4) 20**]**

2. The series $1+4x+8x^2+\frac{32}{3}x^3+\cdots+\infty$ is

(1) e^x (2) e^{4x} (3) e^{2x} (4) e^{8x} **[Ans : (2) e^{4x}]**

3. The Co-efficient of x^3 in $\sqrt{\frac{1-x}{1+x}}$, $|x|<1$ is

(1) $\frac{1}{2}$ (2) $\frac{3}{8}$ (3) $\frac{-3}{8}$ (4) $\frac{-1}{2}$ **[Ans:(4) $\frac{-1}{2}$]**

4. The remainder when 52^{40} is divided by 17 is

(1) 1 (2) 3 (3) 5 (4) 6 **[Ans : (1) 1]**

Board Expected Question & Answers

1. The Co-efficient of x^{-17} in $\left(x^4-\frac{1}{x^3}\right)^{15}$ is

(1) 1365 (2) –1365 (3) 3003 (4) –3003

[Ans : (2) –1365]

2. The term without x in $\left(2x-\frac{1}{2x^2}\right)^{12}$ is

(1) 495 (2) –495 (3) –7920 (4) 7920

[Ans : (4) 7920]

3. The first and last term of an A. P. are 1 and 11. If the sum of its terms is 36, then the number of terms will be

(1) 5 (2) 6 (3) 7 (4) 8 **[Ans : (2) 6]**

4. If the first, second and last term of an A. P. are a, b and $2a$ respectively, then its sum is

(1) $\frac{ab}{2(b-a)}$ (2) $\frac{ab}{b-a}$ (3) $\frac{3ab}{2(b-a)}$ (4) none of these

[Ans : (3) $\frac{3ab}{2(b-a)}$]

5. If in an infinite G. P., first term is equal to 10 times the sum of all successive terms, then its common ratio is

(1) $\frac{1}{10}$ (2) $\frac{1}{11}$ (3) $\frac{1}{9}$ (4) $\frac{1}{20}$ **[Ans : (2) $\frac{1}{11}$]**

6. The value of $9^{\frac{1}{3}}\cdot 9^{\frac{1}{9}}\cdot 9^{\frac{1}{27}}\cdots\infty$ is

(1) 1 (2) 3 (3) 9 (4) none of these

[Ans : (2) 3]

7. **The sum of the series** $\frac{1}{\log_2 4}+\frac{1}{\log_4 4}+\frac{1}{\log_8 4}+\cdots+\frac{1}{\log_{2^n} 4}$ **is**

(1) $\frac{n(n+1)}{2}$ (2) $\frac{n(n+1)(2n+1)}{12}$

(3) $\frac{n(n+1)}{4}$ (4) none of these **[Ans:**(3) $\frac{n(n+1)}{4}$**]**

8. **If** $\Sigma n = 210$ **then** $\Sigma n^2 =$

(1) 2870 (2) 2160 (3) 2970 (4) none of these

[Ans : (1) 2870**]**

9. **Sum of** 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 **[Ans:**(3) $\frac{n(n+1)}{\sqrt{2}}$**]**

10. **The series for** $\log\left(\frac{1+x}{1-x}\right)$ **is**

(1) $x+\frac{x^3}{3}+\frac{x^5}{5}+\cdots+\infty$ (2) $2\left[x+\frac{x^3}{3}+\frac{x^5}{5}+\cdots+\infty\right]$

(3) $\frac{x^2}{2}+\frac{x^4}{4}+\frac{x^6}{6}+\cdots+\infty$ (4) $2\left[\frac{x^2}{2}+\frac{x^4}{4}+\frac{x^6}{6}+\cdots+\infty\right]$

[Ans : (2) $2\left[x+\frac{x^3}{3}+\frac{x^5}{5}+\cdots+\infty\right]$**]**

11. **If the co-efficient of** x **in** $\left(x^2+\frac{\lambda}{x}\right)^5$ **is zero, then** $\lambda =$

(1) 3 (2) 4 (3) 5 (4) 6 **[Ans :** (1) 3**]**

Reasoning Question & Answers (Hots)

1. **If the sum of** n **terms of an A. P. be** $3n^2 - n$ **and its common difference is 6, then its first term is**

(1) 2 (2) 3 (3) 1 (4) 4 **[Ans :** (1) 2**]**

2. **The** n^{th} **term of a G. P is 128 and the sum of its** n **terms is 225. If its common ratio is 2, then its first term is**

(1) 1 (2) 3 (3) 8 (4) none of these

[Ans : (1) 1**]**

3. **If** ${}^nC_4, {}^nC_5, {}^nC_6$ **are in AP then value of** n **is**

(1) 14 (2) 11 (3) 9 (4) 5 **[Ans :** (1) 14**]**

6. Two Dimensional Analytical Geometry

Textual Questions

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) $3x^2 - y^2 = 0$

Hint : Let the point (x,y)

Its distance from origin is $\sqrt{x^2 + y^2}$

$$\text{Given } x = \frac{1}{2}\sqrt{x^2 + y^2} \Rightarrow 2x = \sqrt{x^2 + y^2}$$

$$4x^2 = x^2 + y^2$$

$3x^2 - y^2 = 0$ is the locus required.

[Ans : (4) $3x^2 - y^2 = 0$**]**

2. 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) $y^2 = 4ax$

Hint : $(at^2, 2at) \Rightarrow x = at^2, y = 2at$

$$y^2 = 4a^2 t^2 = 4a^2 \left(\frac{x}{a}\right) = 4ax$$

[Ans : (4) $y^2 = 4ax$**]**

3. 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)

Hint : (1, 2) lies on $3x^2 + 3y^2 - 8x - 12y + 17 = 0$

Because $3(1)^2 + 3(2)^2 - 8(1) - 12(2) + 17$

$= 3 + 12 - 8 - 24 + 17 = 0$ **[Ans :** (3) (1,2)**]**

25. The equation of one the line represented by the equation $x^2 + 2xy \cot\theta - y^2 = 0$ is

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

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

Hint : $x^2 + 2xy\cot\theta - y^2 = 0$

$x^2 + x(2y\cot\theta) - y^2 = 0$

$$x = \frac{-2y\cot\theta \pm \sqrt{4y^2\cot^2\theta + 4y^2}}{2}$$

$x = -y\cot\theta \pm y\,\text{cosec}\,\theta$

$x\sin\theta = -y\cos\theta - y$

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

[Ans : (4) $x\sin\theta + y(\cos\theta + 1) = 0$**]**

In-text Question & Answers

1. The locus of a point which moves such that it maintains equal distance from the fixed point is a

(1) straight line (2) line bisector

(3) circle (4) angle bisector **[Ans :** (3) circle**]**

2. The value of x so that 2 is the slope of the line through (2, 5) and (x, 3) is

(1) –1 (2) 1 (3) 0 (4) 2 **[Ans :** (2) 1**]**

3. Slope of X-axis or a line parallel to X-axis is

(1) 0 (2) positive (3) negative (4) infinity

[Ans : (1) 0**]**

4. The angle between the lines $2x - y + 3 = 0$ and $x + 2y + 3 = 0$ is

(1) 90° (2) 60° (3) 45° (4) 30°

[Ans : (1) 90°**]**

5. If the lines $x + q = 0$, $y - 2 = 0$ and $3x + 2y + 5 = 0$ are concurrent, then the value of q will be

(1) 1 (2) 2 (3) 3 (4) 5 **[Ans :** (3) 3**]**

6. A point equi-distant from the lines $4x + 3y + 10 = 0$, $5x - 12y + 26 = 0$ and $7x + 24y - 50 = 0$ is

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

[Ans : (3) $(0, 0)$**]**

7. The distance between the line $12x - 5y + 9 = 0$ and the point $(2, 1)$ is

(1) $\pm\frac{28}{13}$ (2) $\frac{28}{13}$ (3) $-\frac{28}{13}$ (4) none of these

[Ans : (2) $\frac{28}{13}$**]**

Board Expected Question & Answers

1. The locus of a point which moves such that it maintains equal distances from two fixed points is a

(1) straight line (2) line bisector
(3) pair of straight lines (4) angle bisector

[Ans : (2) line bisector**]**

2. If the points $(a, 0)$, $(0, b)$ and (x, y) are collinear, then

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

(3) $\frac{x}{a} + \frac{y}{b} = -1$ (4) $\frac{x}{a} + \frac{y}{b} = 0$

[Ans : (2) $\frac{x}{a} + \frac{y}{b} = 1$**]**

3. The equation of the line passing through (1, 5) and perpendicular to the line $3x - 5y + 7 = 0$ is

(1) $5x + 3y - 20 = 0$ (2) $3x - 5y + 7 = 0$
(3) $3x - 5y + 6 = 0$ (4) $5x + 3y + 7 = 0$

[Ans : (1) $5x + 3y - 20 = 0$**]**

4. Distance between the lines $5x + 3y - 7 = 0$ and $15x + 9y + 14 = 0$ is

(1) $\frac{35}{\sqrt{34}}$ (2) $\frac{1}{3\sqrt{34}}$ (3) $\frac{35}{3\sqrt{34}}$ (4) $\frac{35}{2\sqrt{34}}$

[Ans : (3) $\frac{35}{3\sqrt{34}}$**]**

5. The value of λ for which the lines $3x + 4y = 5$, $5x + 4y = 4$ and $\lambda x + 4y = 6$ meet at a point is

(1) 2 (2) 1 (3) 4 (4) 3 **[Ans :** (2) 1**]**

6. **If $7x^2 - 8xy + A = 0$ represents a pair of perpendicular lines, then A is**

(1) 7 (2) –7 (3) –8 (4) 8 **[Ans : (2) –7]**

7. **When $h^2 = ab$, the angle between the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ is**

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{6}$ (4) 0° **[Ans : (4) 0°]**

Reasoning Question & Answers (Hots)

1. **The figure formed by the lines $ax \pm by \pm c = 0$ is a**

(1) rectangle (2) square

(3) rhombus (4) none of these

[Ans : (3) rhombus**]**

Volume - 2

7. Matrices and Determinants

Textual Questions

Choose the correct or the most suitable answer from the given four alternatives.

1. **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) $\begin{bmatrix} -\frac{1}{2} & \frac{1}{2} \\ 1 & 2 \end{bmatrix}$

Hint : $a_{ij} = \frac{1}{2}(3i - 2j)$

$a_{11} = \frac{1}{2}(3-2) = \frac{1}{2}$, $a_{12} = \frac{1}{2}(3-4) = -\frac{1}{2}$

$a_{21} = \frac{1}{2}(6-2) = 2$, $a_{22} = \frac{1}{2}(6-4) = \frac{2}{2} = 1$

$\therefore A = \begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ 2 & 1 \end{bmatrix}$ **[Ans:** (2) $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ 2 & 1 \end{bmatrix}$**]**

9. If A and B are square matrices of order 3 and $|A| = 5$, $|B| = 3$ then $|3AB|$ is

(1) 27 (2) 81 (3) 135 (4) 405

[Ans: (4) 405**]**

10. If $f(x) = \begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix}$ **then**

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

[Ans: (3) $f(0) = 0$**]**

Board Expected Question & Answers

1. If A is a matrix of order 3×3, then $(A^2)^{-1} =$

(1) $\frac{1}{A^2}$ (2) A^{-2} (3) $(A^{-1})^2$ (4) I **[Ans:** (3) $(A^{-1})^2$**]**

2. $|adj\ A| =$ ___ where A is a square matrix of order

(1) $|A|$ (2) $|A|^2$ (3) $|A|^3$ (4) I **[Ans:** (2) $|A|^2$**]**

3. If A is a square matrix of order 3, then the number of minors in determinant of A are

(1) 3 (2) 21 (3) 9 (4) 27 **[Ans:** (3) 9**]**

Reasoning Question & Answers (Hots)

1. The value of $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} = 0$, **where a, b, c are in AP is**

(1) $(x+1)(x+2)(x+3)$ (2) I

(3) 0 (4) $(x+a)(x+b)(x+c)$

[Ans: (3) 0**]**

2. On using elementary row operation $R_1 \to R_1 - 3R_2$ in the following matrix equation $\begin{pmatrix} 4 & 2 \\ 3 & 3 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}\begin{pmatrix} 2 & 0 \\ 1 & 1 \end{pmatrix}$ we get,

(1) $\begin{pmatrix} -5 & -7 \\ 3 & 3 \end{pmatrix} = \begin{pmatrix} 1 & -7 \\ 0 & 3 \end{pmatrix}\begin{pmatrix} 2 & 0 \\ 1 & 1 \end{pmatrix}$

(2) $\begin{pmatrix} -5 & -7 \\ 3 & 3 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}\begin{pmatrix} -1 & -3 \\ 1 & 1 \end{pmatrix}$

(3) $\begin{pmatrix} -5 & -7 \\ 3 & 3 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 1 & -7 \end{pmatrix}\begin{pmatrix} 2 & 0 \\ 1 & 1 \end{pmatrix}$

(4) $\begin{pmatrix} 4 & 2 \\ -5 & -7 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ -3 & -3 \end{pmatrix}\begin{pmatrix} 2 & 0 \\ 1 & 1 \end{pmatrix}$

[Ans: (1) $\begin{pmatrix} -5 & -7 \\ 3 & 3 \end{pmatrix} = \begin{pmatrix} 1 & -7 \\ 0 & 3 \end{pmatrix}\begin{pmatrix} 2 & 0 \\ 1 & 1 \end{pmatrix}$**]**

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8. VECTOR ALGEBRA-I

Textual Questions

CHOOSE THE CORRECT OR THE MOST SUITABLE ANSWER FROM THE GIVEN FOUR ALTERNATIVES.

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

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

Hint : $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{DA} + \overrightarrow{CD} = \overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} + \overrightarrow{DA} = \overrightarrow{AA} = \vec{0}$

[Ans : (3) $\vec{0}$ **]**

2. 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) $\frac{1}{6}$

Hint : $\vec{a} + 2\vec{b} = 3(\vec{a} + 2\vec{b}) = 3\vec{a} + 6\vec{b} = 3\vec{a} + m\vec{b}$

$m = 6$ **[Ans:** (3) 6**]**

4. The value of λ when the vectors $\vec{a} = 2\vec{i} + \lambda\vec{j} + \vec{k}$ and $\vec{b} = \vec{i} + 2\vec{j} + 3\vec{k}$ are orthogonal is

(1) 0 (2) 1 (3) $\frac{3}{2}$ (4) $-\frac{5}{2}$ **[Ans:**(4) $-\frac{5}{2}$ **]**

5. The vectors from origin to the points A and B are $2\hat{i} - 3\hat{j} + 2\hat{k}$ and $2\hat{i} + 3\hat{j} + \hat{k}$ respectively, then the area of ΔOAB is equal to

(1) 340 (2) 5 (3) $\sqrt{229}$ (4) $\frac{1}{2}\sqrt{229}$

[Ans: (4) $\frac{1}{2}\sqrt{229}$ **]**

6. The number of vectors of unit length perpendicular to the vectors $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} + 6\hat{k}$ is

(1) 1 (2) 2 (3) 3 (4) infinite **[Ans:**(2)2]

7. If $|\vec{a}| = |\vec{b}|$ then

(1) $\vec{a} = \vec{b}$ (2) $\vec{a} = -\vec{b}$

(3) $\vec{a} = \pm\vec{b}$ (4) both are null vectors

[Ans: (3) $\vec{a} = \pm\vec{b}$ **]**

Board Expected Question & Answers

1. The vector having initial and terminal points as (2, 5, 0) and (–3, 7, 4) respectively is

(1) $-\hat{i} + 12\hat{j} + 4\hat{k}$ (2) $5\hat{i} + 2\hat{j} - 4\hat{k}$

(3) $-5\hat{i} + 2\hat{j} + 4\hat{k}$ (4) $\hat{i} + \hat{j} + \hat{k}$ **[Ans:** (3) $-5\hat{i} + 2\hat{j} + 4\hat{k}$ **]**

2. The position vector of the point which divides the join of points $2\vec{a} - 3\vec{b}$ and $\vec{a} + \vec{b}$ in the ratio 3:1 is

(1) $\frac{3\vec{a} - 2\vec{b}}{2}$ (2) $\frac{7\vec{a} - 8\vec{b}}{2}$

(3) $\frac{3\vec{a}}{4}$ (4) $\frac{5\vec{a}}{4}$ **[Ans:** (4) $\frac{5\vec{a}}{4}$ **]**

3. The value of the expression $|\vec{a} \times \vec{b}|^2 + (\vec{a} \cdot \vec{b})^2$ is

(1) $\cos^2\theta$ (2) $\sin^2\theta$

(3) $|\vec{a}|^2|\vec{b}|^2$ (4) $(|\vec{a}|+|\vec{b}|)^2$ **[Ans:** (3) $|\vec{a}|^2|\vec{b}|^2$ **]**

4. The vector in the direction of the vector $\hat{i}-2\hat{j}+2\hat{k}$ that has magnitude 9 is

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

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

[Ans: (3) $3(\hat{i}-2\hat{j}+2\hat{k})$ **]**

5. If the direction cosines of a line are k, k and k, then

(1) $k > 0$ (2) $0 < k < 1$

(3) $k = 1$ (4) $k = \frac{1}{\sqrt{3}}$ or $-\frac{1}{\sqrt{3}}$

[Ans: (4) $k = \frac{1}{\sqrt{3}}$ or $-\frac{1}{\sqrt{3}}$ **]**

6. The projection of $\vec{b}$ on $\vec{a}$ is

(1) $\left(\frac{\vec{a}\cdot\vec{b}}{|\vec{b}|}\right)\vec{b}$ (2) $\frac{\vec{a}\cdot\vec{b}}{|\vec{b}|}$ (3) $\frac{\vec{a}\cdot\vec{b}}{|\vec{a}|}$ (4) $\left(\frac{\vec{a}\cdot\vec{b}}{|\vec{a}|}\right)$

[Ans: (4) $\left(\frac{\vec{a}\cdot\vec{b}}{|\vec{a}|}\right)$ **]**

Reasoning Question & Answers (Hots)

1. If $|\vec{a}| = 4$ and $-3 \leq \lambda \leq 2$ then the range of $|\lambda\vec{a}|$ is

(1) [0, 8] (2) [–12, 8] (3) [0, 12] (4) [8, 12]

[Ans: (3) [0, 12]**]**

2. The value of m for which the vectors $3\hat{i}-6\hat{j}+\hat{k}$ and $2\hat{i}-4\hat{j}+\lambda\hat{k}$ are parallel is

(1) $\frac{2}{3}$ (2) $\frac{3}{2}$ (3) $\frac{5}{2}$ (4) $\frac{2}{5}$ **[Ans:** (1) $\frac{2}{3}$ **]**

9. Differential Calculus - Limits and Continuity

Textual Questions

Choose the correct or the most suitable answer from the given four alternatives.

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

(1) 1 (2) 0 (3) ∞ (4) $-\infty$ **[Ans:** (2) 0**]**

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

(1) 2 (2) 1 (3) -2 (4) 0 **[Ans:** (3) -2**]**

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

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

[Ans: (4) does not exist**]**

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

(1) 1 (2) -1 (3) 0 (4) 2 **[Ans:** (1) 1**]**

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

(1) e^4 (2) e^2 (3) e^3 (4) 1 **[Ans:** (1) e^4**]**

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

(1) 1 (2) 0 (3) -1 (4) $\frac{1}{2}$ **[Ans:** (4) $\frac{1}{2}$**]**

7. $\lim_{x\to\infty} \frac{a^x-b^x}{x} =$

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

[Ans: (2) $\log\left(\frac{a}{b}\right)$**]**

24. 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) $\frac{f(4.5)-f(3)}{1.5}$ **[Ans:** (2) 12**]**

25. 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 at $x = 1$

(4) continuous for all x except at $x = 0$

[Ans: (4) continuous for all x except at $x = 0$**]**

In-text Question & Answers

1. $\lim_{x\to 2}\frac{2x^2+x+1}{x+2}$ is equal to

(1) $\frac{1}{2}$ (2) 2 (3) $\frac{11}{4}$ (4) 0 **[Ans:** (3) $\frac{11}{4}$**]**

2. $\lim_{x\to\infty}\left(\frac{1}{x}+2\right)$ is equal to

(1) ∞ (2) 0 (3) 1 (4) 2 **[Ans:** (4) 2**]**

3. $\lim_{x\to\infty}\frac{1+2+3+\cdots+n}{2n^2+6}$ is

(1) 2 (2) 6 (3) $\frac{1}{4}$ (4) $\frac{1}{2}$ **[Ans:** (3) $\frac{1}{4}$**]**

4. The point of discontinuity for the function $\frac{2x^2-8}{x-2}$ is

(1) 0 (2) 8 (3) 2 (4) 4 **[Ans:** (3) 2**]**

5. The function $y = \frac{|3x-4|}{3x-4}$ is discontinuous at $x =$

(1) 0 (2) $\frac{3}{4}$ (3) $\frac{4}{3}$ (4) 1 **[Ans:** (3) $\frac{4}{3}$**]**

6. **The slope of the curve $y = x^3 - 7x^2 + 5x + 10$ at $x = 1$ is.**

(1) 6 (2) –6 (3) 5 (4) 15 **[Ans:** (2) – 6**]**

7. **If $y = 6x - x^3$ and x increases at the ratio of 5 units per second, the rate of change of slope when $x = 3$ is ___ units/sec.**

(1) – 90 (2) 90 (3) 180 (4) –180

[Ans: (1) – 90**]**

8. **A function $f(x)$ is said to be continuous at $x = a$ if $\lim_{x \to a} f(x)$ is equal to**

(1) $f(a)$ (2) $f(-a)$ (3) $2f(a)$ (4) $f\left(\frac{1}{a}\right)$

[Ans: (1) $f(a)$**]**

Board Expected Question & Answers

1. $\lim_{x \to 1} \frac{x^m - 1}{x^n - 1}$ is

(1) mn (2) $m + n$ (3) $m - n$ (4) $\frac{m}{n}$ **[Ans:** (4) $\frac{m}{n}$ **]**

2. $\lim_{x \to \frac{\pi}{2}} \frac{\sin x}{x} =$

(1) π (2) $\frac{\pi}{2}$ (3) $\frac{2}{\pi}$ (4) 1 **[Ans:** (3) $\frac{2}{\pi}$ **]**

3. **The function $f(x) = \tan x$ is discontinuous on the set**

(1) $\{n\pi : n \in z\}$ (2) $\{2n\pi : n \in z\}$

(3) $\{(2n + 1)\frac{\pi}{2}, n \in z\}$ (4) $\{n\frac{\pi}{2}, n \in z\}$

[Ans: (3) $\{(2n + 1)\frac{\pi}{2}, n \in z\}$**]**

4. **The rate of change of area A of a circle of radius r is**

(1) $2\pi r$ (2) $2\pi r \frac{dr}{dt}$ (3) $\pi r^2 \frac{dr}{dt}$ (4) $\pi \frac{dr}{dt}$

[Ans: (2) $2\pi r \frac{dr}{dt}$ **]**

5. **The slope of the graph of $f(x) = \frac{|x|}{x}, x > 0$ is**

(1) 1 (2) 0

(3) –1 (4) undefined **[Ans:** (2) 0**]**

6. For what values of x is the rate of increase of $x^3 - 2x^2 + 3x + 8$ is twice the rate of increase of x?

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

(3) $\left(-\frac{1}{3}, 3\right)$ (4) $\left(\frac{1}{3}, 1\right)$ **[Ans:** (4) $\left(\frac{1}{3}, 1\right)$**]**

7. The points of discontinuity of the function $\frac{x^2+6x+8}{x^2-5x+6}$ is

(1) 3, 2 (2) 3, –2

(3) –3, 2 (4) –3, –2 **[Ans:** (1) 3, 2**]**

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10. Differential Calculus - Differentiability and Methods of Differentiation

Textual Questions

Choose the correct or the most suitable answer from the given four alternatives.

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

(1) $\frac{\pi}{180}\cos x^o$ (2) $\frac{1}{90}\cos x^o$

(3) $\frac{\pi}{90}\cos x^o$ (4) $\frac{2}{\pi}\cos x^o$

Hint : $\frac{d}{dx}\left(\frac{2}{\pi}\sin x^o\right) = \frac{d}{dx}\left(\frac{2}{\pi}\sin\left(\frac{\pi x}{180}\right)\right) = \frac{2}{180}\cos x^o = \frac{1}{90}\cos x^o$

[Ans : (2) $\frac{1}{90}\cos x^o$**]**

Since $f(x)$ is differentiable at $x = 1, f'(1^+) = f'(1^-)$

$$\lim_{x\to 1^+} \frac{f(x)-f(1)}{x-1} = \lim_{x\to 1^-} \frac{f(x)-f(1)}{x-1}$$

$$\Rightarrow \lim_{x\to 1^+} \frac{\frac{1}{|x|}-1}{x-1} = \lim_{x\to 1^-} \frac{ax^2-b-1}{x-1}$$

$$\Rightarrow -1 = \lim_{x\to 1^-} \frac{ax^2-b-1}{x-1}$$

$$\Rightarrow a-b-1 = 0 \Rightarrow a-b=1$$

$$\text{Only } a = -\frac{1}{2}, b = -\frac{3}{2}$$

satisfies the equation $a - b = 1$ **[Ans :** (3) $a = -\frac{1}{2}, b = -\frac{3}{2}$**]**

25. 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

Hint :

$f(x) = |x-1| + |x-3| + \sin x$ is not differentiable at $x = 1$ and $x = 3$.

Since at $x = 1$, and at $x = 3$, $f(x)$ will have vertical tangent.

[Ans : (2) 2**]**

In-text Question & Answers

1. If $f(x) = 4x^8$, then

(1) $f'\left(\frac{1}{2}\right) = f'\left(\frac{-1}{2}\right)$ (2) $f\left(\frac{1}{2}\right) = -f'\left(\frac{-1}{2}\right)$

(3) $f\left(\frac{1}{2}\right) = f\left(\frac{-1}{2}\right)$ (4) $f\left(\frac{1}{2}\right) = f'\left(\frac{-1}{2}\right)$

[Ans : (3) $f\left(\frac{1}{2}\right) = f\left(\frac{-1}{2}\right)$**]**

2. If $y = \log_a x$ then $\frac{dy}{dx}$ is

(1) $\frac{1}{x}$ (2) $\frac{1}{x \log_e a}$ (3) $\log_e a$ (4) $\frac{1}{\log_a x}$

[Ans : (2) $\frac{1}{x \log_e a}$ **]**

3. If $y = \log\left(\frac{1-x^2}{1+x^2}\right)$ then $\frac{dy}{dx}$ is

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

[Ans : (2) $-\frac{4x}{1-x^4}$ **]**

4. If $f(x)$ is an odd function, then $f'(x)$ is an _____ function

(1) even (2) odd

(3) even or odd (4) neither even nor odd

[Ans : (1) even**]**

5. If $y = a + bx^2$, where a, b are arbitrary constants, then

(1) $\frac{d^2y}{dx^2} = 2xy$ (2) $x\frac{d^2y}{dx^2} = y_1$

(3) $x\frac{d^2y}{dx^2} - \frac{dy}{dx} + y = 0$ (4) $x\frac{d^2y}{dx^2} = 2xy$

[Ans : (2) $x\frac{d^2y}{dx^2} = y_1$ **]**

Board Expected Question & Answers

1. If $y = \sin^{-1}x + \cos^{-1}x$ then $\frac{dy}{dx}$ is

(1) 1 (2) π (3) $\frac{\pi}{2}$ (4) 0 **[Ans :** (4) 0**]**

2. If $f(x) = x + 1$, then $\frac{d}{dx}\big(fof(x)\big)$ is

(1) 1 (2) 0 (3) 2 (4) x **[Ans :** (1) 1**]**

3. If $\sin(x + y) = \log(x + y)$ then $\frac{dy}{dx}$ is

(1) 2 (2) -2 (3) 1 (4) -1 **[Ans :** (4) -1**]**

4. **For the curve $\sqrt{x}+\sqrt{y}=1$, $\frac{dy}{dx}$ at $\left(\frac{1}{4},\frac{1}{4}\right)$ is**

(1) $\frac{1}{2}$ (2) 1 (3) −1 (4) 2 **[Ans : (3) –1]**

5. **If $f(x)$ is an even functions, then $f'(x)$ is an ____ function**

(1) even (2) odd

(3) even and odd (4) even or odd **[Ans : (2) odd]**

6. **If $y=\sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ then $\frac{dy}{dx}$ is**

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

[Ans : (1) $\frac{-2}{1+x^2}$]

7. **If $x=a(\theta+\sin\theta)$, $y=a(1+\cos\theta)$ then $\frac{dy}{dx}$ is**

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

[Ans : (2) $-\tan\frac{\theta}{2}$]

Reasoning Question & Answers (Hots)

1. **The derivative of $\cos^{-1}(2x^2-1)$ with respect to $\cos^{-1}x$ is**

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

[Ans : (1) 2]

2. **If $y=\sqrt{\sin x+y}$ then $\frac{dy}{dx}$ is**

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

[Ans : (4) $\frac{\cos x}{2y-1}$]

3. **The derivative of $\sin x$ with respect to $\cos x$ is**

(1) $\tan x$ (2) $\cot x$ (3) $-\tan x$ (4) $-\cot x$

[Ans : (4) $-\cot x$]

11. Integral Calculus

Textual Questions

Choose the correct or most suitable answer from the given four alternatives.

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) $\int (g(x))^2\,dx$

Hint : Given $\int f(x)\,dx = g(x)+c$

$\Rightarrow f(x) = g'(x)$

$\therefore \int f(x)g'(x)dx = \int f(x)f(x)dx = \int [f(x)]^2\,dx$

[Ans : (1) $\int (f(x))^2\,dx$ **]**

2. 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) $\frac{1}{\log 3}$

Hint : $\int \frac{3^{\frac{1}{x}}}{x^2}dx = k(3^{\frac{1}{x}})+c$

Let $t = 3^{\frac{1}{x}} \Rightarrow dt = \frac{3^{\frac{1}{x}}\log 3}{-x^2}dx$

$\Rightarrow -dt\,\frac{1}{\log 3} = \frac{3^{\frac{1}{x}}dx}{x^2}$

$\therefore \int \frac{1}{-\log 3}dt = k.3^{\frac{1}{x}} \Rightarrow \frac{1}{-\log 3}.t = k.3^{\frac{1}{x}}$

$\frac{1}{-\log 3}\cdot 3^{\frac{1}{x}} = k.3^{\frac{1}{x}} \Rightarrow k = -\frac{1}{\log 3}$

[Ans : (3) $-\frac{1}{\log 3}$ **]**

25. $\int e^{\sqrt{x}}\, dx$ **is**

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

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

Hint : $I = \int e^{\sqrt{x}} dx$

Put $\sqrt{x} = t$; $\frac{1}{2\sqrt{x}} dx = dt \Rightarrow dx = 2\sqrt{x}dt = 2t\,dt$

$I = \int e^t (2t\,dt) = 2\int te^t dt$

$u = t$; $u' = 1$; $dv = e^t$; $v = e^t$; $v_1 = e^t$

$\therefore$ By Bernoulli's formula, $I = 2\left[uv - u'v_1\right] = 2\left[te^t - 1\cdot e^t\right] + c$

$= 2e^t(t-1)+c = 2e^{\sqrt{x}}\left(\sqrt{x}-1\right)+c \left[\because t = \sqrt{x}\right]$

[Ans : (4) $2e^{\sqrt{x}}\left(\sqrt{x}-1\right)+c$**]**

In-text Question & Answers

1. $\int \sin e^x \cdot d(e^x) =$ _____ $+ c$.

(1) cos (e^x) (2) sin (e^x) (3) –cos (e^x) (4) –sin (e^x)

[Ans : (3) –cos (e^x)**]**

2. $\int \frac{(\log x)^3}{x} dx =$ _____ $+ c$.

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

[Ans : (1) $\frac{(\log x)^4}{4}$ **]**

3. $\int \frac{4(\sin^{-1} x)^3}{\sqrt{1-x^2}} dx =$ _____ $+ c$.

(1) log $(\sin^{-1} x)$ (2) $(\sin^{-1} x)^4$

(3) $4(\sin^{-1} x)^4$ (4) $\frac{(\sin^{-1} x)^4}{4}$ **[Ans :** (2)$(\sin^{-1} x)^4$**]**

9. $\int e^x [f(x) + f'(x)]\, dx =$ _____ $+ c$.

(1) $e^x f(x)$ (2) $e^x + f(x)$ (3) $2e^x f(x)$ (4) $e^x - f(x)$

[Ans : (1) $e^x f(x)$

10. $\int x \sin x\, dx = -x \cos x + \alpha$, **then** $\alpha =$

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

(3) c (3) none of these

[Ans : (1) $\sin x + c$]

Board Expected Question & Answers

1. $\int \frac{1}{2} \sec^2 x\, dx$ **is** _____ $+ c$.

(1) $\frac{1}{2} \tan x$ (2) $\tan x$ (3) $2 \tan x$ (4) none of these

[Ans : (1) $\frac{1}{2} \tan x$]

2. $\int 3^{x+2}\, dx =$ _____ $+ c$.

(1) $\frac{3^x}{\log 3}$ (2) $9\left(\frac{3^x}{\log 3}\right)$ (3) $\frac{3^x}{9 \log 3}$ (4) $3^x \cdot 9$

[Ans : (2) $9\left(\frac{3^x}{\log 3}\right)$]

3. $\int \frac{\sin \sqrt{x}}{\sqrt{x}}\, dx =$ _____ $+ c$.

(1) $2 \cos \sqrt{x}$ (2) $2 \sin \sqrt{x}$ (3) $-2 \sin \sqrt{x}$ (4) $-2 \cos \sqrt{x}$

[Ans : (4) $-2 \cos \sqrt{x}$]

4. $\int \tan^3 2x \cdot \sec 2x\, dx =$ _____ $+ c$.

(1) $\frac{1}{6} \sec^3 2x$ (2) $\frac{1}{6} \sec^3 2x - \frac{1}{2} \sec 2x$

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

[Ans : (2) $\frac{1}{6} \sec^3 2x - \frac{1}{2} \sec 2x$]

Reasoning Question & Answers (Hots)

1. $\int |x|^3 \, dx =$ _____ $+ c$.

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

(3) $\frac{x^4}{4}$ (4) none of these

[Ans : (4) none of these**]**

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12. Introduction of Probability Theorem

Textual Questions

Choose the correct or most suitable answer from the given four alternatives.

1. 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) $\frac{10}{21}$

Hint :

Number of ways of choosing the 4 people group = ${}^9C_4 = 126$

Number of ways of choosing the 4 people group with exactly 2 children = ${}^4C_2 \times {}^5C_2 = 60$

Probability = $\frac{60}{126} = \frac{10}{21}$ **[Ans :** (4) $\frac{10}{21}$ **]**

2. A number is selected from the set {1, 2, 3, ... , 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) $\frac{2}{3}$

Hint : S = {1, 2, 3, ... 20}

$\Rightarrow$ n (S) = 20

In-text Question & Answers

1. Three integers are chosen at random from the first 20 integers. The probability that their product is even is

(1) $\frac{2}{19}$ (2) $\frac{3}{19}$ (3) $\frac{17}{19}$ (4) $\frac{4}{19}$ **[Ans:** (3) $\frac{17}{19}$ **]**

2. A bag contains 5 black balls, 4 white balls and 3 red balls. If a ball is selected at random, the probability that it is black or red ball is

(1) $\frac{1}{3}$ (2) $\frac{1}{4}$ (3) $\frac{5}{12}$ (4) $\frac{2}{3}$ **[Ans :** (4) $\frac{2}{3}$ **]**

3. A box contains 10 good articles and 6 with defects. One item is drawn at random. The probability that it is either good or has a defect is

(1) $\frac{64}{64}$ (2) $\frac{49}{64}$ (3) $\frac{40}{64}$ (4) $\frac{24}{64}$ **[Ans:** (1) $\frac{64}{64}$ **]**

4. If S is the sample space, P(A) = $\frac{1}{3}$ P(B) and S = A∪B, where A and B are mutually exclusive events then P(A) =

(1) $\frac{1}{4}$ (2) $\frac{1}{2}$ (3) $\frac{3}{4}$ (4) $\frac{3}{8}$ **[Ans :** (1) $\frac{1}{4}$ **]**

5. If A and B are two events, the P ($\overline{A}$ ∩B) =

(1) P($\overline{A}$). P($\overline{B}$)
(2) 1 – P(A) – P(B)
(3) P(A) + P(B) – P(A∩B)
(4) P(B) – P (A∩B) **[Ans :** (4) P(B) – P (A∩B)**]**

6. If P(A∪B) = 0.8 and P(A∩B) = 0.3 then P($\overline{A}$) + P($\overline{B}$) =

(1) 0.3 (2) 0.5 (3) 0.7 (4) 0.9 **[Ans :** (4) 0.9**]**

7. The probability that in a year of 22nd century, chosen at random there will be 53 Sundays is

(1) $\frac{3}{28}$ (2) $\frac{2}{28}$ (3) $\frac{7}{28}$ (4) $\frac{5}{28}$ **[Ans :** (4) $\frac{5}{28}$ **]**

8. If $P(B) = \frac{3}{5}$, $P(A/B) = \frac{1}{2}$ and $P(A \cup B) = \frac{4}{5}$, then $P(\overline{A \cup B})$ $P(\overline{A} \cap B) =$

(1) $\frac{1}{5}$ (2) $\frac{4}{5}$ (3) $\frac{1}{2}$ (4) 1 **[Ans :** (4) 1**]**

9. If $P(B) = \frac{3}{5}$, $P(A/B) = \frac{1}{2}$ and $P(A \cup B) = \frac{4}{5}$, then $P(B/\overline{A}) =$

(1) $\frac{1}{5}$ (2) $\frac{3}{10}$ (3) $\frac{1}{2}$ (4) $\frac{3}{5}$ **[Ans :** (4) $\frac{3}{5}$**]**

10. If $P(A) = 0.4$, $P(B) = 0.3$ and $P(A \cup B) = 0.5$, then $P(\overline{B} \cap A)$

(1) $\frac{2}{3}$ (2) $\frac{1}{2}$ (3) $\frac{3}{10}$ (4) $\frac{1}{5}$ **[Ans :** (4) $\frac{1}{5}$**]**

11. If A and B are two events such that $A \neq \phi$, $B \neq \phi$, then

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

(3) $P(A/B) = P(B/A) = 1$ (4) $P(A/B) = \frac{P(A)}{P(B)}$

[Ans : (1) $P(A/B) = \frac{P(A \cap B)}{P(B)}$**]**

12. A die is thrown and a card is selected at random from a deck of 52 playing cards. The probability of getting an even number on the die and a spade card is

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$ (3) $\frac{1}{8}$ (4) $\frac{3}{4}$ **[Ans :** (3) $\frac{1}{8}$**]**

13. A flash light has 8 batteries out of which 3 are dead. If 2 batteries are selected without replacement and tested, the probability that both are dead is

(1) $\frac{3}{28}$ (2) $\frac{1}{14}$ (3) $\frac{9}{64}$ (4) $\frac{33}{56}$ **[Ans :**(1) $\frac{3}{28}$**]**

Board Expected Question & Answers

1. Out of 30 consecutive integers, 2 are chosen at random. The probability that their sum is odd is

(1) $\frac{14}{29}$ (2) $\frac{16}{29}$ (3) $\frac{15}{29}$ (4) $\frac{10}{29}$ **[Ans:** (3) $\frac{15}{29}$**]**

8. Let A and B be two events such that P(A) = 0.6, P(B) = 0.2 and P(A/B) = 0.5, then P($\overline{A}$ / $\overline{B}$) is

(1) $\frac{1}{10}$ (2) $\frac{3}{10}$ (3) $\frac{3}{8}$ (4) $\frac{6}{7}$ **[Ans :** (1) $\frac{1}{10}$ **]**

9. Two dice are thrown. It is known that the sum of the numbers on the dice was less than 6, the probability of getting a sum 3 is

(1) $\frac{1}{18}$ (2) $\frac{5}{18}$ (3) $\frac{1}{5}$ (4) $\frac{2}{5}$ **[Ans :** (3) $\frac{1}{5}$ **]**

Reasoning Question & Answers (Hots)

1. A speaks truth in 75% cases and B speaks truth in 80% cases. Probability that they contradict each other in a statement is

(1) $\frac{7}{20}$ (2) $\frac{13}{20}$ (3) $\frac{3}{5}$ (4) $\frac{2}{5}$ **[Ans :** (1) $\frac{7}{20}$ **]**

2. A coin is tossed three times. If events A and B are defined as A = Two heads occurs, B = Last should be head. Then A and B are

(1) Independent (2) dependent
(3) both (4) mutually exclusive

[Ans : (2) dependent**]**

3. If A and B are two independent events with P(A) = $\frac{3}{5}$ and P(B) = $\frac{4}{9}$ then P($\overline{A} \cap \overline{B}$) equals

(1) $\frac{4}{15}$ (2) $\frac{8}{45}$ (3) $\frac{1}{3}$ (4) $\frac{2}{9}$ **[Ans :** (4) $\frac{2}{9}$ **]**

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