INDUS RANGERS DEFENCE ACADEMY

4TH Floor Shakumbhari Complex, Chetmani Near: IP Vijaya Mall Bhelupur Varanasi, (U.P.– 221010)

NDA [MATHEMATICS]
PRACTICE SHEET – 4

Time: 01:30 Hr **M. M.: 240**

General Instructions:

- There are 60 questions
- All questions have 4 marks for correct and –1 mark for wrong answer as a penalty.
- The name, date, and exam must be filled in OMR sheet otherwise the result will not be published.
- OMR fill should be properly.

1. A dice is thrown twice. Each time, the number appearing on it is recorded. Describe the following events:
   A = The sum of the numbers is more than 7.
   B = Both of them are prime numbers.
   C = The sum of the numbers is less than 5.
   Which pairs of events are mutually exclusive?
   (a) B and C (b) A and B, B and C
   (c) A and C (d) A and B
2. Three coins are tossed.
   A: Getting no tail.
   B: Getting exactly one tail.
   C: Getting at least two tails.
   Which of the following is correct?
   (a) Events are mutually exclusive and exhaustive.
   (b) Events are neither mutually exclusive nor exhaustive
   (c) Events are mutually exclusive but not exhaustive
   (d) Events are not mutually exclusive but exhaustive
3. If three coins are tossed simultaneously, what is the total number of outcomes?
   (a) 8 (b) 9 (c) 27 (d) 81
4. When 3 dice are tossed together, there are _____ independent possibilities.
   (a) 36 (b) 180 (c) 216 (d) Infinite
5. The outcomes that ensure the occurrence of an event are called
   (a) Worst outcomes (b) Disliked outcomes
   (c) Favourable outcomes (d) Liked outcomes
6. Which of the following statements is true?
   (a) An event with more than one sample point is called a compound event.
   (b) An event with one sample point is called the compound event.
   (c) An event with a fixed sample point is called the compound event.
   (d) An event with more than one sample point is called an impossible event.

7. The set of all outcomes of a random experiment is called:
   (a) Probability (b) Trial
   (c) Event (d) Sample space
8. Fifteen coupons are numbered 1, 2, 3, …, 15. Seven coupons are selected at random one at a time with replacement. The probability that the largest number appearing on the selected coupon is 9 is
   (a) $\left(\frac{9}{15}\right)^6$ (b) $\left(\frac{8}{15}\right)^7$ (c) $\frac{9^7-3^7}{15^7}$ (d) $\frac{9^7-8^7}{15^7}$
9. In a lottery with 30 tickets numbered 1 to 30, two tickets are drawn simultaneously. The probability that at least one of the two tickets drawn is not a prime number is:
   (a) $\frac{3}{29}$ (b) $\frac{5}{29}$ (c) $\frac{25}{29}$ (d) $\frac{26}{29}$
10. A bag contains 50 tickets numbered 1, 2, 3, …, 50 of which five are drawn at random and arranged in ascending order of magnitude ($x_1 < x_2 < x_3 < x_4 < x_5$). The probability that $x_3 = 30$, is
    (a) $\frac{^{20}C_2}{^{50}C_5}$ (b) $\frac{^{2}C_2}{^{50}C_5}$ (c) $\frac{^{20}C_2 \times ^{29}C_2}{^{50}C_5}$ (d) N.O.T
11. Ten pairs of shoes are in a closet. Four shoes are selected at random. The probability that there will be at least one pair among the four shoes selected is
    (a) 0.3065 (b) 0.1065 (c) 0.5132 (d) 0.0365
12. Five digit numbers can be formed from the digits 1, 2, 3, 4, 5. If one number is selected at random, the probability that it is an even number is
    (a) 4/7 (b) 2/5 (c) 7/16 (d) 1/16
13. Two numbers x and y are chosen at random from the set {1, 2, 3, …, 30}. The probability that $x^2 – y^2$ is divisible by 3 is:
    (a) 3/29 (b) 4/29 (c) 5/29 (d) 47/87
14. The 4 different biscuits are distributed among 3 children then the probability of receiving at least one biscuit by the 1st child is
    (a) $\frac{2^4}{3^4}$ (b) $1 - \frac{2^4}{3^4}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$
15. In a class 60% are boys and rest are girls. 50% of boys and 25% of girls know cricket. If a student is selected at random and given that the selected student is a cricketer, the probability that the selected student is a girl is
    (a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) $\frac{3}{4}$
16. The coefficients b and c of the equation $x^2 + bx + c = 0$ are determined by throwing an ordinary dice. The probability that the equation has equal roots is
    (a) $\frac{1}{18}$ (b) $\frac{13}{18}$ (c) $\frac{5}{18}$ (d) $\frac{1}{9}$
17. Two numbers are chosen at random from {1, 2, 3, 4, 5, 6, 7, 8} at a time. The probability that smaller of the two numbers is less than 4 is
    (a) $\frac{7}{14}$ (b) $\frac{8}{14}$ (c) $\frac{9}{14}$ (d) $\frac{10}{14}$

18. The probability that in a family of four children, there will be atleast one boy is

(a) $\frac{1}{16}$ (b) $\frac{3}{16}$ (c) $\frac{13}{16}$ (d) $\frac{15}{16}$

19. If two sections of strengths 30 and 45 are formed from 75 students who are admitted in a school, then the probability that two particular students are always together in the same section is

(a) $\frac{66}{185}$ (b) $\frac{19}{37}$ (c) $\frac{29}{185}$ (d) $\frac{18}{37}$

20. When a coin is tossed 6 times, the probability of getting more heads over tails, is

(a) $\frac{13}{32}$ (b) $\frac{15}{32}$ (c) $\frac{9}{32}$ (d) $\frac{11}{32}$

21. The letters of the word QUESTION are arranged in a row at random. The probability that there are exactly 2 letters between Q and S is

(a) $\frac{5}{28}$ (b) $\frac{1}{7}$ (c) $\frac{3}{28}$ (d) $\frac{1}{14}$

22. If X is chosen at random {1, 2, 3, 4} and Y is chosen at random from {5, 6, 7}, the probability that XY will be even is

(a) $\frac{5}{6}$ (b) $\frac{1}{6}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

23. A number is chosen at random from {1, 2, 3, …, 1000}. Then the probability that number which leaves a remainder 1 when divided by 7 is

(a) $\frac{71}{1000}$ (b) $\frac{144}{1000}$ (c) $\frac{143}{1000}$ (d) $\frac{73}{1000}$

24. Six faces of a dice are marked with the number 1, –1, 0, –2, 2, 3 and the dice is thrown thrice. The probability that the sum of the numbers thrown is six is

(a) $\frac{3}{216}$ (b) $\frac{6}{216}$ (c) $\frac{10}{216}$ (d) $\frac{18}{216}$

25. If 3 cards are drawn from pack of 52 cards at random, then the probability of getting 2 cards from one suit and one card from another suit is

(a) $\frac{{}^{4}C_{2}\times{}^{13}C_{2}\times{}^{13}C_{1}}{{}^{52}C_{3}}$ (b) $\frac{{}^{4}P_{2}\times{}^{13}C_{2}\times{}^{13}C_{1}}{{}^{52}C_{3}}$

(c) $\frac{{}^{13}C_{2}\times{}^{13}C_{1}}{{}^{52}C_{3}}$ (d) N.O.T

26. The probability that a leap year contains 53 Sundays or 53 Mondays, is

(a) 2/7 (b) 4/7 (c) 3/7 (d) 1/7

27. If 4 different biscuits are distributed among 3 children at random, the probability that the first child receives exactly one biscuit is

(a) 32/81 (b) 27/81 (c) 17/81 (d) 1/81

28. From the **PROBABILITY,** what is the probability of drawing vowel?

(a) 5/11 (b) 2/11 (c) 3/11 (d) 4/11

29. The probability of a non-leap year having 53 Mondays is

(a) 2/7 (b) 1/7 (c) 5/7 (d) 6/7

30. Words with or without meaning are to be formed using all the letters of the word **SRICHAITANYA.** The probability that the letter S appears at beginning and C at the end of any such word is

(a) 5/132 (b) 1/132 (c) 13/132 (d) 17/132

31. What is the value of $\frac{cosec(\pi+\theta)\cot\left\{\left(\frac{9\pi}{2}-\theta\right)\right\}cosec^2(2\pi-\theta)}{\cot(2\pi-\theta)sec^2(\pi-\theta)\sec\left\{\left(\frac{3\pi}{2}\right)+\theta\right\}}$

(a) 0 (b) 1 (c) –1 (d) ∞

32. If $x = r\sin\theta\cos\phi$, $y = r\,sin\theta\sin\phi$ and $z = r\cos\theta$, then $x^2 + y^2 + z^2$ is independent of which of the following?

(a) r only (b) r, ϕ (c) θ, ϕ (d) r, θ

33. If $3\tan\theta + 4 = 0,\ where\left(\frac{\pi}{2}\right) < \theta < \pi$, then what is the value of $2\cot\theta - 5\cos\theta + \sin\theta$?

(a) –53/10 (b) 7/10 (c) 23/10 (d) 37/10

34. What is the value of $\cot(-870°)$?

(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) $-\sqrt{3}$ (d) $-\frac{1}{\sqrt{3}}$

35. How many values of θ between 0 ° and 360° satisfy $\tan\theta = k \neq 0$, where k is a given number?

(a) 1 (b) 2 (c) 4 (d) Many

36. If sin x + sin y = a, cos x + cos y = b, then what is the value of cos (x – y)?

(a) $a^2 - 1$ (b) $b^2 - 1$

(c) $\frac{1}{2}(a^2 + b^2 - 2)$ (d) $\frac{1}{2}(a^2 + b^2)$

37. If $cosec\ \theta - \cot\theta = \frac{1}{\sqrt{3}}$ where $\theta \neq 0$, then what is the value of cos θ?

(a) 0 (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$

38. If $cosec\ \theta + \cot\theta = c$, then what is cos θ equal to?

(a) $\frac{c}{c^2-1}$ (b) $\frac{c}{c^2+1}$ (c) $\frac{c^2-1}{c^2+1}$ (d) N.O.T

39. If $\sin\theta + 2\cos\theta = 1$, then what is $2\sin\theta - \cos\theta$ equal to?

(a) 0 (b) 1 (c) 2 (d) 4

40. If A + B = 90°, then what is $\sqrt{\sin A\sec B - \sin A\cos B}$ equal to?

(a) sin A (b) cos A (c) tan A (d) 0

Directions (Qs. 41 – 43): For the next three (03) items that follow;

Given that $16\ sin^5x = p\ sin5x + q\sin3x + r\sin x$.

41. What is the value of p?

(a) 1 (b) 2 (c) –1 (d) –2

42. What is the value of q?

(a) 3 (b) 5 (c) 10 (d) –5

43. What is the value of r?

(a) 5 (b) 8 (c) 10 (d) –10

44. If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$, then what is $\frac{\tan x}{\tan y}$ equal to?

(a) $\frac{a}{b}$ (b) $\frac{b}{a}$ (c) $\frac{a+b}{a-b}$ (d) $\frac{a-b}{a+b}$

Directions (Qs. 45 – 47): For the next three (03) items that follow;

If $p = Xcos\ q - Ysin\ q, q = Xsin\ q + Ycos\ q\ and\ p^2 + 4pq + q^2 = AX^2 + BY^2, 0$

45. What is the value of q?
    (a) $\pi/2$ (b) $\pi/3$ (c) $\pi/4$ (d) $\pi/6$
46. What is the value of A?
    (a) 4 (b) 3 (c) 2 (d) 1
47. What is the value of B?
    (a) –1 (b) 0 (c) 1 (d) 2
48. Consider the following statements in respect of the function y = [x], x ∈(–1, 1) where [.] is the greatest integer function:
    A. Its derivative is 0 at x = 0.5.
    B. It is continuous at x = 0.
    Which of the above statements is/are correct?
    (a) A only (b) B only
    (c) Both A and B (d) Neither A nor B
49. Consider the following statements in respect of the function:
    $f(x) = sin\left(\frac{1}{x^2}\right), x^1 0$:
    A. It is continuous at x = 0, if f(0) = 0.
    B. It is continuous at $x = \frac{2}{\sqrt{\pi}}$
    Which of the above statements is/are correct?
    (a) A only (b) B only
    (c) Both A and B (d) Neither A nor B
50. If $f(x) = \frac{|x|}{|x|}, x^1 0$, where [.] denotes the greatest integer function, then what is the right-hand limit of f(x) at x = 1?
    (a) –1 (b) 0 (c) 1
    (d) Right-hand limit of f(x) at x = 1 does not exist
51. Consider the following statements in respect of f(x) = |x| – 1.
    A. f(x) is continuous at x = 1.
    B. f(x) is differentiable at x = 0.
    Which of the above statements is/are correct?
    (a) A only (b) B only
    (c) Both A and B (d) Neither A nor B
52. Let $f(x) = \begin{cases} 1 + \frac{x}{2k}, & 0 < x < 2 \\ kx, & 2 \leq x < 4 \end{cases}$
    If $\lim_{n \to 2} f(x)$ exists, then what is the value of k?
    (a) –2 (b) –1 (c) 0 (d) 1

53. If the function $f(x) = \begin{cases} a + bx, & x < 1 \\ 5, & x = 1 \\ b - ax, & x > 1 \end{cases}$ is continuous, then what is the value of (a + b)?

(a) 5 (b) 10 (c) 15 (d) 20

54. What is $\lim_{n \to 0} \frac{\sin x \log (1-x)}{x^2}$ equal to?

(a) –1 (b) Zero (c) –e (d) –1/e

55. Consider the following statements for $f(x) = e^{-|x|}$:

A. The function is continuous at x = 0.

B. The function is differentiable at x = 0.

Which of the above statements is/are correct?

(a) A only (b) B only

(c) Both A and B (d) Neither A nor B

56. For the function f(x) = |x – 3|, which of the following is not correct?

(a) The function is not continuous at x = – 3.

(b) The function is continuous at x = 3.

(c) The function is differentiable at x = 3

(d) The function is differentiable at x = – 3.

57. Which of the following statements is/are correct?

A. g(x) is differentiable at x = 0.

B. g(x) is differentiable at x = 2.

Select the correct answer using the code given below:

(a) A only (b) B only

(c) Both A and B (d) Neither A nor B

58. What is the value of the differentiable coefficients of g(x) at x = –2?

(a) –1 (b) 0 (c) 1 (d) 2

59. Which of the following statements are correct?

(a) g(x) in continuous at x = 0.

(b) g(x) is continuous at x = 2.

(c) g(x) is continuous at x = –1.

Select the correct answer using the code given below

(a) A and B only (b) B and C only

(c) A and C only (d) A, B and C

60. What is $\lim_{x \to 0} \frac{e^x - (1+x)}{x^2}$ equal to?

(a) 0 (b) ½ (c) 1 (d) 2