INDUS RANGERS DEFENCE ACADEMY

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

NDA [MATHEMATICS]
PRACTICE SHEET – 1

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- The name, date, and exam must be filled in OMR sheet otherwise the result will not be published.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.

Directions: (Qs. 1 – 2): Read the following information and answer the two items that follow:

Let $\frac{\tan 3A}{\tan A} = K$, where tan A ≠ 0 and K ≠ 1/3.

1. What is $tan^2 A$ equal to?
   (a) $\frac{K+3}{3K-1}$ (b) $\frac{K-3}{3K-1}$ (c) $\frac{3K-3}{K-3}$ (d) $\frac{K+3}{3K+1}$
2. For real values of tan A, K **cannot** lie between
   (a) 1/3 and 3 (b) ½ and 2
   (c) 1/5 and 5 (d) 1/7 and 7
3. If $\tan\theta = \frac{\cos 17° - \sin 17°}{\cos 17° + \sin 17°}$, then what is the value of θ?
   (a) $0°$ (b) $28°$ (c) $38°$ (d) $52°$
4. A and B are positive acute angles such that $\cos 2B = 3sin^2 A \; and \; 3\sin 2A = 2\sin 2B$. What is the value of (A + 2B)?
   (a) $\pi/6$ (b) $\pi/4$ (c) $\pi/3$ (d) $\pi/2$
5. What is $\sin 3x + \cos 3x + 4\,sin^3 x - 3\sin x + 3\cos x - 4\,cos^3 x$ equal to?
   (a) 0 (b) 1 (c) 2 sin 2x (d) 4 cos 4x
6. The value of ordinate of the graph of y = 2 + cos x lies in the interval
   (a) [0, 1] (b) [0, 3] (c) [–1, 1] (d) [1, 3]
7. What is the value of $8\cos 10° \cdot \cos 20° \cdot \cos 40°$?
   (a) $\tan 10°$ (b) $\cot 10°$ (c) $\text{cosec}\, 10°$ (d) $\sec 10°$
8. What is the value of $\cos 48° - \cos 12°$?
   (a) $\frac{\sqrt{5}-1}{4}$ (b) $\frac{1-\sqrt{5}}{4}$ (c) $\frac{\sqrt{5}+1}{2}$ (d) $\frac{1-\sqrt{5}}{8}$
9. The value of x, satisfying the equation $\log_{\cos x} \sin x = 1$, where $0 < x < \frac{\pi}{2}$, is
   (a) $\pi/12$ (b) $\pi/3$ (c) $\pi/4$ (d) $\pi/6$
10. What is $\cot 2x \cot 4x - \cot 4x \cot 6x - \cot 6x \cot 2x$ equal to?
    (a) –1 (b) 0 (c) 1 (d) 2
11. If $\tan x = -\frac{3}{4}$ and x is in the second quadrant, then what is the value of $\sin x \,.\, \cos x$?
    (a) 6/25 (b) 12/25 (c) –6/25 (d) –12/25

12. What is the value of the following?

$$cosec\left(\frac{7\pi}{6}\right)\sec\left(\frac{5\pi}{3}\right)$$

(a) 4/3 (b) 4 (c) –4 (d) $-\frac{4}{\sqrt{3}}$

13. What is the value of the following?

$$\tan 31° \tan 33° \tan 35° \ldots \tan 57° \tan 59°$$

(a) –1 (b) 0 (c) 1 (d) 2

14. What is the value of the following?

$$(\sin 24° + \cos 66°)(\sin 24° - \cos 66°)$$

(a) –1 (b) 0 (c) 1 (d) 2

15. What is $(1 + \cot\theta - cosec\,\theta)(1 + \tan\theta + \sec\theta)$ equal to?

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

16. What is $\frac{1+tan^2\theta}{1+cot^2\theta} - \left(\frac{1-\tan\theta}{1-\cot\theta}\right)^2$ equal to?

(a) 0 (b) 1 (c) $2\tan\theta$ (d) $2\cot\theta$

17. If $7\sin\theta + 24\cos\theta = 25$, then what is the value of $(\sin\theta + \cos\theta)$?

(a) 1 (b) 26/25 (c) 6/5 (d) 31/25

18. If $3\cos\theta = 4\sin\theta$, then what is the value of $\tan(45° + \theta)$?

(a) 10 (b) 7 (c) 7/2 (d) 7/4

19. If tan A = 1/7, then what is cos 2A equal to?

(a) 24/25 (b) 18/25 (c) 12/25 (d) 6/25

20. Let $4\ sin^2x = 3$, where $0 \le x \le p$. What is tan 3x equal to?

(a) –2 (b) –1 (c) 0 (d) 1

21. Consider the following statements in respect of the roots of the equation $x^3 - 8 = 0$:

A. The roots are non-collinear.

B. The roots lie on a circle of unit radius.

Which of the above statements is/are correct?

(a) A only (b) B only

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

22. Let the equation sec x . cosec x = p have a solution, where p is a positive real number. What should be the smallest value of p?

(a) ½ (b) 1 (c) 2 (d) Does not exist

23. For what value of q, where $0 < q < \frac{\pi}{2}$, does $\sin q + \sin q \cos q$ attain maximum value?

(a) $\pi/2$ (b) $\pi/3$ (c) $\pi/4$ (d) $\pi/6$

24. Let ABC be a triangle. If $\cos 2A + \cos 2B + \cos 2C = -1$ then which one of the following is correct?

(a) $\sin A \sin B \sin C = 0$ (b) $\sin A \sin B \cos C = 0$

(c) $\cos A \sin B \sin C = 0$ (d) $\cos A \cos B \cos C = 0$

25. If sin θ and cos θ are the roots of the equation $ax^2 + bx + c = 0$, then which one of the following is correct?
    (a) $a^2 + b^2 - 2ac = 0$ (b) $-a^2 + b^2 + 2ac = 0$
    (c) $a^2 - b^2 + 2ac = 0$ (d) $a^2 + b^2 + 2ac = 0$
26. What is the period of the function $f(x) = \ln(2 + sin^2)$?
    (a) $\frac{\pi}{2}$ (b) p (c) 2p (d) 3p
27. If $\sin(A + B) = 1$ and $2\sin(A - B) = 1$, where $0 < A, B < \frac{\pi}{2}$ then what is tan A : tan B equal to?
    (a) 1 : 2 (b) 2 : 1 (c) 1 : 3 (d) 3 : 1
28. Let $\sin x + \sin y = \cos x + \cos y$ for all 0 < x, y < $\frac{\pi}{2}$. What is $\tan\left(\frac{x}{2} + \frac{y}{2}\right)$ equal to?
    (a) 1 (b) 2 (c) $\sqrt{2}$ (d) $2\sqrt{2}$
29. What is the range of the function f(x) = 1 – sin x defined on entire real time?
    (a) (0, 2) (b) [0, 2] (c) (–1, 1) (d) [–1, 1]
30. What is value of $cot^2 15° + tan^2 15°$?
    (a) 12 (b) 14 (c) $8\sqrt{3}$ (d) 4
31. If $P(A) = \frac{1}{4}, P(B) = \frac{1}{5}\ and\ P(AB) = \frac{1}{8}, then\ P\left(\frac{A^C}{B^C}\right) =$
    (a) 21/32 (b) 25/32 (c) 27/32 (d) 29/32
32. If A and B are any two events such that $P(A) = \frac{2}{5}$ and $P(A \cap B) = \frac{3}{20}$, then the conditional probability, $P(A \mid (A' \cup B'))$, where A' denotes the complement of A, is equal to
    (a) 11/20 (b) 5/17 (c) 8/17 (d) ¼
33. If $P(A \cap B) = \frac{7}{10}\ and\ P(B) = \frac{17}{20}$, where P stands for probability then P(A | B) is equal to
    (a) 7/8 (b) 17/20 (c) 14/17 (d) 1/8
34. A fair die is rolled. Consider the events A = {1, 3, 5}, B = {2, 3} and C = {2, 3, 4, 5}. Then the conditional probability P((A ∪ B) | C) is
    (a) 1/4 (b) 5/4 (c) 1/2 (d) ¾
35. Given that P(A) = 0.1, P(B | A) = 0.6 and P(B | A^C) = 0.3. What is P(A | B)
    (a) 2/11 (b) 4/11 (c) 7/11 (d) 9/11
36. A card is picked at random from a pack of cards. Given that the picked card is a Queen, what is the probability that it is a spade?
    (a) 1/3 (b) 4/13 (c) 1/4 (d) 1/2
37. A six faced unbiased die is thrown twice and the sum of the numbers appearing on the upper face is observed to be 7. The probability that the number 3 has appeared at least once is
    (a) 1/2 (b) 1/3 (c) 1/4 (d) 1/5
38. A and B are two events such that $P(A) \neq 0, P(B|A)$ is
    (i) A is subset of B (ii) A ∩ B = ϕ are respectively

(a) 1, 1 (b) 0 and 1 (c) 0, 0 (d) 1, 0

39. A and B are any two events associated with a random experiment such that P(A) = 3/8, P(B) = 5/8 and P(A or B) = 3/4, then P(A | B) is
(a) 1/4 (b) 2/3 (c) 3/4 (d) 2/5
40. Three numbers are chosen at random without replacement from {1, 2, 3, …, 8}. The probability that their minimum is 3, given that their maximum is 6, is
(a) 1/4 (b) 2/5 (c) 3/8 (d) 1/5
41. For the married couple living in Jammu, the probability that a husband will vote in an election in 0.5 and the probability that his wife will vote is 0.4. The probability that the husband votes, given that his wife also votes is 0.7. Then the probability that husband and wife both will vote is
(a) 0.28 (b) 0.20 (c) 0.35 (d) 0.15
42. Let A and B be two events with $P(A^C) = 0.3$, P(B) = 0.4 and $P(A \cap B^C) = 0.5$. Then $P(B \mid A \cup B^C)$ is equal to
(a) 1/4 (b) 1/3 (c) 1/2 (d) 2/3
43. If C and D are two events such that $C \subset D$ and $P(D) \neq 0$, then the correct statement among the following is
(a) $P(C|D) < P(C)$ (b) $P(C|D) = P(D)/P(C)$
(c) $P(C|D) = P(C)$ (d) $P(C|D) \geq P(C)$
44. A dice is rolled twice and the sum of the numbers appearing on them is observed to be 7. What is the conditional probability that the number 2 has appeared at least once?
(a) 1/2 (b) 1/3 (c) 2/3 (d) 2/5
45. One Indian and four American men and their wives are to be seated randomly around a circular table. Then the conditional probability that the Indian man is seated adjacent to his wife given that each American man is seated adjacent to his wife is
(a) 1/2 (b) 1/3 (c) 2/5 (d) 2/3
46. If P(A) = 1/12, P(B) = 5/12 and P(B|A) = 1/15, then $P(A \cup B)$ is equal to?
(a) 89/180 (b) 90/180 (c) 91/180 (d) 92/180
47. Let X and Y be two events such that P(X) = 1/3, P(X | Y) = 1/2 and P(Y | X) = 2/5. Then
(a) $P(X \cap Y) = 1/5$ (b) P(X' | Y) = 1/2
(c) P(Y) = 4/15 (d) $P(X \cup Y) = 2/5$
48. Three persons P, Q and R independently try to hit a target. If the probabilities of their hitting the target are $\frac{3}{4}, \frac{1}{2}, and\ \frac{5}{8}$ respectively, then the probability that the target is hit by P or Q but not by R is
(a) 39/64 (b) 21/64 (c) 15/64 (d) 9/64
49. Let E and F be two independent events. The probability that both E and f happen is 1/12 and the probability that neither E nor F happens is 1/2, then a value of $\frac{P(E)}{P(F)}$ is
(a) 1/3 (b) 5/12 (c) 3/2 (d) 4/3

50. P speaks truth in 70% cases and Q speaks in 80% of the cases. In what percentage of cases are they likely to contradict each other in stating the same fact?
(a) 25% (b) 38% (c) 42% (d) 48%

51. Two events A and B will be independent if
(a) P(A' ∩ B') = (1 – P(A)) (1 – P(B)) (b) A and b are mutually exclusive
(c) P(A) + P(B) = 1 (d) P(A) = P(B)

52. If A and B are independent events associated to some experiment E such that $P(A^C \cap B) = \frac{2}{15}$ and $P(A \cap B^C) = \frac{1}{6}$, then P(B) is equal to
(a) $\frac{1}{6}, \frac{1}{5}$ (b) $\frac{1}{6}, \frac{4}{5}$ (c) $\frac{4}{5}, \frac{1}{5}$ (d) $\frac{4}{5}, \frac{5}{6}$

53. If A and B are independent events such that $P(B) = \frac{2}{7}$, $P(A \cup \bar{B}) = 0.8$, then P(A) =
(a) 0.4 (b) 0.3 (c) 0.2 (d) 0.1

54. If A and B are two independent events such that P(B) = 0.4 and P(A ∪ B) = 0.6, then P(A ∩ B)
(a) 1/3 (b) 2/3 (c) 1/5 (d) 2/15

55. Let A and B be two events such that P(A ∩ B) = 1/6 , P(A ∪ B) = 31/45 and $P(\bar{B}) = \frac{7}{10}$ then
(a) A and B are independent (b) A and B are mutually exclusive
(c) $P\left(\frac{A}{B}\right) < \frac{1}{6}$ (d) $P\left(\frac{B}{A}\right) < \frac{1}{6}$

56. A candidate takes three tests in succession and the probability of passing the first test is p. The probability of passing each succeeding test is p or p/2 according as he passes or fails in the preceding one. The candidate is selected if he; passes at least two tests. The probability that the candidate is selected is
(a) p (2 – p) (b) $p + p^2 + p^3$
(c) $p^2(1-p)$ (d) $p^2(2-p)$

57. 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 $P(\bar{A}) = \frac{1}{4}$, where $\bar{A}$ stands for the complement of the event A. Then the events A and B are
(a) equally likely but not independent
(b) independent but not equally likely
(c) independent and equally likely
(d) mutually exclusive and independent

58. If the events A and B are independent and if $P(\bar{A}) = \frac{2}{3}$, $P(\bar{B}) = \frac{2}{7}$, then P(A ∩ B) is equal to
(a) 4/21 (b) 3/21 (c) 5/21 (d) 2/21

59. Let X and Y be two events such that P(X|Y) = 1/2 , P(Y|X) = 1/3 and P(X ∩ Y) = 1/6. Which of the following is(are) correct?
(a) P(X ∪ Y) = 2/3 (b) X and Y are independent
(c) X and Y are not independent (d) $P(X^C \cap Y) = 1/3$

60. Let E and F be two independent events. The probability that exactly one of them occurs is 11/25 and the probability of none of them occurring is 2/25. If P(T) denotes the probability of occurrence of the event T, then

(a) $P(E) = \frac{4}{5}$, $P(F) = \frac{3}{5}$

(b) $P(E) = \frac{1}{5}$, $P(F) = \frac{2}{5}$

(c) $P(E) = \frac{2}{5}$, $P(F) = \frac{1}{5}$

(d) $P(E) = \frac{3}{5}$, $P(F) = \frac{4}{5}$