

NDA MATHEMATICS - SHORT PRACTICE PAPER

30 questions | Maximum Marks: 75 | Suggested Time: 40 minutes

Name: _____ Batch: _____ Date: _____

Choose ONE correct option per question. All questions are compulsory. Use a separate answer sheet. No calculators. Correct answers earn 2.5 marks; wrong answers lose 5/6 mark. Unattempted questions score zero. This is an English-medium shortened NDA-style test, not an official UPSC paper.

BASIC CONCEPTS

- If $A = \{1, 2, 3\}$ and $B = \{3, 4\}$, find $n(A \cup B)$.
(A) 4 (B) 5 (C) 6 (D) 3
- The roots of $x^2 - 5x + 6 = 0$ are:
(A) -1 and -6 (B) -2 and -3 (C) 2 and 3 (D) 1 and 6
- The fifth term of the AP 3, 7, 11, ... is:
(A) 19 (B) 15 (C) 23 (D) 27
- If $\log_2 x = 3$, then x equals:
(A) 6 (B) 8 (C) 9 (D) 16
- The value of $\sin 30^\circ + \cos 60^\circ$ is:
(A) $\sqrt{3}$ (B) 1 (C) $\frac{1}{2}$ (D) 0
- The determinant of the matrix with rows (1,2) and (3,4) is:
(A) 2 (B) 10 (C) -2 (D) -10
- The distance between (1,2) and (4,6) is:
(A) 7 (B) 5 (C) 4 (D) 6
- The slope of $2x + 3y = 6$ is:
(A) $\frac{2}{3}$ (B) $\frac{3}{2}$ (C) $-\frac{3}{2}$ (D) $-\frac{2}{3}$
- The mean of 2, 4, 6, 8, 10 is:
(A) 5 (B) 7 (C) 6 (D) 8
- A fair die is rolled once. The probability of a prime number is:
(A) $\frac{2}{3}$ (B) $\frac{1}{2}$ (C) $\frac{1}{3}$ (D) $\frac{1}{6}$

APPLICATION

- The modulus of $3 + 4i$ is:
(A) 7 (B) 1 (C) 25 (D) 5
- The coefficient of x^3 in $(1 + x)^5$ is:
(A) 20 (B) 5 (C) 15 (D) 10
- If θ is acute and $\tan \theta = \frac{3}{4}$, then $\cos \theta$ is:
(A) $\frac{4}{5}$ (B) $\frac{5}{4}$ (C) $\frac{3}{5}$ (D) $\frac{5}{3}$
- For $0 \leq x < 2\pi$, how many solutions does $\sin x = \frac{1}{2}$ have?
(A) 4 (B) 2 (C) 3 (D) 1
- The radius of $x^2 + y^2 - 6x + 8y = 0$ is:
(A) 25 (B) 4 (C) 3 (D) 5

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Continued | Choose one correct option. Questions increase in difficulty within each subject block.

16. If $a = (1, 2, -1)$ and $b = (2, 0, 3)$, then $a \cdot b$ equals:
(A) 5 (B) 1 (C) -1 (D) -5
17. If $y = x^3 - 2x$, the value of dy/dx at $x = 2$ is:
(A) 12 (B) 6 (C) 8 (D) 10
18. The value of $\int_0^1 2x \, dx$ is:
(A) 1 (B) 0 (C) 2 (D) $1/2$
19. Three fair coins are tossed. The probability of exactly two heads is:
(A) $5/8$ (B) $1/2$ (C) $3/8$ (D) $1/8$
20. The sum to infinity of $6 + 3 + 3/2 + \dots$ is:
(A) 18 (B) 12 (C) 15 (D) 9

HIGHER APPLICATION AND REASONING

21. If α and β are roots of $x^2 - 3x + 1 = 0$, find $\alpha^3 + \beta^3$.
(A) 9 (B) 27 (C) 18 (D) 24
22. The perpendicular distance of $(2, -1)$ from $3x + 4y - 10 = 0$ is:
(A) $8/5$ (B) $2/5$ (C) $12/5$ (D) $4/5$
23. The number of distinct arrangements of the letters in LEVEL is:
(A) 20 (B) 120 (C) 30 (D) 60
24. If A has rows $(2, 1)$ and $(1, 1)$, A^{-1} has rows:
(A) $(1, 1)$ and $(1, 2)$ (B) $(2, -1)$ and $(-1, 1)$ (C) $(-1, 1)$ and $(1, -2)$ (D) $(1, -1)$ and $(-1, 2)$
25. The value of $\lim_{x \rightarrow 0} (\sin 3x)/(\sin 2x)$ is:
(A) $2/3$ (B) $3/2$ (C) 1 (D) 0
26. For $f(x) = x^3 - 3x$, the local maximum value is:
(A) 3 (B) -2 (C) 0 (D) 2
27. The area between $y = x$ and $y = x^2$ for $0 \leq x \leq 1$ is:
(A) $1/6$ (B) $1/2$ (C) $1/3$ (D) $2/3$
28. Two fair dice are rolled. Given that their sum is 8, the probability that at least one die shows 3 is:
(A) $2/5$ (B) $1/3$ (C) $1/5$ (D) $1/2$
29. The acute angle between vectors $(1, 1, 0)$ and $(1, 0, 1)$ is:
(A) 30° (B) 60° (C) 45° (D) 90°
30. If $dy/dx = 2xy$ and $y(0) = 1$, then $y(x)$ is:
(A) $e^{(2x)}$ (B) $e^{(-x^2)}$ (C) $e^{(x^2)}$ (D) $x^2 + 1$

NDA MATHEMATICS - ANSWER KEY AND BRIEF REASONS

Teacher copy | Detach this page before distributing the question paper.

1. (A) $A \cup B = \{1, 2, 3, 4\}$.
2. (C) Factor as $(x - 2)(x - 3)$.
3. (A) $a_5 = 3 + 4(4) = 19$.
4. (B) $x = 2^3$.
5. (B) Both terms equal $\frac{1}{2}$.
6. (C) $1(4) - 2(3) = -2$.
7. (B) $\sqrt{3^2 + 4^2} = 5$.
8. (D) Write $y = -(2/3)x + 2$.
9. (C) Sum 30 divided by 5.
10. (B) Prime outcomes are 2, 3 and 5.
11. (D) $|z| = \sqrt{9 + 16}$.
12. (D) The coefficient is ${}^5C_3 = 10$.
13. (A) Use a 3-4-5 right triangle.
14. (B) $x = \pi/6$ and $5\pi/6$.
15. (D) $(x - 3)^2 + (y + 4)^2 = 25$.
16. (C) $2 + 0 - 3 = -1$.
17. (D) $dy/dx = 3x^2 - 2$.
18. (A) $[x^2]_0^1 = 1$.
19. (C) There are 3 favourable outcomes among 8.
20. (B) $a/(1 - r) = 6/(1 - 1/2)$.
21. (C) $(\alpha + \beta)^3 - 3\alpha\beta(\alpha + \beta) = 27 - 9$.
22. (A) $|6 - 4 - 10|/5 = 8/5$.
23. (C) $5!/(2!2!) = 30$.
24. (D) $\det A = 1$; interchange diagonal entries and negate the others.
25. (B) Use $\lim \sin(kx)/(kx) = 1$.
26. (D) $f' = 3(x^2 - 1)$; maximum at $x = -1$, with $f(-1) = 2$.
27. (A) $\int_0^1 (x - x^2) dx = 1/2 - 1/3$.
28. (A) Five outcomes have sum 8; (3,5) and (5,3) qualify.
29. (B) $\cos \theta = 1/(\sqrt{2}\sqrt{2}) = 1/2$.
30. (C) Integrate $dy/y = 2x dx$; $y = Ce^{(x^2)}$, $C = 1$.