

NATIONAL UNIVERSITY OF SCIENCE & TECNOLOGY (NUST)

Math Admission Test 02

MATHEMATICS

Directions: For each question below you are given four choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

ALL ANSWER MUST BE GIVEN ON THE ANSWER SHEET.

YOUR ANSWERS MUST BE INDICATED BY LETTERS (A, B, C, D) AND NOT BY THE WORDS THEMSELVES.

- The fifth term of the sequence $a_n = 2n - 3$ is _____.
A) 13
B) -13
C) 7
D) -7
- The harmonic mean between a and b is
A) $\frac{a+b}{2}$
B) $\pm\sqrt{ab}$
C) $\frac{a-b}{2}$
D) $\frac{2ab}{a+b}$
- $\frac{8!}{6!} =$ _____.
A) 8
B) $\frac{1}{56}$
C) 56
D) None of these
- ${}^{16}C_{11} + {}^{16}C_{10} =$ _____.
A) ${}^{16}C_{10}$
B) ${}^{15}C_{11}$
C) ${}^{17}C_{10}$
D) ${}^{17}C_{11}$
- In the expansion of $(a+x)^n$ the sum of exponents of a and x in each term of the expansion is
A) $N + 1$
B) $n-1$

C) N

D) 2n

6. The number of terms in the expansion of $\left[x^2 - \frac{4}{x^2}\right]^9$ is

A) 8

B) 9

C) 10

D) 11

7. $\cos^2 \frac{\theta}{2} + \sin^2 \frac{\theta}{2} =$ _____.

A) 2

B) $\frac{1}{2}$

C) 1

D) None of these

8. The area of a sector of a circular region of radius r and central angle θ radians is

A) $r^2\theta$

B) $\frac{1}{2}r^2\theta$

C) $r\theta$

D) $\frac{1}{2}r\theta$

9. $\cos(2\pi + \theta) =$ _____.

A) $\sin \theta$

B) $\cos \theta$

C) $-\sin \theta$

D) $-\cos \theta$

10. $2 \sin a \cos \beta =$ _____.

A) $\cos(a + \beta) - \cos(a - \beta)$

B) $\cos(a + \beta) + \cos(a - \beta)$

C) $\sin(a + \beta) - \sin(a - \beta)$

D) $\sin(a + \beta) + \sin(a - \beta)$

11. Period of $\sin 3x$ is _____.

A) $\frac{\pi}{3}$

B) $\frac{2\pi}{3}$

C) π

D) 2π

12. Range of $\tan x$ is _____.

A) R

B) $[-1, 1]$

C) $\left[-\frac{1}{2}, \frac{1}{2}\right]$

D) None of these

13 $\sin \frac{a}{2} = \frac{\sqrt{(s+b)(s+c)}}{bc}$

A) $\sqrt{\frac{(s+b)(s+c)}{bc}}$

B) $\sqrt{\frac{(s-b)(s-c)}{bc}}$

C) $\sqrt{\frac{bc}{(s-b)(s-c)}}$

D) $\sqrt{\frac{s(s-a)}{bc}}$

14 In = radius of ΔABC is

A) $R = \frac{\Delta}{s}$

B) $R = \frac{abc}{4\Delta}$

C) $R = \frac{\Delta}{s-b}$

D) $R = \frac{abc}{4s}$

15 The solution of the equation $3 \tan^2 x = 1$ is

A) $\left\{ \frac{\pi}{6} + n\pi \right\} \cup \left\{ \frac{5\pi}{6} + n\pi \right\}, n \in Z$

B) $\left\{ \frac{\pi}{3} + 2n\pi \right\} \cup \left\{ \frac{2\pi}{3} + 2n\pi \right\}, n \in Z$

C) $\left\{ \frac{\pi}{4} + n\pi \right\} \cup \left\{ \frac{5\pi}{4} + n\pi \right\}, n \in Z$

D) None of these

16 If $f(x) = x^3 - 2x^2 + 4x - 1$ then $f(0)$ is

A) 0

B) 1

C) -1

D) None of these

17 $F(x) = x$ is

A) Trigonometric function

B) Exponential function

C) Quadratic function

D) None of these

18 $F(x) = \tan x$ is

A) Even function

B) Odd function

C) Linear function

D) None of these

19 If f is a bijective a function then $f(f^{-1}(x))$ is

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

B) $\ln(x^2 - x + 1) + c$

C) $\frac{x^3}{3} - \frac{x^2}{2} + x + c$

D) $\ln(2x - 1) + c$

27 $\int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx = \underline{\hspace{2cm}}$.

A) $\ln|e^x - e^{-x}| + c$

B) $\ln|e^x + e^{-x}| + c$

C) $E^x + e^{-x} + c$

D) $E^x - e^{-x} + c$

28 $\int e^x \left[\tanh^{-1} x + \frac{1}{1-x^2} \right] dx = \underline{\hspace{2cm}}$.

A) $e^x \tan h^{-1} x + c$

B) $e^x \cot h^{-1} x + c$

C) $\frac{e^x}{1-x^2} + c$

D) $e^x \operatorname{cosec} h^{-1} x + c$

29 $\int_0^{\frac{2}{3}} x^2 dx = \underline{\hspace{2cm}}$.

A) $\frac{2}{3}$

B) $\frac{4}{3}$

C) $\frac{8}{3}$

D) None of these

30 The mid point of the line segment joining the points A (-B, 3) an B(2, -1) is

A) (-3, 1)

B) (-6, 2)

C) (5, 2)

D) (-5, 2)

31 The latus rectum of the parabola $x^2 = -4ay$ is

A) $X = a$

B) $Y = -a$

C) $Y = a$

D) $X = -a$

32 The vertices of the ellipse $4x^2 + 9y^2 = 36$ are

A) $(\pm 3, 0)$

B) $(\pm\sqrt{5}, 0)$

C) $(0, \pm 2)$

D) None of these

33 The magnitude of the vector

$$r = a_1 \hat{i} + a_2 \hat{j} + a_3 \hat{k} \text{ is}$$

A) $A_1 + a_2 + a_3$

C) $a_1^2 + a_2^2 + a_3^2$

B) $\sqrt{a_1 + a_2 + a_3}$

D) $\sqrt{a_1^2 + a_2^2 + a_3^2}$

34 If dot product of two vectors is zero then the vector are

A) Collinear

B) Perpendicular

C) Parallel

D) None of these

35

If $3\hat{i} + 9\hat{j} + 3\hat{k}$ and $-\hat{i} + 4\hat{j} - x\hat{k}$ are perpendicular then

A) $x = 2$

B) $x = 11$

C) $x = 14$

D) $x = -33$

36 $\forall a, b, c \in R, a = b \wedge b = c \Rightarrow a = c$ is

A) Reflexive property

B) Symmetric property

C) Transitive property

D) Additive property

37 The value of $i^{-3} =$

A) 1

B) -1

C) i

D) -i

38 What is the number of elements of the power set of $\{\}$?

A) 0

B) 1

C) 2

D) 3

39 A binary operation $*$ is called commutative in S if $\forall a, b, \in S.$

A) $A * b = b * a$

B) $A * b = -b * a$

C) $AB = BA$

D) None of these

40 If $A = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ then order of A^t is

A) 3×1

B) 1×3

C) 3×3

D) 1×1

41 If n is any positive integer then $4^n > 3^n + 1$ is true for all

A) $n \leq 2$

B) $n < 3$

C) $n > 2$

D) $n \geq 2$

42 If $\sin \theta$ is in

A) I and III quadrants

B) II and III quadrants

C) I and II quadrants

D) II and IV quadrants

43 If $\sin \theta < 0$ then θ is in

A) I quadrant

B) II quadrant

C) III quadrant

D) IV quadrant

44 $\sec \left(a + \frac{\pi}{2} \right) = \underline{\hspace{2cm}}$.

A) $\sec a$

B) $\operatorname{cosec} a$

C) $-\sec a$

D) $-\operatorname{cosec} a$

45 $1 - \cos 2a = \underline{\hspace{2cm}}$.

A) $2 \sin^2 a$

B) $2 \cos^2$

C) $2 \sec a$

D) None of these

46 Period of $\sin \frac{x}{3}$ is $\underline{\hspace{2cm}}$.

A) π

B) 3π

C) $\frac{2\pi}{3}$

D) 6π

47 The Period of $3 \sin \frac{x}{3}$ is _____.

A) π

B) 2π

C) 3π

D) 6π

48 $\cos \frac{a}{2} =$ _____.

A) $\sqrt{\frac{s(s+a)}{bc}}$

B) $\sqrt{\frac{(s-b)(s-c)}{bc}}$

C) $\sqrt{\frac{s(s-a)}{bc}}$

D) $\sqrt{\frac{(s+b)(s+c)}{bc}}$

49 Area of $\Delta ABC =$ _____.

A) $Ab \sin a$

B) $\frac{1}{2} ab \sin a$

C) $\frac{1}{2} ab \sin y$

D) $\frac{1}{2} ab \sin \beta$

50 The solution of the equation $1 + \cos x - 0$ is -----.

A) $\left\{ \frac{\pi}{2} + 2n\pi \right\} \cup \left\{ \frac{3\pi}{2} + 2n\pi \right\}, n \in Z$

B) $\{ \pi + 2n\pi \}, n \in Z$

C) $\left\{ \frac{2\pi}{4} + 2n\pi \right\} \cup \left\{ \frac{5\pi}{2} + 2n\pi \right\}, n \in Z$

D) None of these

51 If $f(x) = \sec x$ then $f\left(\frac{\pi}{3}\right)$ is

A) 0

B) 1

C) 2

D) $\frac{1}{2}$

52 $f(x) = C$ is

A) Identity function

B) Constant function

C) Linear function

D) Quadratic function

53 $\cos^2 x + \sin^2 x = \dots\dots\dots$.

A) $\sin 2x$

B) $\sin^2 2x$

C) $\cos 2x$

D) $\cos^2 2x$

54 $\lim_{x \rightarrow 0} \frac{e^x - 1}{e^x} = \dots\dots\dots$

A) e^x

B) 1

C) $N a^{n-1}$

D) $\text{Log}_e a$

55 $\lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\theta} = \dots\dots\dots$

A) 0

B) 1

C) 2

D) Does not exist

56 If $f(x) = \frac{1}{x^2}$ then $f'(x) = \dots\dots\dots$.

A) $-2x^3$

B) $2x^{-3}$

C) $-2x^{-3}$

D) $2x^3$

57 Derivative of x^3 w.r.t. x^3 is

A) 0

B) 1

C) $3x^2$

D) x^3

58 $\frac{d}{dx}(2^x) = \dots\dots\dots$

A) 2^x

B) $2^x \ln x$

C) $2x \ln 2$

D) $\frac{2^x}{\ln 2}$

59 If $f(x) = \cos x$ then $f'(\tan x) = \dots\dots\dots$.

A) $-\frac{1}{1+x^2}$

B) $-\text{cosec}^2 x$

C) $\text{Sec}^2 x$

D) $-\cos^2 x$

60 If $f(x) = \cos x$ then $f'(0) = \dots\dots\dots$.

- A) 0
- B) 1
- C) -1
- D) None of these

61 $\int \frac{dx}{ax+b} = \dots\dots\dots$

- A) $\frac{1}{a} \ln|ax+b| + c$
- B) $\frac{1}{a} \ln|ax+b| + c$
- C) $-a \ln|ax+b| + c$
- D) $-\frac{1}{a} \ln|ax+b| + c$

62 $\int a^{\cos x} \sin x \, dx = \dots\dots\dots$

- A) $a^{\cos x} + c$
- B) $-\frac{a^{\cos x}}{\ln a} + c$
- C) $\frac{a^{\cos x}}{\ln a} + c$
- D) $a^{\cos x} \cdot \ln a + c$

63 $\int \frac{dx}{9+x^2} = \dots\dots\dots$

- A) $\frac{1}{3} \sec^{-1} \left(\frac{x}{3} \right) + c$
- B) $\frac{1}{3} \tan^{-1} \left(\frac{x}{3} \right) + c$
- C) $\frac{1}{3} \operatorname{cosec}^{-1} \left(\frac{x}{3} \right) + c$
- D) $\frac{1}{9} \tan^{-1} \left(\frac{x}{3} \right) + c$

64 $\int_0^1 \frac{dx}{\sqrt{1-x^2}} = \dots\dots\dots$

- A) $\frac{\pi}{6}$
- B) $\frac{\pi}{3}$
- C) $\frac{\pi}{4}$
- D) $-\frac{\pi}{6}$

65 The distance between the points (2,2) and (3,3) is

- A) 10
C) 5
- B) $\sqrt{2}$
D) 2

66 The lines l_1, l_2 with slopes m_1, m_2 are perpendicular if

- A) $m_1, m_2 = -1$
C) $m_1 = m_2$
- B) $m_1, m_2 = 1$
D) $m_1 + m_2 = 0$

67 The equation of the line bisecting the first and third quadrants is

- A) $Y = x$
C) $Y = a$
- B) $Y = -x$
D) $X = a$

68 The perpendicular distance of the line $12x + 5y = 7$ from the origin is

- A) $\frac{7}{13}$
C) $\frac{17}{13}$
- B) $\frac{13}{7}$
D) $\frac{1}{13}$

69 (1,2) is in the solution of the inequality

- A) $2x + y > 8$
C) $2x - y > 1$
- B) $2x + y \leq 6$
D) $2x + 3y < 2$

70 The equation of the normal to the circle $x^2 + y^2 = 25$ at (4,3) is

- A) $3x - 4y = 0$
C) $4x + 3y = 5$
- B) $3x - 4y = 5$
D) $4x + 3y = 25$

71 The latus rectum of the parabola $x^2 = -4ay$ is

- A) $X = a$
C) $Y = a$
- B) $Y = -a$
D) $X = -a$

72 The vertices of the ellipse $4x^2 + 9y^2 = 36$ are

- A) $(\pm 3, 0)$
C) $(0, \pm 2)$
- B) $(\pm\sqrt{5}, 0)$
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73 The magnitude of the vector

$$\vec{r} = a_1 \hat{i} + a_2 \hat{j} + a_3 \hat{k} \text{ is}$$

A) $A_1 + a_2 + a_3$

B) $\sqrt{a_1^2 + a_2^2 + a_3^2}$

C) $a_1^2 + a_2^2 + a_3^2$

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A) Collinear

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77 The value of $i^{-3} =$

A) 1

B) -1

C) i

D) -i

78 What is the number of elements of the power set of $\{\}$?

A) 0

B) 1

C) 2

D) 3

79 A binary operation $*$ is called commutative in S if $\forall a, b, \in S.$

A) $A * b = b * a$

B) $A * b = -(b * a)$

C) $AB = BA$

D) None of these

80

If $A = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ then order of A^t is

- A) 3×1
C) 3×3

- B) 1×3
D) 1×1

81 The number of terms in the expansion of $\left[x^2 - \frac{4}{x^2} \right]^8$ is

- A) 8
C) 10

- B) 9
D) 11

82 $\cos^2 \frac{\theta}{2} + \sin^2 \frac{\theta}{2} = \underline{\hspace{2cm}}$.

- A) 2
C) 1

- B) $\frac{1}{2}$
D) None of these

83 The area of a sector of a circular region of radius r and central angle θ radians is

- A) $r^2 \theta$
C) $r \theta$

- B) $\frac{1}{2} r^2 \theta$
D) $\frac{1}{2} r^2 \theta$

84 $\cos(2\pi + \theta) = \underline{\hspace{2cm}}$.

- A) $\sin \theta$
C) $-\sin \theta$

- B) $\cos \theta$
D) $-\cos \theta$

85 $2 \sin a \cos \beta = \underline{\hspace{2cm}}$.

- A) $\cos(a + \beta) - \cos(a - \beta)$
C) $\sin(a + \beta) - \sin(a - \beta)$

- B) $\cos(a + \beta) + \cos(a - \beta)$
D) $\sin(a + \beta) + \sin(a - \beta)$

ENGLISH

Directions: For each question below you are given choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

SENTENCE COMPLETION

Directions

Each sentence below has one or two blanks, each blank indicating that something has been omitted. Beneath in sentence are five lettered words or sets of words. Choose the word or set of words that best fits the meaning of the sentence as a whole.

186. There was a hint of carelessness about her appearance, as though the cut of her blouse or the fit of her slacks was a matter of _____ to her.

- A. satisfaction
- B. Aesthetics
- C. indifference
- D. Significance
- E. Controversy

187. There was a hint of carelessness about her appearance, as though the cut of her blouse or the fit of her slacks was a matter of _____ to her.

- A. satisfaction
- B. Aesthetics
- C. indifference
- D. Significance
- E. Controversy

ANALOGY

Direction: Each question below consists of a related pairs of words or phrases, followed by five lettered pairs of words or phrases, Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

188. SPOKE : WHEEL ::

- (a) square : circle
- (b) balance : lever
- (c) door : latch
- (d) book : shelf
- (e) rung : ladder

189. VESSEL : FLEET ::

- (a) wolf : pack
- (b) forest : clearing
- (c) vehicle : truck
- (d) carriage : horse
- (e) squadron : rank

ANTONYM

Direction: In each of the following antonym questions, a word printed in capital letters precedes five lettered words or phrases. From these five lettered words or phrases, pick the one most nearly opposite in meaning to the capitalized word.

190. PERT:
(A) Polite (B) Deliberate (C) Moral (D) Perishable
191. PRAISE:
(A) Reproof (B) Censure (C) Thymol (D) Trustworthy

READING COMPREHENSION

Direction: Please read the passage below and answer the questions on the basis of what is stated or implied.

Passage:

Hiuen Tasang, the famous Chinese traveler, visited Pakistan in the seventh century. He traveled extensively in Pakistan. He stayed for some time in Kanouj, at the court of the great emperor Harshavardhana. He has left for us graphic descriptions of the pomp and ceremony of the royal regalia and the lavish celebrations of Hindu festivals. During one particular festivity at the confluence of the Ganga and Yamuna, many princes would come to participate in the giving of gifts to poor and needy have resounded across the length and breadth of the land from the most distant times! How those ancient banks of seared rivers have heard voices of collective prayers and the shouts of joy of periodic pilgrims! If only the mute stones and steps could tell all the thrills they have witnessed, volumes of stirring stories would flow from them. Hiuen Tasang spent a long period at the famed Nalanda, the great center of learning in classical Pakistan, where students by the hundreds flocked from all over Pakistan and abroad. It has flourished in the remote century of the Buddha and Mahavira, and now when the Chinese pilgrims visited the place it seemed to have been still full of life and intellectual vigour. For this is what the pilgrim notes: "The day is not sufficient for asking and answering profound questions. From morning till night they engage in discussions; the old and the young mutually help one another. If such is not an ideal place of learning, then what is"?

QUESTIONS

192. Why are the writings of Hiuen Tasng considered very important?
- A) He was the first foreign visitor
B) We get details about the life style of classical Pakistan
C) He wrote his experiences in Pakistan language
D) He was impressed by the Pakistan way of life
E) He recorded stories at the river festivals
193. Why did Hiuen Tsang spend considerable time at Nalanda?
- A) He was to complete a teaching assignment
B) He was desirous of learning Buddhist practices
C) It was an important center of pilgrimage
D) At the request of the local kind
E) None of these
194. The passage refers to all the following except
- A) Footsteps of pilgrims
B) Voices of collective prayers
C) Giving of gifts to the poor and orphans
D) Lavish celebrations

- E) Presence of members of royal families at the pilgrimage spot

195. What has been considered as the most significant aspect of Nalanda?

- A) It was a renowned center of teaching and learning
B) It used to admit only foreign students
C) Princes would come there for their studies
D) It had witnessed volumes of stirring stories of Buddha
E) None of these

INTELIGENCE

Directions: For each question below you are given choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

196. Look at this series: 664, 332, 340, 170, _____, 89... What number should fill the blank?

- A. 85
B. 97
C. 109
D. 178

197. Look at this series: V, VIII, XI, XIV, ____, XX... What number should fill the blank?

- A. IX
B. XXIII
C. XV
D. XVII

198. Look at this series: 70, 71, 76, ____, 81, 86, 70, 91... What number should fill the blank?

- A. 70
B. 71
C. 80
D. 96

199. To which industry India's city Ahmedabad is associated?

- A) Cotton Fibre B) Poly Fibre C) Paper D) Textiles

200. "Cork" industry is associated with Cadiz, city of:

A) Spain

B) Portugal

C) Netherlands

D) Italy