# NIMCET 2020 MATHS

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## GROVER SIR

1

1. If $\binom{15}{8} + \binom{15}{7} = \binom{n}{r}$, then the values of n and r are:

(A) 16 and 7

(B) 16 and 8

(C) 16 and 9

(D) 30 and 15

Correct Answer Key/Option: (B)

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2. In a class of 50 students, it was found that 30 students read ``Hitavad", 35 students read ``Hindustan" and 10 read neither. How many students read both: ``Hitavad" and ``Hindustan" newspapers?

(A) 25
(B) 20
(C) 15
(D) 30

**Correct Answer Key/Option: (A)**

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**3**

3. If A= $\{4^x - 3x - 1 : x \in \mathbb{N}\}$ and B=$\{9(x-1) : x \in \mathbb{N}\}$, where $\mathbb{N}$ is the set of natural numbers, then

(A) $A \subset B$

(B) $A \subseteq B$

(C) $A \supset B$

(D) $A \supseteq B$

**Correct Answer Key/Option: (A)**

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**4**

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4. If A= {x,y,z}, then the number of subsets in powerset of A is

(A) 6

(B) 8

(C) 7

(D) 9

**Correct Answer Key/Option: (B)**

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**5**

5. How many words can be formed starting with letter D taking all letters from word DELHI so that the letters are not repeated:

(A) 4

(B) 12

(C) 24

(D) 120

Correct Answer Key/Option: (C)

6. Naresh has 10 friends, and he wants to invite 6 of them to a party. How many times will 3 particular friends never attend the party?

(A) 8

(B) 7

(C) 720

(D) 35

Correct Answer Key/Option: (B)

7. There is a young boy's birthday party in which 3 friends have attended. The mother has arranged 10 games where a prize is awarded for a winning game. The prizes are identical. If each of the 4 children receives at least one prize, then how many distributions of prizes are possible?

(A) 80
(B) 84
(C) 70
(D) 72

Correct Answer Key/Option: (B)

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**8**

8. Three cities A, B, C are equidistant from each other. A motorist travels from A to B at 30km/hour, from B to C at 40km/hour and from C to A at 50km/hour. Then the average speed is

(A) 39km/hour

(B) 40km/hour

(C) 38.3km/hour

(D) 37.6km/hour

**Correct Answer Key/Option: (C)**

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**9**

9. A problem in Mathematics is given to 3 students A, B and C. If the probability of A solving the problem is $\frac{1}{2}$ and B not solving it is $\frac{1}{4}$. The whole probability of the problem being solved is $\frac{63}{64}$, then what is the probability of solving it by C?

(A) $\frac{1}{8}$

(B) $\frac{1}{64}$

(C) $\frac{7}{8}$

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

Correct Answer Key/Option: (C)

**10**

10. A and B play a game where each is asked to select a number from 1 to 25. If the two numbers match, both win a prize. The probability that they will not win a prize in a single trial is

(A) $\dfrac{1}{25}$

(B) $\dfrac{24}{25}$

(C) $\dfrac{2}{25}$

(D) $\dfrac{3}{25}$

Correct Answer Key/Option: (B)

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**11**

11. A, B, C are three sets of values of x:

A: 2,3,7,1,3,2,3

B: 7,5,9,12,5,3,8

C: 4,4,11,7,2,3,4

Select the correct statement among the following:

(A)   Mean of A is equal to Mode of C.

(B)   Mean of C is equal to Median of B.

(C)   Median of B is equal to Mode of A.

(D)   Mean, Median and Mode of A are same.

**Correct Answer Key/Option: (D)**

**12**

12. Standard deviation for the following distribution is

| Size of item: | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|
| Frequency: | 3 | 6 | 9 | 13 | 8 | 5 | 4 |

(A) 1.607

(B) 9.0

(C) 5.0

(D) 1.88

Correct Answer Key/Option: (A)

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**13**

13. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then for any positive integer n , $A^n$ is

(A) $\begin{bmatrix} \sin n\alpha & \cos n\alpha \\ \cos n\alpha & -\sin n\alpha \end{bmatrix}$

(B) $\begin{bmatrix} \cos n\alpha & \sin n\alpha \\ \sin n\alpha & \cos n\alpha \end{bmatrix}$

(C) $\begin{bmatrix} \cos n\alpha & \sin n\alpha \\ \sin n\alpha & -\cos n\alpha \end{bmatrix}$

(D) $\begin{bmatrix} \cos n\alpha & \sin n\alpha \\ -\sin n\alpha & \cos n\alpha \end{bmatrix}$

Correct Answer Key/Option: (D)

**14**

14. Roots of equation $ax^2 - 2bx + c = 0$ are n and m, then the value of

$$\frac{b}{an^2 + c} + \frac{b}{am^2 + c}$$ is

(A) $\dfrac{c}{a}$

(B) $\dfrac{b}{a}$

(C) $\dfrac{a}{c}$

(D) $\dfrac{b}{c}$

Correct Answer Key/Option: (D)

**15**

15. The number of values of k for which the linear equations

$4x+ky+z=0$

$kx+4y+z=0$

$2x+2y+z=0$

posses a non-zero solution is

(A) 2

(B) 1

(C) 0

(D) 3

Correct Answer Key/Option: (A)

16. Let $A=(a_{ij})$ and $B=(b_{ij})$ be two square matrices of order n and det(A) denotes the determinant of A. Then, which of the following is not correct.

(A) If A is a diagonal matrix, then $det(A)=a_{11}a_{22}...a_{nn}$.

(B) $det(AB)=det(A)det(B)$

(C) $det(cA)=c\,det(A)$

(D) $det(A)=det(A^T)$, where $A^T$ denotes the transpose of the matrix A.

**Correct Answer Key/Option: (C)**

**17**

17. The tangent to an ellipse $x^2+16y^2=16$ and making angel 60° with X-axis is:

(A) $x-\sqrt{3}y+7=0$

(B) $\sqrt{3}x-y+8=0$

(C) $\sqrt{3}x-y+7=0$

(D) $x+\sqrt{3}y-7=0$

**Correct Answer Key/Option: (C)**

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**18**

18. Find the number of point(s) of intersection of the ellipse $\frac{x^2}{4} + \frac{(y-1)^2}{9} = 1$ and the circle $x^2 + y^2 = 4$

    (A)  4

    (B)  3

    (C)  2

    (D)  1

**Correct Answer Key/Option: (B)**

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**19**

19. An arithmetic progression has 3 as its first term. Also, the sum of the first 8 terms is twice the sum of the first 5 terms. Then what is the common difference?

(A) 3/4
(B) 1/2
(C) 1/4
(D) 4/3

**Correct Answer Key/Option: (A)**

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**20**

20. If a+b+c=0, then the value of $\dfrac{a^2}{bc} + \dfrac{b^2}{ca} + \dfrac{c^2}{ab}$ is:

(A) 1

(B) 0

(C) 3

(D) -1

**Correct Answer Key/Option: (C)**

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**21**

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21. Find $\lim\limits_{x \to 0} x^2 e^{\sin\left(\frac{1}{x}\right)}$

(A) 1

(B) limit does not exist

(C) infinity

(D) None of these

**Correct Answer Key/Option: (D)**

**22**

22. If $f(x) = \begin{cases} x^2, & x \leq 0 \\ 2\sin x, & x > 0 \end{cases}$ , then x=0 is

(A) Point of minima

(B) Point of maxima

(C) Point of discontinuity

(D) None of these

Correct Answer Key/Option: (A)

**23**

23. If $g(x) = \begin{cases} (x^2 - x)/2x, & x \neq 0 \\ k \quad , & x = 0 \end{cases}$ is a continuous function at x=0, then the

value of k is

(A) 2

(B) 1/2

(C) 1

(D) None of these

Correct Answer Key/Option: (D)

24. Find the interval(s) on which the graph $y = 2x^3 e^x$ is increasing:

    (A) $(-3, 0)$ and $(0, \infty)$

    (B) $(-3/2, 0)$ and $(0, \infty)$

    (C) $(-3, \infty)$ only

    (D) None of these

**Correct Answer Key/Option: (A)**

**25**

25. If $\int \sec^2 x \, \csc^4 x \, dx = -\frac{1}{3}\cot^3 x + k\tan x - 2\cot x + C$, the value of k is

(A) 1

(B) 2

(C) 3

(D) 4

**Correct Answer Key/Option: (A)**

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26. Evaluate $\int e^x \left( \frac{1+sinxcosx}{cos^2 x} \right) dx$

(A) $e^x cosx + c$

(B) $e^x secxtanx + c$

(C) $e^x tanx + c$

(D) $e^x cos^2x - 1 + c$

Correct Answer Key/Option: (C)

**27**

27. If $I_n = \int_0^a (a^2 - x^2)^n \, dx$ where n is a positive integer, then the relation between $I_n$ and $I_{n-1}$ is

(A) $I_n = \dfrac{2na^2}{2n+1} I_{n-1}$

(B) $I_n = \dfrac{2n^2 a^2}{2n+1} I_{n-1}$

(C) $I_n = \dfrac{2na^2}{2n-1} I_{n-1}$

(D) $I_n = \dfrac{2n^2 a^2}{2n-1} I_{n-1}$

**Correct Answer Key/Option: (A)**

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**28**

28. The value of $\int_{-2}^{2}(ax^5 + bx^3 + c)\ dx$ depends on the

(A) Value of b

(B) Value of c

(C) Value of a

(D) Value of a and b

**Correct Answer Key/Option: (B)**

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29. Find the area bounded by the line $y=3-x$, the parabola $y=x^2-9$ and $x \geq -1$, $y \geq 0$.

    (A) 7/2

    (B) 11/2

    (C) 9/2

    (D) None of these

**Correct Answer Key/Option: (D)**

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**30**

30. If $\vec{a}, \vec{b}, \vec{c}$ are three non-coplanar vectors, then

$(\vec{a} + \vec{b} + \vec{c}).[(\vec{a} + \vec{b}) \times (\vec{a} + \vec{c})] =$

(A) 0

(B) $[\vec{a}\,\vec{b}\,\vec{c}]$

(C) $2\,[\vec{a}\,\vec{b}\,\vec{c}]$

(D) $-[\vec{a}\,\vec{b}\,\vec{c}]$

**Correct Answer Key/Option: (D)**

**31**

31. Two forces $F_1$ and $F_2$ are used to pull a car, which met an accident. The angle between the two forces is $\theta$. Find the values of $\theta$ for which the resultant force is equal to $\sqrt{\{F_1^2 + F_2^2\}}$.

(A) $\theta = 0$
(B) $\theta = 45$
(C) $\theta = 90$
(D) $\theta = 135$

Correct Answer Key/Option: (C)

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**32**

32. If $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ are four vectors such that $\vec{a} + \vec{b} + \vec{c}$ is collinear with $\vec{d}$ and $\vec{b} + \vec{c} + \vec{d}$ is collinear with $\vec{a}$, then $\vec{a} + \vec{b} + \vec{c} + \vec{d}$ is

(A) $\vec{0}$

(B) *collinear with* $\vec{a} + \vec{d}$

(C) *collinear with* $\vec{a} - \vec{d}$

(D) *collinear with* $\vec{b} - \vec{c}$

**Correct Answer Key/Option: (A)**

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**33**

33. Forces of magnitude 5, 3, 1 units act in the directions 6i+2j+3k, 3i-2j+6k, 2i-3j-6k respectively on a particle which is displaced from the point (2, -1, -3) to (5,-1, 1).
    The total work done by the force is

    (A)    21 units
    (B)    5 units
    (C)    33 units
    (D)    105 units

    Correct Answer Key/Option: (C)

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34. The position vectors of points A and B are $\vec{a}$ and $\vec{b}$. Then the position vector of point p dividing AB in the ratio m:n is

(A) $\dfrac{n\,\vec{a}+m\,\vec{b}}{m+n}$

(B) $\dfrac{n\,\vec{a}+m\,\vec{b}}{m-n}$

(C) $\dfrac{n\,\vec{a}-m\,\vec{b}}{m+n}$

(D) None of these

Correct Answer Key/Option: (A)

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**35**

35. If $\vec{a}, \vec{b}, \vec{c}$ are three non-zero vectors with no two of which are collinear, $\vec{a} + 2\vec{b}$ *is collinear with* $\vec{c}$ and $\vec{b} + 3\vec{c}$ *is collinear with* $\vec{a}$, then $|\vec{a} + 2\vec{b} + 6\vec{c}|$ will be equal *to*

(A) Zero

(B) 9

(C) 1

(D) None of the above

Correct Answer Key/Option: (A)

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**36**

36. Vertices of the vectors i-2j+2k, 2i+j-k and 3i-j+2k form a triangle. This triangle is

(A) Equilateral triangle

(B) Right angle triangle

(C) Two sides are equal in length

(D) None of the above

**Correct Answer Key/Option: (B)**

**37**

37. If the volume of a parallelopiped whose adjacent edges are

$$\vec{a} = 2i + 3j + 4k,$$

$$\vec{c} = i + 2j + \alpha k$$

is 15, then α=

(A) 1

(B) 5/2

(C) 9/2

(D) 0

Correct Answer Key/Option: (C)

**38**

38. Solve the equation $\sin^2 x - \sin x - 2 = 0$ for x on the interval $0 \le x < 2\pi$:

(A) $x = -\dfrac{\pi}{2}$ only

(B) $x = \dfrac{\pi}{4}$ and $\dfrac{2\pi}{7}$

(C) $x = \dfrac{2\pi}{3}$ and $\dfrac{2\pi}{5}$

(D) None of these

Correct Answer Key/Option: (D)

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39. If $\dfrac{\tan x}{2} = \dfrac{\tan y}{3} = \dfrac{\tan z}{5}$ and $x+y+z=\pi$, then the value of $\tan^2 x + \tan^2 y + \tan^2 z$ is

(A) 38/3

(B) 38

(C) 114

(D) None of these

Correct Answer Key/Option: (A)

**40**

40. Find the value of sin 12°sin 48°sin 54°:

(A) 1/8

(B) 1/6

(C) 1/2

(D) 1/4

**Correct Answer Key/Option: (A)**

41. If cosx=tany, coty=tanz and cotz=tanx, then sinx=:

(A) $\dfrac{\sqrt{5}-1}{2}$

(B) $\dfrac{\sqrt{5}+1}{2}$

(C) $\dfrac{\sqrt{5}+1}{4}$

(D) $\dfrac{\sqrt{5}-1}{4}$

Correct Answer Key/Option: (A)

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42. The value of $\tan\left(45+\dfrac{\theta}{2}\right)$ is

(A) $\tan\theta - \sec\theta$

(B) $\tan\theta + \sec\theta$

(C) $\cot\theta - \sec\theta$

(D) $\cot\theta + \sec\theta$

Correct Answer Key/Option: (B)

**43**

43. The value of $\sin 10° \sin 50° \sin 70°$ is :

(A) 1/4

(B) 1/2

(C) 3/4

(D) 1/8

**Correct Answer Key/Option: (D)**

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**44**

44. The expression $\dfrac{\tan A}{1-\cot A} + \dfrac{\cot A}{1-\tan A}$ can be written as

(A) $\sin A \cos A + 1$

(B) $\sec A \csc A + 1$

(C) $\tan A + \cot A$

(D) $\sec A + \csc A$

**Correct Answer Key/Option: (B)**

**45**

45. Angle of elevation of the top of the tower from 3 points (collinear) A, B and C on a road leading to the foot of the tower are 30°, 45° and 60°, respectively. The ratio of AB and BC is

(A) $\sqrt{3}:1$

(B) $\sqrt{3}:2$

(C) $1:2$

(D) $2:\sqrt{3}$

Correct Answer Key/Option: (A)

**46**

46. The area enclosed between the curves $y^2 = x$ and $y = |x|$ is

   (A) 2/3 sq. unit

   (B) 1 sq. unit

   (C) 1/6 sq. unit

   (D) 1/3 sq. unit

**Correct Answer Key/Option: (C)**

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47. Test the continuity of the function at x=2

$$f(x) = \begin{cases} \dfrac{5}{2} - x, & x < 2 \\ 1, & x = 2 \\ x - \dfrac{3}{2}, & x > 2 \end{cases}$$

(A) Continuous at x=2

(B) Discontinuous at x=2

(C) Semicontinuous at x=2

(D) None of the above

Correct Answer Key/Option: (B)

**48**

**48.** The value of $2 \tan^{-1}[cosec(\tan^{-1} x) - \tan(\cot^{-1} x)]$ is

(A) $\tan x$

(B) $\cot x$

(C) $\tan^{-1} x$

(D) $cosec^{-1} x$

**Correct Answer Key/Option: (C)**

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49. If $3 \sin x + 4 \cos x = 5$, then $6 \tan \frac{x}{2} - 9 \tan^2 \frac{x}{2} =$

(A) 1

(B) 3

(C) 4

(D) 6

**Correct Answer Key/Option: (A)**

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50. If A is a subset of B and B is a subset of C, then cardinality of A U B U C is equal to

(A) Cardinality of C

(B) Cardinality of B

(C) Cardinality of A

(D) None of the above

**Correct Answer Key/Option: (A)**

51. A set of consecutive positive integers beginning with 1 is written on the blackboard. A student came along and erased one number. The average of the remaining numbers is $35\frac{7}{17}$. What was the number erased?

(A) 7

(B) 8

(C) 9

(D) None of the above

**Correct Answer Key/Option: (A)**

52. Four friends A, B, C and D need to cross a bridge in the night. A maximum of 2 people can cross at a time. They have only one lamp. A takes one minute to cross the bridge. B takes 2 minutes, C takes 8 minutes and D takes 11 minutes to cross the bridge respectively. A pair must walk together at the speed of the person who walks slowly. What is the minimum time required to cross the bridge by all the four people?

(A) 23 minutes

(B) 20 minutes

(C) 18 minutes

(D) 16 minutes

**Correct Answer Key/Option: (C)**

**53**

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**2**

**2**