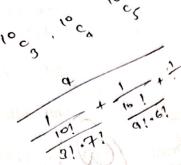
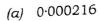


What is the harmonic mean of the numbers C(10, 3), C(10, 4), C(10, 5), C(10, 6) and C(10, 7)?

- (a) 3150/19
- (b) 4000/19
- (c) 252
- (d) 225



2. In a sample survey of a village, the probability that a farmer is in debt is 0.60. What is the probability that three randomly selected farmers are all in debt (assume independence of events)?



- (b) 0.064
- (c) 0.216
- (d) 0.512
- 3. The probability that a family owns a laptop is 0.68; that it also owns a desktop is 0.56. If the probability that it owns both is 0.48, then what is the probability that a randomly selected family owns a laptop or a desktop?
 - (a) 0.80
 - (b) 0.76
 - (c) 0·36
 - (d) 0.28

- 4. An urn contains 10 white and 5 red balls.

 If two balls are drawn at random, then
 what is the probability that both the
 balls are red?
 - (a) 2/21
 - (b) 1/7
 - (c) 4/21
 - (d) 3/7



- 5. An urn contains 5 white, 6 red and 4 blue balls. Three balls are drawn at random. What is the probability that a white ball, a red ball and a blue ball are drawn?
 - (a) 28/91
 - (b) 2/7
 - (c) 24/91



- **6.** Under which of the following conditions may binomial distribution be used?
 - I. The number of trials is infinite and not fixed.
 - II. The trials are independent.
 - III. Each trial has two possible outcomes.

Select the correct answer using the code given below.

- (a) II only
- (b) III only
- (c) I and II
- (d) II and III

- 7. A person X speaks the truth 4 out of 5 times and person Y speaks the truth 5 out of 6 times. What is the probability that they will contradict each other in stating the fact?
 - (a) 3/10
 - (b) 1/15
 - (c) 1/6
 - (d) 7/10
- 8. The probability that a student passes Physics test is 2/3 and the probability that he passes both Physics test and English test is 11/15. The probability that he passes at least one test is 4/5. What is the probability that he passes English test?
 - (a) 11/15
 - (b) 13/15
 - (c) 14/15
 - (d) 1
- 9. An event X can happen with probability p and event Y can happen with probability q. Further, X and Y are independent events. Which of the following statements is/are correct?
 - I. The probability that exactly one of the events happens is p+q-pq.
 - II. The probability that at least one of the events happens is p+q-2pq.

Select the answer using the code given below.

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

- 10. Three faces of a die are black, two faces are white and one face is red. The die is tossed three times. What is the probability that the colours black, white and red appear in the first, second and third tosses respectively?
 - (a) 1/36
 - *(b)* 1/6
 - (c) 7/36
 - (d) 5/36
- 11. A fair coin is tossed 4 times. What is the probability that two heads do not occur consecutively?
 - (a) 1/8
 - (b) 3/8
 - (c) 7/16
 - (d) 1/2
- 12. In a throw of three dice, what is the probability of getting one prime number, one composite number and one number which is neither prime nor composite?
 - (a) 1/2
 - (b) 1/3
 - (c) 1/4
 - (d) 1/6

- 13. An integer is chosen at random from the first 50 integers. What is the probability that the integer is neither divisible by 5 nor 9?
 - (a) 7/10
 - (b) 18/25
 - (c) 37/50
 - (d) 19/25
- 14. Out of 50 consecutive natural numbers, two integers are chosen at random. What is the probability that their sum is odd?
 - (a) 1/2
 - (b) 24/49
 - (c) 1/4
 - (d) 25/49
- 15. The standard deviation of 100 observations is 10. If 20 is added to each observation, then what will be the new standard deviation?
 - (a) 10
 - (b) 15
 - (c) 20
 - (d) 25

- 16. Let X be a random variable following binomial distribution with parameters n=5 and p=k. Further, P(X=1)=0.4096 and P(X=2)=0.2048. What is the value of k?
 - (a) 0.2
 - (b) 0·25
 - (c) 0·3
 - (d) 0.35
- 17. The frequency distribution of the marks obtained by students in a Science examination is given below:

Marks	5–15	15–25	25–35	35–45
Number of students	20	30	30	20

What is the arithmetic mean?

- (a) 20
- (b) 25
- (c) 30
- (d) 35
- **18.** If P(A) = 0.3, P(B) = 0.4 and P(A|B) = 0.5, then what is the value of P(B|A)?
 - (a) 0·325
 - (b) 0·333
 - (c) 0·375
 - (d) 0.667

- 19. If P(A) = 1/3, P(B) = 1/2 and $P(A \cap B) = 1/4$, then what is the value of $P(\overline{A} \cup B)$?
 - (a) 7/12
 - (b) 2/3
 - (c) 3/4
 - (d) 11/12
- 20. Consider the following statements :
 - I. Mean and variance have the same unit of measurement.
 - II. Mean deviation and standard deviation have the same unit of measurement.

Which of the statements given above is/are correct?

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II
- What is the degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^{\frac{3}{2}} = \left(\frac{dy}{dx}\right)^{\frac{5}{2}}$$
?

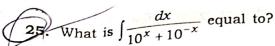
(a) 3

- (c) $\frac{5}{2}$
- (d) $\frac{3}{2}$

- What is $\int_{n}^{n+1} (x-[x]) dx$, where $[\cdot]$ is the greatest integer function and n is natural number?
 - (a) $\frac{4n+1}{2}$
 - (b) $\frac{2n+1}{2}$
- 327
- 23. Consider the following statements:
 - I. $y = xe^{2x}$ is the solution of $\frac{dy}{dx} = y\left(2 + \frac{1}{x}\right).$
 - II. $y = x \ln |x| + cx$ is the solution of $\frac{dy}{dx} = \frac{x + y}{x}$.

Which of the statements given above is/are correct?

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II
- 4.) If k is an arbitrary constant, then what is the general solution of the equation $(x+y)^2 \frac{dy}{dx} = k^2?$
 - (a) $y+x=\tan(x+c)+k$
 - (b) $x + y = k \tan\left(\frac{y-c}{k}\right)$
 - (c) $x-y=k\tan\left(\frac{y-c}{k}\right)$
 - (d) $y-x=\tan(x+c)+k$

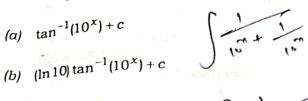


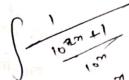
(a)
$$\tan^{-1}(10^x) + c$$

(b)
$$(\ln 10) \tan^{-1}(10^x) + c$$

$$\int_{\ln 10}^{1} \tan^{-1}(10^x) + c$$

(d)
$$\ln(10^x + 10^{-x}) + c$$

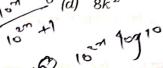


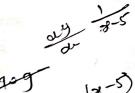




(b)
$$4k^2$$

$$(c) = 5k^2$$





following statements 29 Consider the regarding the function $f(x) = \frac{1}{x-5}$:

28. What is the area of the region bounded

positive real number?

by $|x| \le 2k$ and $|y| \le k$, where k is a

26. A wire of length 20 cm is to be bent into a rectangle. Which of the following statements is/are correct?

- The rectangle of the largest area is the square.
- It is possible to form a rectangle of an area of 27 cm².

Select the answer using the code given below.

- (a) I only
- (b) II only
- Both I and II
- (d) Neither I nor II

27. If $I_1 = \int_e^{e^2} \frac{dx}{\ln x}$ and $I_2 = \int_1^2 \frac{e^x}{x} dx$, then which one of the following is correct?

(a)
$$I_1 - I_2 = 0$$

(b)
$$I_1 + I_2 = 0$$

(c)
$$I_1 - 2I_2 = 0$$

(d)
$$2I_1 - I_2 = 0$$

Statement-I:

f(x) is decreasing on the intervals x < 5 and x > 5.

Statement-II:

$$f'(x) > 0$$
 for all $x \neq 5$.

Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement-II Statement-II correct and explains Statement-I
- Both Statement-I and Statement-II are correct but Statement-II does not explain Statement-I

Statement-I is correct Statement-II is not correct

Statement-I is not correct but Statement-II is correct

30. Consider the following statements:

Statement-I:

The function
$$f(x) = \frac{x^3 + 128}{x}$$
 has a minimum value 48 at $x = 4$.

Statement-II:

As x increases through 4, f'(x)changes sign from positive to negative.

Which one of the following is correct in respect of the above statements?

- Both Statement-I and Statement-II correct and Statement-II explains Statement-I
- Both Statement-I and Statement-II are correct but Statement-II does not explain Statement-I
- Statement-I is Statement-II is not correct
- (d) Statement-I is not correct but Statement-II is correct

For the following two (02) items:

Consider the function $f(x) = 1 - \sqrt[3]{(x-1)^2}$.

31. What is the domain of the function?

(d)
$$(-\infty, \infty) \setminus \{1\}$$

32. The function has

- (a) a minimum at x = 1
- (b) a maximum at x = 1
- neither maximum nor minimum at x = 1
- (d) no extremum

For the following two (02) items:

Consider the function

$$f(x) = \begin{cases} 4(5^x), & x < 0 \\ 8k + x, & x \ge 0 \end{cases}$$

33. If the function is continuous, then what is the value of k?

- (a) 0.5
- (b) 1
- (c) 1.5
- (d) 2

34. What is f'(-1) equal to?

- (a) $\frac{2}{5} \ln 5$
- (b) $\frac{3}{5} \ln 5$
- (c) $\frac{4}{5} \ln 5$
- (d) $20 \ln 5$

For the following two (02) items:

Let $u = \int e^x \cos x \, dx$ and $v = \int e^x \sin x \, dx$.

35. What is u + v equal to?

(a)
$$-\frac{du}{dx}$$

(b)
$$-\frac{dv}{dx}$$

 $\frac{dv}{dx} = -e^{xt} \cos x$

(et)
$$\frac{dv}{dx}$$

I.
$$\int \frac{du}{dx} = -v$$

II.
$$\frac{dv}{dx} = -u$$

Which of the above is/are correct?

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II



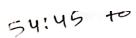
For the following two (02) items :

Let the function f(x) = |x-3| + |x-4| be defined on the interval [0, 5].

37. What is $\frac{dy}{dx}$ at x = 3.5 equal to?



- (b) 1
- (c) 2
- (d) 3·5



38. Consider the following statements:

- I. The function is differentiable at x = 3.
- II. The function is differentiable at x = 4.

Which of the statements given above is/are correct?

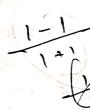
- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

For the following two (02) items:

Consider the function $f(x) = \frac{10^x - 10^{-x}}{10^x + 10^{-x}}$.

39. What is $f \circ f \circ f \circ f \circ f(0)$ equal to?

- (b) 1
- (c) 5
- (d) 10



40. What is the inverse of the function?

- (a) $\log_{10}(2x-1)$
- (b) $\frac{1}{2}\log_{10}(2x-1)$
- $\text{(c)} \quad \frac{1}{4}\log_{10}\left(\frac{2x}{2-x}\right)$
- $(d) \frac{1}{2} \log_{10} \left(\frac{1+x}{1-x} \right)$

15

For the following two (02) items:

Let

$$f(x) = \begin{cases} \frac{1 - \cos 2x}{x^2} &, x < 0\\ 9 &, x = 0\\ \frac{\sqrt{x}}{\sqrt{(16 + \sqrt{x})} - 4}, x > 0 \end{cases}$$

What is $\lim_{x\to 0^-} f(x)$ equal to?

- (c)
- (d) 8

42. What is $\lim_{x\to 0+} f(x)$ equal to?

- (a) 6
- - (d) 9

For the following three (03) items:

Consider the function f(x) = x|x|.

43. What is $\lim_{x\to -1} f(x)$ equal to?

- (a) -1
- (c)
- Limit does not exist



44. What is the area bounded by the curve f(x), the x-axis and the lines x = -2 and x = 1?

- (a)

- 3 (d)

45. Consider the following statements:

- The function is increasing in the interval (-∞, ∞).
- II. The function is differentiable at

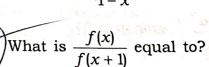
Which of the statements given above is/are correct?

- (a) I only
- (b) II only
- (c) Both I and II
- (d) Neither I nor II

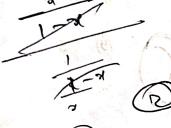
For the following two (02) items:

Consider the function

$$f(x) = \frac{x}{1-x} (x > 0, x \neq 1)$$



- (c) $f(x^2)$
- (d) f(x-1)





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47. What is $(1-x)f(\sqrt{x}) + xf(\sqrt{x} + 1)$ equal to?

- (a) -f(x)
- (b) f(x)
- (c) x
- (d) 0

For the following three (03) items:

Let
$$y = f(x) = \frac{x \sin^{-1} x}{\sqrt{1 - x^2}} + \ln \sqrt{1 - x^2}$$
.



What is the slope of the tangent to the curve y = f(x) at x = 0.5?

- (a) $4\pi\sqrt{3}/27$
- (b) $8\pi\sqrt{3}/27$
- (c) 4n
- (d) 8π



What is $\frac{d^2y}{dx^2}$ at x = 0 equal to?

AND A ENTO.

- (a) 0
- (b) 0·5
- (c) 1
- (d) 1.5

50. If $x = \sin \theta$, then what is $\frac{dy}{dx}$ equal to?

fa) θ sec θ

- (b) $\theta \sec^2 \theta$
- (c) $\theta \sec^3 \theta$
- (d) $2\tan\theta + \theta\sec^2\theta$

51. Which one of the following is the perpendicular form of the straight line $\sqrt{3}x + 2y = 7$?

(a)
$$y = -\frac{\sqrt{3}}{2}x + \frac{7}{2}$$

(b)
$$\frac{x}{\left(\frac{7}{\sqrt{3}}\right)} + \frac{y}{\left(\frac{7}{2}\right)} = 1$$

(c)
$$\frac{\sqrt{3}}{\sqrt{7}}x + \frac{2}{\sqrt{7}}y = \sqrt{7}$$

(d)
$$\frac{\sqrt{3}}{\sqrt{7}}x + \frac{2}{\sqrt{7}}y = 7$$

52. If the vertices B and D of a square ABCD are (2, 3) and (4, 1) respectively, then what is the area of the square?

- (a) 2 square units
- (b) 3 square units
- (c) 4 square units
- (d) 8 square units

53. What is the value of $\sin \theta$ if θ is the acute angle between the lines whose equations are px + qy = p + qp(x-y)+q(x+y)=2q?

(a)
$$\frac{\sqrt{3}}{2}$$

(b)
$$\frac{3}{4}$$

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

(d)
$$\frac{1}{\sqrt{2}}$$

circle $x^2 + y^2 - 2kx - 2ky + k^2 = 0$ touches the x-axis at P and y-axis at Q. What is PQ equal to?

(a)
$$\sqrt{2}k$$

(c)
$$2\sqrt{2}k$$

What is the distance between the foci of the hyperbola $x^2 - 4y^2 = 1$?

(a)
$$\sqrt{3}$$

(b)
$$\sqrt{5}$$

(c)
$$2\sqrt{3}$$

(d)
$$2\sqrt{5}$$

56. Let $\vec{p} = \vec{a} - \vec{b}$, $\vec{q} = \vec{a} + \vec{b}$. If $|\vec{a}| = |\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 2$, then what is the value (a-b) x (a+b) (a-b) x (a+b) 12x + a x b - b x a + 2x 2x + 2x 3 of $|\vec{p} \times \vec{q}|$?

(a)
$$\sqrt{3}$$

(c)
$$2\sqrt{3}$$

$$4\sqrt{3}$$

$$2 = |\vec{a}| \cdot |\vec{b}| \cdot |\vec{c}| \cdot |\vec{c}|$$

57. How many of the following can be a vector perpendicular to both the vectors $2\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + 3\hat{k}$?

I.
$$4\hat{i} + 5\hat{j} - 3\hat{k}$$
 8 -5 -3 =0

II.
$$-8\hat{i} - 10\hat{j} + 6\hat{k}$$
 $+ 5 - 9$

III.
$$\frac{1}{50}(-4\hat{i}-5\hat{j}+3\hat{k})$$
 - 16 + 70+6 - 8 - 10 + 18

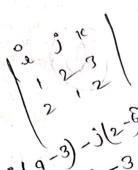
Select the correct answer.

(a) None
$$\frac{-8}{50}$$

58. What is the area of the parallelogram whose sides are represented by the vectors $\hat{i} + 2\hat{j} + 3\hat{k}$ and $2\hat{i} + \hat{j} + 2\hat{k}$?

 $\sqrt{1}\sqrt{26}$ square units

- (b) $\frac{1}{2}\sqrt{27}$ square units
- $\sqrt{26}$ square units
- (d) $\sqrt{27}$ square units



The position vectors of the vertices A, B, C and D of a quadrilateral ABCD are by $3\hat{i} + 4\hat{j} - 2\hat{k}$, $4\hat{i} - 4\hat{j} - 3\hat{k}$ $2\hat{i} - 3\hat{j} + 2\hat{k}$ and $6\hat{i} - 2\hat{j} + \hat{k}$ respectively. What is the angle between the diagonals AC and BD of the quadrilateral?

- 9,
- A force $\vec{F} = 2\hat{i} \lambda \hat{j} + 5\hat{k}$ is applied at the 60. point A(1, 2, 5). If its moment about the point B(-1, -2, 3) is $16\hat{i} - 6\hat{j} + 2\lambda \hat{k}$, then what is the value of λ ?

(a)
$$-2$$

- (c) 1
- (d) 2

For the following two (02) items :

A plane P is parallel to the line having direction ratios (1, 3, 2) and contains the line of

Which of the following are the direction of the line of intersection of the given planes?

(a) $\langle 2, 23, 16 \rangle$ (b) $\langle 2, -23 \rangle$

(b)
$$\langle 2, -23, -16 \rangle$$

(c)
$$\langle 2, 3, 2 \rangle$$

(d)
$$\langle -1, 3, -2 \rangle$$

62. What is the equation of the plane P?

(a)
$$2x-20y+29z+2=0$$

(b)
$$2x-20y+29z-2=0$$

(c)
$$2x + 3y + 2z - 4 = 0$$

(d)
$$x-3y+2z+5=0$$

For the following two (02) items:

Suppose S is the sphere with the smallest radius that passes through the points A(1, 0, 0), B(0, 1, 0) and C(0, 0, 1).

63. What is the radius of S?

(a)
$$\sqrt{\frac{1}{3}}$$

(b)
$$\sqrt{\frac{2}{3}}$$

(c)
$$\frac{1}{3}$$

64. On which one of the following planes does the centre of S lie?

(a)
$$x + y + z - 1 = 0$$

(b)
$$x+y+z+1=0$$

(c)
$$3x + 3y + 3z - 1 = 0$$

(d)
$$3x + 3y + 3z + 1 = 0$$

For the following two (02) items:

Let A(1, -1, 0), B(-2, 1, 8) and C(-1, 2, 7) are three consecutive vertices of a parallelogram ABCD.

65. What is the fourth vertex D?

(a)
$$(0, -2, 1)$$

66. If angle *BCD* is θ , then what is $\cos^2 \theta$ equal to?

- 67. For different values of m, the equation 4y = mx m + 2 represents
 - (a) parallel lines
 - (b) concurrent lines
 - (c) lines at a fixed distance from the origin of coordinates
 - (d) the same line
- 68. The equation of the locus of a point equidistant from the points (a, b) and (c, d) is (a-c)x+(b-d)y+k=0. What is the value of k?

(a)
$$a^2 - c^2 + b^2 - d^2$$

(b)
$$c^2 + d^2 - a^2 - b^2$$

(c)
$$(a^2-c^2+b^2-d^2)/2$$

(d)
$$(c^2+d^2-a^2-b^2)/2$$

- **69.** Consider the following statements in respect of the equation $x^2 + 3y = 0$:
 - I. The equation represents the equation to parabola that opens upwards.
 - II. The axis of the parabola is x = 0.
 - III. The equation of the latus rectum is 4y-3=0.

How many of the statements given above are correct?

- (a) None
- (b) One
- (c) Two
- (d) All three

70. What is the sum of the intercepts of the line

$$\frac{x}{a^2} + \frac{y}{b^2} = \frac{2}{a^2 + b^2}$$

on the coordinate axes?

- (a) 2
- (b) 1
- (c) $\frac{1}{2}$
- (d) $a^2 + b^2$
- What is the sum of the binary numbers (101101101)₂ and (100011)₂?

(110010000)₂

101001000

- (b) (110001000)₂(c) (110000100)₂
- (d) (100100000)₂
- Set X contains 3n elements and set Y contains 2n elements, and they have n elements in common. How many elements does $(X Y) \times (Y X)$ have?
 - (a) $5n^2$
 - (b) $4n^2$
 - (c) $3n^2$
 - (d) $2n^2$

- 73. Let $A = \{-3, -2, -1, 0, 1, 2, 3\}$ and $B = \{0, 1, 4, 9\}$. How many elements does the subset of $A \times B$ corresponding to the relation $R = \{(x, y) : |x| < y\}$ have, where $x \in A$ and $y \in B$?
 - fa) 9
 - (b) 12
 - (c) 15
 - (d) 16

74. Consider the following statements:

Statement-I:

If X is an $n \times n$ matrix, then $det(mX) = m^n det(X)$, where m is a scalar.

Statement-II:

If Y is a matrix obtained from X by multiplying any row or column by a scalar m, then det(Y) = m det(X).

Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II explains Statement-I
- (b) Both Statement-I and Statement-II are correct but Statement-II does not explain Statement-I
- (c) Statement-I is correct but Statement-II is not correct
- (d) Statement-I is not correct but Statement-II is correct

75. Consider the following statements about

the matrix
$$M = \begin{bmatrix} 71 & 23 & 48 \\ 57 & 28 & 29 \\ 65 & 17 & 48 \end{bmatrix}$$
:

Statement-I: The inverse of M does not exist.

Statement-II:
$$M$$
 is non-singular. X

Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement! II are correct and Statement-II explains Statement-I
- (b) Both Statement-I and Statement-II are correct but Statement-II does not explain Statement-I
- Statement-I is correct Statement-II is not correct
 - Statement-I is not correct but Statement-II is correct

What is

$$\cot^{-1} 9 + \csc^{-1} \left(\frac{\sqrt{41}}{4} \right)$$

equal to?

(a)
$$\frac{\pi}{4}$$

(b)
$$\frac{\pi}{3}$$

(c)
$$\frac{\pi}{2}$$

(d)
$$\pi$$

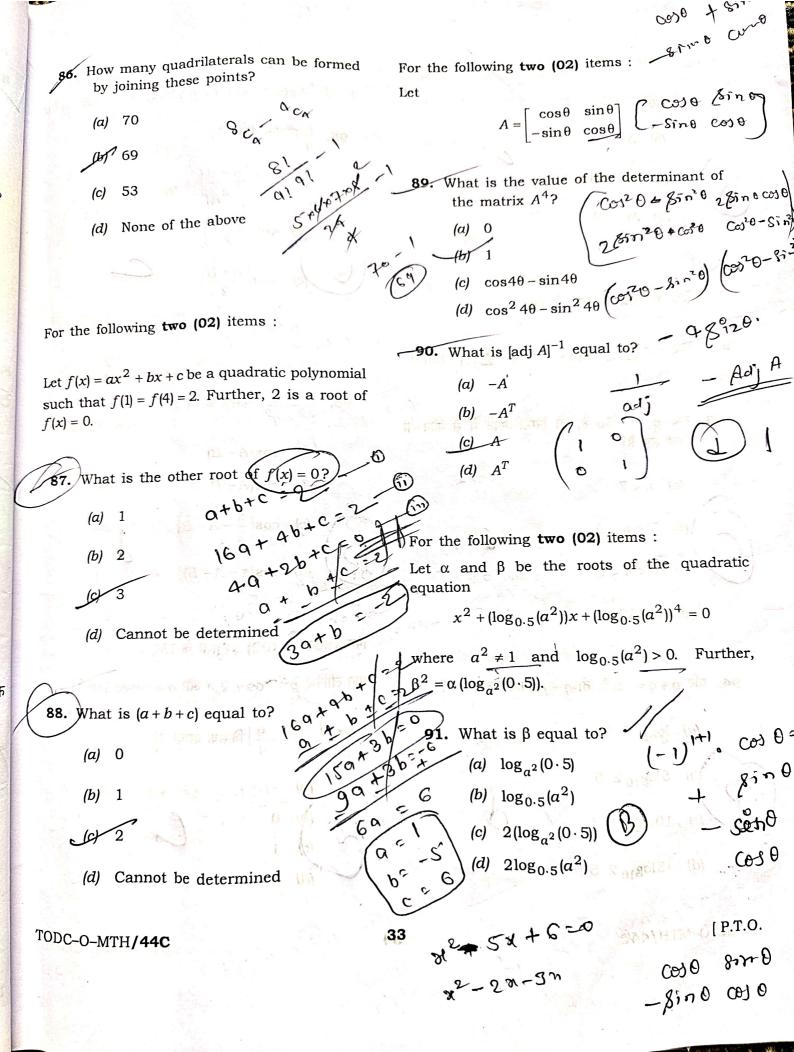
- 77. How many values of θ , where $-\pi < \theta < \pi$, satisfy both the equations $\cot \theta = -\sqrt{3}$ and $\csc\theta = -2$ simultaneously?
 - (a)

 - (c)
 - (d) None

$$(b) \cos 3\theta$$

$$\tan x + \sec x = 2\cos x?$$

For the following two (02) items : 80. What is the value of Let (6+10+14+... up to m terms) $\tan \left[\frac{1}{2} \sec^{-1} \left(\frac{2}{\sqrt{3}}\right)\right]$? = (1+3+5+7+... up to n terms) jar (2 Beë geet) where m < 25 and n < 25. (a) $2 - \sqrt{3}$ 83. What is the relation between m and n? (a) $n^2 = m(m+1)$ (b) $n^2 = m(m+2)$ $n^2 = 2m(m+2)$ m(12+4m-9) = (2m+2)m(g-qm)=n(qm) (c) $n^2=2m(m+1)$ (d) $\sqrt{3} + 1$ For the following two (02) items: 2 $abx^2 + bcx + ca = cax^2 + abx + bc$ 271/2 + 7)84. How many values of m are possible? ab +bC+ca=actabi Consider the equation ab - ea = Ca - bc(b) One If the roots of the equation are equal, (ab-ca) $x^2+(bC-ab)$ $x^2+(c)$ Two (b) a+c=2b(c) $\frac{1}{a}+\frac{1}{c}=\frac{1}{2b}$ (d) More than two ab(ab -ca) -ca then which one of the following is bc + ab = 2 ca There are 8 points on a plane out of which 85. How many triangles can be formed by If the roots of the equation are equal, joining these points? then a, b, c are in 56 (a) AP 54 (b) GP 4 a s c' - 4 a b ct 4 a b c 2 = 0 53 Jet HP b2 c2+ a2b2+2ab2c2-(d) None of the above TODC-O-MTH/44C



92. What is the relation between α and β ?

(a)
$$\alpha = 2\beta$$

(b)
$$2\alpha = \beta$$

(c)
$$\alpha = -2\beta$$

(d)
$$2\alpha = -\beta$$

For the following two (02) items :

Let
$$p = \sum_{j=1}^{n} \log_{10} 2^{j}$$
 and $q = \sum_{j=1}^{n} \log_{10} 5^{j}$.

93. If p+q=66, then which one of the following is correct?

(a)
$$n < 7$$

(b)
$$7 < n < 9$$

(c)
$$9 < n < 12$$

(d)
$$n > 12$$

94. If p+q=15, then what is q-p equal to?

(a)
$$\log_{10} 2.5$$

(b)
$$5\log_{10} 2.5$$

(c)
$$10\log_{10} 2.5$$

(d)
$$15\log_{10} 2.5$$

For the following two (02) items:

Let $\sin A + \sin B = p$ and $\cos A + \cos B = q$.

95. What is
$$\frac{p}{q}$$
 equal to?

(a)
$$\tan\left(\frac{A-B}{2}\right)$$

(b)
$$\cot\left(\frac{A-B}{2}\right)$$

(e)
$$\tan\left(\frac{A+B}{2}\right)$$

(d)
$$\cot\left(\frac{A+B}{2}\right)$$

96. What is $\frac{p^2 - q^2}{p^2 + q^2}$ equal to?

(a)
$$\cos(A+B)$$

(b)
$$cos(A-B)$$

(c)
$$\cos\left(\frac{\pi}{2}-A-B\right)$$

$$(d) \cos(\pi - A - B)$$

$$\cot^2 A \cot^2 B + 2 \cos A \cot^2 B$$

For the following two (02) items:

Let $p = \csc 20^{\circ}$ and $q = \csc 70^{\circ}$.

97. What is
$$\left(\frac{\sqrt{3}p}{4} - \frac{q}{4}\right)$$
 equal to?

(a)
$$-1$$

35

- 98. What is $\frac{p^2+q^2}{p^2q^2}$ equal to?

 - *(b)*

 - 2 (d)

For the following two (02) items :

Let $\cos(2x+3y) = \frac{1}{2}$ and $\cos(3x+2y) = \frac{\sqrt{3}}{2}$, where $-\pi < (2x + 3y) < \pi$ and $-\pi < (3x + 2y) < \pi$.

- 99. How many values does (x + y) have?

 - Three
 - Four
 - (d) More than four
- 100. How many values does (y-x) have?

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- (a) Two
- Three
- Four
- (d) More than four

- 101. In a class of 45 students, 34 like to play cricket and 26 like to play football. Further, each student likes to play at least one of the two games. How many students like to play exactly one game?
 - (a)
 - 30 (b)
 - 25
 - (d) 15
- 102. The system of equations

$$2x - 3y - 5 = 0$$
, $15y - 10x + 50 = 0$

- has a unique solution
- has infinitely many solutions
- is inconsistent (c)
- is consistent and has exactly two solutions

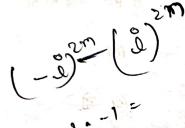
103. If

$$\left(\frac{1-i}{1+i}\right)^{2m} \left(\frac{1+i}{1-i}\right)^{2n} = 1 \qquad -1$$

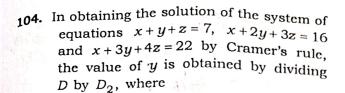
where $i = \sqrt{-1}$, then what is the smallest positive value of (m-n)?



- (b)
- (c)



(d)



$$D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 4 \end{vmatrix}$$

What is the value of the determinant D_2 ?

- (a) -13
- (b) -3
- (c)
- (d) 13

Consider the following in respect of non-singular matrices A and B:

I.
$$(AB)^{-1} = A^{-1}B^{-1}$$

II. $(BA)(AB)^{-1} = I$, where Iidentity matrix

III.
$$(AB)^T = A^T B^T$$

How many of the above are correct?

(a) None

- (c) Two
- (d) All three

196, The value of the determinant

$$\begin{vmatrix} a & b & c \\ l & m & n \\ p & q & r \end{vmatrix}$$

is equal to

(a)
$$\begin{vmatrix} a & b & c \\ p & q & r \\ l & m & n \end{vmatrix}$$

$$\begin{array}{c|cccc}
p & q & r \\
a & b & c \\
l & m & n
\end{array}$$

$$\begin{array}{c|cccc}
a & p & l \\
b & q & m \\
c & r & n
\end{array}$$

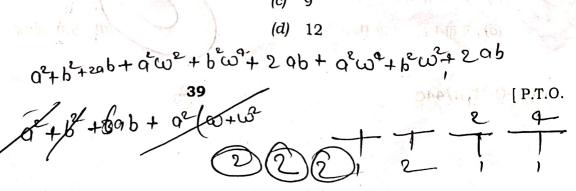
167. Let 1, ω , ω^2 be three cube roots of unity. If x = a + b, $y = a\omega + b\omega^2$, $z = a\omega^2 + b\omega$, then what is $x^2 + y^2 + z^2$ equal to?

(a)
$$6ab$$
 $(a+b)^2 +$
(b) $3ab$ $(c)^2 + (c)^2 + (d)^2 + (d)$

$$(c) \quad a^2 + b^2$$

108. How many 4-digit numbers that are divisible by 4 can be formed using the digits 1, 2, 3 and 4 (repetition of digits is not allowed)?

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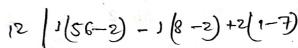
109, If a, b, c are the sides of a triangle ABC and p is the perimeter of the triangle. then what is

$$\begin{vmatrix} p+c & a & b \\ c & p+a & b \\ c & a & p+b \end{vmatrix}$$

equal to?

(b)
$$2p^3$$

(c) $3p^3$ $p+q+b+c$ $\frac{1}{2}$



- 110. Which one of the following is the greatest coefficient in the expansion of $(1+x)^{100}$?
 - The coefficient of x^{100}
 - The coefficient of x^{99} $(2(5^{-9}-18)$ 12 (36
 - The coefficient of x^{51}
 - (d) The coefficient of x^{50}
- 111. If $p^x = q^y = r^z$, where x, y and z are in GP, then consider the following statements:
 - p, q and r are in AP.
 - $\ln p$, $\ln q$ and $\ln r$ are in GP.

Which of the statements given above is/are correct?

- (a) I only
- II only
- Both I and
- (d) Neither I nor II

112. If A and B are non-empty subsets of a set, and A^c and B^c represent their complements, then which of the following is/are correct?

$$I. \qquad A - B = B^c - A^c$$

II.
$$A - B^c = A^c - B$$

Select the answer using the code given below.

- (a) I only
- (b) II only
- Both I and II (c)
- (d) Neither I nor II
- Let y = x! and z = (2x)!. If (z/y) = 120, then what is the value of (3x)!?
- 362880
- 181440 (b)
- 90720 (c)
- 45360 (d)
- 114. Let n be a natural number. The number of consecutive zeros at the end of the expansion of n! is exactly 2. How many values of n are possible?
 - (a)

 - 5 (c)

More than 5



 $(10 + \log_{10} x), (10 + \log_{10} y)$ and $(10 + \log_{10} z)$ are in AP, then consider the following statements:

- The GM of x and z is y^2 . I.
- The AM of $\log_{10} x$ and $\log_{10} z$ is $\log_{10} y$.

Which of the statements given above is/are correct?

- (a) I only
- (b) II only
- Both I and II
- Neither I nor II

terms of the many 1+3+5+7+... amount to a sum equal to 12345678987654321?



- 11111111 (a)
- 110000011 (b)
- 111101111 (c)
- A11111111

118. If

$$\alpha = \frac{-1 + \sqrt{-3}}{2} \quad \text{so} \quad \boxed{-1}$$

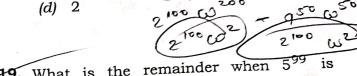
then what is the value of

$$(1+\alpha^{19}-\alpha^{35})^{100}-(1-3\alpha^{25}+\alpha^{38})^{50}$$
?

$$1 + \alpha^{19} - \alpha^{30}$$
) $= (1 - 3\alpha^{2})^{100} - (1 - 3\alpha^{2})^{100}$

(b)
$$-1$$
 $(-\omega^2)^{100} - (-\omega - 3\omega)$

$$(1+\alpha^{19}-\alpha^{33})^{100} = (1-3\omega^{2})^{100} = (1-3\omega^{2}+\omega^{2})^{100} = (1-3\omega^{2}+\omega^{2}+\omega^{2})^{100} = (1-3\omega^{2}+\omega^{2}+\omega^{2})^{100} = (1-3\omega^{2}+\omega^{2}+\omega^{2})^{100} = (1-3\omega^{2}+\omega^{2}+\omega^{2})^{100} = (1-3\omega^{2}+\omega^{2}+\omega^{2})^{100} = (1-3\omega^{2}+\omega^{2}+\omega^{2})^{100} = (1-3\omega^{2}+\omega^{2}+\omega^{2}+\omega^{2})^{100} = (1-3\omega^{2}+\omega^{2$$



119. What is the remainder when divided by 13?

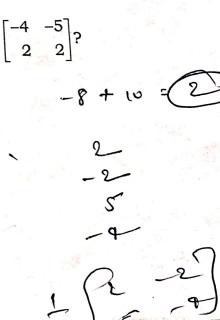
- (a) 10
- 8×1×2×2×3×2
- (b) 9
 - 8 (c)
 - (d)6

What is the value of the determinant of the inverse of the matrix

How many terms are identical in the two APs 19, 21, 23, ... up to 110 terms and 19, 22, 25, 28, ... up to 75 terms?

- 35
 - 36 (b)
 - 37 (c)
 - (d) 38

- - (c)
 - (d)



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