- 1. If $z\overline{z} = |z + \overline{z}|$, where z = x + iy, $i = \sqrt{-1}$, then the locus of z is a pair of:
 - (a) straight lines
 - (b) rectangular hyperbolas
 - (c) parabolas
- (\mathcal{P})

- (d) circles
- 2 If 1! + 3! + 5! + 7! + ... + 199! is divided by 24, what is the remainder?
 - (a) 3
 - (b) 6
 - (c) 7
 - (d) 9
- What is the value of $\sqrt{12+5i} + \sqrt{12-5i}$, where $i = \sqrt{-1}$?
 - (a) 24
 - (b) 25
 - (c) $5\sqrt{2}$
 - (d) $5(\sqrt{2}-1)$
- 4. If $A = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, then what is the value of

det(I + AA'), where I is the 3×3 identity matrix?

- (a) 15
- (b) 6
- (c) 0
- (d) -1

- If A, B and C are square matrices of order 3 and det(BC) = 2 det(A), then what is the value of $det(2A^{-1}BC)$?
 - (a) 16
 - (b) 8



- (c) 4
- (d) 2
- If the nth term of a sequence is $\frac{2n+5}{7}$, then what is the sum of its first 140 terms?
 - (a) 2840
 - (b) 2780



- (c) 2920
- (d) 5700
- Let A be a skew-symmetric matrix of order 3.

 What is the value of $\det(4A^4) \det(3A^3) + \det(2A^2) \det(A) + \det(-I)$

 $det(4A^4) - det(3A^6) + det(2A^6) - det(A) + det(-1)$ where I is the identity matrix of order 3?

- (a) -1
- (b) 0
 - (c) 1
- (d) 2

If
$$A = \begin{bmatrix} 0 & 3 & 4 \\ -3 & 0 & 5 \\ -4 & -5 & 0 \end{bmatrix}$$
, then which one of the

following statements is correct?

- A^2 is symmetric matrix with $det(A^2) = 0$.
- A^2 is symmetric matrix with $det(A^2) \neq 0$. (b)



- A² is skew-symmetric matrix with (c) $\det(A^2) = 0.$
- A² is skew-symmetric matrix with (d) $det(A^2) \neq 0$.



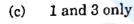
If $A = \begin{bmatrix} 0 & 3 & 0 \end{bmatrix}$, then which of the following

statements are correct?

- An will always be singular for any 1. positive integer n.
- An will always be a diagonal matrix for 2. any positive integer n.
- An 'will always be a symmetric matrix for any positive integer n.

Select the correct answer using the code given below:

- (a) 1 and 2 only
- 2 and 3 only (b)



1, 2 and 3 ****(d)



If (a + b), 2b, (b + c) are in HP, then which one of the following is correct?

a, b and c are in AP (a)



- κ (b) a-b, b-c and c-a are in AP
 - a, b and c are in GP (c)
 - a-b, b-c and c-a are in GP (d)

DFTK-S-MTH

(5-A)

- Let t_1 , t_2 , t_3 ... be in GP. What is $(t_1 t_3 \dots t_{21})^{\frac{1}{11}}$ equal to?
 - (a) t_{10}
 - (b)



- (c)
- (d)
- Which one of the following is a square root of $-\sqrt{-1}$?
 - (a) 1+i



- (c)
- (d)
- What is the maximum number of points of (13)intersection of 10 circles?
 - (a) 45
 - 60 (b)
 - 90 (c)
 - 120 (d)



- A set S contains (2n.+ 1) elements. There are 14. 4096 subsets of S which contain at most n elements. What is n equal to?
 - (a) 5

 - (d)



2n+16+-+2n+1cn

$$\begin{cases} x^2 + 3x & x - 1 & x + 3 \\ x + 1 & -2x & x - 4 \\ x - 3 & x + 4 & 3x \end{cases}$$

$$= ax^4 + bx^3 + cx^2 + dx + e$$

then what is the value of e?

- -1 (a)
- (b)
- (c) 1
- (d)
- If all elements of a third order determinant are equal to 1 or -1, then the value of the 19 determinant is:
 - 0 only (a)
 - an even number but not necessarily 0 (b)
 - an odd number (c)
 - (d) 0, 1 or -1
 - If $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 3 & 0 \\ 1 & 0 & 1 \end{bmatrix}$, then what is the value $\begin{bmatrix} 20 \\ 1 \end{bmatrix}$ If $A_k = \begin{bmatrix} k-1 & k \\ k-2 & k+1 \end{bmatrix}$, then what is

of det[adj(adjA)]?

- (a)
- (b) 25
- (c) 125
- (d) 625



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If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then what is

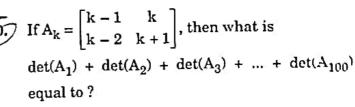
 $23A^3 - 19A^2 - 4A$ equal to?

Null matrix of order 3



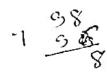
- Identity matrix of order 3 (b)

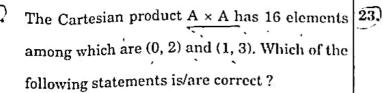
- The value of the determinant of a matrix A of order 3 is 3. If C is the matrix of cofactors of the matrix A, then what is the value of determinant of \mathbb{C}^2 ?
 - 3 (a)
 - (b)
 - (c) 81
 - (d) 729



- 9900
- 10000







- 1. It is possible to determine set A.
- 2. $A \times A$ contains the element (3, 2).

Select the correct answer using the code given below:

- (a) 1 only
- (b) 2 only



- (c) Both 1 and 2
- (d) Neither 1 nor 2
- Let $A = \{1, 2, 3, ..., 20\}$. Define a relation R from A to A by $R = \{(x, y) : 4x 3y = 1\}$, where x, $y \in A$. Which of the following statements is/are correct?
 - 1. The domain of R is {1, 4, 7, 10, 13, 16}.
 - 2. The range of R is {1, 5, 9, 13, 17}.
- 3. The range of R is equal to codomain of R.
 Select the correct answer using the code given below:
- (a) 1 only

(b) 2 only



- (c) 1 and 2
- (d) 2 and 3

- 3) Consider the following statements:
 - The relation f defined by

$$f(x) = \begin{cases} x^3, & 0 \le x \le 2 \\ 4x, & 2 \le x \le 8 \end{cases}$$
 is a function.

2. The relation g defined by

$$g(x) = \begin{cases} x^2, & 0 \le x \le 4 \\ 3x, & 4 \le x \le 8 \end{cases}$$
 is a function.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2
- Consider the following statements:

$$(A = (A \cup B) \cup (A - B)) X$$

$$2$$
 $A \cup (B - A) = (A \cup B)$

3.
$$B = (A \cup B) - (A - B)$$

Which of the statements given above are correct?

(a) 1 and 2 only

2 and 3 only

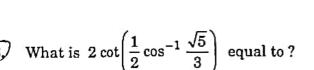


- (d) 1, 2 and 3

satisfies 25. function

where $f(y) \neq 0$. If f(1) = 0.5, then what is

- f(2) + f(3) + f(4) + f(5) + f(6) equal to?
- $\frac{15}{32}$ (a)
- (b)
- (c)
- (d)



- (a) -1
- (b)
- (c) $3 + \sqrt{5}$
- (d) $3 \sqrt{5}$
- If $\sec^{-1} p \csc^{-1} q = 0$, where p > 0, q > 0; then what is the value of $p^{-2} + q^{-2}$?
 - (a) 1
 - (b)
 - (c)
 - (d)



 $f(x-y) = \frac{f(x)}{f(y)}, \quad 28$ What is $1 + \sin^2\left(\cos^{-1}\left(\frac{3}{\sqrt{17}}\right)\right)$ equal to?

- (a)



- (d)
- If $\tan (\pi \cos \theta) = \cot (\pi \sin \theta)$, $0 < \theta < \frac{\pi}{2}$; then what is the value of $8 \sin^2 \left(\theta + \frac{\pi}{4}\right)$?
 - 16 (a)
 - (b)
 - (c)
 - (d)



- 30. If $\tan \alpha = \frac{1}{7}$, $\sin \beta = \frac{1}{\sqrt{10}}$; $0 < \alpha$, $\beta < \frac{\pi}{2}$, then what is the value of $\cos (\alpha + 2\beta)$?
 - (a) $-\frac{1}{2}$

Consider the following for the next two (02) 34. items that follow:

Consider the equation $(1-x)^4 + (5-x)^4 = 82$.

- 31. What is the number of real roots of the equation?
 - (a) 0
 - (b) 2



- (c) 4
- (d) 8
- 32. What is the sum of all the roots of the equation?
 - (a) 24
 - (b) 12



- (c) 10
- (d) 6

Consider the following for the next three (03) items that follow:

Consider equation-I : $z^3 + 2z^2 + 2z + 1 = 0$ and equation-II : $z^{1985} + z^{100} + 1 = 0$.

- 33.) What are the roots of equation-I?
 - (a) $1, \omega, \omega^2$
 - (b) $-1, \omega, \omega^2$



- (c) $1, -\omega, \omega^2$
- (d) $-1, -\omega, -\omega^2$

- Which one of the following is a root of equation-II?
 - (a) -1
 - (b) $-\omega$





- (d) ω
- 35. What is the number of common roots of equation-I and equation-II?
 - (a) 0
 - (b) 1



- (c) 2
- (d) 3

Consider the following for the next two (02) items that follow:

A quadratic equation is given by $(a + b) x^2 - (a + b + c) x + k = 0$, where a, b, c are real.

- 36. If $k = \frac{c}{2}$, $(c \neq 0)$, then the roots of the equation are:
 - (a) Real and equal
 - (b) Real and unequal



- (c) Real iff a > c
- (d) Complex but not real

If k = c, then the roots of the equation are:

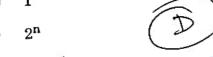
- (a) $\frac{a+c}{a+b}$ and $\frac{b}{a+b}$
- (b) $\frac{a+c}{a+b}$ and $-\frac{b}{a+b}$
- (c) 1 and $\frac{c}{a+b}$
- (d) -1 and $-\frac{c}{a+b}$

Consider the following for the next three (03) tems that follow:

Let $(1 + x)^n = 1 + T_1 x + T_2 x^2 + T_3 x^3 + ... + T_n x^n$.

What is $T_1 + 2T_2 + 3T_3 + ... + nT_n$ equal to? 38.

- 0 (a)
- (b)
- (c)
- $n2^{n-1}$ (d)



- What is $1 T_1 + 2T_2 3T_3 + ... + (-1)^n nT_n$ 39. equal to?
 - (a)
 - (b) -2^{n-1}
 - $n2^{n-1}$ (c)
 - (d) 1
 - What is $T_1 + T_2 + T_3 + ... + T_n$ equal to?
 - 2^n (a)
 - $2^{n} 1$ (b)
 - 2^{n-1} (c)
 - (d) $2^{n} + 1$



Consider the following for the next two (02) items that follow:

Let $f(x) = x^2 - 1$ and $gof(x) = x - \sqrt{x} + 1$.

- Which one of the following is a possible expression for g(x)?
 - (a) $\sqrt{x+1} \sqrt[4]{x+1}$
 - (b) $\sqrt{x+1} \sqrt[4]{x+1} + 1$
 - (c) $\sqrt{x+1} + \sqrt[4]{x+1}$
 - (d) $x+1-\sqrt{x+1}+1$
- (42.) What is g(15) equal to?
 - 1 (a)



- (c)

Consider the following for the next two (02) items that follow:

Let a function f be defined on $\mathbb{R}-\{0\}$ and $2f(x) + f\left(\frac{1}{x}\right) = x + 3.$

43) What is f(0.5) equal to?



- (d)



- If f is differentiable, then what is f'(0.5) equal to?
 - (a) $\frac{1}{4}$
 - (b) $\frac{2}{3}$
- (c) 2
- (d) 4

Consider the following for the next two (02) items that follow:

A function is defined by

$$f(x) = \begin{vmatrix} x+1 & 2 & 3 \\ 2 & x+4 & 6 \\ 3 & 6 & x+9 \end{vmatrix}.$$

- 45. The function is decreasing on :
 - (a) $\left[-\frac{28}{3},0\right]$
 - (b) $\left[0, \frac{28}{3}\right]$



- (c) $\left[0, \frac{50}{3}\right]$
- (d) $\left[0, \frac{56}{3}\right]$
- 46. The function attains local minimum value at:
 - (a) $x = -\frac{28}{3}$
 - (b) x = -1
 - (c) x = 0
 - (d) $x = \frac{28}{3}$

Given that $4x^2 + y^2 = 9$.

- 47. What is the maximum value of y?
 - (a) $\frac{3}{2}$
 - (b) 3 (B)
 - (c) 4
 - (d) 6
- 48. What is the maximum value of xy?
 - (a) $\frac{9}{4}$



- (c) $\frac{4}{9}$
- (d) $\frac{2}{3}$

Consider the following for the next two (02) items that follow:

A function is defined by $f(x) = \pi + \sin^2 x$.

- What is the range of the function?
 - (a) [0, 1]
 - (b) $[\pi, \pi + 1]$



$$\pi$$
 [π – 1, π + 1]

- (d) $[\pi 1, \pi 1]$
- What is the period of the function?



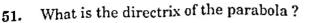
(b) π



- (c) $\frac{\pi}{2}$
- (d) The function is non-periodic

Consider the following for the next two (02) items that follow:

A parabola passes through (1, 2) and satisfies the differential equation $\frac{dy}{dx} = \frac{2y}{x}$, x > 0, y > 0.



- (a) $y = -\frac{1}{8}$
- (b) $y = \frac{1}{8}$



- (c) $x = -\frac{1}{8}$
- (d) $x = \frac{1}{8}$

52. What is the length of latus rectum of the parabola?

- (a) 1
- (b) $\frac{1}{2}$



- (c) $\frac{1}{4}$
- (d) $\frac{1}{8}$

Consider the following for the next two (02) items that follow:

Let $f(x) = \frac{a^{x-1} + b^{x-1}}{2}$ and g(x) = x - 1.

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

- (a) $\frac{ln\,(ab)}{4}$
- (b) $\frac{ln(ab)}{2}$



- (c) ln (ab)
- (d) 2 ln (ab)

- 54. What is $\lim_{x\to 1} f(x)^{\frac{1}{g(x)}}$ equal to?
 - (a) \sqrt{ab}
 - (b) ab
 - (c) 2ab
 - (d) $\frac{\sqrt{ab}}{2}$

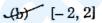


Consider the following for the next two (02) items that follow:

Let
$$f(x) = \sqrt{2-x} + \sqrt{2+x}$$
.

55) What is the domain of the function?

(a)
$$(-2, 2)$$





- (c) R (-2, 2)
- (d) R [-2, 2]
- 56.) What is the greatest value of the function?
 - (a) $\sqrt{3}$
 - (b) $\sqrt{6}$
 - (c) $\sqrt{8}$
 - (d) 4



Consider the following for the next two (02) items that follow:

Let f(x) = |x| and g(x) = [x] - 1, where [.] is the greatest integer function.

Let
$$h(x) = \frac{f(g(x))}{g(f(x))}$$
.

- 57.) What is $\lim_{x\to 0+} h(x)$ equal to?
 - (a) -2
 - (b) -1
 - (c) 0



(DC)-1 (DC)

(d)

$\underbrace{58.} \text{ What is } \lim_{x \to 0^-} h(x) \text{ equal to ?}$

- (a) -2
- (b) -1



- (c) 0
- (d) 2

Consider the following for the next two (02) items that follow:

Let
$$f(x) = \begin{cases} \frac{x-3}{|x-3|} + a; & x < 3 \\ a - b; & x = 3 \text{ and } \\ \frac{x-3}{|x-3|} + b; & x > 3 \end{cases}$$

f(x) be continuous at x = 3.

59. What is the value of a ?

- (a) ·-1 '
- (b) 1
- (c) 2
- (d) 3

60.) What is the value of b?

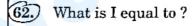
- (a) -1
- (b) 1
- (c) 2
- (q) 3

DFTK-S-MTH

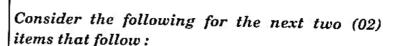
Consider the following for the next two (02) items that follow:

Let
$$I = \int_{-2\pi}^{2\pi} \frac{\sin^4 x + \cos^4 x}{1 + 3^x} dx$$

- 61.) What is $\int_{0}^{\pi} (\sin^{4} x + \cos^{4} x) dx \text{ equal to ?}$
 - (a) $\frac{3\pi}{8}$
 - (b) $\frac{3\pi}{4}$
 - (c) $\frac{3\pi}{2}$
 - (d) 3π



- (a) 0
- (b) $\frac{3\pi}{4}$
- (c) $\frac{3\pi}{2}$
- (d) 3π



Let
$$f(x) = \begin{cases} ax (x + 1) + b, & x < 1 \\ x - 1, & 1 \le x \le 2 \end{cases}$$

- 63. If the function f(x) is differentiable at x = 1, then what is the value of (a + b)?
 - (a) $-\frac{1}{3}$
 - (b) -1
 - (c) 0
 - (d) 1



- 64. What is $\lim_{x\to 0} f(x)$ equal to?
 - (a) $-\frac{1}{3}$
 - (b) $-\frac{2}{3}$

(B)

- (c) 0
- (d) 1
- 65. If f(x) = |ln|x| where 0 < x < 1, then what is f'(0.5) equal to ?
 - (a) -2
 - (b) -1



- (c) 0
- (d) 2
- 66. If $f'(x) = \cos(\ln x)$ and $y = f\left(\frac{2x-3}{x}\right)$, then what is $\frac{dy}{dx}$ equal to?
 - (a) $\cos\left(ln\left(\frac{2x-3}{x}\right)\right)$
 - (b) $-\frac{3}{x^2}\sin\left(ln\left(\frac{2x-3}{x}\right)\right)$



- (c) $\frac{3}{x^2} \cos \left(ln \left(\frac{2x-3}{x} \right) \right)$
- (d) $-\frac{3}{x^2}\cos\left(ln\left(\frac{2x-3}{x}\right)\right)$
- 67. What is $\int_{0}^{8\pi} |\sin x| dx \text{ equal to } ?$
 - (a) 2
 - (b) 4
 - (c) 8
 - (d) 16



,J ,

- 68. What is the area between the curve f(x) = x |x| and x-axis for $x \in [-1, 1]$?
 - (a) $\frac{2}{3}$
 - (b) $\frac{1}{2}$



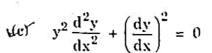
- (c) $\frac{1}{4}$
- (d) $\frac{1}{3}$
- 69. What are the order and the degree respectively of the differential equation $x^2 \left(\frac{d^3y}{dx^3}\right)^2 + \left(\frac{dy}{dx}\right)^4 + \sin x = 0?$
 - (a) 3, 4
 - (b) 1, 4
 - (c) 2, 2

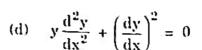


- (d) 3, 2
- 70. What is the differential equation of all parabolas of the type $y^2 = 4a(x-b)$?
 - (a) $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = 0$



(b) $\frac{d^2y}{dx^2} + x^2 \left(\frac{dy}{dx}\right)^2 = 0$





Consider the following for the next two (02) 74. items that follow:

Let a_1 , a_2 , a_3 ... be in AP such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{25} + a_{30} + a_{34} = 300$.

71. What is

$$a_1 + a_5 - a_{10} - a_{15} - a_{20} - a_{25} + a_{30} + a_{34}$$
 equal to?

- (a) 0
- (A)
- (b) 25
- (c) 125
- (d) 250
- 72. What is $\sum_{n=1}^{34} a_n$ equal to?
 - (a) 900

(b)

- \bigcirc
- (c) 1200

1025

(d) 1275

Consider the following for the next two (02) items that follow:

Let $p = \cos\left(\frac{\pi}{5}\right)\cos\left(\frac{2\pi}{5}\right)$ and $q = \cos\left(\frac{4\pi}{5}\right)\cos\left(\frac{8\pi}{5}\right)$.

- 73. What is the value of p + q?
 - (a) $-\frac{1}{2}$
 - (b) $-\frac{1}{4}$



- (c) 0
- (d) $\frac{1}{2}$

- 74. What is the value of pq?
 - (a) $-\frac{1}{16}$
 - (b) $-\frac{1}{4}$



- (c) $\frac{1}{4}$
- (d) $\frac{1}{16}$

Consider the following for the next two (02) items that follow:

Let $p = \frac{1}{3} - \frac{\tan 3x}{\tan x}$ and

 $q = 1 - 3 \tan^2 x$, $0 < x < \pi$, $x \neq \frac{\pi}{2}$.

- 75. What is pq equal to?
 - (a) 1



- (b) 2
- (c) $\frac{8}{3}$
- (d) $-\frac{8}{3}$
- 76. For how many values of x does $\frac{1}{p}$ become zero?
 - (a) No value



- (b) Only one value
- (c) Only two values
- (d) Only three values

Consider the following for the next two (02) 81. tems that follow:

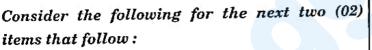
Let
$$\sin x + \sin y = \sqrt{3} (\cos y - \cos x); x + y = \frac{\pi}{2},$$

$$0 < x, y < \frac{\pi}{2}.$$

- What is a value of $\sin 3x + \sin 3y$?
- -1(a)
- (b) 0

17.

- (c) 1
- (d) 3
- What is a value of $\cos^3 x + \cos^3 y$? 78.
 - (a)
 - (b)
 - (c)
 - (d) 1



The angles A, B and C of a triangle ABC are in the ratio 3:5:4.

- What is the value of $a + b + \sqrt{2} c$ equal to? 79.
 - 3a (a)
 - (b) 2b
 - (c) 3b
 - (d) 2c
- What is the ratio of $a^2 : b^2 : c^2$? 80.
 - $2:2+\sqrt{3}:3$ (a)
 - $2:2-\sqrt{3}:2$ (b)
 - $2:2+\sqrt{3}:2$ (c)
 - $2:2-\sqrt{3}:3$ (d)



- What is the equation of directrix of parabola $y^2 = 4bx$, where b < 0 and $b^2 + b - 2 = 0$?
 - x + 1 = 0
 - x 2 = 0(b)
 - x 1 = 0(c)
 - x + 2 = 0(d)



- The points (-a, -b), (0, 0), (a, b) and (a^2, ab) 82.
 - lying on the same circle (a)
 - vertices of a square (b)
 - vertices of a parallelogram that is not a (c) square
 - collinear (d)
- Given that $16p^2 + 49q^2 4r^2 56pq = 0$. 83. Which one of the following is a point on a pair of straight lines (px + qy + r)(px + qy - r) = 0?
 - $\left(2,\frac{7}{2}\right)$
 - $\left(2,-\frac{7}{2}\right)$



- (4, -7)(c)
- (4, 7)(d)
- If 3x + y 5 = 0 is the equation of a chord of 84. the circle $x^2 + y^2 - 25 = 0$, then what are the coordinates of the mid-point of the chord?
 - (a) $\left(\frac{3}{4}, \frac{1}{4}\right)$

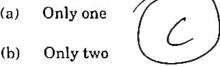
 - (d) $\left(\frac{3}{2}, -\frac{1}{2}\right)$

DFTK-S-MTH

- Consider the following in respect of the equation $\frac{x^2}{24 - k} + \frac{y^2}{k - 16} = 2$.
 - The equation represents an ellipse if 1. k = 19.
 - 2. The equation represents a hyperbola if k = 12.
 - The equation represents a circle if 3. k = 20.

How many of the statements given above are correct?

(a)



- (c) All three
- (d) None
- Consider the following statements in respect 86. of hyperbola $\frac{x^2}{\cos^2 \theta} - \frac{y^2}{\sin^2 \theta} = 1$:
 - 1. The two foci are independent of θ .
 - 2. The eccentricity is $\sec \theta$.
 - The distance between the two foci is 3. 2 units.

How many of the statements given above are 90. correct?

(a) Only one

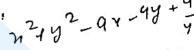


- (b) Only two
- (c) All three
- (d) None

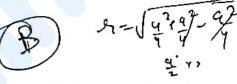
- Consider the following in respect of the circle $4x^2 + 4y^2 - 4ax - 4ay + a^2 = 0$:
 - The circle touches both the axes. 1.
 - The diameter of the circle is 2a. 2.
 - The centre of the circle lies on the line 3. x + y = a.

How many of the statements given above are correct?

Only one (a)



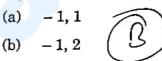
- Only two (b)
 - All three

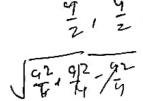


None (d)

(c)

values of k is what $(k-3)x-(5-k^2)y+k^2-7k+6=0$ parallel to the line x + y = 1?





- 1, -2(c)
- (d) 2, -2
- The line x + y = 4 cuts the line joining P(-1, 1)89. and Q(5, 7) at R. What is PR: RQ equal to?
 - 1:1 (a)
 - 1:2 (b)



- (c) 2:1
- 1:3 (d)
- What is the sum of the intercepts of the line whose perpendicular distance from origin is 4 units and the angle which the normal makes with positive direction of x-axis is 15°?

 - (b)



(d)

91. What is the length of projection of the vector $\hat{i} + 2\hat{j} + 3\hat{k}$ on the vector $2\hat{i} + 3\hat{j} - 2\hat{k}$?



- (b) $\frac{2}{\sqrt{17}}$
- B
- (d) $\frac{2}{\sqrt{2}}$

(c)

92. If $(\overrightarrow{a} \times \overrightarrow{b})^2 + (\overrightarrow{a} \cdot \overrightarrow{b})^2 = 144$ and $|\overrightarrow{b}| = 4$, then what is the value of $|\overrightarrow{a}|$?

40 3

(b) 4



- (c) 5
- (d) 6
- 93. If θ is the angle between vectors \overrightarrow{a} and \overrightarrow{b} such that \overrightarrow{a} . $\overrightarrow{b} \ge 0$, then which one of the following is correct?
 - (a) $0 \le \theta \le \pi$
 - (b) $\frac{\pi}{2} \le \theta \le \pi$



- $0 \le \theta \le \frac{\pi}{2}$
- (d) $0 < \theta < \frac{\pi}{2}$

- 94. The vectors $60\hat{i} + 3\hat{j}$, $40\hat{i} 8\hat{j}$ and $6\hat{i} 52\hat{j}$ are collinear if:
 - (a) $\beta = 20$
 - (b) $\beta = 40$



- $\beta = -40$
- (d) $\beta = 26$
- 95. Consider the following in respect of the vectors $\overrightarrow{a} = (0, 1, 1)$ and $\overrightarrow{b} = (1, 0, 1)$:
 - 1. The number of unit vectors perpendicular to both \overrightarrow{a} and \overrightarrow{b} is only one.
 - 2. The angle between the vectors is $\frac{\pi}{3}$.

Which of the statements given above is/are correct?

- Ya 1 only
 - (b) 2 only



- Both 1 and 2
- (d) Neither 1 nor 2
- 96. If L is the line with direction ratios < 3, -2, 6 > and passing through (1, -1, 1), then what are the coordinates of the points on L whose distance from (1, -1, 1) is 2 units?
 - (a) $\left(-\frac{11}{7}, \frac{13}{7}, \frac{19}{7}\right)$ and $\left(\frac{1}{7}, \frac{3}{7}, \frac{5}{7}\right)$
 - (b) $\left(\frac{19}{7}, -\frac{11}{7}, \frac{13}{7}\right)$ and $\left(-\frac{1}{7}, \frac{3}{7}, -\frac{5}{7}\right)$
 - (c) $\left(\frac{13}{7}, \frac{11}{7}, \frac{19}{7}\right)$ and $\left(-\frac{1}{7}, -\frac{3}{7}, \frac{5}{7}\right)$
 - (d) $\left(\frac{13}{7}, -\frac{11}{7}, \frac{19}{7}\right)$ and $\left(\frac{1}{7}, -\frac{3}{7}, -\frac{5}{7}\right)$

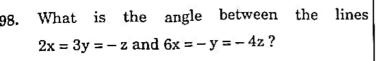
Which one of the planes is parallel to the line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$?

(a)
$$2x + 2y + z - 1 = 0$$

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

(c)
$$2x + 2y - 2z + 1 = 0$$

(d)
$$x-2y+z-1=0$$





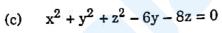




99. What is the equation of the sphere concentric with the sphere $x^2 + y^2 + z^2 - 2x - 6y - 8z - 5 = 0$ and which passes through the origin?

(a)
$$x^2 + y^2 + z^2 - 2x - 8z = 0$$

(b)
$$x^2 + y^2 + z^2 - 2x - 6y = 0$$



$$x^2 + y^2 + z^2 - 2x - 6y - 8z = 0$$

100. A point P lies on the line joining A(1, 2, 3) and B(2, 10, 1). If z-coordinate of P is 7, what is the sum of other two coordinates?

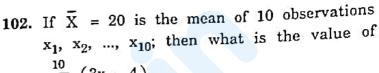
(a)
$$-15$$





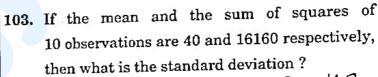


- 101. The sum of deviations of n numbers from 10 and 20 are p and q respectively. If $(p-q)^2 = 10000$, then what is the value of n?
 - (a) 10
 - (b) 20
 - (c) 50
 - (d) 100

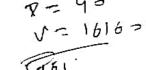


$$\sum_{i=1}^{10} \left(\frac{3x_i - 4}{5} \right) ?$$

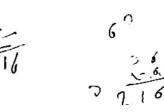
- (a) 0
- (b) 12
- (c) 112
- (d) 1012



- (a) 16
- (b) 6
- (c) 5
- (d) 4



- 104. Three dice are thrown. What is the probability of getting a sum which is a perfect square?
 - (a) $\frac{17}{108}$
 - (b) $\frac{5}{108}$
 - (c) $\frac{19}{108}$
 - (d) $\frac{23}{108}$



exhaustive events.

If 2P(A) = 3P(B) = 4P(C) = 5P(D), then what is 77P(A) equal to?

- (a) 12
- (b) 15



- 20 (c)
- (d) 30
- 106. Two distinct natural numbers from 1 to 9 are picked at random. What is the probability that their product has 1 in its unit place?
 - (a)
 - (b)



- (c)
- (d)
- 107. Two dice are thrown. What is the probability that difference of numbers on them is 2 or 3?
 - (a)
 - (b)



- (c)
- (d)

- 105. A, B, C and D are mutually exclusive and 108. What is the mean of the numbers 1, 2, 3, ..., 10 with frequencies ⁹C₀, ⁹C₁, ⁹C₂, ..., ⁹C₉, respectively?
 - 1.1×2^8 (a)
 - 1.2×7^4 (b)



- 5.5 (c)
- (d) 0.55
- 109. The probability that a person recovers from a disease is 0.8. What is the probability that exactly 2 persons out of 5 will recover from the disease?
 - 0.00512(a)
 - 0.02048(b)



- 0.2048(c)
- 0.0512(d)
- 110. Suppose that there is a chance for a newly constructed building to collapse, whether the design is faulty or not. The chance that the design is faulty is 10%. The chance that the building collapses is 95% if the design is faulty, otherwise it is 45%. If it is seen that the building has collapsed, then what is the probability that it is due to faulty design?
 - 0.10(a)
 - (b) 0.19
 - (c) 0.45
- (d) 0.95

111. If r is the coefficient of correlation between x 113. If H is the Harmonic Mean of three numbers and y, then what is the correlation coefficient between (3x + 4) and (-3y + 3)?



(b)



- (c)
- (d)

- 112. A fair coin is tossed 6 times. What is the probability of getting a result in the 6th toss which is different from those obtained in the first five tosses?
 - (a)
 - (b)



- (c)
- (d)

- $^{10}\mathrm{C}_4$, $^{10}\mathrm{C}_5$, and $^{10}\mathrm{C}_6$, then what is the value of $\frac{270}{H}$?
 - 1 (a)
 - (b)



- (d)
- 114. In a class, there are n students including the students P and Q. What is the probability that P and Q sit together if seats are assigned randomly?
 - (a)



- (b)
- (c)
- (d)
- 115. In a Binomial distribution B(n, p), n = 6 and 9P(X = 4) = P(X = 2). What is p equal to?
 - (a)
 - (b)

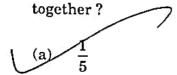


- (d)

Consider the following for the next five (05) 118. What is the probability that no two girls sit items that follow:

Three boys P, Q, R and three girls S, T, U are to be arranged in a row for a group photograph.

116. What is the probability that all three boys sit



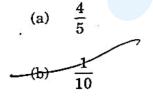


(b)
$$\frac{1}{4}$$



(d)
$$\frac{1}{12}$$

117. What is the probability that boys and girls sit alternatively?





$$\frac{5}{6}$$

(d)
$$\frac{1}{7}$$

together?

- (a)
- (b)



- (d)

119. What is the probability that P and Q take the two end positions?

- (a)
- (b)



- (c)
- (d) $\frac{11}{45}$

120. What is the probability that Q and U sit together?



(d)

