**IIT-JEE-ADVANCED-Solved paper-2022**

**Paper-1**

**Section A**

**Numerical Value Type 08 Numerical value type questions.**

**Question number-1**

Considering only the principal values of the inverse trigonometric functions, the value of

**Answer (2.35 or2.36)**

**Solution:**

To find, value of:

Now, Let

Here,

**Question number-2**

Let be a positive real number. Let and be the functions defined byand . Then the value of is \_\_\_\_\_\_\_\_.

**Answer (0.5)**

**Solution:**

Now

Now

By applying L Hospital Rule,

Now

Putting,

**Question number-3**

In a study about a pandemic, data of persons was collected. It was found that

persons had symptom of fever, persons had symptom of cough,

persons had symptom of breathing problem,

persons had symptom of fever or cough or both,

persons had symptom of cough or breathing problem or both,

persons had symptom of fever or breathing problem or both,

persons had all three symptoms (fever, cough and breathing problem).

If a person is chosen randomly from these persons, then the probability that the person has at most one symptom is\_\_\_\_\_.

**Answer (0.80)**

**Solution:**

Assume,persons having symptoms of fever.

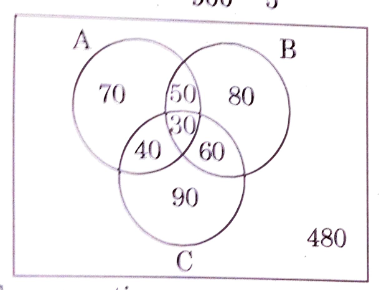
Bpersons having symptoms of cough C persons having symptoms of breathing problem Now,

Similarly and

By drawing , Venn diagram

Number of persons having at most one symptom

Probability



**Question number-4**

Let be a complex number with non-zero imaginary part. If is a real number, then the value of is

**Answer (0.50)**

**Solution:**

From question,

is a real number

**Question number-5**

Let denote the complex conjugate of a complex number and let . In the set of complex numbers, the number of distinct roots of the equation is \_\_\_\_\_\_\_.

**Answer (4)**

**Solution:**

Let

or

Put in (i) or (ii) we get

2 complex numbers are possible and

putor

and are possible

Hence, four solutions are possible.

**Question number-6**

Let be consecutive terms of an arithmetic with common difference , and let be consecutive terms of another arithmetic progression with common difference d₂, where . For each , let R, be a rectangle with length ;, width w; and area . If , then the value of is\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Answer ((18900)**

**Solution:**

Given:

**Question number-7**

The number of 4-digit integers in the closed interval formed by using the digits is\_\_\_\_\_\_\_\_\_\_\_.

**Answer (569)**

**Solution:**

Number of numbers whose digits are

|  |  |
| --- | --- |
| 2 | 0 |
| \_\_\_\_ | \_\_\_\_ \_\_\_\_ \_\_\_\_ |
|  |  |
| 2 |  |
| \_\_\_\_ | \_\_\_\_ \_\_\_\_ \_\_\_\_ |
|  |  |
| 3 | \_\_\_\_ \_\_\_\_ \_\_\_\_ |
|  |  |
| 4 | \_\_\_\_ \_\_\_\_ \_\_\_\_ |
|  |  |

Now, Total numbers are

**Question number-8**

Let ABC be the triangle with . If a circle of radius touches the sides and also touches internally the Circumcircle of the triangle , then the value of is\_\_\_\_\_\_\_\_.

**Answer (0.83 or 0.84)**

**Solution:**

Let be and

lies on and lies on

equation of circle touching both and is of the form

**Section B**

**One or More than one Choice Type**

This section contains **06 questions**. Each question has 4 choices (a), (b), (c) and (d). **One or More Than One** of these four option (s) is (are) correct answer (s)..

**Question number-9**

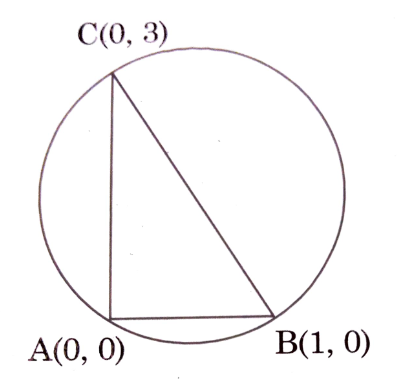
Consider the equation

Which of the following statements is/are TRUE?

1. No a satisfies the above equation
2. An integer a satisfies the above equation
3. An irrational number a satisfies the above equation
4. More than one a satisfy the above equation

**Answer (c, d)**

**Solution:**



Let,

Now,

By solving,

**Question number-10**

Let ag, be an arithmetic progression with and commondifference 8. Let be such that and for . n+1 n Then, which of the following is/are TRUE?

**Answer (b, c)**

**Solution:**

For option

(B)

For option

(C)

**Question number-11**

Letand be two planes given by ,. Which of the following straight lines can be an edge of some tetrahedron whose two faces lie on and ?

**Answer (a, b, d)**

**Solution:**

Given:

The line should be either coincident on or on or intersect on and on different points.

(A) intersect and on different points.

(B) also intersects and on different points.

(D)

lie on

**Question number-12**

Let be the reflection of a point with respect to the plane given by where , p are real parameters and are the unit vectors along the three positive coordinate axes. If the position vectors of Q and S are and

respectively, then which of the following is/are TRUE?

1. =
2. =
3. =

**Answer (a, b, c)**

**Solution:**

Clearly plane is given by using mirror image formula

By mirror formula,

and

**Question number-13**

Consider the parabola . Let S be the focus of the parabola. A pair of tangents drawn to the parabola from the point

meet the parabola at and . Let and be points on the lines and respectively such that is perpendicular to and is perpendicular to . Then, which of the following is/are TRUE?

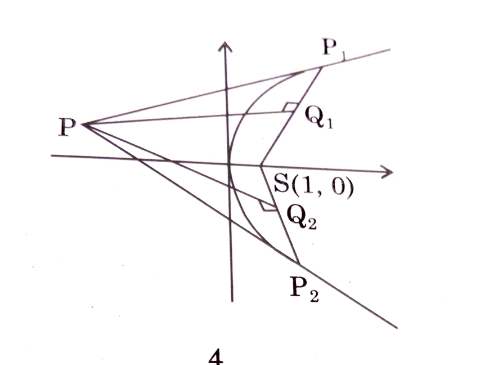
**Answer (b, c, d)**

**Solution:**

Let and be and

or

and



Slope of

Equation of

Equation of

Equation of

And

**Question number-14**

Let denote the determinate of a square matrix M. Letbe the function defined by where

Let be a quadratic polynomial whose roots are the maximum and minimum values of the function and . Then, which of the following is/ are TRUE?

**Answer (a, c)**

**Solution:**

F

Secondary determinant is skew symmetric

its value is 0.

as

and hence

and

**Section C**

**Multiple Choice Type**

This section contains **04 Matching Lists Sets**. Each set has **ONE** Multiple Choice Question Each set has **TWO** lists: **List-I** and **List-II**.

**Question number-15**

Consider the following lists:

|  |  |  |  |
| --- | --- | --- | --- |
| List-I | | List-II | |
| (i) |  | (P) | has two elements |
| (ii) |  | (Q) | has three  elements |
| (iii) |  | (R) | has four elements |
| (iv) |  | (S) | Has five  elements |
|  |  | (T) | Has six  elements |

The correct option is:

1. (I) (P); (II) (S); (III) (P); (IV) (S)
2. (I) (P); (II) (P); (III) (T); (IV) (R)
3. (I) (Q); (II) (P); (III) (T); (IV) (S)
4. (I) (Q); (II) (S); (III) (P); (IV) (R)

**Answer (b)**

**Solution:**

(I)

for

for no solution in

(II)

for

for no solution

(III)

For

(IV)

has 4 elements

**Question number-16**

Two players, and , play a game against each other. In every round of the game, each player rolls a fair die once, where the six faces of the die have six distinct numbers. Let x and y denote the readings on the die rolled by and respectively. If , then scores 5 points and scores 0 points. If , then each player scores 2 points. If , then scores 0 point and scores 5 points. Let and be the total scores of and , respectively, after playing the ith round.

List-I List-II

(I) Probability of is (P)

(II) Probability of is (Q)

(III) Probability of is (R)

(IV) Probability of is (S)

(T)

The correct option is:

1. (I) (Q); (II) (R); (III) (T); (IV) (S)
2. (I) (Q); (II) (R); (III) (T); (IV) (T)
3. (I) (P); (II) (R); (III) (Q); (IV) (S)
4. (I) (P); (II) (R); (III) (Q); (IV) (T)

**Answer (a)**

**Solution:**

Let won the round

(I)

(II)

(III)

(IV)

**Question number-17**

Let p, q, r be nonzero real numbers that are, respectively, the , and terms of a harmonic progression. Consider the system of linear equation

|  |  |  |  |
| --- | --- | --- | --- |
| List-I | | List-II | |
| (i) | If then the system of linear equations has | (P) |  |
| (ii) | If then the system of linear equations has | (Q) |  |
| (iii) | If then the system of linear equations has | (R) | Infinitely many  solutions |
| (iv) | If , then the system of linear equations has | (S) | No solutions |
|  |  | (T) | At least one solution |

The correct option is:

1. (I) (T); (II) (R); (III)(S); (IV) (T)
2. (I) (Q); (II) (S); (II) (S); (IV) (R)
3. (I)→ (Q); (II) (R); (III) (P); (IV) (R)
4. (I) (T); (II) (S); (III) (P); (IV) → (T)

**Answer (b)**

**Solution:**

From equation and,

we get

If , then no solution

If then

the equations have infinit solutions Now, equation and both are same So, and both equation are satisfying

**Question number-18**

Consider . Let be a point. A straight line drawn through H parallel to crosses the ellipse and its auxiliary circle at points E and F respectively, in the first quadrant. The tangents to the ellipse at the point E intersects the positive at a point G. Suppose the straightline joining F and the origin makes an angle with the positive

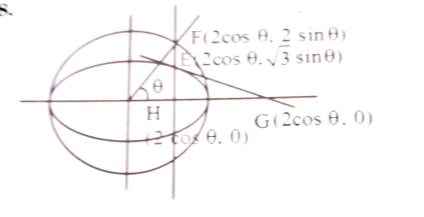
|  |  |  |  |
| --- | --- | --- | --- |
| List-I | | List-II | |
| (I) | If ,thenthe area of the triangle is | (P) |  |
| (II) | If ,thenthe area of the triangle is | (Q) | 1 |
| (III) | If ,thenthe area of the triangle is | (R) |  |
| (IV) | If ,thenthe area of the triangle is | (S) |  |
|  |  | (T) |  |

The correct option is:

1. (I) (R); (II) (S); (III) (Q); (IV) (P)
2. (I) (R); (II) (T); (III) (S); (IV) (P)
3. (I) (Q); (II) (T); (III) (S); (IV) (P)
4. (I) (Q); (II) (S); (III) (Q); (IV) (P)

**Answer (c)**

**Solution:**



Equation of auxiliary circle

Let F be

E is

Equation of tangent at E,

It cut at

G is

H is and F

Area of FGH is

(I) If area

(II) If area

(III) If area

(IV) If area