DIRECTORATE OF SCHOOL EDUCATION
TAMILNADU

12JPCM04 (2023-24)	JEE PRACTICE QUESTIONS (TEST-4)	Class : XII Time : 1.15 hrs Total Marks : 180

Answer key

12th – MATHS

31. Ans : C

$x^2 + y^2 - 5x - y + 5 = 0$

$\left(x - \frac{5}{2}\right)^2 + \left(y - \frac{1}{2}\right)^2 = \frac{3}{2}$

$Q = \left(\frac{5}{2} + \sqrt{\frac{3}{2}}\cos\theta, \frac{1}{2}, + \sqrt{\frac{3}{2}}\sin\theta\right)^2$

P (0, -2)

$PQ^2 = \left(\frac{5}{2} + \sqrt{\frac{3}{2}}\cos\theta\right)^2 + \left(\frac{5}{2} + \sqrt{\frac{3}{2}}\sin\theta\right)^2$

$= 14 + 5\sqrt{\frac{3}{2}}(\cos\theta + \sin\theta)$

Maximum value of

$\cos\theta + \sin\theta = \sqrt{2} \quad [\because \theta = 45]$

$PQ^2 = 14 + 5\frac{\sqrt{2}}{2}(\sqrt{2})$

$= 14 + 5\sqrt{3}$

32. Ans: A

$x^2 + y^2 = 9$

Let line though P, A and B make angle θ with x - *axis* equation of line

$\frac{x-4}{\cos\theta} = \frac{y-7}{\sin\theta} = K$

Any point = $(K\cos\theta + 4, K\sin\theta + 7)$

$x^2 + y^2 = 9$

$(K\cos\theta + 4)^2 + (K\sin\theta + 7)^2 = 9$

$K^2 + K(8\cos\theta + 14\sin\theta) + 65 - 9 = 0$

$K^2 + K(8\cos\theta + 14\sin\theta) + 56 = 0$

Which is quadratic in K

$$PA.PB = S_3 = \frac{56}{1} = 56$$

33. Ans: B

$x^2 + y^2 - 4x + 6y - 12 = 0$

$(x - 2)^2 + (y + 3)^2 = 5^2$

Distance between (2, -3) and (-3, 2) = $5\sqrt{2}$

Radius of S = $\sqrt{25+50}$

= $\sqrt{75}$

S = $5\sqrt{3}$

34. Ans : B

The equation of circle touching x axis at (3, 0) is

$(x - 3)^2 + y^2 + \lambda y = 0$

It passes though (1, -2)

$(-2)^2 + 4 + \lambda(-2) = 0$

$4 + 4 = 2\lambda$

$\lambda = 4$

The equation of circle is $(x - 3)^2 + y^2 + 4y = 0$ *clearly (5, -2) satisfies the equation*

Answer = (5, -2)

35. Ans: D

According to the figure

$(1 + y)^2 = (1 - y)^2 + 1 \ (y > 0)$

$y = \frac{1}{4}$

36. Ans : B

Point of intersection of lines x – y = 1 and 2x + y= 3 is $\left(\frac{4}{3}, \frac{1}{3}\right)$

slope of OP $\frac{\frac{1}{3}+1}{\frac{4}{3}-1} = \frac{\frac{4}{3}}{\frac{1}{3}} = 4$

Slope of tangents = $-\frac{1}{4}$

Equation of tangent $y + 1 = \frac{1}{4}(x - 1)(1, -1)$

$4y + 4 = -x - 1$

$x + 4y + 3 = 0$

37. Ans : B Let the required circle be

$x^2 + y^2 + 2gx + 2fy + c = 0$

Since it passes through (0,0) and (1, 0)

$\Rightarrow C = 0 \qquad and \ \ g = -\frac{1}{2}$

Points (0, 0) and (1, 0) lie inside the circle $x^2 + y^2 = 9$, so two circles touch internally

$\Rightarrow c_1c_2 = r_1 - r_2$

$\sqrt{g^2 + f^2} = 3 - \sqrt{g^2 + f^2} \Rightarrow \sqrt{g^2 + f^2} = \frac{3}{2}$

$\Rightarrow f^2 = \frac{9}{4} - \frac{1}{4} = 2$

$f = \pm\sqrt{2}$

Hence the centres of required circle are

$\left(\frac{1}{2}, \sqrt{2}\right) or \left(\frac{1}{2}, -\sqrt{2}\right)$

38. Ans : A

Intersection of given lines is the centre of the circle i.e. (1, -1)

Circumference = 10 π

$\Rightarrow$ *radius r = 5*

$\Rightarrow$ *equation of circle is* $x^2 + y^2 - 2x + 2y - 23 = 0$

39. **Ans: B**

$\frac{b}{a} = \frac{n\text{Pr}}{n\text{Pr}-1} = n - r + 1$

$\frac{c}{b} = \frac{n\text{Pr}+1}{n\text{Pr}} = n - r$

$\therefore \frac{b}{a} = \frac{c}{b} + 1 = \frac{b + c}{b}$

$b^2 = a(b + c)$

$\frac{b^2}{a(b + c)} = 1$

$$\therefore \frac{b^2}{a(b+c)} + 2 = 1 + 2 = 3$$

40. Ans : C

4	3	5	1	2
T	O	U	G	H
3	2	2	0	0
4!	3!	2!	1!	0!

Rank = 3(4!) + 2(3!) + 2 (2!) + 0 (1!) + 0 (0!) + 1 = 89

M = 89

1	1	2
I	I	T
$\frac{0}{2!}$	$\frac{0}{1!}$	$\frac{0}{1!}$
2!	1!	0!

Rank = $\frac{0}{2!}(2!) + \frac{0}{1!}(1!) + \frac{0}{1!}(0!) + 1 = 1$

$\therefore n = 1$

m + n + 10 = 89 + 1 + 10 = 100

41. Ans : A

The sum of the digits in the unit places of all number formed = (sum of digits) $(n-1)^!$

$= (2 + 3 + 4 = 5)\ (4 - 1)^!$

$= (14)3! = 6 \times 14 = 84$

42. Sum of the total numbers which can be formed with given n – differ digits

$= (n - 1)\ !\ (\text{sum of digits}) \left(\frac{10^n - 1}{9}\right)$

$= (3!)\ (1 + 2 + 3 + 4) \left(\frac{10^4 - 1}{9}\right)$

$= 6(10)\ (1111)$

$= 66660$

43. Ans : D

$$4P_2 \times 6P_3 = 1440$$

44. Ans: B

26 × 25 × 10 × 9 × 8 × 7

= 3,276,000

45. Ans: A

Four digit not which start from 6, 7, 8

3 × 4 × 3 × 2 = 72

5 digit. No = 5! = 120

Total on of Integns = 192

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11JPCM04 (2023-24)	JEE PRACTICE QUESTIONS (TEST-4)	Class : XI Time : 1.15 hrs Total Marks : 180

Answer key

11th – MATHS

31. **Ans: B**

$$\frac{b}{a}=\frac{n\Pr}{n\Pr-1}=n-r+1$$

$$\frac{c}{b}=\frac{n\Pr+1}{n\Pr}=n-r$$

$$\therefore \frac{b}{a}=\frac{c}{b}+1=\frac{b+c}{b}$$

$$b^2=a(b+c)$$

$$\frac{b^2}{a(b+c)}=1$$

$$\therefore \frac{b^2}{a(b+c)}+2=1+2=3$$

32. Ans : C

4	3	5	1	2
T	O	U	G	H
3	2	2	0	0
4!	3!	2!	1!	0!

Rank = 3(4!) + 2(3!) + 2 (2!) + 0 (1!) + 0 (0!) + 1 = 89

M = 89

1	1	2
I	I	T
$\frac{0}{2!}$	$\frac{0}{1!}$	$\frac{0}{1!}$
2!	1!	0!

Rank = $\frac{0}{2!}(2!)+\frac{0}{1!}(1!)+\frac{0}{1!}(0!)+1=1$

$\therefore n = 1$

m + n + 10 = 89 + 1 + 10 = 100

33. Ans : A

The sum of the digits in the unit places of all number formed = (sum of digits) $(n-1)^!$

= (2 + 3 + 4 = 5) $(4-1)^!$

= (14)3! = 6 × 14 = 84

34. Sum of the total numbers which can be formed with given n – differ digits

= (n – 1) ! (sum of digits) $\left(\frac{10^n - 1}{9}\right)$

= (3!) (1 + 2 + 3 + 4) $\left(\frac{10^4 - 1}{9}\right)$

= 6(10) (1111)

= 66660

35. Ans : D

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36. Ans: B

26 × 25 × 10 × 9 × 8 × 7

= 3,276,000

37. Ans: A

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5 digit. No = 5! = 120

Total on of Integns = 192

38. Ans : C

8

3 3 2

$\frac{8!}{3!3!2!}(3!) = 1680$

39. Ans : C Each player will ser 13 cards

The no. of ways of distributions 52 cards giving 13 cards to each player

$= (52\ (13)) \times (39(13)) \times (26(13)) \times (13(13))$

$= \frac{(52)!}{[(13)!]^4}$

40. Ans C

A 5 digit number divisible by 3 in K be formed using the no 0, 1, 2, 3, 4 and 5 without repetition, the total no. of ways

$^5P_5 + {}^5P_5 - {}^4P_4 = 216$

Sum of digits = 0 + 1 + 2 + 3 + 4 + 5 = 15

To form a 5 digit number divisible by 3, we must Loewe either 0 (or) 3

When 0 is left out, the nos are 5P5

When 3 is left out, the nos are 5P5 – 4P4

Also 0 con nor be used at extreme left

Reqd n. of ways = $^5P_5 + {}^5P_5 - {}^4P_4$

= 120 + 120 – 24

= 240 – 24

= 216

41. Ans: C

$x_n = \frac{195}{4(^n p_n)} - \frac{n+3P_3}{n+1P_{n+1}}$

$\frac{195}{4n!} - \frac{(n+3)(n+2)(n+1)}{(n+1)!}$

$\frac{195}{4n!} - \frac{(n+3)(n+2)}{n!}$

X_n is + ve

$\therefore \frac{171-4n^2-20n}{4n!} > 0$

$4n^2 + 20n - 171 > 0$

Which is true n = 1, 2, 3, 4

Hence the given sequence has 4 + ve terms

42. Ans: C

Since the unit digit of a factorial more than 4 is zero, so the unit digit of the given expression

= 1! + 2! + 3! + 4! + ……. + (10)!
= Unit digit of 1! + 2! + 3! + 4!
= Unit digit of (1 + 2 + 6 + 24)
= unit digit of 33
= 3

43. Ans : A

Since x + y + z = 25, so the possible, values of xyz = 9, 9, 7 and 9, 8, 8. Hence,
The required sum

= 3× 9! × 9! × 7! + 3 × 9! × 8! × 8!
= 3 × 9! × 9 × 8! × 7! + 3 × 9! × 8! × 8 × 7!
= 3 × 9! × 8! × 7! (9 + 8)
= 3 × (9 + 8) × 9! × 8! × 7!
= 5! × 9! × 8! × 7!

44. Ans : C

There are 3 vowels (A, I, O) and 5 consonants (F, R, C, T, N) Thus,
There are 6 gaps in between 5 consonants
Here, we place 3 vowels in between 6 gaps in ${}^6P_3$ ways
Where as 5 consonants can be arranged them selves in 5! Ways.
Thus, the total number of ways it can be done

$= {}^6P_3 \times 5!$

$= \frac{6!}{3!} \times 5!$

= 5! × 5!
= 120 × 120
= 14400

45. Ans: D

$N = P_1^{a_1} P_2^{a_2} \ldots\ldots P_k^{a\Delta e}$

Total no. of divisors including

$n(a_{1+1})(a_{2+1})\ldots\ldots(a_{k+1})$

$9600 = 2^7 \times 3 \times 5^2$

No. of divisor = (7 + 1) (1 + 1) (2+1)

= 48