Q.1) Max Marks: 1

In the class 10 examination a candidate has to pass in atleast 5 of his 6 papers in order to pass the class. The number of ways in which he can fail is

A. 32

B. 57 — Correct Option

Solution: (B)

In order to fail, he must fail in atleast 2 subjects, no ways he can do that=C(6,2)+C(6,3)+C(6,4)+C(6,5)+C(6,6)=2^6-C(6,0)-C(6,1)=57.

C. 64

D. 63

Q.2) Max Marks: 1

If the eigenvalues of a 3*3 matrix A are 1,2 and 3 then the value of |Adj A|=__

Correct Answer

Solution: (36)

|A|= product of all the Eigenvalues=6
|Adj A|=$|A|^{n-1}$ here n=2.
6^{3-1}=36.

Q.3) Max Marks: 1

If 0 is a characteristic root of the matrix A then.

A. A is non-singular.

B. $A=I_n$

C. A=O (zero matrix)

D. A is not invertible. — Correct Option

Solution: (D)

Solution D.

If 0 is a root of the characteristic equation then
|A-λI|=0
If we substitute λ=0 it means |A|=0 that means that A is singular and hence it is not invertible.

Q.4) Max Marks: 1

Suppose A is a square matrix which satisfies A^2-5A+7I=0. If A^5=aA+bI then the absolute value of a+b=___

Correct Answer

Solution: (236)

Solution 236

$A^4=(5A-7I)^2$
$=25A^2-70A+49I$
$=25(5A-7I)-70A+49I$
$=55A-126I$

$A^5=A(55A-126I)$
$=55A^2-126A$
$=55(5A-7I)-126A$
$=275A-385I-126A$
$=149A-385I$
a=149
b=-385
a+b=-236

a+b=-236
|a+b|=236

Q.5)

A man his 4 friends. In how many ways can he invite one or more them to dinner?

Max Marks: 1

A 15 — Correct Option

Solution: (A)

Total No of ways they can invite= No of ways to invite 0 people + no of ways to invite 1 person +no of ways to invite 2 people + no of ways to invite 3 people + no of ways to invite 4 people=2^4.
No of ways to invite >=1 people= total no of ways- no of ways to invite 0 people =2^4-1=15 ways.

B 20

C 25

D 31

Q.6)

$\int e^{5x} \sin 6x\, dx =$

Max Marks: 1

A (1/61) * e^{5x} [5sin 6x - 6cos 6x] +c — Correct Option

Solution: (A)

$\int e^{5x} \sin 6x = e^{5x}/(5^2+6^2)(5 \sin 6x - 6\cos 6x) + c$

= (1/61) * e^{5x} [5sin 6x - 6cos 6x] +c

B (1/61) * e^{5x} [5sin 6x + 6cos 6x] +c

C (1/61) * e^{5x} [5sin 6x - 2cos 6x] +c

D (1/61) * e^{5x} [5sin 6x + 2cos 6x] +c

Q.7)

The probability of drawing two black balls in succession from a bag containing 4 red and 3 black balls when the ball that is drawn first is replaced is

Max Marks: 1

A 1/7

B 9/49 — Correct Option

Solution: (B)

Let A be the event of getting a black ball in the first draw P(A)=3/7
Let B be the event of getting a black ball in the second draw P(B)=3/7

P(A∩B)=P(A)*P(B)=3/7 * 3/7= 9/49

C 16/49

D 12/49

Q.8)

The value of f(0) for which the following function is continuous is

Max Marks: 1

f(x)= $\frac{512(\sqrt{x+4}-2)}{\sin 2x}$ ____

Correct Answer

Solution: (64)

Solution 64

f(0)= $512 * \lim_{x\to 0} \frac{\sqrt{x+4}-2}{\sin 2x}$

$= \lim_{x\to 0} \frac{(x+2)-4}{\sin 2x} \frac{1}{\sqrt{x+4}+2}$

$=512 * \frac{1}{2} \lim_{x\to 0} \frac{2x}{\sin 2x} \frac{1}{\sqrt{x+4}+2}$

$=512*(½)*(\frac{1}{2+\sqrt{4}})=64.$

Q.9)

Max Marks: 1

$$\int_{\pi/6}^{\pi/4} \frac{dx}{\sin 2x} = \_\_$$

A ¼ log 3 — Correct Option

Solution: (A)

$$\int_{\pi/6}^{\pi/4} \frac{dx}{\sin 2x} = \int_{\pi/6}^{\pi/4} \frac{dx}{2\sin x \cos x} = \frac{1}{2}\int_{\pi/6}^{\pi/4} \frac{\sec^2 x\, dx}{(\sin x/\cos x)} = \frac{1}{2}[\log(\tan x)]^{\pi/4}{}_{\pi/6} = ¼ \log 3$$

B ½ log 3

C **log 3**

D **2 log 3**

Q.10)

Max Marks: 1

If A is an n*n square matrix then the rank of the matrix=n then which of the following statements are true.

I. A is invertible.

II. The solution to the system of linear equations represented by A (as the coefficient matrix) is always is unique and exists.

A **I is only true.**

B **II is only true.**

C **Both I and II are true.** — Correct Option

Solution: (C)

If Rank (A) = n then by the definition of the rank the n rows are independent of each other and the solution to the system of linear equations exists and is uniques irrespective of whether the system is homogeneous or non-homogenous.

D **Neither I nor II is true.**

Q.11)

Max Marks: 2

$\int \text{Sin}^{5/2} x \cos^3 x\, dx =$

A $2 \sin^{7/2} x[1/7 + (1/11)\sin^2 x] +c$

B $2 \sin^{7/2} x[1/7 - (1/11)\sin^2 x] +c$ — Correct Option

Solution: (B)

$\int \text{Sin}^{5/2} x \cos^3 x\, dx = \int \text{Sin}^2 x \cos^{1/2} x \cos^2 x \cos x\, dx = \int \text{Sin}^2 x \cos^{1/2} x\,(1 - \sin^2 x)\cos x\, dx$

t=sinx let dt=cosx dx

$\int t^2\, t^{1/2}\,(1-t^2)\, dt = \int t^{5/2}\, dt - \int t^{9/2}\, dt = t^{7/2}/(7/2) - t^{11/2}/(11/2)+C$

$=2/7\text{Sin}^{7/2} x - 2/11\text{Sin}^{11/2}x + C$

C $3 \sin^{7/2} x[1/5 + (1/9)\sin^2 x] +c$

D **None of the above.**

Q.12)

Max Marks: 2

A bag contains 2n + 1 coins. It is known that n of these coins have heads on both sides, whereas the remaining n + 1 coins are fair. A coin is picked up at random from the bag and tossed. If the probability that the toss results in a head is 31/42, then n

A **10** — Correct Option

Solution: (A)

Let A1 be the event of picking up a coin having head on both sides from the bag and A2, be the event of picking up a fair coin from the bag.
Then P(A1)=n/(2n+1), P(A2)=(n+1)/(2n+1)
Let E be the event of getting head when the selected coin tossed.
P(E|A1)=1 P(E|A2)=1/2
P(E)=P(A1)P(E | A1) + P(A2) P(E|A2) = (n/(2n+1)*1)+((n+1)/(2n+1)*(½))=(3n+1)/(2(2n+1))
Given that (3n+1)/(2(2n+1))=21/42 on solving for n we get n=10.

B 11

C 12

D 13

Q.13)

Max Marks: 2

A multiple-choice examination has 5 questions. Each question has three alternative answers of which exactly one is correct. The probability that a student will get 4 or more correct answers just by guessing is

A $11/3^5$ Correct Option

Solution: (A)

Let X be the number of questions for which the student guess the correct answer. Then X follows binomial distribution with parameters n=5, p=1/3 q=2/3

P(X>= 4)= P(X= 4)+ P(X=5) = $C(5,4)(⅓)^4(⅔)+C(5,5)(⅓)^5(⅔)^0=10/3^5+1/3^5=11/3^5$.

B $10/3^5$

C $17/3^5$

D $13/3^5$

Q.14)

Max Marks: 2

The solution set of the equation is

$$\begin{vmatrix} 1 & 1 & x \\ p+1 & p+1 & p+x \\ 3 & x+1 & x+2 \end{vmatrix} = 0$$

A {1,2} Correct Option

Solution: (A)

Applying transformations

$C_2 \to C_2 - C_1$ we get

$$\begin{vmatrix} 1 & 0 & x \\ p+1 & 0 & p+x \\ 3 & x-2 & x+2 \end{vmatrix}$$

On solving (x-2)p(1-x)=0

Solutions are x=1, x=2.

B {2,3}

C {1, p, 2}

D {1, 2, -p}

Q.15)

Max Marks: 2

Three boxes numbered, I, II, III contain balls as follows

	White	Black	Red
I	1	2	3
II	2	1	1
III	4	5	3

One box is randomly selected and a ball is drawn from it. If the ball is red, then the probability that it is from box II.

A 1/2

B 1/3

C 1/4 Correct Option

Solution: (c)

Let A1, A2, A3 be the events denoting that the ball is drawn from box1 box II and boxII respectively then
P(A1)=P(A2)=P(A3)=⅓
P of getting red ball from each of the boxes is given by

P(E|A1)=3/6=1/2
P(E|A2)=¼
P(E|A3)=3/12=1/4

By Bayes Theorem

P(A2|E)= P(A2)*P(E|A2)/(P(A1)*P(E|A1)+P(A2)*P(E|A2)+P(A3)*P(E|A3))
=⅓*¼/(⅓*(½+¼+¼))
=¼

D 1/9

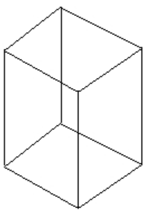
Q.16)

Max Marks: 2

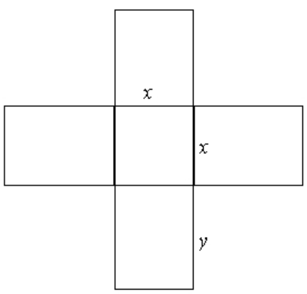
A box with a square base has no top. If 64 cm^2 of material is used, what is the maximum possible volume for the box rounded to single decimal place___?

Correct Answer

Solution: (49)



The net for this box would be:



The **volume** of the box is $V = x^2 y$

We are told that the surface area of the box is 64 cm^2. The area of the base of the box is x^2 and the area of each side is xy, so the area of the base plus the area of the 4 sides is given by:

$$x^2 + 4xy = 64\ \mathrm{cm}^2$$

Solving for y gives:

$$y = \frac{64 - x^2}{4x}$$

So the volume can be rewritten:

$$V = x^2\left(\frac{64 - x^2}{4x}\right)$$

Now $\frac{dv}{dx} = 16 - \frac{3x^2}{4}$

$\frac{dv}{dx} = 0$ when $x = \pm\frac{8}{\sqrt{3}}$ (-ve x has no meaning in this case)

We can check if it is max

$\frac{d^2v}{dx^2} = -\frac{6x}{4}$ at $x = \frac{8}{\sqrt{3}}$ (=4.62 approx), it is -ve, therefore, it is maximum.

Solving for y by putting x=4.62, we get y=2.31

So the **dimensions** of the box are:

Base 4.62 cm × 4.62 cm and sides 2.31 cm.

The **maximum possible volume** is

$V = 4.62 \times 4.62 \times 2.31 \approx \mathbf{49.3}\ \mathrm{cm}^3$

Check: Surface Area of material:

$x^2 + 4xy = 21.3 + 4 \times 4.62 \times 2.31 = 64.$

Q.17)

Max Marks: 2

$\lim_{x \to 2} \frac{x-2}{|x-2|} =$ ___

A 2

B 0

C -2

D **None of these.** Correct Option

Solution: (D)

$\lim_{x \to 2^+} \frac{x-2}{|x-2|} = \lim_{x \to 2^+} \frac{x-2}{x-2} = 1$

$\lim_{x \to 2^-} \frac{x-2}{|x-2|} = \lim_{x \to 2^-} \frac{x-2}{-(x-2)} = -1$

Therefore the limit does not exist.

Q.18)

Max Marks: 2

If the solution for the system of linear equations is given by $x_1=p$, $x_2=q$ and $x_3=r$, then the value of $p^3+q^2+r=$___

$3x_1+7x_2+4x_3=27$
$7x_1+13x_2+17x_3=64$
$11x_1+15x_2+21x_3=84$

Correct Answer

Solution: (32)

Solution 32

On solving
R2−(7/3)×R1→R2
R3−(11/3)×R1→R3
R3−(16/5)×R2→R3
We get

$$\begin{cases} 3 \times x_1 + 7 \times x_2 + 4 \times x_3 = 27 \\ \frac{-10}{3} \times x_2 + \frac{23}{3} \times x_3 = 1 \\ \frac{-91}{5} \times x_3 = \frac{-91}{5} \end{cases}$$

$x_1=3$ $x_2=2$ $x_3=1$
The value $x^3+y^2+z=32$

Q.19)

Max Marks: 2

From 0 to 9, the number of four digited numbers can be formed such that the digits are in ascending order is

A **P(10, 4)**

B **C(10, 4)**

C **P(10, 4)-P(9, 3)**

D **C(10, 4)-C(9, 3)** Correct Option

Solution: (D)

Since the digits are in ascending order only one particular order can be considered i.e. ascending order which can be counted by section, therefore the total number of ways =C(10,4)-C(9,3)

Q.20)

Max Marks: 2

Five per cent of objects prepared by a machine are defective. The probability that in a sample of 20 objects, 4 will be defective is

A $C(20,4)(29^{16}/40^{20})$

B $C(20,4)(19^{16}/20^{20})$ **Correct Option**

Solution: (B)

p=probability that the object will be defective =5/100=1/20
We have n=20.
$P(X=4)= C(20,4)(1/20)^4(19/20)^{16}= C(20,4)(19^{16}/20^{20})$.

C $C(10,2)(30^{16}/20^{20})$

D $C(20,4)(19^{16}/10^{20})$

close