

17/08/2022

Slot-1



Corporate Office : Aakash Tower, 8, Pusa Road, New Delhi-110005 | Ph.: 011-47623456

## Answers & Solutions

Time : 45 min.

*for*

M.M. : 200

## CUET UG-2022

(Mathematics)

### IMPORTANT INSTRUCTIONS:

1. The test is of 45 Minutes duration.
2. The test contains is divided into two sections.
  - a. Section A contains 15 questions which will be compulsory for all candidates.
  - b. Section B will have 35 questions out of which 25 questions need to be attempted.
3. Marking Scheme of the test:
  - a. Correct answer or the most appropriate answer: Five marks (+5)
  - b. Any incorrect option marked will be given minus one mark (-1).

Choose the correct answer :

Question ID: 481291

If  $x = 2at$ ,  $y = at^2$ , then  $\frac{d^2y}{dx^2}$  is

(A) 1

(B)  $\frac{1}{2a}$

(C)  $t$

(D) 0

**Answer (B)**

**Sol.**  $x = 2at$ ,  $y = at^2$

$$\text{So, } \frac{dx}{dt} = 2a, \frac{dy}{dt} = 2at$$

$$\therefore \frac{dy}{dx} = t$$

$$\begin{aligned} \therefore \frac{d^2y}{dx^2} &= \frac{d}{dt} \left( \frac{dy}{dx} \right) \cdot \frac{dt}{dx} \\ &= 1 \cdot \frac{1}{2a} = \frac{1}{2a} \end{aligned}$$

Question ID: 481292

A die is thrown once. If  $E$  is the event that 'the number appearing is a multiple of 3' and  $F$  be the event 'the number appearing is even', then the incorrect option is

(A)  $P(E) = \frac{1}{3}$

(B)  $P(F) = \frac{1}{2}$

(C)  $P(E \cap F) = \frac{1}{6}$

(D)  $E$  and  $F$  are dependent events

**Answer (D)**

**Sol.**  $P(E) = \frac{2}{6} = \frac{1}{3}$

$P(F) = \frac{3}{6} = \frac{1}{2}$

$P(E \cap F) = \frac{1}{6}$

Now,  $P(E) \cdot P(F) = \frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6}$

$\therefore P(E \cap F) = P(E) \cdot P(F)$

$\therefore E$  and  $F$  are independent events

Question ID: 481293

Ten eggs are drawn successively with replacement from a lot containing 10% defective eggs. The probability that there is at least one defective egg is

(A)  $\frac{10^{10} - 9^{10}}{10^{10}}$

(B)  $\frac{9^{10} - 10^{10}}{10^{10}}$

(C)  $\frac{10^9 - 9^{10}}{10^{10}}$

(D)  $\frac{10^{10} + 9^{10}}{10^{10}}$

**Answer (A)**

**Sol.**  $P(E) = 1 - \left( \frac{9}{10} \right)^{10}$

$$= \frac{10^{10} - 9^{10}}{10^{10}}$$

Question ID: 481294

If  $m$  is the degree and  $n$  is the order of the given differential equation

$$\frac{x^3 \left( \frac{d^3y}{dx^3} \right)^2 + 2x^2 \left( \frac{d^2y}{dx^2} \right)^3}{(x+1)^5} = \left( 3x - \frac{d^2y}{dx^2} \right)^4$$

(A)  $m - n = 2$

(B)  $m + n = 5$

(C)  $m = 4, n = 3$

(D) Order ( $n$ ) is 3 but degree ( $m$ ) is not defined

**Answer (B)**

**Sol.** 
$$\frac{x^3 \left( \frac{d^3y}{dx^3} \right)^2 + 2x^2 \left( \frac{d^2y}{dx^2} \right)^3}{(x+1)^5} = \left( 3x - \frac{d^2y}{dx^2} \right)^4$$

$$\Rightarrow x^3 \left( \frac{d^3y}{dx^3} \right)^2 + 2x^2 \left( \frac{d^2y}{dx^2} \right)^3 - (x+1)^5 \left( 3x - \frac{d^2y}{dx^2} \right)^4 = 0$$

$\therefore$  Order ( $n$ ) = 3

Degree ( $m$ ) = 2

**Question ID: 481295**

The differential equation representing the family of curves  $y = m(x - d)$  where  $m$  and  $d$  are arbitrary constants, is

(A)  $\frac{dy}{dx} = 0$

(B)  $\frac{d^2y}{dx^2} = 0$

(C)  $x \frac{d^2y}{dx^2} + y = 0$

(D)  $x \frac{d^2y}{dx^2} - y = 0$

**Answer (B)****Sol.**  $y = m(x - d)$ 

$$\frac{dy}{dx} = m$$

$$\frac{d^2y}{dx^2} = 0$$
, this is the required differential equation
**Question ID: 481296**

$$\int_1^2 \frac{dx}{x(x^4 + 1)} = ?$$

(A)  $\log\left(\frac{32}{17}\right)$

(B)  $\log\left(\frac{16}{17}\right)$

(C)  $\frac{1}{4} \log\left(\frac{16}{17}\right)$

(D)  $\frac{1}{4} \log\left(\frac{32}{17}\right)$

**Answer (D)**

**Sol.**  $I = \int_1^2 \frac{dx}{x(x^4 + 1)} = \int_1^2 \frac{dx}{x^5(1+x^{-4})}$

Let  $1+x^{-4} = t$

$-4x^{-5} dx = dt$

$\therefore I = \int_2^{17/16} \frac{-1}{4t} dt = \frac{-1}{4} [\ln t]_2^{17/16}$

$= \frac{-1}{4} \left[ \ln \frac{17}{16} - \ln 2 \right]$

$= \frac{1}{4} \ln \left[ \frac{32}{17} \right]$

**Question ID: 481297**

If the area of the region in first quadrant, bounded by the curve

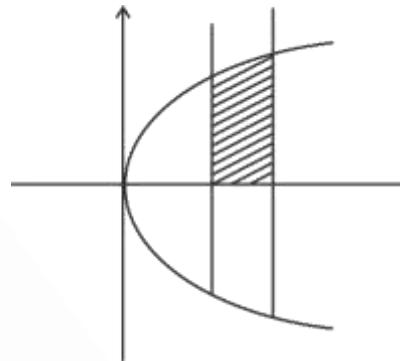
$y^2 = 9x$ ,  $x = 2$ ,  $x = 4$  and the  $x$ -axis is  $a + b\sqrt{2}$ , then the value of  $a + b$  is

(A) 16

(C) 20

(B) 12

(D) 8

**Answer (B)****Sol.** Given curves :  $y^2 = 9x$ ,  $x = 2$ ,  $x = 4$  and  $y = 0$ 

$$\therefore \text{Required area} = \int_2^4 \sqrt{9x} dx = 3 \left[ \frac{x^{3/2}}{\frac{3}{2}} \right]_2^4$$

$$= 2 \left[ 8 - 2\sqrt{2} \right]$$

$$= 16 - 4\sqrt{2}$$

$$\therefore a + b = 12$$

**Question ID: 481298**

If  $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 11 \\ 6 \\ 8 \end{bmatrix}$ , then the value of  $x+2y-3z$  is

(A) 5

(B) 4

(C) 3

(D) 7

**Answer (B)**

**Sol.**  $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 11 \\ 6 \\ 8 \end{bmatrix}$

$$\therefore x+y+z = 11 \quad \dots(i)$$

$$x+z = 6 \quad \dots(ii)$$

$$y+z = 8 \quad \dots(iii)$$

$$\text{By (i) \& (ii)} y = 5$$

$$\text{By (ii) \& (i)} x = 3$$

$$\therefore z = 3$$

$$\text{So, } x+2y-3z = 4$$

**Question ID: 481299**

If  $x = 3t^2 + 5t + 6$  and  $y = -4t^3 - 2t^2 + 5t + 7$ ,  $t \neq -\frac{5}{6}$

then the value of  $\frac{dy}{dx}$  is

(A)  $-2t + 1$

(B)  $\frac{-12t^2 - 4t - 5}{6t + 5}$

(C)  $\frac{-4t^3 - 2t^2 + 5t + 7}{3t^2 + 5t + 6}$

(D)  $\frac{-4t^3 - 2t^2 + 5t + 7}{6t + 5}$

**Answer (B)**

**Sol.**  $x = 3t^2 + 5t + 6$ ,  $y = -4t^3 - 2t^2 + 5t + 7$

So,  $\frac{dx}{dt} = 6t + 5$ ,  $\frac{dy}{dt} = -12t^2 - 4t + 5$

$\therefore \frac{dy}{dx} = \frac{-12t^2 - 4t + 5}{6t + 5}$

**Question ID: 4812910**

The interval in which the function  $f$  given by  $f(x) = x^2 - 4x + 6$  is strictly increasing is

(A)  $(-\infty, 2)$

(B)  $(-\infty, -2)$

(C)  $(2, \infty)$

(D)  $(-2, \infty)$

**Answer (C)**

**Sol.**  $f(x) = x^2 - 4x + 6$

for increasing,  $f'(x) > 0$

$$\Rightarrow 2x - 4 > 0$$

$$\Rightarrow x > 2$$

**Question ID: 4812911**

If  $y = \log_e\left(\frac{2x}{1-x}\right)$ , then  $\frac{d^2y}{dx^2}$  at  $x = \frac{1}{2}$  is

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

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

(C) 0

(D)  $\frac{3}{5}$

**Answer (C)**

**Sol.**  $y = \log_e\left(\frac{2x}{1-x}\right)$

So,  $\frac{dy}{dx} = \frac{1}{2x} \cdot \frac{d}{dx}\left(\frac{2x}{1-x}\right)$

$$= \frac{1-x}{2x} \frac{(1-x)2+2x}{(1-x)^2}$$

$$= \frac{2}{2x(1-x)} = \frac{1}{1-x} + \frac{1}{x}$$

$$\therefore \frac{d^2y}{dx^2} = \frac{1}{(1-x)^2} - \frac{1}{x^2}$$

$$\text{at } x = \frac{1}{2}, \frac{d^2y}{dx^2} = 4 - 4 = 0$$

**Question ID: 4812912**

If  $a, b, c$  are mutually unequal real numbers, then

$$\text{the value of } \begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \\ \hline 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} =$$

- (A)  $-(a+b+c)$  (B)  $a+b+c$   
(C)  $a^2 + b^2 + c^2$  (D)  $a^3 + b^3 + c^3$

**Answer (B)**

$$\text{Sol. } \begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \\ \hline 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = \begin{vmatrix} 1 & a & a^3 \\ 0 & b-a & b^3-a^3 \\ 0 & c-a & c^3-a^3 \\ \hline 1 & a & a^2 \\ 0 & b-a & b^2-a^2 \\ 0 & c-a & c^2-a^2 \end{vmatrix}$$

$$= \frac{(b-a)(c-a)}{\begin{vmatrix} 1 & a & a^3 \\ 0 & 1 & b^2+a^2+ab \\ 0 & 1 & c^2+a^2+ac \end{vmatrix}} = \frac{c^2+ac-b^2-ab}{(c-b)} = (c+b)+a = a+b+c$$

**Question ID: 4812913**

If  $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$  and  $n \in N$  (where  $N$  is the set of natural numbers), then  $A^n$  is equal to

(A)  $nA$  (B)  $2nA$

(C)  $2^{n-1}A$  (D)  $2^nA$

**Answer (C)**



(ii)  $\because (1, 2) \in R$  but  $(2, 1) \notin R$

$\therefore R$  is not symmetric

(iii)  $\because (1, 2), (2, 3) \in R$  but  $(1, 3) \notin R$

$\therefore R$  is not transitive

### Question ID: 4812953

If  $f : R - \{-1\} \rightarrow R - \{1\}$  be a function defined by

$$f(x) = \frac{x-1}{x+1}, \text{ then}$$

A.  $f$  is one-one but not onto

B.  $f$  is onto but not one-one

C.  $f$  is one-one and onto

$$D. f^{-1}(x) = \frac{x+1}{x-1}$$

$$E. (f \circ f)(x) = -\frac{1}{x}; x \neq 0, -1$$

Choose the correct answer from the options given below

(A) A, D, E only

(B) C, D only

(C) B, E only

(D) C, E only

### Answer (D)

**Sol.**  $f : R - \{-1\} \rightarrow R - \{1\}$

$$\text{and } f(x) = \frac{x-1}{x+1} = \frac{(x+1)}{x+1} - \frac{2}{x+1} = 1 - \frac{2}{x+1}$$

$$f'(x) = \frac{2}{(x+1)^2} > 0 \quad \therefore f \text{ is one-one}$$

$$\text{and } f(x) = 1 - \frac{2}{x+1} \in R - \{1\}$$

$$\therefore f \text{ is onto also and } y = \frac{x-1}{x+1}$$

$$\Rightarrow \frac{y+1}{y-1} = \frac{x}{-1}$$

$$\therefore f^{-1}(x) = \frac{x+1}{1-x}$$

$$\text{and } f \circ f(x) = \frac{\frac{x-1}{x+1}-1}{\frac{x-1}{x+1}+1} = -\frac{2}{2x}$$

$$= -\frac{1}{x}$$

### Question ID: 4812954

The domain of the function  $\cos^{-1}(2x-1)$  is

(A)  $[0, 1]$

(B)  $[-1, 1]$

(C)  $(-1, 1)$

(D)  $[0, \pi]$

### Answer (A)

**Sol.**  $f(x) = \cos^{-1}(2x-1)$

$\therefore$  Degree for domain

$$-1 \leq 2x-1 \leq 1$$

$$0 \leq 2x \leq 2$$

$$0 \leq x \leq 1$$

$$\therefore D_f \equiv [0, 1]$$

### Question ID: 4812955

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

$$(A) \frac{\pi}{6} \quad (B) \frac{\pi}{3}$$

$$(C) \frac{\pi}{4} \quad (D) \frac{\pi}{2}$$

### Answer (C)

**Sol.** Let  $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right) = t$

$$\therefore \tan t = \frac{\frac{x}{y} - \left(\frac{x-y}{x+y}\right)}{1 + \frac{x}{y} \cdot \frac{x-y}{x+y}} = \frac{x^2 + xy - xy + y^2}{xy + y^2 + x^2 - xy}$$

$$= 1$$

$$\therefore t = \frac{\pi}{4}$$

### Question ID: 4812956

If the matrix  $A = \begin{bmatrix} 3 & 2a & -5 \\ -4 & 0 & b \\ -5 & 3 & 7 \end{bmatrix}$  is symmetric then

the value of  $(a+b)$  is

(A) 1

(B) 5

(C) 3

(D) 4

### Answer (A)

**Sol.**  $A = \begin{bmatrix} 3 & 2a & -5 \\ -4 & 0 & b \\ -5 & 3 & 7 \end{bmatrix}$

$$A^T = \begin{bmatrix} 3 & -4 & -5 \\ 2a & 0 & 3 \\ -5 & b & 7 \end{bmatrix}$$

Since  $A$  is symmetric

$$\therefore A = A^T$$

$$\Rightarrow 2a = -4 \text{ and } b = 3$$

$$a = -2$$

$$\text{So, } a + b = 1$$

#### Question ID: 4812957

If  $A$  is square matrix of size 4 and  $|A| = 6$ . If  $|\text{Adj.}(\text{Adj.}(3A))| = 2^a \cdot 3^b$ , then value of  $a + b$  is

(A) 24

(B) 54

(C) 72

(D) 216

#### Answer (B)

**Sol.**  $\because |\text{Adj.}(\text{Adj.}A)| = |A|^{(n-1)^2}$

$$\therefore |\text{Adj.}(\text{Adj.}3A)| = |3A|^{3^2}$$

$$= \left(3^4 |A|\right)^9$$

$$= 3^{36} 6^9$$

$$= 3^{45} 2^9$$

$$\therefore a + b = 54$$

#### Question ID: 4812958

The value of  $x$  for which  $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$ , is

(A) 2

(B)  $\pm 2\sqrt{2}$

(C) 4

(D)  $\pm 2\sqrt{3}$

#### Answer (B)

**Sol.**  $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$

$$\Rightarrow 3 - x^2 = 3 - 8$$

$$\Rightarrow x^2 = 8$$

$$\Rightarrow x = \pm 2\sqrt{2}$$

#### Question ID: 4812959

If  $y = \left(\frac{1}{x}\right)^x$ , then  $\frac{d^2y}{dx^2} =$

(A)  $x^{-x}(1+\log x)^2 - x^{-(x+1)}$

(B)  $x^{-x}(1+\log x)^2 - x^{-(x-1)}$

(C)  $x^{-x}(1+\log x)^{-2} - x^{-(x+1)}$

(D)  $x^{-x}(1+\log x)^{-1} + x^{-(x-1)}$

#### Answer (A)

**Sol.**  $y = \left(\frac{1}{x}\right)^x$

$$y = x^{-x}$$

$$\therefore \log y = -x \log x$$

$$\Rightarrow \frac{1}{y} \frac{dy}{dx} = \frac{-x}{x} + \log x(-1) = -1 - \log x$$

$$\Rightarrow \frac{dy}{dx} = -y(1+\log x)$$

$$\therefore \frac{d^2y}{dx^2} = -y \left[ \frac{1}{x} \right] - (1+\log x) \frac{dy}{dx}$$

$$= -x^{-x-1} + x^{-x}(1+\log x)^2 = x^{-x}(1+\log x)^2 - x^{-(x+1)}$$

#### Question ID: 4812960

If  $\vec{a}$  is a unit vector and  $(\vec{x} - \vec{a}) \cdot (\vec{x} + \vec{a}) = 8$  then  $|\vec{x}|$  is :

(A) 2

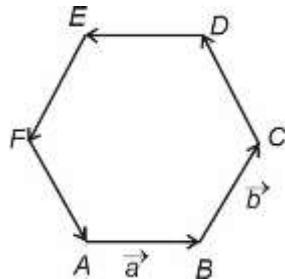
(B) 3

(C)  $\pm 3$

(D) 5

#### Answer (B)



**Sol.**

$$\begin{aligned}\therefore \overrightarrow{CD} &= \overrightarrow{CA} + \overrightarrow{AD} \\ &= -(\vec{a} + \vec{b}) + 2\vec{b} = \vec{b} - \vec{a}\end{aligned}$$

**Question ID: 4812965**

The integrating factor of the differential equation

$$x \frac{dy}{dx} + y - x + xy \cot x = 0, (x \neq 0) \text{ is :}$$

- (A)  $x \sin x$
- (B)  $x \cos x$
- (C)  $x$
- (D)  $\sin x$

**Answer (A)**

$$\text{Sol. } x \frac{dy}{dx} + y - x + xy \cot x = 0 (x \neq 0)$$

$$\begin{aligned}\Rightarrow \frac{dy}{dx} + \left( \frac{1}{x} + \cot x \right) y &= 1 \\ \therefore \text{IF} &= e^{\int \left( \frac{1}{x} + \cot x \right) dx} = e^{\ln x + \ln \sin x} \\ &= x \sin x\end{aligned}$$

**Question ID: 4812966**

$$\int \frac{dx}{\frac{1}{4} \sqrt{-x^2 - 2x + 3}} =$$

- (A)  $\sin^{-1} \left( \frac{1}{4} \right)$
- (B)  $\sin^{-1} \left( \frac{3}{4} \right)$
- (C)  $\sin^{-1} \left( \frac{5}{8} \right)$
- (D)  $\cos^{-1} \left( \frac{5}{8} \right)$

**Answer (D)**

$$\text{Sol. } I = \int \frac{dx}{\frac{1}{4} \sqrt{-x^2 - 2x + 3}} = \int \frac{dx}{\frac{1}{4} \sqrt{4 - (x+1)^2}}$$

$$= \left( \sin^{-1} \frac{x+1}{2} \right) \Big|_4$$

$$= \frac{\pi}{2} - \sin^{-1} \left( \frac{5}{8} \right)$$

$$= \cos^{-1} \left( \frac{5}{8} \right)$$

**Question ID: 4812967**

A random variable  $X$  has the following probability distribution

$x$	0	1	2	3	4	5	6	7
$P(X = x)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

The value of  $P(0 < X < 5)$  is

- (A)  $\frac{1}{5}$
- (B)  $\frac{2}{5}$
- (C)  $\frac{4}{5}$
- (D)  $\frac{3}{5}$

**Answer (C)**

$$\text{Sol. } P(0 < X < 5) = P(x = 1) + P(x = 2) + P(x = 3) + P(x = 4)$$

and

$$k + 2k + 2k + 3k + k^2 + 2k^2 + 7k^2 + k = 1$$

$$10k^2 + 9k = 1$$

$$\Rightarrow 10k^2 + 10k - k - 1 = 0$$

$$\Rightarrow (k+1)(10k-1) = 0$$

$$k = \frac{1}{10} \text{ or } (-1)x$$

$$\therefore P(0 < x < 5) = k + 2k + 2k + 3k$$

$$= 8k = \frac{8}{10} = \frac{4}{5}$$



**Sol.**  $I = \int_0^\pi \sin^3 x \cos^2 x dx$

$$I = 2 \int_0^{\pi/2} \sin^3 x \cos^2 x dx$$

$$= 2 \cdot \frac{(3-1)(3-2)(2-1)}{5 \cdot 3 \cdot 1} = \frac{4}{15}$$

**Question ID : 4812973**

The distance of the point  $(3, -2, 1)$  from the plane  $2x - y + 2z + 3 = 0$  is :

(A)  $\frac{3}{13}$

(B)  $\frac{13}{3}$

(C)  $\frac{14}{3}$

(D)  $\frac{3}{14}$

**Answer (B)**

**Sol.**  $P : 2x - y + 2z + 3 = 0$

$$P_1 \equiv (3, -2, 1)$$

$$\therefore d = \frac{6+2+2+3}{\sqrt{4+1+4}} = \frac{13}{3}$$

**Question ID : 4812974**

The maximum value of the function  $z = 3x + 3y$ , subject to the constraints

$$x + 2y \leq 30, 2x + y \leq 50, x \geq 0, y \geq 0 \text{ is :}$$

(A) 75

(B) 90

(C) 80

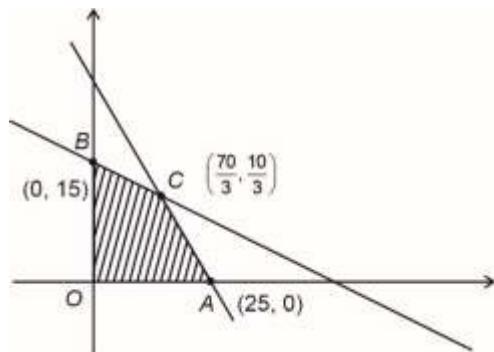
(D) 45

**Answer (C)**

**Sol.**  $z = 3x + 3y$

So, corner points of feasible region are

$$O(0, 0), A(25, 0), B(0, 15) \text{ and } C\left(\frac{70}{3}, \frac{10}{3}\right)$$



$$\begin{array}{c|c|c|c|c} \text{Value of } z & | A & | B & | C & | O \\ \hline = 3x + 3y & | 3 \times 25 = 75 & | 3 \times 15 = 45 & | 80 & | 0 \end{array}$$

$\therefore$  Maximum value of  $z = 80$

**Question ID : 4812975**

Let  $R$  be the relation in the set  $A = \{a, b, c, d\}$  given by  $R = \{(a, a), (b, b), (c, c), (a, b), (b, a), (c, d), (d, d), (d, c)\}$

- (A)  $R$  is reflexive and symmetric but not transitive
- (B)  $R$  is reflexive and transitive but not symmetric
- (C)  $R$  is symmetric and transitive but not reflexive
- (D)  $R$  is an equivalence relation

**Answer (D)**

**Sol.**  $A = \{a, b, c, d\}$

$$R = \{(a, a)(b, b)(c, c), (a, b)(b, a)(c, d)(d, d)(d, c)\}$$

(i)  $\because (a, a) \in R \forall a \in A$

(ii) If  $(x, y) \in R \Rightarrow (y, x) \in R \therefore R$  is symmetric

(iii)  $R$  is transitive also

$\therefore R$  is an equivalence relation.

**Passage :**

Three pizza outlets  $A$ ,  $B$  and  $C$  sell three types of pizza namely cheese pizza, veg pizza and paneer pizza. In a day,  $A$  can sell 40 cheese pizza, 30 veg pizza and 20 paneer pizza;  $B$  can sell 20 cheese pizza, 40 veg pizza and 60 paneer pizza;  $C$  can sell 60 cheese pizza, 20 veg pizza and 30 paneer pizza. If the revenue generated in a day by  $A$  is ₹6000, by  $B$  is ₹9000 and by  $C$  is ₹7000. If  $x$  denotes selling price of cheese pizza,  $y$  is selling price of veg pizza and  $z$  be the selling price of Paneer pizza then based on this information, answer the following question:

**Question ID : 4812976**

The revenue generated by three outlets  $A$ ,  $B$  and  $C$  are :

(A) 6000

(B) 22000

(C) 16000

(D) 15000

**Answer (B)**

$$\text{Outlet } A \quad 40x + 30y + 20z = 6000$$

$$\text{Outlet } B \quad 20x + 40y + 60z = 9000$$

$$\text{Outlet } C \quad 60x + 20y + 30z = 7000$$

$$\left. \begin{array}{l} x = 50 \\ y = 80 \\ z = 80 \end{array} \right\}$$

Total revenue generated by  $A$ ,  $B$  and  $C$  are :

$$6000 + 9000 + 7000 = ₹22000$$

**Question ID : 4812977**

The matrix representation of the above problem is :

$$(A) \begin{bmatrix} 4 & 2 & 6 \\ 3 & 4 & 2 \\ 2 & 6 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 600 \\ 900 \\ 700 \end{bmatrix}$$

$$(B) \begin{bmatrix} 4 & 3 & 2 \\ 2 & 4 & 6 \\ 6 & 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 600 \\ 900 \\ 700 \end{bmatrix}$$

$$(C) \begin{bmatrix} 4 & 3 & 2 \\ 1 & 2 & 3 \\ 6 & 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 600 \\ 450 \\ 700 \end{bmatrix}$$

$$(D) \begin{bmatrix} 4 & 2 & 6 \\ 3 & 4 & 2 \\ 2 & 6 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6000 \\ 9000 \\ 7000 \end{bmatrix}$$

**Answer (C)**

**Sol.** Equation will be

$$4x + 3y + 2z = 600$$

$$x + 2y + 3z = 450$$

$$6x + 2y + 3z = 700$$

$$\begin{bmatrix} 4 & 3 & 2 \\ 1 & 2 & 3 \\ 6 & 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 600 \\ 450 \\ 700 \end{bmatrix}$$

**Question ID: 4812978**

The price of a cheese pizza is :

- (A) ₹50
- (B) ₹80
- (C) ₹500
- (D) ₹800

**Answer (A)**

**Sol.** Price of cheese pizza =  $x$

i.e. ₹50

**Question ID: 4812979**

The price of a paneer pizza is :

- |         |         |
|---------|---------|
| (A) ₹50 | (B) ₹60 |
| (C) ₹65 | (D) ₹80 |

**Answer (D)**

**Sol.** Price of paneer pizza =  $z$

i.e. ₹80

**Question ID: 4812980**

If the cost price of a cheese pizza is ₹30, a veg pizza is ₹50 and a paneer pizza is ₹50, what is the profit of outlet A in a day?

- (A) ₹6300
- (B) ₹3300
- (C) ₹2300
- (D) ₹18300

**Answer (C)**

**Sol.** CP of 40 cheese + 30 veg + 20 paneer

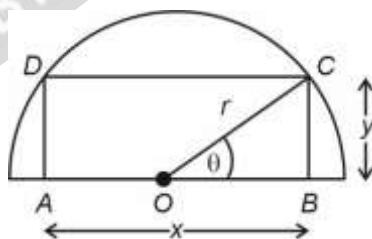
$$\begin{aligned} &= 40 \times 30 + 30 \times 50 + 20 \times 50 \\ &= 1200 + 1500 + 1000 \\ &= ₹3700 \end{aligned}$$

SP of 40 cheese + 30 veg + 20 paneer

$$\begin{aligned} &= ₹6000 \\ \therefore \text{Profit} &= 6000 - 3700 \\ &= ₹2300 \end{aligned}$$

**Passage:**

A rectangle of length ' $x$ ' and breadth ' $y$ ' is inscribed in a semi-circle of fixed radius ' $r$ ' as shown in the figure given below.



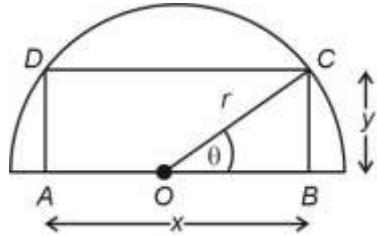
Based on the above information answer the following question:

**Question ID: 4812981**

Area  $A(\theta)$ ,  $0 < \theta < \frac{\pi}{2}$  of the rectangle ABCD, is

- (A)  $r^2 \sin \theta$
- (B)  $r^2 \sin 2\theta$
- (C)  $r^2 \cos 2\theta$
- (D)  $r^2 \cos \theta$

**Answer (B)**

**Sol.**

Now,

$$x = 2r \cos\theta$$

$$y = r \sin\theta$$

$$\begin{aligned} \text{Area } (ABCD) &= 2r^2 \cos\theta \sin\theta \\ &= r^2 \sin 2\theta \end{aligned}$$

**Question ID: 4812982**The value of  $\theta$ , for which  $A'(\theta) = 0$  is

- |                     |                     |
|---------------------|---------------------|
| (A) $\pi$           | (B) $\frac{\pi}{2}$ |
| (C) $\frac{\pi}{4}$ | (D) $\frac{\pi}{3}$ |

**Answer (C)****Sol.**  $A'(\theta) = 0$ 

$$A = r^2 \sin 2\theta$$

$$A' = 2r^2 \cos 2\theta = 0$$

$$\therefore 2\theta = (2n+1)\frac{\pi}{2}$$

$$\theta = (2n+1)\frac{\pi}{4}$$

$$\therefore \theta = \frac{\pi}{4}$$

**Question ID: 4812983**Dimensions  $x, y$  of the rectangle  $ABCD$ , when area is maximum are:

- |  |                                     |
|--|-------------------------------------|
| (A) $r\frac{\sqrt{3}}{2}, \frac{2r}{\sqrt{3}}$ | (B) $r\sqrt{2}, \frac{r}{\sqrt{2}}$ |
| (C) $\frac{r}{\sqrt{2}}, \sqrt{2}r$            | (D) $r, \frac{r}{\sqrt{2}}$         |

**Answer (B)****Sol.** If area is max.

$$A' = 0$$

$$\Rightarrow \theta = \frac{\pi}{4}$$

$$\therefore x = 2r \cos\theta \quad y = r \sin\theta$$

$$x = \frac{2r}{\sqrt{2}} \quad y = \frac{r}{\sqrt{2}}$$

$$x = \sqrt{2}r \quad y = \frac{r}{\sqrt{2}}$$

**Question ID: 4812984**

Maximum area of the Rectangle is:

- (A)  $2r^2$
- (B)  $3r^2$
- (C)  $r^2$
- (D)  $4r^2$

**Answer (C)****Sol.**  $\text{Area}_{\max} \Rightarrow r^2 \sin 2\theta$  is max.

$$\text{Area} = r^2$$

**Question ID: 4812985**

Perimeter of rectangle when its area is maximum is:

- |                            |                  |
|----------------------------|------------------|
| (A) $\frac{8\sqrt{3}r}{3}$ | (B) $4r$         |
| (C) $\frac{7\sqrt{3}r}{3}$ | (D) $3\sqrt{2}r$ |

**Answer (D)****Sol.** Max. perimeter =  $2(l + b)$ 

$$\begin{aligned} &= 2 \left( r\sqrt{2} + \frac{r}{\sqrt{2}} \right) \\ &= 2r \left[ \frac{2+1}{\sqrt{2}} \right] \\ &= 3\sqrt{2}r \end{aligned}$$