# DU BTech IT N Mathematical Innovations

Topic:- DU_J19_BTECH_T1

**1)** **Directions for questions** : The accompanying figure (i) shows the graph of a function $f(x)$ with domain [-3, 4] and range [-1, 2].

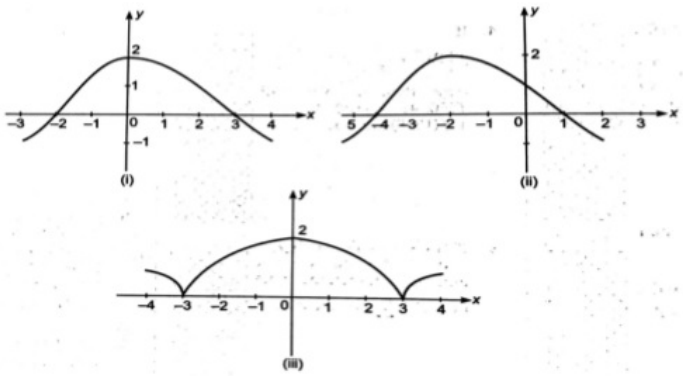


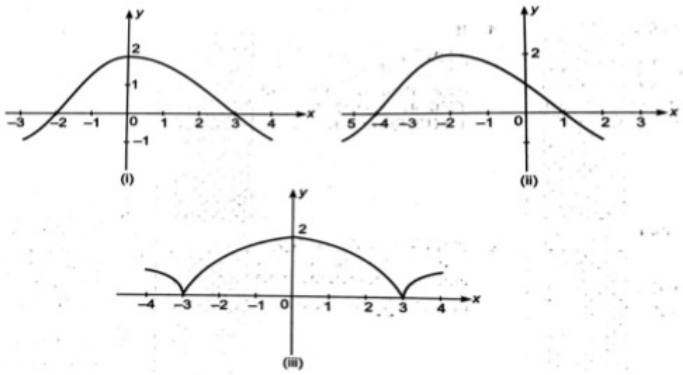

**Figure (iii) represents the graph of the function [Question ID = 13738]**

1. $|f(|x|)|$ [Option ID = 24952]
2. $|f(x)|$ [Option ID = 24951]
3. $f(|x|)$ [Option ID = 24950]
4. $f(x)$ [Option ID = 24949]

**Correct Answer :-**

- $f(x)$ [Option ID = 24949]

**2)** **Directions for questions** : The accompanying figure (i) shows the graph of a function $f(x)$ with domain [-3, 4] and range [-1, 2].




The points of intersection of Figure (iii) and $(2x-6)^2+4y^2=49$ are

**[Question ID = 13739]**

1. 6 [Option ID = 24955]
2. 2 [Option ID = 24953]
3. 1 [Option ID = 24956]
4. 4 [Option ID = 24954]

**Correct Answer :-**

- 2 [Option ID = 24953]

**3)** **Directions for questions** : The accompanying figure (i) shows the graph of a function $f(x)$ with domain [-3, 4] and range [-1, 2].

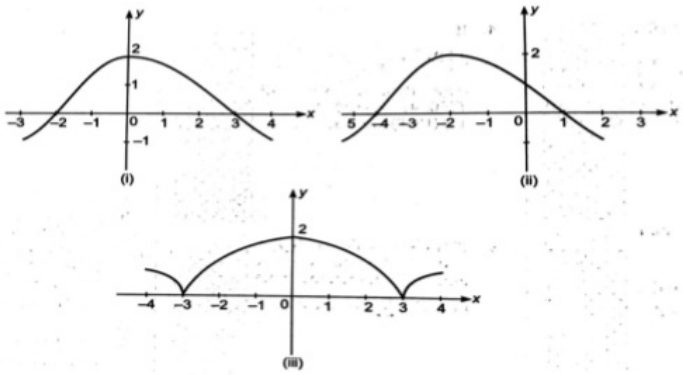



**Figure (ii) represents the graph of the function [Question ID = 13737]**

1. $f(x-2)$ [Option ID = 24946]
2. $f(x+2)$ [Option ID = 24947]
3. $f(x)$ [Option ID = 24945]
4. $f(x-1)+1$ [Option ID = 24948]

**Correct Answer :-**

- $f(x)$ [Option ID = 24945]

Topic:- DU_J19_BTECH_T2

**1) Let z be a complex number such that the imaginary part of z is non-zero and a = z2 + z + 1 is real. Then a cannot take the value [Question ID = 36452]**

1. 1/3 [Option ID = 55804]
2. -1 [Option ID = 55803]
3. 1/2 [Option ID = 55805]
4. 3/4 [Option ID = 55806]

**Correct Answer :-**

- -1 [Option ID = 55803]

**2) A point is selected at random from the interior of a circle. The probability that the point is close to the center than the boundary of the circle is [Question ID = 13746]**

1. 1/4 [Option ID = 24984]
2. 1/3 [Option ID = 24983]
3. 1/2 [Option ID = 24982]
4. 3/4 [Option ID = 24981]

**Correct Answer :-**

- 3/4 [Option ID = 24981]

**3) A variable triangle is inscribed in a circle of radius *R*. If the rate of change of a side is *R* times the rate of change of opposite angle, then that angle is [Question ID = 13758]**

1. $\frac{\pi}{4}$ [Option ID = 25030]
2. $\frac{\pi}{2}$ [Option ID = 25032]

3. $\frac{\pi}{3}$ [Option ID = 25031]
4. $\frac{\pi}{6}$ [Option ID = 25029]

**Correct Answer :-**

- $\frac{\pi}{6}$ [Option ID = 25029]

**4) Five persons entered the lift cabin on the ground floor of an 8 floor house. Suppose that each of them have an independent and equal probability to leave the cabin at any floor beginning with the first. Then the probability of all 5 persons leaving at different floors is [Question ID = 13747]**

1. $\frac{{}^{7}C_{5}}{7^{5}}$ [Option ID = 24986]
2. $\frac{{}^{5}P_{5}}{5^{5}}$ [Option ID = 24988]
3. $\frac{{}^{7}P_{5}}{7^{5}}$ [Option ID = 24985]
4. $\frac{6}{{}^{6}P_{5}}$ [Option ID = 24987]

**Correct Answer :-**

- $\frac{{}^{7}P_{5}}{7^{5}}$ [Option ID = 24985]

**5)** Given that $c$ is an integer, the value of $c+2$ for which the area of the figure bounded by the curve $y = 8x^2 - x^5$,the straight lines $x = 1, x = c$ and X-axis is equal to $\frac{16}{3}$, is

**[Question ID = 13762]**

1. 2 [Option ID = 25045]
2. -1 [Option ID = 25048]
3. 1 [Option ID = 25046]
4. 3 [Option ID = 25047]

**Correct Answer :-**

- 2 [Option ID = 25045]

**6)** If $f(x)$ is a polynomial function of the second degree such that $f(-3) = 6, f(0) = 6$ and $f(2) = 11$, then the graph of the function $f(x)$ cuts the ordinate $x = 1$ at the point

**[Question ID = 13741]**

1. (1,8) [Option ID = 24961]
2. (1,4) [Option ID = 24963]
3. (1,-2) [Option ID = 24962]
4. (1,2) [Option ID = 24964]

**Correct Answer :-**

- (1,8) [Option ID = 24961]

**7)**

If the equations $x^2 + 2x + 3 = 0$ and $ax^2 + bx + c = 0, a, b, c \in R$, have a common root, then $a : b : c$ is

**[Question ID = 13776]**

1. $1 : 2 : 3$ [Option ID = 25104]
2. $3 : 2 : 1$ [Option ID = 25101]
3. $3 : 1 : 2$ [Option ID = 25103]

4. $1:3:2$ [Option ID = 25102]

**Correct Answer :-**

- $3:2:1$ [Option ID = 25101]

**8)** The value of the expression

$$2\left(1+\frac{1}{w}\right)\left(1+\frac{1}{w^2}\right)+3\left(2+\frac{1}{w}\right)\left(2+\frac{1}{w^2}\right)+4\left(3+\frac{1}{w}\right)\left(3+\frac{1}{w^2}\right)+\ldots+(n+1)\left(n+\frac{1}{w}\right)\left(n+\frac{1}{w^2}\right),$$

where $w$ is an imaginary cube root of unity, is

**[Question ID = 13770]**

1. $\frac{n(n^2+2)}{3}$ [Option ID = 25077]
2. $\frac{n^2(n-1)^2+n}{4}$ [Option ID = 25080]
3. $\frac{n(n^2-2)}{3}$ [Option ID = 25078]
4. $\frac{n^2(n+1)^2+4n}{4}$ [Option ID = 25079]

**Correct Answer :-**

- $\frac{n(n^2+2)}{3}$ [Option ID = 25077]

**9)** Let $f$ and $g$ be differential functions satisfying $g'(a)=2$, $g(a)=b$ and $fog=I$ (identity function). Then $f'(b)$ is equal to

**[Question ID = 25891]**

1. 1/2 [Option ID = 43562]
2. 1/4 [Option ID = 43561]
3. 2 [Option ID = 43559]
4. 2/3 [Option ID = 43560]

**Correct Answer :-**

- 2 [Option ID = 43559]

**10)** Let $f(x)=\int e^x(x-1)(x-2)dx$, then $f$ decreases in the interval

**[Question ID = 24956]**

1. $(-2,-1)$ [Option ID = 39820]
2. $(1,2)$ [Option ID = 39821]
3. $(2,\infty)$ [Option ID = 39822]
4. $(-\infty,-2)$ [Option ID = 39819]

**Correct Answer :-**

- $(-\infty,-2)$ [Option ID = 39819]

**11)**

Let $S$ be the set of all non-zero real numbers $\alpha$ such that the quadratic equation $\alpha x^2 - x + \alpha = 0$ has two distinct real roots $x_1$ and $x_2$ satisfying the inequality $|x_1 - x_2| < 1$. Which of the following interval is a subset of $S$?

**[Question ID = 24958]**

1. $\left(-\frac{1}{\sqrt{5}}, \frac{1}{\sqrt{5}}\right)$ [Option ID = 39830]
2. $\left(-\frac{1}{2}, -\frac{1}{\sqrt{5}}\right)$ [Option ID = 39827]
3. $\left(-\frac{1}{\sqrt{5}}, 0\right)$ [Option ID = 39828]
4. $\left(0, \frac{1}{\sqrt{5}}\right)$ [Option ID = 39829]

**Correct Answer :-**

- $\left(-\frac{1}{2}, -\frac{1}{\sqrt{5}}\right)$ [Option ID = 39827]

**12)** Let $\mathbf{R}$ be the set of real numbers. If $f: R \to R$ is a function such that $|f(x) - f(p)|^2 \leq |x - y|^3$, for all $x, y \in R$, then $f'(x)$ is equal to

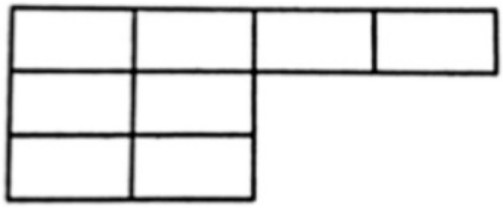
**[Question ID = 25892]**

1. 0 [Option ID = 43566]
2. $X$ [Option ID = 43565]
3. 1 [Option ID = 43564]
4. $f(x)$ [Option ID = 43563]

**Correct Answer :-**

- $f(x)$ [Option ID = 43563]

**13)** The number of different ways the letters of the word *VECTOR* can be placed in the 8 boxes of the figure given below such that no row is empty is equal to



**[Question ID = 13750]**

1. 6! [Option ID = 24999]
2. 26 x 6! [Option ID = 24998]
3. 26 [Option ID = 24997]
4. 2! x 6! [Option ID = 25000]

**Correct Answer :-**

- 26 [Option ID = 24997]

**14)** If $a \in [-20.\ 0]$, then the probability that the graph of the function $y = 16\,x^2 + 8(a + 5)x - 7a - 5$ is strictly above the *x-axis* is

**[Question ID = 13751]**

1. 1/2 [Option ID = 25001]
2. 1/17 [Option ID = 25002]
3. 17/20 [Option ID = 25003]
4. 13/20 [Option ID = 25004]

**Correct Answer :-**

- 1/2 [Option ID = 25001]

**15)** If $f(x) = \frac{sin^2(\pi x)}{1+\pi^x}$, then $\int f(x) + f(-x)dx$ is equal to

**[Question ID = 24953]**

1. $\frac{x}{2} - \frac{cos\pi x}{2\pi} + C$ [Option ID = 39809]
2. $\frac{x}{2} - \frac{sin2\pi x}{4\pi} + C$ [Option ID = 39810]
3. $0$ [Option ID = 39807]
4. $x+C$ [Option ID = 39808]

**Correct Answer :-**

- $0$ [Option ID = 39807]

**16)** Let $f(z) = \sin z$ and $g(z) = \cos z$. If $*$ denotes a composition of functions, then the value of $(f+ig)*(f-ig)(z)$ (where $i = \sqrt{-1}$) is

**[Question ID = 13768]**

1. $ie^{-e^{-iz}}$ [Option ID = 25072]
2. $ie^{-e^{iz}}$ [Option ID = 25070]
3. $ie^{e^{iz}}$ [Option ID = 25069]
4. $ie^{e^{-iz}}$ [Option ID = 25071]

**Correct Answer :-**

- $ie^{e^{iz}}$ [Option ID = 25069]

**17)** If $y = f(x)$ is an odd differential function defined on $(-\infty, \infty)$ such that $f'(3) = -2$ then $f'(-3)$ equals

**[Question ID = 24952]**

1. 2 [Option ID = 39804]
2. 0 [Option ID = 39806]
3. -2 [Option ID = 39805]
4. 4 [Option ID = 39803]

**Correct Answer :-**

- 4 [Option ID = 39803]

**18)** The equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has

**[Question ID = 13775]**

1. No real roots [Option ID = 25098]
2. Infinite number of real roots [Option ID = 25097]
3. Exactly four real roots [Option ID = 25100]
4. Exactly one real root [Option ID = 25099]

**Correct Answer :-**

- Infinite number of real roots [Option ID = 25097]

**19)** If the function $f$ is continuous and has the property $f(f(x)) = 1 - x$, then the value of $f\left(\frac{1}{4}\right) + f\left(\frac{3}{4}\right)$ is

**[Question ID = 13745]**

1. 2 [Option ID = 24980]
2. 0 [Option ID = 24979]

3. -1 [Option ID = 24978]
4. 1 [Option ID = 24977]

**Correct Answer :-**

- 1 [Option ID = 24977]

**20)**

If the difference between the roots of the equation $x^2 + ax + 1 = 0$ is less than $\sqrt{5}$, then the set of possible values of $a$ is

**[Question ID = 13774]**

1. [4, 5) [Option ID = 25094]
2. (3, ∞) [Option ID = 25095]
3. (-∞, -3) [Option ID = 25096]
4. (-3, 3) [Option ID = 25093]

**Correct Answer :-**

- (-3, 3) [Option ID = 25093]

**21)**

The domain of the function $\frac{1}{\sqrt{{}^{10}C_{x-1} - 3\,{}^{10}C_x}}$ contains the points

**[Question ID = 13744]**

1. 9, 10, 12 [Option ID = 24974]
2. 9, 10, 11 [Option ID = 24973]
3. 9, 10 [Option ID = 24976]
4. All Natural numbers [Option ID = 24975]

**Correct Answer :-**

- 9, 10, 11 [Option ID = 24973]

**22)**

If lines of regression of $y$ on $x$ and $x$ on $y$ are respectively $y = kx + 4$, $x = 4y + 5$, then which is true for $k$?

**[Question ID = 24951]**

1. $0 \le k \le 4$ [Option ID = 39799]
2. $0 \le k \le 1/4$ [Option ID = 39800]
3. $k > 1/4$ [Option ID = 39801]
4. $k < 1/4$ [Option ID = 39802]

**Correct Answer :-**

- $0 \le k \le 4$ [Option ID = 39799]

**23)**

The solution set of $f'(x) > g'(x)$, where $f(x) = \frac{1}{2}5^{2x+1}$ and $g(x) = 5^x + 4x\log_e 5$ is

**[Question ID = 24954]**

1. $(0, \infty)$ [Option ID = 39814]
2. $(0,1)$ [Option ID = 39812]
3. $(1, \infty)$ [Option ID = 39811]
4. $[0, \infty)$ [Option ID = 39813]

**Correct Answer :-**

- $(1, \infty)$ [Option ID = 39811]

**24)**

The tangent to the graph of the function $y = f(x)$ at the point with abscissa $x = 1$ form an angle of $\frac{\pi}{6}$, at the point $x$=2 an angle of $\frac{\pi}{3}$ and at the point $x$=3 an angle of $\frac{\pi}{4}$. The value of $\int_1^3 f'(x)f''(x)dx + \int_2^3 f''(x)dx$ is (given that $f''(x)$ is continuous)

**[Question ID = 24955]**

1. $\frac{3\sqrt{3}-1}{2}$ [Option ID = 39816]
2. $1$ [Option ID = 39818]
3. $\frac{4-3\sqrt{3}}{3}$ [Option ID = 39817]
4. $\frac{4\sqrt{3}-1}{3\sqrt{3}}$ [Option ID = 39815]

**Correct Answer :-**

- $\frac{4\sqrt{3}-1}{3\sqrt{3}}$ [Option ID = 39815]

**25)** Let S be the set of all triangles and $R^+$ be the set of positive real numbers. Then, the function $f: S \to R^+, f(\Delta) =$ area of the $\Delta$, where $\Delta \in S$, is

**[Question ID = 13743]**

1. Surjective but not Injective [Option ID = 24970]
2. Injective as well as Surjective [Option ID = 24971]
3. Injective but nor Surjective [Option ID = 24969]
4. Neither Injective nor Surjective [Option ID = 24972]

**Correct Answer :-**

- Injective but nor Surjective [Option ID = 24969]

**26)** The fundamental period of $e^{\cos^4 \pi x + x - [x] + \cos^2 \pi x}$ is ([.] denotes the greatest integer function)

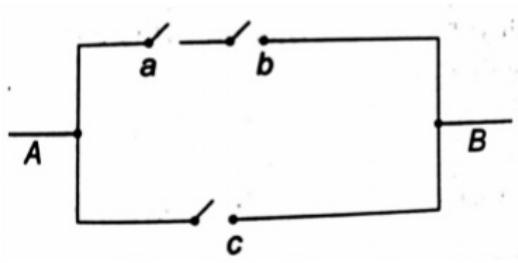
**[Question ID = 13742]**

1. 2 [Option ID = 24965]
2. 0 [Option ID = 24967]
3. -1 [Option ID = 24968]
4. 1 [Option ID = 24966]

**Correct Answer :-**

- 2 [Option ID = 24965]

**27)** Consider the circuit




If the probability that each switch is closed is $p$, then the probability of current flowing through $AB$ is

**[Question ID = 13752]**

1. $p^2 + p - 1$ [Option ID = 25006]
2. $p^2 + p + 1$ [Option ID = 25008]
3. $p^2 + p$ [Option ID = 25005]
4. $p^3 + p$ [Option ID = 25007]

**Correct Answer :-**

- $p^2 + p$ [Option ID = 25005]

**28)**

If $x^2 + y^2 = t - \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $x^3 y \left(\frac{dy}{dx}\right)$ equals

**[Question ID = 13764]**

1. 2 [Option ID = 25056]
2. 0 [Option ID = 25054]
3. -1 [Option ID = 25053]
4. 1 [Option ID = 25055]

**Correct Answer :-**

- -1 [Option ID = 25053]

**29)**

Let $\omega$ be the complex number $\cos\frac{2\pi}{3} + i\sin\frac{2\pi}{3}$. Then the number of distinct complex numbers $z$ satisfying $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 0$ is equal to

**[Question ID = 13772]**

1. 2 [Option ID = 25086]
2. 1 [Option ID = 25085]
3. 3 [Option ID = 25087]
4. 4 [Option ID = 25088]

**Correct Answer :-**

- 1 [Option ID = 25085]

**30)** If $I_n = \int cot^n x dx$ and $I_0 + I_1 + 2(I_2 + \ldots + I_8) + I_9 + I_{10} = A\left(u + \frac{u^2}{2} + \ldots + \frac{u^9}{9}\right) +$ constant, where, $u = cotx$, then

**[Question ID = 13760]**

1. *A* is dependent on *x* [Option ID = 25040]
2. *A*=0 [Option ID = 25037]
3. *A*=-1 [Option ID = 25038]
4. *A*=1 [Option ID = 25039]

**Correct Answer :-**

- *A*=0 [Option ID = 25037]

**31)**

The smallest positive integer $n$ for which $\left(\frac{1+i}{1-i}\right)^n = 1$, where $i = \sqrt{-1}$, is a real number is

**[Question ID = 13769]**

1. 2 [Option ID = 25074]
2. 1 [Option ID = 25073]
3. 3 [Option ID = 25075]
4. 4 [Option ID = 25076]

**Correct Answer :-**

- 1 [Option ID = 25073]

**32)** A vector ***a*** has components $2p$ and 1 with respect to a rectangular Cartesian system. This system is rotated through a certain angle about the origin in the counter clockwise sense. With respect to new system, if ***a*** has component $p+1$ and 1, then

**[Question ID = 13763]**

1. $p = 1 \text{ or } p = \frac{1}{3}$ [Option ID = 25051]
2. $p = 1 \text{ or } p = -\frac{1}{3}$ [Option ID = 25050]
3. $p = 0$ [Option ID = 25049]
4. $p = 1 \text{ or } p = -1$ [Option ID = 25052]

**Correct Answer :-**

- $p = 0$ [Option ID = 25049]

**33)** Let $z = x + iy$ be a complex number where $x$ and $y$ are integers. Then the area of the rectangle whose vertices are the roots of the equation $(\bar{z})z^3 + z(\bar{z})^3 = 350$ is

**[Question ID = 24957]**

1. 32 [Option ID = 39824]
2. 48 [Option ID = 39823]
3. 80 [Option ID = 39826]
4. 40 [Option ID = 39825]

**Correct Answer :-**

- 48 [Option ID = 39823]

**34)** If $z = x + iy$ is a complex number with rationals $x$ and $y$ and $|z| = 1$, then $|z^{2n} - 1|$ is $(n \in N, i = \sqrt{-1})$

**[Question ID = 13779]**

1. An irrational number [Option ID = 25113]
2. A rational number [Option ID = 25114]
3. Non terminating nor recurring [Option ID = 25115]
4. A positive number [Option ID = 25116]

**Correct Answer :-**

- An irrational number [Option ID = 25113]

**35)** A rectangle with one side lying along $X$-axis is to be inscribed in the closed region of the $XY$-plane bounded by the lines $y = 0, y = 3x$ and $y = 30 - 2x$. If M is the largest area of such a rectangle, then the value of $\frac{2M}{27}$ is

**[Question ID = 25896]**

1. 6 [Option ID = 43579]
2. 5 [Option ID = 43580]
3. 1 [Option ID = 43582]
4. 4 [Option ID = 43581]

**Correct Answer :-**

- 6 [Option ID = 43579]

**36)** For every integer $n$, let $a_n$ and $b_n$ be real numbers. A function $f: R \to R$ is given by

$$f(n) = \begin{cases} a_n + \sin \pi x & \text{for } x \in [2n, 2n+1] \\ b_n + \cos \pi x & \text{for } x \in (2n-1, 2n) \end{cases}$$

for all integers $n$. If $f(n)$ is continuous, then which of the following holds for all $n$

**[Question ID = 25893]**

1. $a_{n-1} - b_{n-1} = 0$ [Option ID = 43567]
2. $a_{n-1} - b_n = -1$ [Option ID = 43570]
3. $a_n - b_{n+1} = 1$ [Option ID = 43569]
4. $a_n - b_n = -1$ [Option ID = 43568]

**Correct Answer :-**

- $a_{n-1} - b_{n-1} = 0$ [Option ID = 43567]

**37)** If $lim_{x\to\infty}\{\sqrt{(x^2 - x + 1)} - ax - b\} = 0$, then $b$ is equal to

**[Question ID = 25894]**

1. -1/3 [Option ID = 43572]
2. 1/4 [Option ID = 43574]
3. 1/2 [Option ID = 43573]
4. -1/2 [Option ID = 43571]

**Correct Answer :-**

- -1/2 [Option ID = 43571]

**38)**

Let $z_k$, $k = 1,2,3,4$ be four complex numbers such that $|z_k| = \sqrt{k+1}$ and $|30z_1 + 20z_2 + 15z_3 + 12z_4| = k|z_2z_3z_4 + z_3z_4z_1 + z_1z_2z_4 + z_1z_2z_3|$. Then $k$ is equal to

**[Question ID = 36451]**

1. |z1 z3 z4| [Option ID = 55801]
2. |z1 z2 z3| [Option ID = 55802]
3. |z1 z2 z4| [Option ID = 55799]
4. |z3 z2 z4| [Option ID = 55800]

**Correct Answer :-**

- |z1 z2 z4| [Option ID = 55799]

**39) The numbers 1, 2, 3,..., n are arranged in a random order. The probability that the digits 1, 2, 3, ... , *k (k < n)* appears as neighbors in that order, is**

**[Question ID = 13748]**

1. $\frac{(n-k+1)!}{n!}$ [Option ID = 24992]
2. $\frac{1}{n!}$ [Option ID = 24989]
3. $\frac{(n-k)!}{n!}$ [Option ID = 24991]
4. $\frac{k!}{n!}$ [Option ID = 24990]

**Correct Answer :-**

- $\frac{1}{n!}$ [Option ID = 24989]

Topic:- DU_J19_BTECH_T3

**1)**

**Paragraph for Questions** Let $V_r$ denote the sum of the first $r$ terms of an A.P. whose first term is $r$ and common difference is $(2r-1)$. Let

$$T_r = V_{r+1} - V_r - 2 \text{ and } Q_r = T_{r+1} - T_r \text{ for } r = 1, 2, \ldots$$

**Which one of the following statement is a correct?**

**[Question ID = 13783]**

1. $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 6 [Option ID = 25130]
2. $Q_1 = Q_2 = Q_3 = \ldots$ [Option ID = 25132]
3. $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 5 [Option ID = 25129]

4. $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 11 [Option ID = 25131]

**Correct Answer :-**

- $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 5 [Option ID = 25129]

**2)**

**Paragraph for Questions** Let $V_r$ denote the sum of the first $r$ terms of an A.P. whose first term is $r$ and common difference is $(2r-1)$. Let

$$T_r = V_{r+1} - V_r - 2 \text{ and } Q_r = T_{r+1} - T_r \text{ for } r = 1, 2, \ldots$$

The sum $V_1 + V_2 + \ldots + V_n$ is

**[Question ID = 13781]**

1. $\frac{n(n+1)(3n^2+n+2)}{12}$ [Option ID = 25122]
2. $\frac{n(n+1)(3n^2-n+1)}{12}$ [Option ID = 25121]
3. $\frac{n(2n^2-n+1)}{12}$ [Option ID = 25123]
4. $\frac{(2n^2-2n+3)}{3}$ [Option ID = 25124]

**Correct Answer :-**

- $\frac{n(n+1)(3n^2-n+1)}{12}$ [Option ID = 25121]

**3)**

**Paragraph for Questions** Let $V_r$ denote the sum of the first $r$ terms of an A.P. whose first term is $r$ and common difference is $(2r-1)$. Let

$$T_r = V_{r+1} - V_r - 2 \text{ and } Q_r = T_{r+1} - T_r \text{ for } r = 1, 2, \ldots$$

$T_r$ is always

**[Question ID = 13782]**

1. A prime number [Option ID = 25127]
2. A composite number [Option ID = 25128]
3. An even number [Option ID = 25126]
4. An odd number [Option ID = 25125]

**Correct Answer :-**

- An odd number [Option ID = 25125]

Topic:- DU_J19_BTECH_T4

**1)**

For all non-negative integers $x$ and $y$, if

$f(x, y) = f(x - 1, f(x, y - 1))$

$f(0, y) = y + 1$

$f(x + 1, 0) = f(x, 1)$,

then the value of $f(1, 2)$ is

**[Question ID = 13786]**

1. 2 [Option ID = 25142]
2. 1 [Option ID = 25144]
3. 3 [Option ID = 25143]
4. 4 [Option ID = 25141]

**Correct Answer :-**

- 4 [Option ID = 25141]

**2)** The minimum value of $f(x) = x^x$ for $x > 0$, is (approximated to 1 decimal place)

**[Question ID = 13795]**

1. 0.5 [Option ID = 25179]
2. 1 [Option ID = 25177]
3. 0.7 [Option ID = 25178]
4. 0.2 [Option ID = 25180]

**Correct Answer :-**

- 1 [Option ID = 25177]

**3)** A function $f(x)$ is defined as

$$f(x) = \begin{cases} \text{integer closet to } x, & x \neq 0.5, x \neq 1.5 \\ 1, & x = 0.5 \\ 2, & x = 1.5 \end{cases}$$

The area under the graph for $0 \leq x \leq 2$ is

**[Question ID = 13792]**

1. 2 [Option ID = 25165]
2. 1 [Option ID = 25168]
3. 3 [Option ID = 25167]
4. 4 [Option ID = 25166]

**Correct Answer :-**

- 2 [Option ID = 25165]

**4)**

If $I = \int_1^2 \left(\cot^{-1}\sqrt{x-1}\right)dx$, then the value of $I$ is

**[Question ID = 13787]**

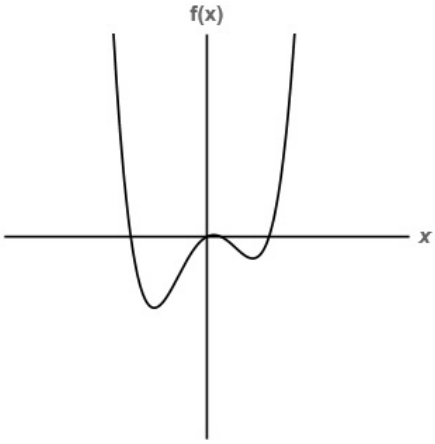
1. 2 [Option ID = 25146]
2. 1/2 [Option ID = 25148]
3. 1 [Option ID = 25147]
4. 4 [Option ID = 25145]

**Correct Answer :-**

- 4 [Option ID = 25145]

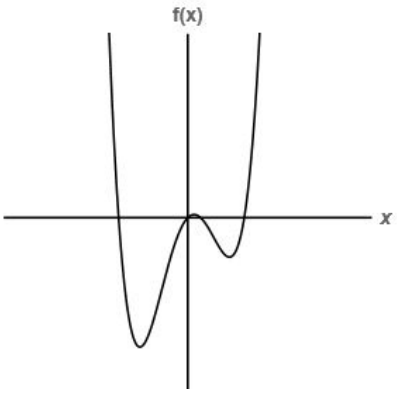
**5)**

The graph of a function $y = f(x)$ is given as

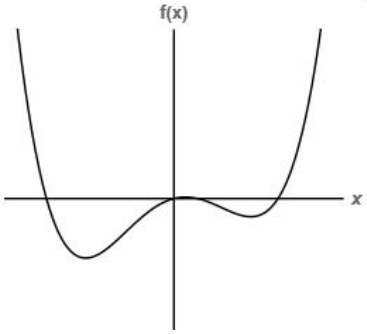



The graph of $y = f(4x)$ can be

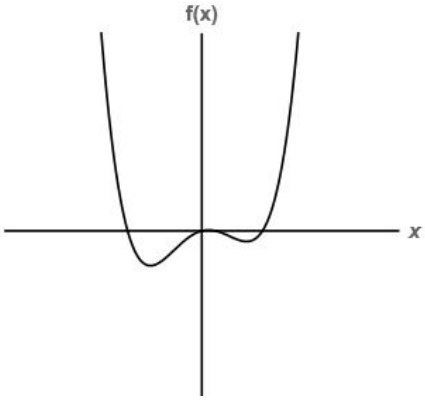
**[Question ID = 13789]**

1. 

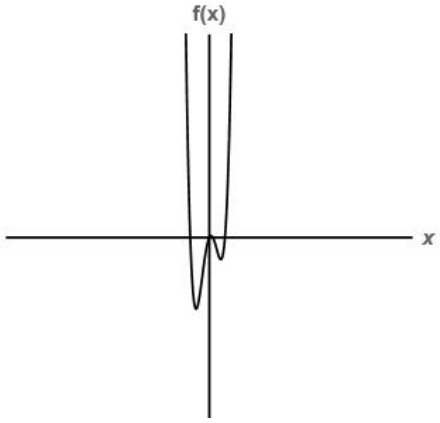
[Option ID = 25153]

2. 

[Option ID = 25155]

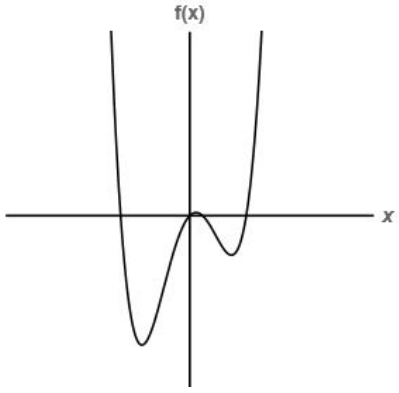
3. 

[Option ID = 25154]




4. [Option ID = 25156]

**Correct Answer :-**




- [Option ID = 25153]

**6)** If $x \in (0, \pi/2)$, and $\cos x = 1/3$, then $\sum_{m=0}^{\infty} \frac{\cos mx}{3^m} =$

**[Question ID = 13788]**

1. 2 [Option ID = 25150]
2. 0 [Option ID = 25151]
3. 1 [Option ID = 25149]
4. 3 [Option ID = 25152]

**Correct Answer :-**

- 1 [Option ID = 25149]

**7)** $\frac{\int_0^{\pi/2} \sin^{102} x\, dx}{\int_0^{\pi/2} \sin^{100} x\, dx} =$

**[Question ID = 13793]**

1. $\frac{100}{102}$ [Option ID = 25171]
2. $\frac{203}{204}$ [Option ID = 25169]
3. $\frac{101}{102}$ [Option ID = 25172]
4. $\frac{102}{100}$ [Option ID = 25170]

**Correct Answer :-**

- $\frac{203}{204}$ [Option ID = 25169]

**8)**

Three functions $f(x)$, $g(x)$ and $H(x)$ are defined as follows:

$$f''(x) = -f(x)$$

$$g(x) = f'(x)$$

$$H(x) = \left(f\left(\frac{x}{2}\right)\right)^2 + \left(g\left(\frac{x}{2}\right)\right)^2$$

If $H(e) = \pi$, then $H(\pi) =$

**[Question ID = 25075]**

1. $0$ [Option ID = 40297]
2. $\pi$ [Option ID = 40295]
3. $1$ [Option ID = 40298]
4. $e$ [Option ID = 40296]

**Correct Answer :-**

- $\pi$ [Option ID = 40295]

**9)** If $\log_{0.4}(x-1) < \log_{0.16}(x-1)$, then $x$ lies in the interval

**[Question ID = 13785]**

1. [2, ∞) [Option ID = 25137]
2. (0, 1) ∪ (2, ∞) [Option ID = 25138]
3. (1, ∞) [Option ID = 25140]
4. (2, ∞) [Option ID = 25139]

**Correct Answer :-**

- [2, ∞) [Option ID = 25137]

**10)** The minimum value of $3\tan^2 A + 12\cot^2 A =$

**[Question ID = 13790]**

1. 6 [Option ID = 25160]
2. 15 [Option ID = 25157]
3. 9 [Option ID = 25158]
4. 12 [Option ID = 25159]

**Correct Answer :-**

- 15 [Option ID = 25157]

**11)** Let $f:(1,\infty) \to R$ be a continuous function such that

$$\int_2^{150} \left((x-1)\left(\ln(x-1)\right)\left(2f(x) - (x-1)\ln(x-1)\right)dx\right) = \int_2^{150} (f(x))^2\,dx$$

The value of $f(101)$ is

**[Question ID = 25076]**

1. 101 ln (101) [Option ID = 40301]
2. 149 ln (149) [Option ID = 40302]
3. 100 ln (100) [Option ID = 40299]
4. 148 ln (148) [Option ID = 40300]

**Correct Answer :-**

- 100 ln (100) [Option ID = 40299]

**12)** $\int_{1331}^{1728} \frac{dx}{x - x^{1/3}} =$

**[Question ID = 13791]**

1. $\frac{12}{11}\ln\frac{144}{121}$ [Option ID = 25163]
2. $\frac{11}{12}\ln\frac{144}{121}$ [Option ID = 25162]

3. $\frac{1}{2}\ln\frac{143}{120}$ [Option ID = 25164]
4. $\frac{3}{2}\ln\frac{143}{120}$ [Option ID = 25161]

**Correct Answer :-**

- $\frac{3}{2}\ln\frac{143}{120}$ [Option ID = 25161]

Topic:- DU_J19_BTECH_T5

**1) Directions for questions** Consider the equation $x^2 + 4xy + 4y^2 + 3x + 6y - 18 = 0$

The area enclosed by the curve $x^2 + 4xy + 4y^2 + 3x + 6y - 18 = 0$ on the interval $-1 \le x \le 1$ is

**[Question ID = 13799]**

1. 6 [Option ID = 25196]
2. 18 [Option ID = 25193]
3. 9 [Option ID = 25195]
4. 4 [Option ID = 25194]

**Correct Answer :-**

- 18 [Option ID = 25193]

**2) Directions for questions** Consider the equation $x^2 + 4xy + 4y^2 + 3x + 6y - 18 = 0$

**The equation represents [Question ID = 13798]**

1. An ellipse [Option ID = 25190]
2. A parabola [Option ID = 25189]
3. A pair of straight lines [Option ID = 25192]
4. A hyperbola [Option ID = 25191]

**Correct Answer :-**

- A parabola [Option ID = 25189]

Topic:- DU_J19_BTECH_T6

**1) A Ferris wheel with a radius of 10 m is rotating at a rate of one revolution every 2 minutes. How fast is a rider rising when his seat is 16 m above the lowest point of the Ferris wheel? [Question ID = 25180]**

1. $32\pi$ m/ min [Option ID = 40717]
2. $8\pi$ m/ min [Option ID = 40715]
3. $16\pi$ m/ min [Option ID = 40716]
4. $40\pi$ m/ min [Option ID = 40718]

**Correct Answer :-**

- $8\pi$ m/ min [Option ID = 40715]

**2)**

A boat is pulled into a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is 1 m higher than the bow of the boat. If the rope is pulled in at a rate of 1 m/s, how fast is the boat approaching the dock when it is 8 m from the dock?

**[Question ID = 13809]**

1. 1 m/sec [Option ID = 25233]
2. 2.2 m/ sec [Option ID = 25234]
3. $\frac{8}{\sqrt{65}}$ m/sec [Option ID = 25235]
4. $\frac{\sqrt{65}}{8}$ m/sec [Option ID = 25236]

**Correct Answer :-**

- 1 m/sec [Option ID = 25233]

**3)** $\int_0^{\pi/3} \frac{\cos 2x - \cos 2\alpha}{\sin x - \sin \alpha} d\alpha =$

**[Question ID = 13801]**

1. $-1+\frac{2\pi}{3}\cos x$ [Option ID = 25202]
2. $-1-\frac{\pi}{3}\cos x$ [Option ID = 25201]
3. $-1-\frac{2\pi}{3}\sin x$ [Option ID = 25204]
4. $1+\frac{2\pi}{3}\sin x$ [Option ID = 25203]

**Correct Answer :-**

- $-1-\frac{\pi}{3}\cos x$ [Option ID = 25201]

**4)**

A curve $y = f(x)$ satisfies the differential equation $\frac{d^2y}{dx^2} = \sqrt{1-\left(\frac{dy}{dx}\right)^2}$ and the tangent to the curve at the origin is inclined at an angle of $45^\circ$ with the positive direction of the $x$ – axis. The value of $y$ at $x = 90^\circ$ is

**[Question ID = 13807]**

1. 2 [Option ID = 25227]
2. 0 [Option ID = 25226]
3. 1/2 [Option ID = 25228]
4. 1 [Option ID = 25225]

**Correct Answer :-**

- 1 [Option ID = 25225]

**5)**

A square is inscribed in a circle with diameter 4 cms. Four smaller circles are then constructed with their diameters on each of the sides of the square. The area of the shaded region is

**[Question ID = 26028]**

1. 16 sq cms. [Option ID = 44107]
2. 4 π - 8 sq. cms [Option ID = 44110]
3. 8 sq cms. [Option ID = 44108]
4. 2 π - 8 sq. cms. [Option ID = 44109]

**Correct Answer :-**

- 16 sq cms. [Option ID = 44107]

**6)** Let $f(x) = (x + 1)(x^2 + 1)\,(x^4 + 1)\,(x^8 + 1)\,(x^{16} + 1)$. Then $f'(1) =$

**[Question ID = 25178]**

1. $2^{32}$ [Option ID = 40708]
2. $2^{31}$ +2 [Option ID = 40710]
3. 496 [Option ID = 40709]
4. 16 [Option ID = 40707]

**Correct Answer :-**

- 16 [Option ID = 40707]

**7)** If the solution curve of the differential equation $\frac{dy}{dx} = \frac{1+ax}{2y+b}$ is a circle, then the value of $a$ is

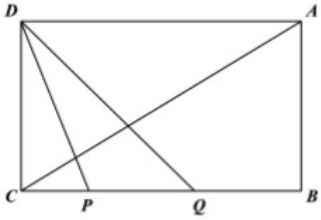
**[Question ID = 13806]**

1. 2 [Option ID = 25222]
2. -2 [Option ID = 25221]
3. -4 [Option ID = 25224]
4. 4 [Option ID = 25223]

**Correct Answer :-**

- -2 [Option ID = 25221]

**8)** In the rectangle $ABCD$, $DC : CP : PQ : QB = 1 : 3 : 1 : 9$. $\sin \angle PDQ : \sin \angle DAC =$




**[Question ID = 13811]**

1. 4:3 [Option ID = 25244]
2. 1:1 [Option ID = 25242]
3. 3:2 [Option ID = 25243]
4. 2:1 [Option ID = 25241]

**Correct Answer :-**

- 2:1 [Option ID = 25241]

**9)** The area bounded by the curves $x^2 + y^2 = 1$ and $y = |x|$ is

**[Question ID = 25179]**

1. $\pi/4$ [Option ID = 40713]
2. $\pi/8$ [Option ID = 40712]
3. $\pi/8 + ½$ [Option ID = 40714]
4. $\pi/8 - ½$ [Option ID = 40711]

**Correct Answer :-**

- $\pi/8 - ½$ [Option ID = 40711]

**10)** $$\lim_{x \to \infty} \left( \left( x - \sqrt{x^2 + x + 1} \right) \frac{\ln\left(e^x + x\right)}{x} \right) =$$

**[Question ID = 13802]**

1. -0.5 [Option ID = 25207]
2. 0.5 [Option ID = 25205]
3. does not exist [Option ID = 25208]
4. 1 [Option ID = 25206]

**Correct Answer :-**

- 0.5 [Option ID = 25205]

**11) A new social media company *Whatstotalk* currently has 10,000 users registered for a subscription price of Rs. 100. The marketing research team has found that for every rupee drop in the subsciption rate there is an increase of 125 in the number of registered users. The subscription rate for maximum revenue must be then [Question ID = 13804]**

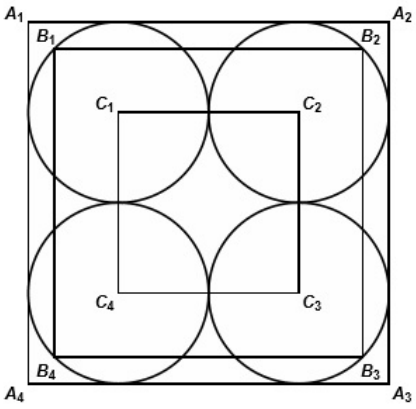
1. Rs 40 [Option ID = 25215]
2. Rs 90 [Option ID = 25213]
3. Rs 75 [Option ID = 25214]
4. Rs 60 [Option ID = 25216]

**Correct Answer :-**

- Rs 90 [Option ID = 25213]

Topic:- DU_J19_BTECH_T7

**1) Directions for Questions** : Four congruent circles with centres $C_1$, $C_2$, $C_3$ and $C_4$ touch each other externally (as shown in the figure). Three squares whose sides are parallel to each other are drawn so that the vertices of the second square $B_1$, $B_2$, $B_3$ and $B_4$ are on the circles. The sides of the first square are tangent to the circles.



$A_1A_2$, $A_2A_3$, $A_3A_4$ and $A_4A_1$, are covered with speeds of 30m/sec, 45m/sec, 18m/sec and 48m/sec respectively. Each side of the second square is covered with a speed of $36+18\sqrt{2}$ m/sec. $C_1C_2$, $C_2C_3$ and $C_3C_4$ are covered with a speed of 72m/sec where as $C_4C_1$, is covered with a speed of 36m/ sec. Three objects $A$, $B$ and $C$ start moving in the clockwise direction from points $A_1$, $B_1$ and $C_1$ simultaneously. When $B$ reaches its starting point for the first time, then the position of $A$ and $C$ are

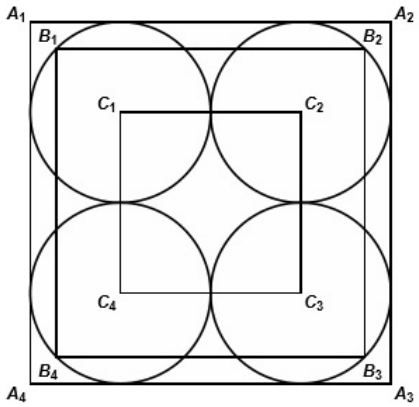
**[Question ID = 13814]**

1. $A_3$ and $C_4$ respectively. [Option ID = 25254]
2. $A_4$ and $C_3$ respectively. [Option ID = 25255]
3. $A_3$ and $C_1$ respectively. [Option ID = 25256]
4. $A_1$ and $C_1$ respectively. [Option ID = 25253]

**Correct Answer :-**

- $A_1$ and $C_1$ respectively. [Option ID = 25253]

**2) Directions for Questions** : Four congruent circles with centres $C_1$, $C_2$, $C_3$ and $C_4$ touch each other externally (as shown in the figure). Three squares whose sides are parallel to each other are drawn so that the vertices of the second square $B_1$, $B_2$, $B_3$ and $B_4$ are on the circles. The sides of the first square are tangent to the circles.




**If the side of the largest square is a, of the second square is b and of the smallest square is c, then**

**[Question ID = 13813]**

1. $ac = 4b^2$ [Option ID = 25252]
2. $b(a - b) = 2c$ [Option ID = 25249]
3. $2b(a - b) = c^2$ [Option ID = 25251]
4. $ac = b^2$ [Option ID = 25250]

**Correct Answer :-**

- $b(a - b) = 2c$ [Option ID = 25249]

**3)** All complex numbers $z = x + iy$ satisfying $|z - 2i| + |z + 2i| = 6$ form an ellipse of the form $Ax^2 + By^2 = C$. The value of $A + B + C$ is

**[Question ID = 13815]**

1. 68 [Option ID = 25260]
2. 90 [Option ID = 25259]
3. 14 [Option ID = 25257]
4. 59 [Option ID = 25258]

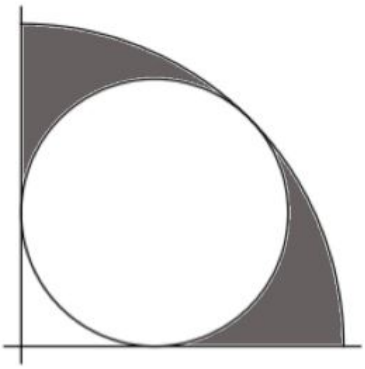
**Correct Answer :-**

- 14 [Option ID = 25257]

Topic:- DU_J19_BTECH_T8

**1)**

The area of the shaded region is



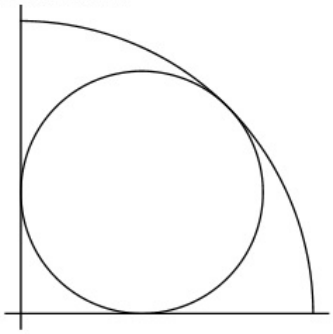
**[Question ID = 13818]**

1. $16\pi - 64(\sqrt{2}-1)^2 - 48\pi(\sqrt{2}-1)^2$ [Option ID = 25271]
2. $16\pi - 48\pi(\sqrt{2}-1)^2$ [Option ID = 25270]
3. $16\pi - 64\pi(\sqrt{2}-1)^2$ [Option ID = 25269]
4. $16\pi - 64(\sqrt{2}-1)^2 - 64\pi(\sqrt{2}-1)^2$ [Option ID = 25272]

**Correct Answer :-**

- $16\pi - 64\pi(\sqrt{2}-1)^2$ [Option ID = 25269]

**2)** **Directions for questions** : A circle of largest possible radius is inscribed in the quadrant of a circle of radius 8 cms.



**The radius of the inscribed circle is [Question ID = 13817]**

1. $\frac{4\sqrt{2}}{\sqrt{2}+1}$ [Option ID = 25268]
2. $8\left(\sqrt{2}-1\right)$ [Option ID = 25266]
3. $\frac{8}{\sqrt{2}+1}$ [Option ID = 25267]
4. $\frac{8\sqrt{2}}{\sqrt{2}+1}$ [Option ID = 25265]

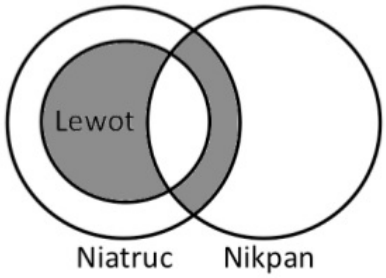
**Correct Answer :-**

- $\frac{8\sqrt{2}}{\sqrt{2}+1}$ [Option ID = 25265]

Topic:- DU_J19_BTECH_T9

**1)**

Which of the following is not true for the Venn Diagram?



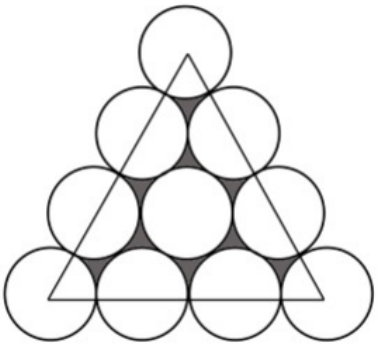

**[Question ID = 13826]**

1. Part of Niatruc and Nikpan is not in the shaded part. [Option ID = 25304]
2. Part of the shaded region is only in Nikpan. [Option ID = 25302]
3. Part of the shaded region is in Lewot but not in Niatruc. [Option ID = 25301]
4. Part of the shaded region is in Niatruc and Nikpan but not in Lewot. [Option ID = 25303]

**Correct Answer :-**

- Part of the shaded region is in Lewot but not in Niatruc. [Option ID = 25301]

**2)** 10 circles of equal radii are arranged as shown in the figure.



If the area of the shaded region is $36\sqrt{3}-18\pi$, then the area of the triangle formed by joining the centers of the three corner circles is

**[Question ID = 13822]**

1. $16\sqrt{3}$ [Option ID = 25285]
2. $18\sqrt{3}$ [Option ID = 25288]
3. $36\sqrt{3}$ [Option ID = 25287]
4. $12\sqrt{3}$ [Option ID = 25286]

**Correct Answer :-**

- $16\sqrt{3}$ [Option ID = 25285]

**3)** A machine is showing the number 0. It has 4 buttons:


If you press a button, the number that the machine is showing will be changed by the operation on the button. At least how many times do you need to press the buttons in order to make 2018?

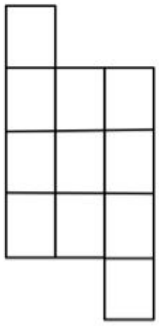
**[Question ID = 13825]**

1. 22 [Option ID = 25297]
2. 11 [Option ID = 25300]
3. 13 [Option ID = 25299]
4. 17 [Option ID = 25298]

**Correct Answer :-**

- 22 [Option ID = 25297]

**4)** The number of rectangles in the given figure is



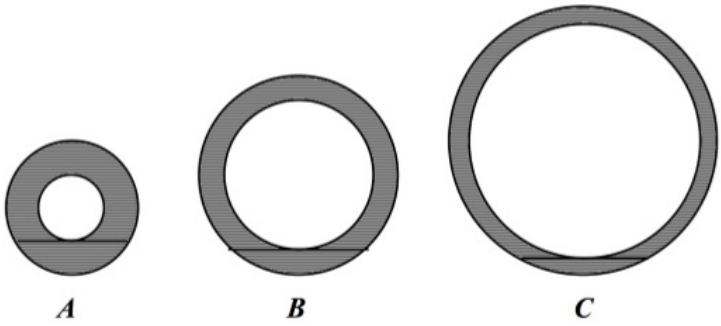
**[Question ID = 13827]**

1. 44 [Option ID = 25308]
2. 42 [Option ID = 25307]
3. 41 [Option ID = 25306]
4. 40 [Option ID = 25305]

**Correct Answer :-**

- 40 [Option ID = 25305]

**5)** Three annuli each have a chord of length 10 cms that is tangent to the inner circle.




**[Question ID = 13820]**

1. Annulus C has the smallest area. [Option ID = 25279]
2. All have equal areas. [Option ID = 25280]
3. Annulus A has the smallest area [Option ID = 25277]
4. Annulus B has the smallest area [Option ID = 25278]

**Correct Answer :-**

- Annulus A has the smallest area [Option ID = 25277]

**6)** In the figure each of the smaller square is of 1 unit. The shaded area is obtained from arc of circles. The area of the shaded region is

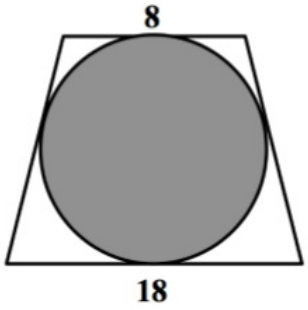
**[Question ID = 13823]**

1. 3 π- 9 square units [Option ID = 25289]
2. π - 1 square units [Option ID = 25292]
3. 2 π - 4 square units C [Option ID = 25290]
4. 8 $\pi$ - 9 square units [Option ID = 25291]

**Correct Answer :-**

- 3 π- 9 square units [Option ID = 25289]

**7)** A circle is inscribed in an isosceles trapezium with parallel sides equal to 8 units and 18 units. The radius of the circle is



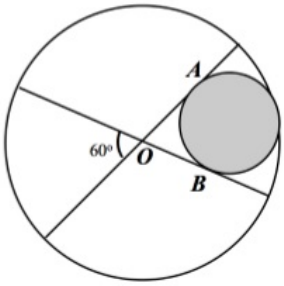

**[Question ID = 13821]**

1. 13 units [Option ID = 25284]
2. 12 units [Option ID = 25281]
3. 6 units [Option ID = 25282]
4. 10 units [Option ID = 25283]

**Correct Answer :-**

- 12 units [Option ID = 25281]

**8)** Two diameters of a circle with centre $O$ intersect at $60^{\circ}$. A smaller circle is inscribed so that it is tangent to the two diameters and the circle (as in the figure).




**If the diameter of the bigger circle is 18 units, then the radius of the smaller circle is**

**[Question ID = 13824]**

1. 3 units [Option ID = 25296]
2. 9 units [Option ID = 25294]
3. 6 units [Option ID = 25293]
4. $3\sqrt{3}$ units [Option ID = 25295]

**Correct Answer :-**

- 6 units [Option ID = 25293]

Topic:- DU_J19_BTECH_T10

**1) If you can take one or two steps at a time, then the number of ways you can climb a set of 7 stairs is [Question ID = 13833]**

1. 22 [Option ID = 25329]
2. 18 [Option ID = 25332]
3. 20 [Option ID = 25331]
4. 21 [Option ID = 25330]

**Correct Answer :-**

- 22 [Option ID = 25329]

**2)**

**Directions for questions** : A countdown number is a positive integer where the sum of each pair of consecutive digits forms part of a countdown. For example 241302 is a countdown number because

$\boxed{2\ 4}\ 1\ 3\ 0\ 2 \rightarrow 2 + 4 = \mathbf{6}$
$2\ \boxed{4\ 1}\ 3\ 0\ 2 \rightarrow 4 + 1 = \mathbf{5}$
$2\ 4\ \boxed{1\ 3}\ 0\ 2 \rightarrow 1 + 3 = \mathbf{4}$
$2\ 4\ 1\ \boxed{3\ 0}\ 2 \rightarrow 3 + 0 = \mathbf{3}$
$2\ 4\ 1\ 3\ \boxed{0\ 2} \rightarrow 0 + 2 = \mathbf{2}$

$p\ q\ r\ s\ t\ u$ is the largest 6-digit countdown number with distinct digits.

**Which of the following statement is true?**

**[Question ID = 13842]**

1. $q^2 = s^2 + u^2$ [Option ID = 25367]
2. $p$ is a multiple of $q$ [Option ID = 25368]
3. $r^2 = 10q + u$ [Option ID = 25365]
4. $p = q + u$ [Option ID = 25366]

**Correct Answer :-**

- $r^2 = 10q + u$ [Option ID = 25365]

**3)** **Directions for questions** : A countdown number is a positive integer where the sum of each pair of consecutive digits forms part of a countdown. For example 241302 is a countdown number because

$\boxed{2\ 4}\ 1\ 3\ 0\ 2 \rightarrow 2 + 4 = \mathbf{6}$
$2\ \boxed{4\ 1}\ 3\ 0\ 2 \rightarrow 4 + 1 = \mathbf{5}$
$2\ 4\ \boxed{1\ 3}\ 0\ 2 \rightarrow 1 + 3 = \mathbf{4}$
$2\ 4\ 1\ \boxed{3\ 0}\ 2 \rightarrow 3 + 0 = \mathbf{3}$
$2\ 4\ 1\ 3\ \boxed{0\ 2} \rightarrow 0 + 2 = \mathbf{2}$

$p\ q\ r\ s\ t\ u$ is the largest 6-digit countdown number with distinct digits.

***r – u =***

**[Question ID = 13840]**

1. 1 [Option ID = 25360]
2. 5 [Option ID = 25357]
3. 4 [Option ID = 25358]
4. 2 [Option ID = 25359]

**Correct Answer :-**

- 5 [Option ID = 25357]

**4)**

**Directions for questions** : A countdown number is a positive integer where the sum of each pair of consecutive digits forms part of a countdown. For example 241302 is a countdown number because

**2 4** 1 3 0 2 → 2 + 4 = **6**
2 **4 1** 3 0 2 → 4 + 1 = **5**
2 4 **1 3** 0 2 → 1 + 3 = **4**
2 4 1 **3 0** 2 → 3 + 0 = **3**
2 4 1 3 **0 2** → 0 + 2 = **2**

*p q r s t u* is the largest 6-digit countdown number with distinct digits.

***$q^2 + r^2$ =***

**[Question ID = 13841]**

1. 80 [Option ID = 25363]
2. 100 [Option ID = 25364]
3. 60 [Option ID = 25362]
4. 40 [Option ID = 25361]

**Correct Answer :-**

- 40 [Option ID = 25361]

**5)** **Directions for questions** : A countdown number is a positive integer where the sum of each pair of consecutive digits forms part of a countdown. For example 241302 is a countdown number because

**2 4** 1 3 0 2 → 2 + 4 = **6**
2 **4 1** 3 0 2 → 4 + 1 = **5**
2 4 **1 3** 0 2 → 1 + 3 = **4**
2 4 1 **3 0** 2 → 3 + 0 = **3**
2 4 1 3 **0 2** → 0 + 2 = **2**

*p q r s t u* is the largest 6-digit countdown number with distinct digits.

***q + s + u =***

**[Question ID = 13839]**

1. 15 [Option ID = 25354]
2. 3 [Option ID = 25353]
3. 9 [Option ID = 25356]
4. 6 [Option ID = 25355]

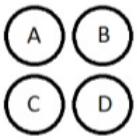
**Correct Answer :-**

- 3 [Option ID = 25353]

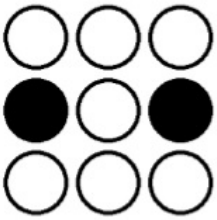
Topic:- DU_J19_BTECH_T11

**1)**

When clicked, a bulb and its diagonally adjacent bulbs will turn on (if it's off), or turn off (if it's on). White circles indicate lighted bulbs. For example, in the diagram below, when A is clicked, A and D will turn off.




What is the minimum number of clicks required to switch on all the bulbs in the diagram below?



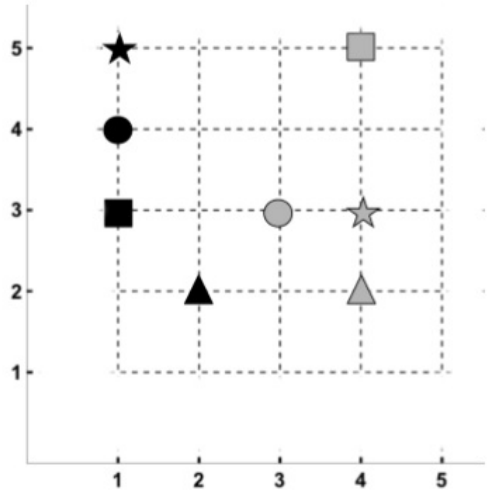
**[Question ID = 13848]**

1. 2 [Option ID = 25389]
2. 5 [Option ID = 25392]
3. 3 [Option ID = 25390]
4. 4 [Option ID = 25391]

**Correct Answer :-**

- 2 [Option ID = 25389]

**2) Directions for questions** : A neighbourhood has 25 houses located at the grid points of a 5 x 5 mesh. Mr Star's, Mr Circle's, Mr Square's and Mr Triangle's houses are located at (4, 3), (3, 3), (4, 5) and (4, 2) respectively on the mesh (as in the figure). They all volunteer to distribute pamphlets for an event being organised in their locality. Each one of them can travel on the horizontal or vertical path connecting the houses. In order to have an optimal path, each house is covered exactly once by any of the four volunteers. The points marked in black are the houses where they end. Assume that they cover their own home and the house where they end.




**Number of houses covered by Mr Square is [Question ID = 13847]**

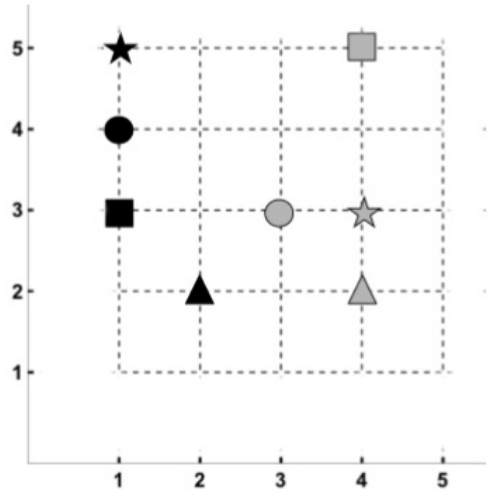
1. 6 [Option ID = 25388]
2. 12 [Option ID = 25387]
3. 3 [Option ID = 25385]
4. 4 [Option ID = 25386]

**Correct Answer :-**

- 3 [Option ID = 25385]

**3)**

**Directions for questions** : A neighbourhood has 25 houses located at the grid points of a 5 x 5 mesh. Mr Star's, Mr Circle's, Mr Square's and Mr Triangle's houses are located at (4, 3), (3, 3), (4, 5) and (4, 2) respectively on the mesh (as in the figure). They all volunteer to distribute pamphlets for an event being organised in their locality. Each one of them can travel on the horizontal or vertical path connecting the houses. In order to have an optimal path, each house is covered exactly once by any of the four volunteers. The points marked in black are the houses where they end. Assume that they cover their own home and the house where they end.



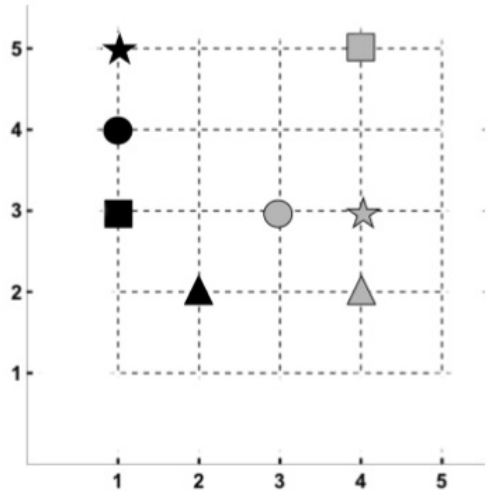

**Odd number of houses are covered by [Question ID = 13846]**

1. Mr. Triangle [Option ID = 25382]
2. Mr Star [Option ID = 25381]
3. Mr. Circle [Option ID = 25384]
4. Mr. Square [Option ID = 25383]

**Correct Answer :-**

- Mr Star [Option ID = 25381]

**4)** **Directions for questions** : A neighbourhood has 25 houses located at the grid points of a 5 x 5 mesh. Mr Star's, Mr Circle's, Mr Square's and Mr Triangle's houses are located at (4, 3), (3, 3), (4, 5) and (4, 2) respectively on the mesh (as in the figure). They all volunteer to distribute pamphlets for an event being organised in their locality. Each one of them can travel on the horizontal or vertical path connecting the houses. In order to have an optimal path, each house is covered exactly once by any of the four volunteers. The points marked in black are the houses where they end. Assume that they cover their own home and the house where they end.




**The maximum number of houses are covered by [Question ID = 13845]**

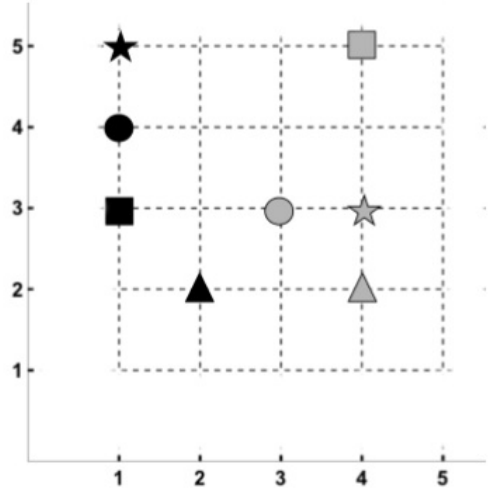
1. Mr. Triangle [Option ID = 25378]
2. Mr Star [Option ID = 25377]

3. Mr. Circle [Option ID = 25380]
4. Mr. Square [Option ID = 25379]

**Correct Answer :-**

- Mr Star [Option ID = 25377]

**5)** **Directions for questions** : A neighbourhood has 25 houses located at the grid points of a 5 x 5 mesh. Mr Star's, Mr Circle's, Mr Square's and Mr Triangle's houses are located at (4, 3), (3, 3), (4, 5) and (4, 2) respectively on the mesh (as in the figure). They all volunteer to distribute pamphlets for an event being organised in their locality. Each one of them can travel on the horizontal or vertical path connecting the houses. In order to have an optimal path, each house is covered exactly once by any of the four volunteers. The points marked in black are the houses where they end. Assume that they cover their own home and the house where they end.




**The person who distributes the pamphlet to the house located at (3, 4) is [Question ID = 13844]**

1. Mr. Triangle [Option ID = 25374]
2. Mr Star [Option ID = 25373]
3. Mr. Circle [Option ID = 25376]
4. Mr. Square [Option ID = 25375]

**Correct Answer :-**

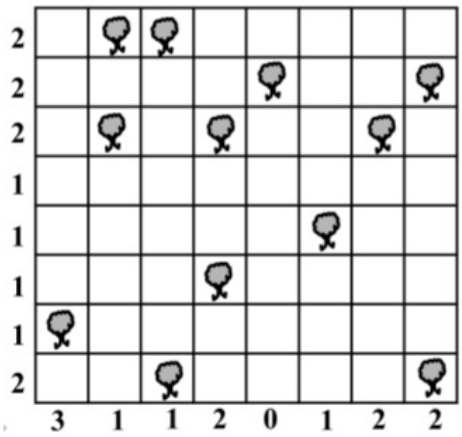
- Mr Star [Option ID = 25373]

Topic:- DU_J19_BTECH_T12

**1)**

**Directions for questions** : An 8 x 8 forest area is divided into 1 x 1 square units. Twelve group of campers plan to visit the forest area and set up their camps as per the following rules:

- Each camp is attached to one tree (so there are as many camps as there are trees).
- The numbers across the bottom and the left side tell you how many camps are in the respective row or column.
- A camp can only be set up horizontally or vertically adjacent to a tree.
- Camps are never adjacent to each other, **neither vertically, horizontally, nor diagonally**.
- A tree might be next to two camps, but it only caters to one camp.
- $(a, b)$ represents the square in the $a^{th}$ row from the top and $b^{th}$ row from the left.




**The two camps in the topmost row are located at [Question ID = 13850]**

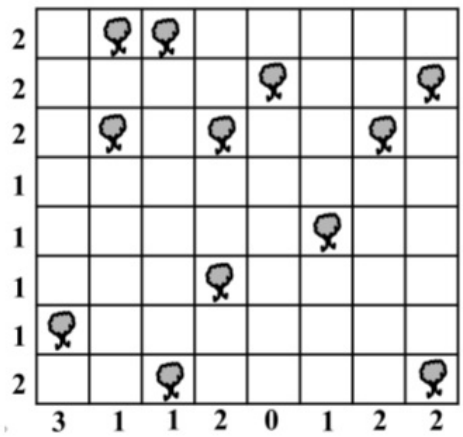
1. (1, 1) and (1, 8) [Option ID = 25400]
2. (1, 1) and (1, 4) [Option ID = 25397]
3. (1, 4) and (1, 8) [Option ID = 25398]
4. (1, 4) and (1, 5). [Option ID = 25399]

**Correct Answer :-**

- (1, 1) and (1, 4) [Option ID = 25397]

2) **Directions for questions** : An 8 x 8 forest area is divided into 1 x 1 square units. Twelve group of campers plan to visit the forest area and set up their camps as per the following rules:

- Each camp is attached to one tree (so there are as many camps as there are trees).
- The numbers across the bottom and the left side tell you how many camps are in the respective row or column.
- A camp can only be set up horizontally or vertically adjacent to a tree.
- Camps are never adjacent to each other, **neither vertically, horizontally, nor diagonally**.
- A tree might be next to two camps, but it only caters to one camp.
- $(a, b)$ represents the square in the $a^{th}$ row from the top and $b^{th}$ row from the left.



**The square patch where there is no camp is [Question ID = 13851]**

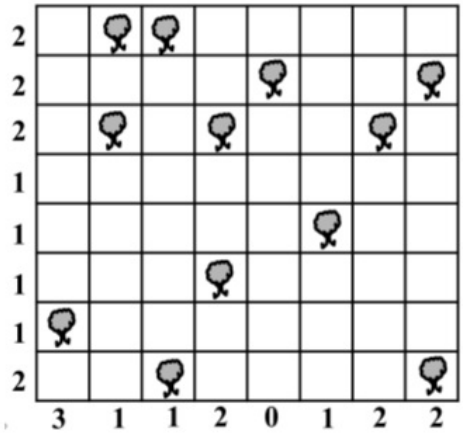
1. (8, 2) [Option ID = 25404]
2. (3, 8) [Option ID = 25403]
3. (3, 1) [Option ID = 25402]
4. (3, 3) [Option ID = 25401]

**Correct Answer :-**

- (3, 3) [Option ID = 25401]

**3) Directions for questions :** An 8 x 8 forest area is divided into 1 x 1 square units. Twelve group of campers plan to visit the forest area and set up their camps as per the following rules:

- Each camp is attached to one tree (so there are as many camps as there are trees).
- The numbers across the bottom and the left side tell you how many camps are in the respective row or column.
- A camp can only be set up horizontally or vertically adjacent to a tree.
- Camps are never adjacent to each other, **neither vertically, horizontally, nor diagonally**.
- A tree might be next to two camps, but it only caters to one camp.
- $(a, b)$ represents the square in the $a^{th}$ row from the top and $b^{th}$ row from the left.




**The total number of camps in the two main diagonals of the forest area are [Question ID = 13853]**

1. 2 [Option ID = 25410]
2. 1 [Option ID = 25409]
3. 3 [Option ID = 25411]
4. 4 [Option ID = 25412]

**Correct Answer :-**

- 1 [Option ID = 25409]

**4)**

**Directions for questions** : An 8 x 8 forest area is divided into 1 x 1 square units. Twelve group of campers plan to visit the forest area and set up their camps as per the following rules:

- Each camp is attached to one tree (so there are as many camps as there are trees).
- The numbers across the bottom and the left side tell you how many camps are in the respective row or column.
- A camp can only be set up horizontally or vertically adjacent to a tree.
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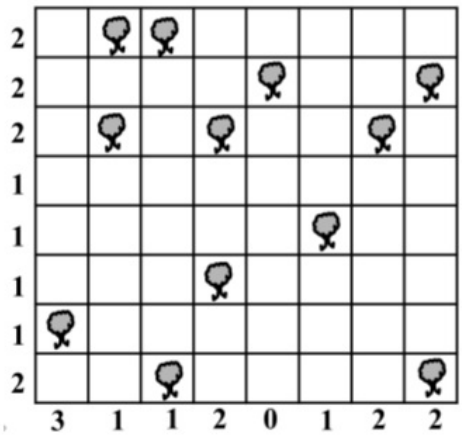
- $(a, b)$ represents the square in the $a^{th}$ row from the top and $b^{th}$ row from the left.




**The camp associated with the tree in (3, 2) is at [Question ID = 13852]**

1. (4, 2) [Option ID = 25408]
2. (2, 2) [Option ID = 25406]
3. (3, 3) [Option ID = 25407]
4. (3, 1) [Option ID = 25405]

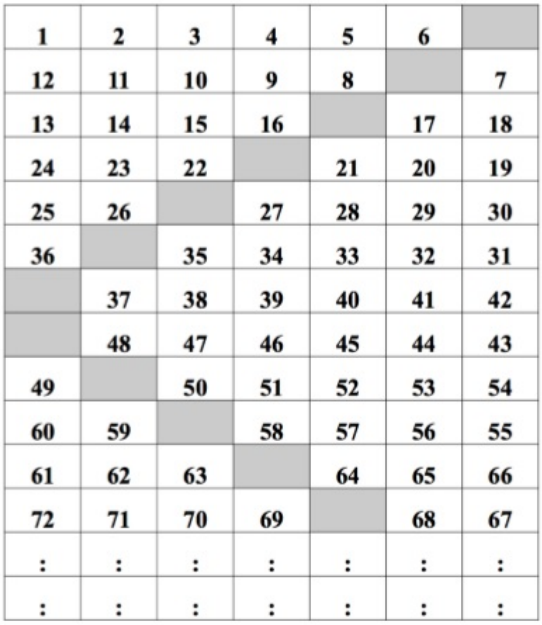
**Correct Answer :-**

- (3, 1) [Option ID = 25405]

Topic:- DU_J19_BTECH_T13

**1)**

**Directions for questions** : An $n$ x 7 grid is filled with consecutive integers 1, 2, 3, … as given in the figure.



| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | |
| 12 | 11 | 10 | 9 | 8 | | 7 |
| 13 | 14 | 15 | 16 | | 17 | 18 |
| 24 | 23 | 22 | | 21 | 20 | 19 |
| 25 | 26 | | 27 | 28 | 29 | 30 |
| 36 | | 35 | 34 | 33 | 32 | 31 |
| | 37 | 38 | 39 | 40 | 41 | 42 |
| | 48 | 47 | 46 | 45 | 44 | 43 |
| 49 | | 50 | 51 | 52 | 53 | 54 |
| 60 | 59 | | 58 | 57 | 56 | 55 |
| 61 | 62 | 63 | | 64 | 65 | 66 |
| 72 | 71 | 70 | 69 | | 68 | 67 |
| : | : | : | : | : | : | : |
| : | : | : | : | : | : | : |

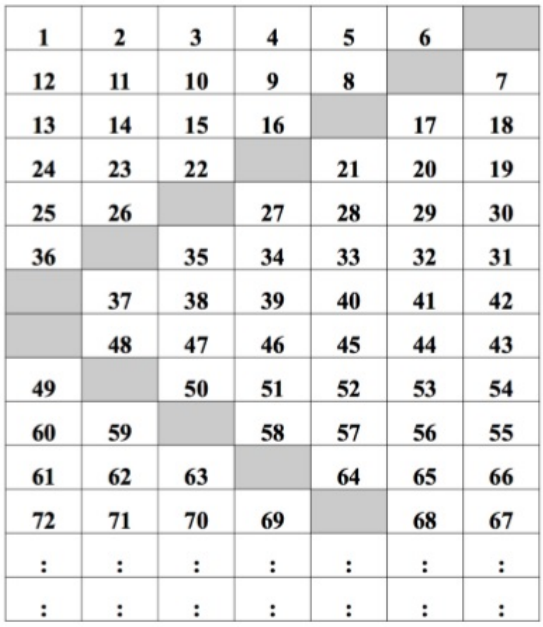
**The number 1264 occurs in which column from the left? [Question ID = 13856]**

1. Sixth column [Option ID = 25421]
2. Second column [Option ID = 25423]
3. Fifth column [Option ID = 25422]
4. Fourth column [Option ID = 25424]

**Correct Answer :-**

- Sixth column [Option ID = 25421]

**2)** **Directions for questions** : An $n$ x 7 grid is filled with consecutive integers 1, 2, 3, … as given in the figure.



| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | |
| 12 | 11 | 10 | 9 | 8 | | 7 |
| 13 | 14 | 15 | 16 | | 17 | 18 |
| 24 | 23 | 22 | | 21 | 20 | 19 |
| 25 | 26 | | 27 | 28 | 29 | 30 |
| 36 | | 35 | 34 | 33 | 32 | 31 |
| | 37 | 38 | 39 | 40 | 41 | 42 |
| | 48 | 47 | 46 | 45 | 44 | 43 |
| 49 | | 50 | 51 | 52 | 53 | 54 |
| 60 | 59 | | 58 | 57 | 56 | 55 |
| 61 | 62 | 63 | | 64 | 65 | 66 |
| 72 | 71 | 70 | 69 | | 68 | 67 |
| : | : | : | : | : | : | : |
| : | : | : | : | : | : | : |

**The row that has a blank space in its fourth column from the left is [Question ID = 13857]**

1. 272 [Option ID = 25427]
2. 270 [Option ID = 25425]
3. 273 [Option ID = 25428]
4. 271 [Option ID = 25426]

**Correct Answer :-**

- 270 [Option ID = 25425]

**3)** **Directions for questions** : An $n$ x 7 grid is filled with consecutive integers 1, 2, 3, … as given in the figure.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | |
| 12 | 11 | 10 | 9 | 8 | | 7 |
| 13 | 14 | 15 | 16 | | 17 | 18 |
| 24 | 23 | 22 | | 21 | 20 | 19 |
| 25 | 26 | | 27 | 28 | 29 | 30 |
| 36 | | 35 | 34 | 33 | 32 | 31 |
| | 37 | 38 | 39 | 40 | 41 | 42 |
| | 48 | 47 | 46 | 45 | 44 | 43 |
| 49 | | 50 | 51 | 52 | 53 | 54 |
| 60 | 59 | | 58 | 57 | 56 | 55 |
| 61 | 62 | 63 | | 64 | 65 | 66 |
| 72 | 71 | 70 | 69 | | 68 | 67 |
| : | : | : | : | : | : | : |
| : | : | : | : | : | : | : |

**After how many numbers does the pattern repeat itself? [Question ID = 13855]**

1. 36 [Option ID = 25419]
2. 42 [Option ID = 25420]
3. 84 [Option ID = 25418]
4. 78 [Option ID = 25417]

**Correct Answer :-**

- 78 [Option ID = 25417]