DU BTech IT N Mathematical Innovations

Topic:- DU_J18_BTECH_Topic01

1) the number of ways in which an examiner can assign 30 marks to 8 questions, giving not less than 2 marks to any question, is [Question ID = 6603]

1. $^{21}C_9$ [Option ID = 26405]
2. $^{21}C_{10}$ [Option ID = 26406]
3. $^{21}C_8$ [Option ID = 26404]
4. $^{21}C_7$ [Option ID = 26403]

Correct Answer :-

- $^{21}C_7$ [Option ID = 26403]

2) A circle passes through the points (-1, -1) and (3, 7). Which of the following cannot also be a point on the circle? [Question ID = 6560]

1. (0, 1) [Option ID = 26232]
2. (1, 1) [Option ID = 26234]
3. (1, 0) [Option ID = 26231]
4. (0, 0) [Option ID = 26233]

Correct Answer :-

- (0, 1) [Option ID = 26232]

3) A circle is tangent to both negative x axis and positive y axis and passes through the point (-4, 6). The sum of the radii of all such posiible circles is [Question ID = 6565]

1. 24 [Option ID = 26252]
2. 12 [Option ID = 26254]
3. 20 [Option ID = 26253]
4. 10 [Option ID = 26251]

Correct Answer :-

- 20 [Option ID = 26253]

4) A circle is inscribed in an ellipse. If 'P' is the probability that a point within the ellipse chosen at random lies outside the circle, then the eccentricity of the ellipse is [Question ID = 6583]

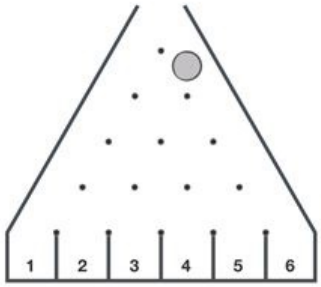
1. $\sqrt{1-P^2}$ [Option ID = 26324]
2. $\sqrt{1-P}$ [Option ID = 26323]
3. $\sqrt{(1+P)^2-1}$ [Option ID = 26326]
4. $\sqrt{1-(1-P)^2}$ [Option ID = 26325]

Correct Answer :-

- $\sqrt{1-(1-P)^2}$ [Option ID = 26325]

5) The figure shows a peg board used for a game show. Whenever the gray chip falls onto a peg, it has an equal chance to bounce either to the left or the right peg right.

If the chip is dropped from the right peg on the second row (as shown), the slot it would most likely fall to is



[Question ID = 6576]

1. 6 [Option ID = 26298]
2. 1 [Option ID = 26295]
3. 3 [Option ID = 26296]
4. 4 [Option ID = 26297]

Correct Answer :-

- 4 [Option ID = 26297]

6) A man takes a forward step with probability 0.8 and backward step with probability 0.2. What is the probability that at the end of 9 steps he is exactly three steps away from the starting point; [Question ID = 6585]

1. $\frac{5377}{5^7}$ [Option ID = 26332]
2. $\frac{5354}{5^6}$ [Option ID = 26334]
3. $\frac{5376}{5^7}$ [Option ID = 26333]
4. $\frac{69888}{5^8}$ [Option ID = 26331]

Correct Answer :-

- $\frac{69888}{5^8}$ [Option ID = 26331]

7) In each of the following questions a part of the figure is missing. Find the right figure from the options to fit the missing pieces.

[Question ID = 6619]

1.  [Option ID = 26468]
2.  [Option ID = 26470]
3.  [Option ID = 26469]

4.  [Option ID = 26467]

Correct Answer :-

-  [Option ID = 26467]

8) In each of the following questions a part of the figure is missing. Find the right figure from the options to fit the missing pieces.

[Question ID = 6618]

1.  [Option ID = 26464]
2.  [Option ID = 26465]
3.  [Option ID = 26463]
4.  [Option ID = 26466]

Correct Answer :-

-  [Option ID = 26465]

9) Let $f(x)=ax^2+bx+c$ and $f(-1)<1, f(1)>-1, f(3)<-4$ and $a\neq 0$, then

[Question ID = 7155]

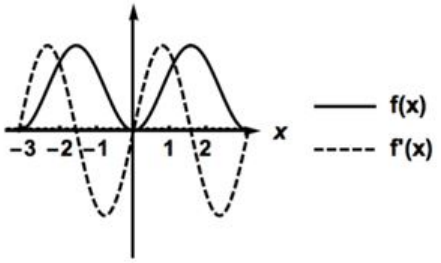
1. $a > 0$ [Option ID = 28611]
2. $a < 0$ [Option ID = 28612]
3. $a=1/2$ [Option ID = 28614]
4. sign of a cannot be determined [Option ID = 28613]

Correct Answer :-

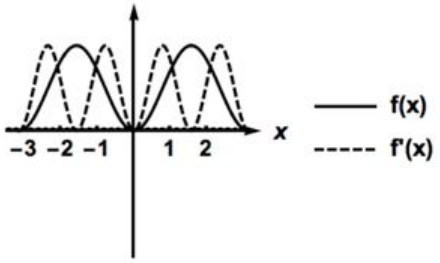
- $a < 0$ [Option ID = 28612]

10)

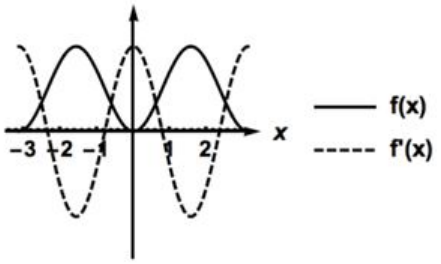
The following graphs represent the function $f(x)$ (in bold line) and its derivative $f'(x)$ (in dotted lines). The graph that shows the correct relation is



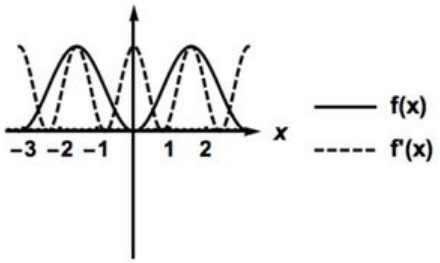
GRAPH I



GRAPH II



GRAPH III



GRAPH IV

[Question ID = 6553]

1. GRAPH III [Option ID = 26205]
2. GRAPH I [Option ID = 26203]
3. GRAPH II [Option ID = 26204]
4. GRAPH IV [Option ID = 26206]

Correct Answer :-

- GRAPH I [Option ID = 26203]

11) Two points are taken at random on the given straight line segment of length 'a'. The probability for the distance between them to exceed a given length 'c' is, where $0 < c < a$;

[Question ID = 6579]

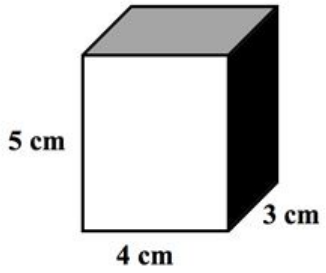
1. $\left(1-\frac{a^2}{c^2}\right)$ [Option ID = 26310]
2. $\left(1-\frac{c^2}{a^2}\right)$ [Option ID = 26309]
3. $\left(1-\frac{c}{a}\right)^2$ [Option ID = 26307]
4. $\left(1-\frac{a}{c}\right)^2$ [Option ID = 26308]

Correct Answer :-

- $\left(1-\frac{c}{a}\right)^2$ [Option ID = 26307]

12)

A block has edge lengths of 3 cm, 4 cm, and 5 cm (as shown), where opposite faces have the same color. If the block is rolled, which color is most likely to come up on top? (Assume the block's mass is evenly distributed.)



[Question ID = 6617]

1. Each colour is equally likely [Option ID = 26462]
2. Black [Option ID = 26461]
3. Gray [Option ID = 26460]
4. White [Option ID = 26459]

Correct Answer :-

- White [Option ID = 26459]

13) In a computer graphics program, the coordinates of each point of the image given below is transformed using the matrix $\begin{bmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$ followed by the transformation matrix $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$. The transformed image will be

IMAGE

IMAGE I

IMAGE II

IMAGE III

IMAGE IV

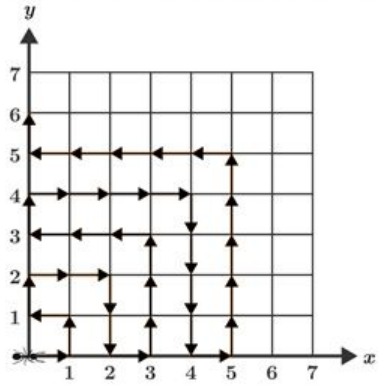
[Question ID = 6566]

1. IMAGE II [Option ID = 26256]
2. IMAGE I [Option ID = 26255]
3. IMAGE IV [Option ID = 26258]
4. IMAGE III [Option ID = 26257]

Correct Answer :-

- IMAGE II [Option ID = 26256]

14) An ant begins from (0, 0) in the xy-coordinate plane. It then travels to each point with non-negative integer coordinates following the pattern shown below. The ant stops moving after 2018 units, to its final position (x, y). The value of $x + y$ is



[Question ID = 6611]

1. 44 [Option ID = 26435]
2. 50 [Option ID = 26436]
3. 45 [Option ID = 26438]
4. 25 [Option ID = 26437]

Correct Answer :-

- 50 [Option ID = 26436]

15) If $a>0$ and the equation $\left|z-a^2\right|+\left|z-2a\right|=3$ represents an ellipse, then a lies in the interval

[Question ID = 6607]

1. $(1,\sqrt{3})$ [Option ID = 26422]
2. $(1,3)$ [Option ID = 26419]
3. $(\sqrt{2},\sqrt{3})$ [Option ID = 26420]
4. $(0,3)$ [Option ID = 26421]

Correct Answer :-

- $(0,3)$ [Option ID = 26421]

16) Let α_1 and α_2 be roots of the equation $x^2-x+p=0$ and let α_3, α_4 be the roots of the equation $x^2-4x+q=0$. If $\alpha_1,\alpha_2,\alpha_3,\alpha_4$ are in geometric progression. Then the integral values of p and q respectively are

[Question ID = 6591]

1. -6, -32 [Option ID = 26358]
2. -6, 3 [Option ID = 26357]
3. -2, -3 [Option ID = 26356]
4. -2, -32 [Option ID = 26355]

Correct Answer :-

- -2, -32 [Option ID = 26355]

17)

If $f(x)$ is a polynomial satisfying $\lim_{x\to\infty}\frac{xf(x)}{1+x^5}=1, f(0)=0, f(1)=2, f(2)=4, f(3)=6$, then $f(4)=$

[Question ID = 6538]

1. 32 [Option ID = 26145]
2. 0 [Option ID = 26146]
3. 8 [Option ID = 26144]
4. 4 [Option ID = 26143]

Correct Answer :-

- 32 [Option ID = 26145]

18)

Consider the equation $|x+1|^{\log_{(x+1)}(3+2x-x^2)}=(x-3)|x|$

The equation has

[Question ID = 6589]

1. unique solution [Option ID = 26347]
2. no solution [Option ID = 26349]
3. more than two solutions [Option ID = 26350]
4. Exactly two solutions [Option ID = 26348]

Correct Answer :-

- no solution [Option ID = 26349]

19) The sum of the squares of three distinct real numbers which are in strictly increasing GP is S^2. their sum is αS.

If $S=10\sqrt{3}$, then the greatest value of the middle term is

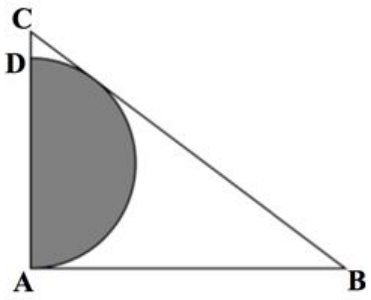
[Question ID = 6599]

1. 12 [Option ID = 26389]
2. 5 [Option ID = 26387]
3. 10 [Option ID = 26388]
4. 8 [Option ID = 26390]

Correct Answer :-

- 10 [Option ID = 26388]

20) Given that $AB = 12$, $CD = 1$ and the semicircle is tangent to BC, the radius of the semicircle is



[Question ID = 6567]

1. 6 [Option ID = 26259]
2. 9 [Option ID = 26261]

3. 8 [Option ID = 26260]
4. 4 [Option ID = 26262]

Correct Answer :-

- 4 [Option ID = 26262]

21) The number of solutions of $z^3 + \bar{z} = 0$ is

[Question ID = 6606]

1. 2 [Option ID = 26416]
2. 5 [Option ID = 26418]
3. 3 [Option ID = 26417]
4. 4 [Option ID = 26415]

Correct Answer :-

- 5 [Option ID = 26418]

22) Given $f(x)=\begin{cases} 1-|x|, & |x|\le 1 \\ |x|-1 & |x|>1 \end{cases}$ and $g(x) = f(x-1) + f(x+1)$, the value of the integral $\int_{-3}^{5} g(x)\,dx$ is

[Question ID = 6554]

1. 2 [Option ID = 26209]
2. 24 [Option ID = 26207]
3. 8 [Option ID = 26208]
4. 40 [Option ID = 26210]

Correct Answer :-

- 24 [Option ID = 26207]

23) Let $f\colon [-1, 0] \to \boldsymbol{R}$ be a function differentiable within the domain such that $\int_{-1}^{0} (f(x))^2\,dx = 10$, $f(-1) = 2$.

Then the value of the integral $\int_{-1}^{0} xf'(x)f(x)\,dx$ is

[Question ID = 6557]

1. – 3 [Option ID = 26222]
2. – 6 [Option ID = 26221]
3. – 14 [Option ID = 26219]
4. – 7 [Option ID = 26220]

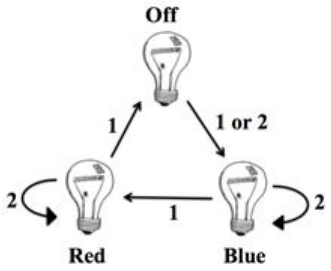
Correct Answer :-

- – 3 [Option ID = 26222]

24)

There is a light in another room that can be in one of three states: *blue*, *red* or *off*. In your room, you have two buttons numbered 1 and 2 that control the state of the light. The state of light changes as follows:

- If you press button 1, then the light changes to the next state clockwise around the diagram.
- If you press button 2 while the light is *blue* or *red* the state of the light will not change.
- If you press button 2 while the light is *off* the light will change to *blue*



You want to make sure that the light is *off* but since the light is in another room, you do not know what state the light is currently in. The shortest sequence of button presses that will guarantee that the light will be off is $x_1x_2\ldots x_n$ where $x_i = 1$ or 2 for $I = 1, 2, \ldots, n$.

The value of n is

[Question ID = 6613]

1. 6 [Option ID = 26445]
2. 7 [Option ID = 26446]
3. 5 [Option ID = 26444]
4. 4 [Option ID = 26443]

Correct Answer :-

- 6 [Option ID = 26445]

25) Let P(x) denotes the probability of the occurrence of event X. Then, all those points $(x, y) = (P(A), P(B))$, in a plane which satisfies the condition $P(A \cup B) \geq 3/4$ and $1/8 \leq P(A \cap B) \leq 3/8$ implies;

[Question ID = 6584]

1. $7/8 \leq x + y \leq 11/8$ [Option ID = 26329]
2. $x + y < 7/8$ [Option ID = 26330]
3. $x + y > 11/8$ [Option ID = 26328]
4. $x + y \leq 11/8$ [Option ID = 26327]

Correct Answer :-

- $7/8 \leq x + y \leq 11/8$ [Option ID = 26329]

26) The period of the function which satisfies the relation $f(x) + f(x + 4) = f(x + 2) + f(x + 6)$ is

[Question ID = 6534]

1. 6 [Option ID = 26128]
2. 5 [Option ID = 26129]
3. 8 [Option ID = 26127]
4. 4 [Option ID = 26130]

Correct Answer :-

- 8 [Option ID = 26127]

27)

$$\lim_{x\to\infty}\left(x^2\ln\left(\cot^{-1}x\right)\right)=$$

[Question ID = 6536]

1. 2/3 [Option ID = 26137]
2. 1/3 [Option ID = 26135]
3. – 1/3 [Option ID = 26136]
4. – 2/3 [Option ID = 26138]

Correct Answer :-

- – 1/3 [Option ID = 26136]

28) A maths professor asked one of his students to visit his house regarding some work. The student asked the professor his house number. The professor replied in a strange way:

- If my house number is a multiple of 3, then it is a number from 50 to 59.
- If my house number is not a multiple of 4, then it is a number from 60 to 69.
- If my house number is not a multiple of 6, then it is a number from 70 to 79.

The sum of the prime factors of the professor's house number is

[Question ID = 6612]

1. 18 [Option ID = 26439]
2. 21 [Option ID = 26441]
3. 26 [Option ID = 26442]
4. 73 [Option ID = 26440]

Correct Answer :-

- 21 [Option ID = 26441]

29) The sum of the squares of three distinct real numbers which are in strictly increasing GP is S^2. their sum is αS.

If $r=2$, then the value of $\left[\alpha^2\right]$ is (where [.] denotes the greatest integer function and r is common ratio of GP)

[Question ID = 6598]

1. 2 [Option ID = 26385]
2. 0 [Option ID = 26383]
3. 1 [Option ID = 26384]
4. 3 [Option ID = 26386]

Correct Answer :-

- 2 [Option ID = 26385]

30) Let $f: R \to R$ be given by $f(x) = (x+1)^2 - 1, x \geq -1$. Then $f^{-1}(x)$ is

[Question ID = 6533]

1. Does not exist, as f is not onto. [Option ID = 26126]
2. $-1-\sqrt{x+1}$ [Option ID = 26124]
3. Does not exist, as f is not one-one [Option ID = 26125]
4. $-1+\sqrt{x+1}$ [Option ID = 26123]

Correct Answer :-

- $-1+\sqrt{x+1}$ [Option ID = 26123]

31) Let α, β, γ be three numbers such that $\alpha^2+\beta^2+\gamma^2-\gamma=0$ and $z=\frac{\alpha+i\beta}{1-\gamma}$.

Value of α is

[Question ID = 6609]

1. $\frac{z-\bar{z}}{2(1+|z|^2)}$ [Option ID = 26428]
2. $\frac{\bar{z}}{2(1+|z|^2)}$ [Option ID = 26429]
3. $\frac{z}{2(1+|z|^2)}$ [Option ID = 26430]
4. $\frac{z+z}{2(1+|z|^2)}$ [Option ID = 26427]

Correct Answer :-

- $\frac{z+z}{2(1+|z|^2)}$ [Option ID = 26427]

32) The real values of x that satisfy the equation $x^2-2^x=0$ is

[Question ID = 6546]

1. 2 [Option ID = 26176]
2. 1 [Option ID = 26175]
3. 3 [Option ID = 26177]
4. 4 [Option ID = 26178]

Correct Answer :-

- 3 [Option ID = 26177]

33) The number of integral solutions of the equation $x+y+z=0$, where x, y, z are all ≥ -5 is

[Question ID = 6602]

1. 455 [Option ID = 26401]
2. 105 [Option ID = 26402]
3. 135 [Option ID = 26399]
4. 136 [Option ID = 26400]

Correct Answer :-

- 136 [Option ID = 26400]

34) If $\sum_{n=1}^{k}\left[\frac{1}{3}+\frac{n}{90}\right]=21$, where $[x]$ denotes the integral part of x, then k equal to

[Question ID = 6594]

1. 80 [Option ID = 26368]
2. 85 [Option ID = 26369]
3. 84 [Option ID = 26367]
4. 83 [Option ID = 26370]

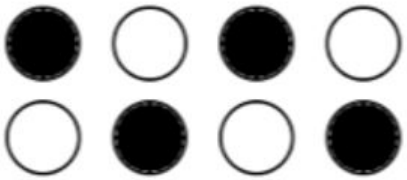
Correct Answer :-

- 80 [Option ID = 26368]

35) The diagram below shows a grid of 2 x 4 dots (of negligible size) that alternate between black and white. The number of ways there are to draw ten line segments between the dots such that

- each white dot is connected to exactly one black dot (and vice versa),
- no segment passes through more than two dots, and
- none of the segments intersect each other

is



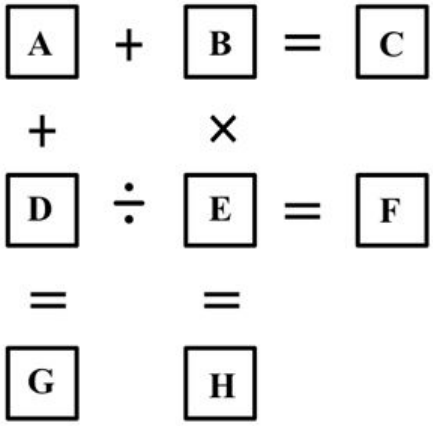
[Question ID = 6575]

1. 11 [Option ID = 26292]
2. 12 [Option ID = 26291]
3. 10 [Option ID = 26293]
4. 17 [Option ID = 26294]

Correct Answer :-

- 11 [Option ID = 26292]

36) Each of the digits 1, 2, …, 8 are placed exactly once in the grid below so that the equations are true.



A x B x C x E = [Question ID = 6616]

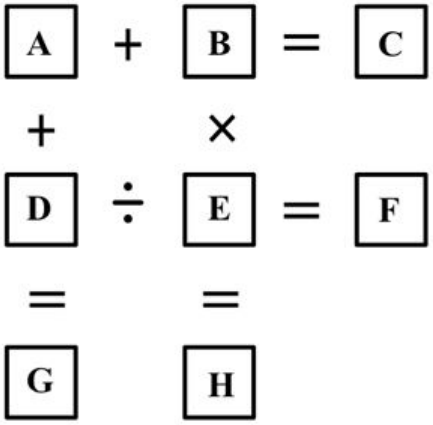
1. 240 [Option ID = 26457]
2. 70 [Option ID = 26458]
3. 48 [Option ID = 26456]
4. 40 [Option ID = 26455]

Correct Answer :-

- 40 [Option ID = 26455]

37)

Each of the digits 1, 2, …, 8 are placed exactly once in the grid below so that the equations are true.



A + B + D + E = [Question ID = 6615]

1. 15 [Option ID = 26454]
2. 18 [Option ID = 26451]
3. 13 [Option ID = 26452]
4. 16 [Option ID = 26453]

Correct Answer :-

- 13 [Option ID = 26452]

38) If $\vec{a}, \vec{b}$ and $\vec{c}$ are non-coplanar vectors and λ is a real number, then $\lambda\left(\vec{a}+\vec{b}\right)\cdot\left(\lambda^2\vec{b}\times\lambda\vec{c}\right)=\vec{a}\cdot\left(\left(\vec{b}+\vec{c}\right)\times\vec{b}\right)$ for

[Question ID = 6564]

1. exactly two values of λ. [Option ID = 26248]
2. exactly one value of λ. [Option ID = 26247]
3. no value of λ. [Option ID = 26250]
4. exactly three values of λ. [Option ID = 26249]

Correct Answer :-

- no value of λ. [Option ID = 26250]

39) Let $P(x) = (x-1)(x-2)(x-3)\ldots\ldots(x-50)$ and
$Q(x) = (x+1)(x+2)(x+3)\ldots\ldots(x+50)$.

If $P(x)\,Q(x) = a_{100}x^{100} + a_{99}x^{99} + a_{98}x^{98} + \ldots + a_1x^1 + a_0$ then the value of $a_{100} - a_{99} - a_{98} - a_{97}$ is

[Question ID = 6535]

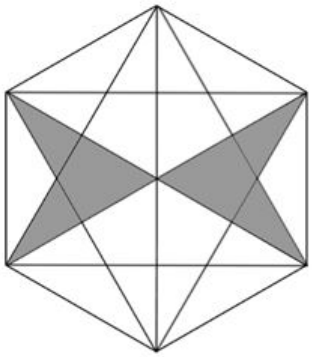
1. 21926 [Option ID = 26131]
2. 42926 [Option ID = 26132]
3. 0 [Option ID = 26133]
4. -1 [Option ID = 26134]

Correct Answer :-

- 42926 [Option ID = 26132]

40)

The area of a regular hexagon is H and the area of the shaded region in it is S. The ratio of $H : S$ is



[Question ID = 6569]

1. 7:2 [Option ID = 26267]
2. 6:1 [Option ID = 26270]
3. 5:1 [Option ID = 26269]
4. 9:2 [Option ID = 26268]

Correct Answer :-

- 9:2 [Option ID = 26268]

41) Let A be the area bounded by the curve $y = -k^{17}x^{16} + k$ and the x axis. The value of $68A$ is

[Question ID = 6549]

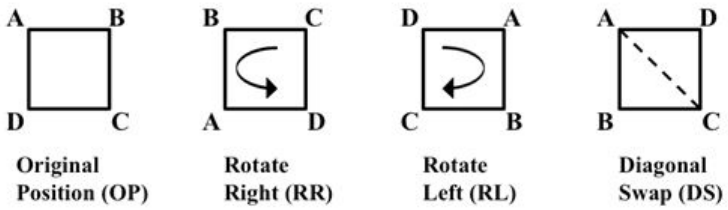
1. 128 [Option ID = 26189]
2. 68 [Option ID = 26188]
3. 34 [Option ID = 26187]
4. 32 [Option ID = 26190]

Correct Answer :-

- 128 [Option ID = 26189]

42) A square dance has the following commands:

- "Rotate Right" means everyone moves one pace around the square, counterclockwise.
- "Rotate Left" means everyone moves one pace around the square, clockwise.
- "Diagonal Swap" means the person in the lower-left position and the person in the upper-right position switch places, while the other two people stay still.



A choreographer choreographs a sequence that is made of the steps, starting from the original position

RR → RR → DS → RL → DS

The position of A after 21 repetitions of the above steps is

[Question ID = 6570]

1. The upper right corner [Option ID = 26274]
2. The upper left corner [Option ID = 26272]
3. The lower right corner [Option ID = 26273]

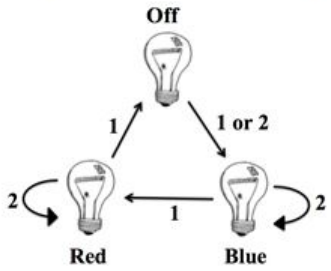
4. The lower left corner [Option ID = 26271]

Correct Answer :-

- The lower right corner [Option ID = 26273]

43) There is a light in another room that can be in one of three states: *blue*, *red* or *off*. In your room, you have two buttons numbered 1 and 2 that control the state of the light. The state of light changes as follows:

- If you press button 1, then the light changes to the next state clockwise around the diagram.
- If you press button 2 while the light is *blue* or *red* the state of the light will not change.
- If you press button 2 while the light is *off* the light will change to *blue*



You want to make sure that the light is *off* but since the light is in another room, you do not know what state the light is currently in. The shortest sequence of button presses that will guarantee that the light will be off is $x_1x_2\ldots x_n$ where $x_i = 1$ or 2 for $I = 1, 2, \ldots, n$.

$x_1 + x_2 + \ldots + x_n =$

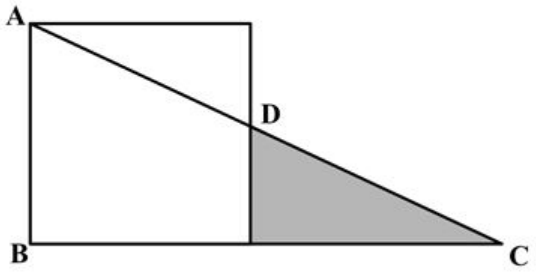
[Question ID = 6614]

1. 6 [Option ID = 26447]
2. 9 [Option ID = 26450]
3. 7 [Option ID = 26448]
4. 8 [Option ID = 26449]

Correct Answer :-

- 8 [Option ID = 26449]

44) A right triangle ABC with side $AB = x$ and $BC = 12$ intersects a square with side AB at the point D. The value of x that maximizes the area of the shaded portion of the triangle is



[Question ID = 6547]

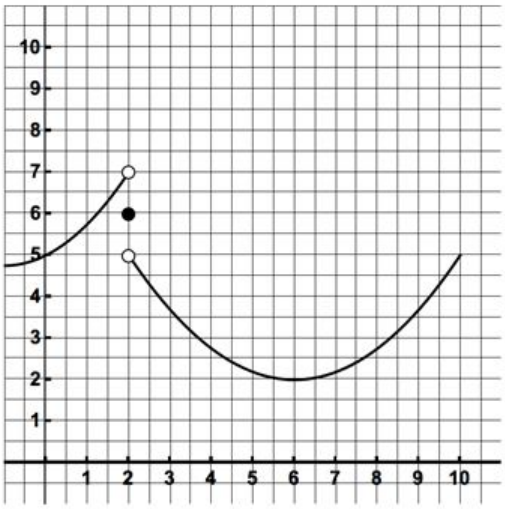
1. 6 [Option ID = 26181]
2. 12 [Option ID = 26179]
3. 3 [Option ID = 26182]
4. 4 [Option ID = 26180]

Correct Answer :-

- 4 [Option ID = 26180]

45)

The graph of a function $f(x)$ is given below. The value of $\lim_{x\to 6} f(f(x))$ is



[Question ID = 6539]

1. 6 [Option ID = 26148]
2. 7 [Option ID = 26149]
3. does not exist [Option ID = 26150]
4. 5 [Option ID = 26147]

Correct Answer :-

- 5 [Option ID = 26147]

46) If the root of the equation $x^2+2ax+b=0$ are real and distinct and they differ by at most $2m$, then b lies in the interval

[Question ID = 6588]

1. (a^2-m^2,a^2) [Option ID = 26343]
2. $[a^2-m^2,a^2)$ [Option ID = 26344]
3. (a^2,a^2+m^2) [Option ID = 26345]
4. $[a^2,a^2+m^2]$ [Option ID = 26346]

Correct Answer :-

- $[a^2-m^2,a^2)$ [Option ID = 26344]

47) Let $F(x)$ be a function defined by $F(x)=x-[x]$, $0\neq x\in R$, where $[x]$ is the greatest integer less than or equal to x. Then the number of solutions of $F(x)+F(1/x)=1$ is/are

[Question ID = 6590]

1. 2 [Option ID = 26354]
2. 0 [Option ID = 26351]
3. 1 [Option ID = 26353]
4. infinite [Option ID = 26352]

Correct Answer :-

- infinite [Option ID = 26352]

48) If $f(x) = \max(|2\sin y - x|)$ for $y \in (-\infty, \infty)$, then the minimum value of $f(x)$ is

[Question ID = 6540]

1. 2 [Option ID = 26151]
2. 1 [Option ID = 26154]
3. 0 [Option ID = 26153]
4. – 2 [Option ID = 26152]

Correct Answer :-

- 2 [Option ID = 26151]

49) The distance between the two foci F and F' of an ellipse is 8 units. P is any point on the ellipse such that $|PF| + |PF'| = 32$. The maximum area of the triangle PFF' is

[Question ID = 6559]

1. $4\sqrt{238}$ [Option ID = 26229]
2. $4\sqrt{240}$ [Option ID = 26227]
3. $3\sqrt{240}$ [Option ID = 26228]
4. $3\sqrt{238}$ [Option ID = 26230]

Correct Answer :-

- $4\sqrt{240}$ [Option ID = 26227]

50) The determinant $\begin{vmatrix} a & b & a\alpha - b \\ b & c & b\alpha - c \\ 2 & 1 & 0 \end{vmatrix} = 0, \ \alpha \neq 0$ if

[Question ID = 6595]

1. a,b,c are in HP [Option ID = 26373]
2. a,b,c are in AGP [Option ID = 26374]
3. a,b,c are in AP [Option ID = 26371]
4. a,b,c are in GP [Option ID = 26372]

Correct Answer :-

- a,b,c are in GP [Option ID = 26372]

51) Let α, β, γ be three numbers such that $\alpha^2 + \beta^2 + \gamma^2 - \gamma = 0$ and $z = \frac{\alpha + i\beta}{1 - \gamma}$.

Value of β is

[Question ID = 6610]

1. $\frac{z - \bar{z}}{2(1 + |z|^2)}$ [Option ID = 26431]
2. $\frac{z}{2(1 + |z|^2)}$ [Option ID = 26434]
3. $\frac{(\bar{z} - z)i}{2(1 + |z|^2)}$ [Option ID = 26432]
4. $\frac{2z}{1 + |z|^2}$ [Option ID = 26433]

Correct Answer :-

- $\frac{(\bar{z} - z)i}{2(1 + |z|^2)}$ [Option ID = 26432]

52) Let $P(t)$ represent the amount of chemical a factory produces as a function of time t (in hours). The rate of change of chemical production satisfies the differential equation

$$\frac{dP(t)}{dt} = -\ln 3 \; P(t)\left(1 - \frac{P(t)}{3}\right)$$

If the factory alarm is raised when chemical production exceeds 4 in 4 hours, the inequality that represents the maximum initial amount of chemical that guarantees the alarm will not be raised is

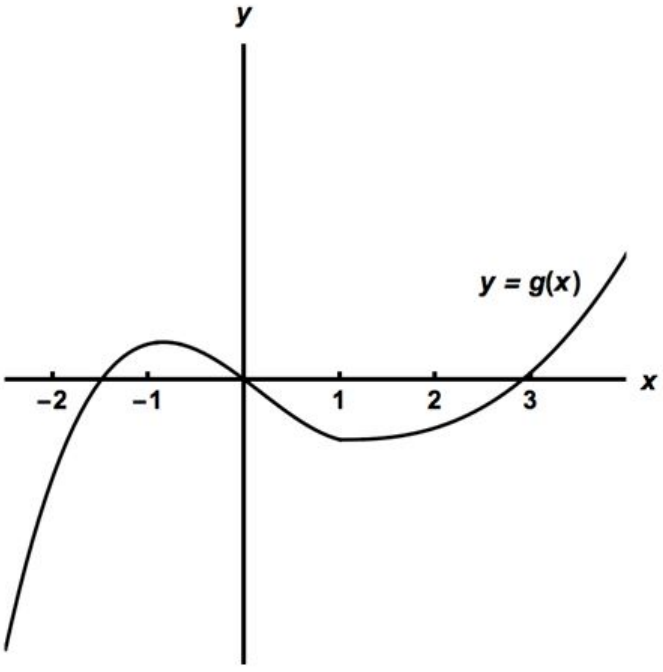
[Question ID = 6550]

1. $P(0) < \frac{108}{37}$ [Option ID = 26191]
2. $P(0) < \frac{108}{373}$ [Option ID = 26194]
3. $P(0) < \frac{972}{337}$ [Option ID = 26192]
4. $P(0) < \frac{972}{323}$ [Option ID = 26193]

Correct Answer :-

- $P(0) < \frac{972}{323}$ [Option ID = 26193]

53) The graph represents the function $y = g(x)$. Which of the following statements is true?



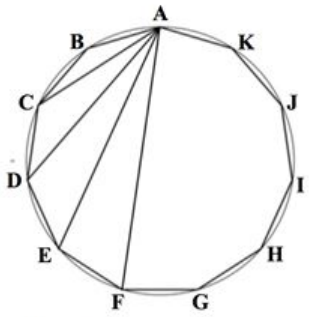
[Question ID = 6544]

1. $g(-2) > g(2) > g(0)$ [Option ID = 26170]
2. $g(-2) > g(0) > g(2)$ [Option ID = 26169]
3. $g(0) > g(2) > g(-2)$ [Option ID = 26167]
4. $g(2) > g(-2) > g(0)$ [Option ID = 26168]

Correct Answer :-

- $g(-2) > g(2) > g(0)$ [Option ID = 26170]

54) A regular 11-sided polygon $ABCDEFGHIJK$ is inscribed in a unit circle, as shown below.



The value of $AB \times AC \times AD \times AE \times AF$ is

[Question ID = 6568]

1. 11 [Option ID = 26263]
2. 22 [Option ID = 26265]
3. $\sqrt{11}$ [Option ID = 26264]
4. $\sqrt{22}$ [Option ID = 26266]

Correct Answer :-

- $\sqrt{11}$ [Option ID = 26264]

55) $\vec{a}, \vec{b}, \vec{c}$ are three vectors of magnitude $\sqrt{2}, 1$ and $\frac{1}{\sqrt{2}}$ respectively, and satisfying $\left[\vec{a}, \vec{b}, \vec{c}\right] = 1$, then the value of $\left(\vec{a}+2\vec{b}+\vec{c}\right)\cdot\left(\left(\vec{a}\times\vec{b}\right)\times\left(\vec{a}-\vec{b}\right)+\vec{c}\right) =$

[Question ID = 6562]

1. 0 [Option ID = 26239]
2. 5 [Option ID = 26241]
3. 6.5 [Option ID = 26240]
4. 8 [Option ID = 26242]

Correct Answer :-

- 6.5 [Option ID = 26240]

56) The range of the function f defined by $f(x) = \left[\frac{1}{\sin\{x\}}\right]$ where $[x]$ & $\{x\}$ respectively denote the greatest integer and fractional part of x, is

[Question ID = 6531]

1. I, the set of integers. [Option ID = 26115]
2. N, the set of natural numbers. [Option ID = 26116]
3. W, the set of whole numbers. [Option ID = 26117]
4. $\{2, 3, 4, \ldots.\}$ [Option ID = 26118]

Correct Answer :-

- N, the set of natural numbers. [Option ID = 26116]

57) The sum of the squares of three distinct real numbers which are in strictly increasing GP is S^2. their sum is αS.

Maximum interval for α^2 is

[Question ID = 6596]

1. $\left(\frac{1}{3},3\right)$ [Option ID = 26377]
2. $(1,2)$ [Option ID = 26376]
3. $\left(\frac{1}{3},1\right)\cup(1,3)$ [Option ID = 26378]
4. $\left(\frac{1}{3},1\right)$ [Option ID = 26375]

Correct Answer :-

- $\left(\frac{1}{3},1\right)\cup(1,3)$ [Option ID = 26378]

58) If $\vec{a},\vec{b},\vec{c}$ are mutually perpendicular vectors and $\vec{a}=\alpha\left(\vec{a}\times\vec{b}\right)+\beta\left(\vec{b}\times\vec{c}\right)+\gamma\left(\vec{c}\times\vec{a}\right)$ and $\left[\vec{a},\vec{b},\vec{c}\right]=1$, then $\alpha+\beta+\gamma=$

[Question ID = 6561]

1. $-|\vec{a}|^2$ [Option ID = 26236]
2. $|2\vec{a}|^2$ [Option ID = 26238]
3. $|\vec{a}|^2$ [Option ID = 26235]
4. 0 [Option ID = 26237]

Correct Answer :-

- $|\vec{a}|^2$ [Option ID = 26235]

59) If $\vec{a},\vec{b}$ and $\vec{c}$ are non-coplanar vectors, then $\left[\left(\vec{a}+\vec{b}\right)\times\left(\vec{b}-\vec{c}\right)\quad\left(\vec{b}+\vec{c}\right)\times\left(\vec{c}+\vec{a}\right)\quad\left(\vec{c}-\vec{a}\right)\times\left(\vec{a}+\vec{b}\right)\right]=$

[Question ID = 6563]

1. $2\left[\vec{a}\ \vec{b}\ \vec{c}\right]^2$ [Option ID = 26245]
2. $3\left[\vec{a}\ \vec{b}\ \vec{c}\right]^2$ [Option ID = 26244]
3. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]^2$ [Option ID = 26246]
4. $4\left[\vec{a}\ \vec{b}\ \vec{c}\right]^2$ [Option ID = 26243]

Correct Answer :-

- $4\left[\vec{a}\ \vec{b}\ \vec{c}\right]^2$ [Option ID = 26243]

60) Consider the system of linear equations $2x+3y+5z=9, 7x+3y-2z=8$ and $2x+3y+\lambda z=\mu$.

Under what condition does the above system of equations have infinitely many solutions? [Question ID = 6604]

1. $\lambda=9$ and $\mu=5$ [Option ID = 26409]
2. $\lambda=9$ and $\mu\neq5$ [Option ID = 26410]
3. $\lambda=5$ and $\mu=9$ [Option ID = 26408]
4. $\lambda=5$ and $\mu\neq9$ [Option ID = 26407]

Correct Answer :-

- $\lambda=5$ and $\mu=9$ [Option ID = 26408]

61) Consider the system of linear equations $2x+3y+5z=9, 7x+3y-2z=8$ and $2x+3y+\lambda z=\mu$.

Under what condition does the above system of equations have a unique solution? [Question ID = 6605]

1. λ has any real value and $\mu\neq9$ [Option ID = 26414]
2. $\lambda\neq5$ and $\mu=7$ only [Option ID = 26412]
3. $\lambda=5$ and $\mu=9$ [Option ID = 26411]
4. $\lambda\neq5$ and μ has any real value [Option ID = 26413]

Correct Answer :-

- $\lambda\neq5$ and μ has any real value [Option ID = 26413]

62) Let $f:[0,1]\to R$ be a continuous function such that $f(x)f(x-1)=1$. Then the value of the integral $\int_0^1 \frac{1}{1+f(x)}dx$ is

[Question ID = 6552]

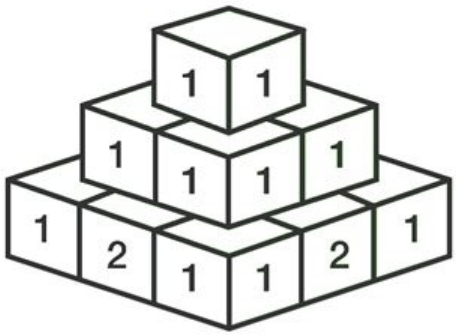
1. 2 [Option ID = 26200]
2. 0 [Option ID = 26201]
3. 0.5 [Option ID = 26202]
4. 1 [Option ID = 26199]

Correct Answer :-

- 0.5 [Option ID = 26202]

63)

A pyramid is made out of blocks, where the first layer has 1 block, the second layer is a square made up of 4 blocks, and the third layer is a square made up of 9 blocks, and so on, so that each n^{th} layer is a square made from n^2 blocks.



Each block has a number written on it. The top block has the number 1 written on it, but every other block has the sum of all the blocks that touch its top side written on it. The first five layers are as follows:

1st

1

2nd

1	1
1	1

3rd

1	2	1
2	4	2
1	2	1

4th

1	3	3	1
3	9	9	3
3	9	9	3
1	3	3	1

5th

1	4	6	4	1
4	16	24	16	4
6	24	36	24	6
4	16	24	16	4
1	4	6	4	1

The number on the block that is in the 3rd column and the 4th row of the 100th layer is [Question ID = 6574]

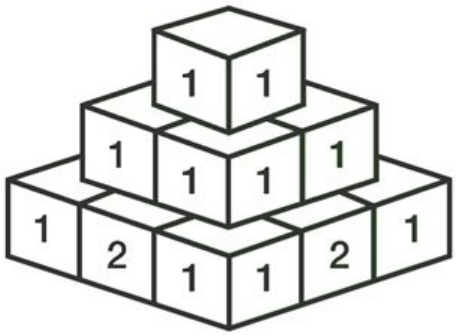
1. 590438611224 [Option ID = 26288]
2. 634062082500 [Option ID = 26289]
3. 66701250 [Option ID = 26290]
4. 760874499 [Option ID = 26287]

Correct Answer :-

- 760874499 [Option ID = 26287]

64)

A pyramid is made out of blocks, where the first layer has 1 block, the second layer is a square made up of 4 blocks, and the third layer is a square made up of 9 blocks, and so on, so that each n^{th} layer is a square made from n^2 blocks.



Each block has a number written on it. The top block has the number 1 written on it, but every other block has the sum of all the blocks that touch its top side written on it. The first five layers are as follows:

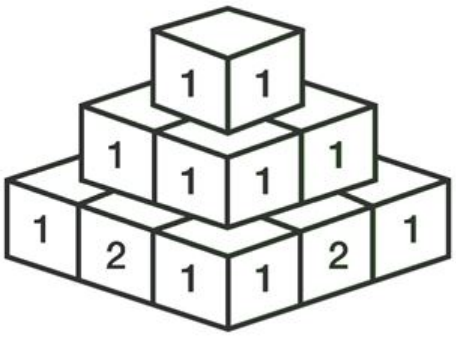
1st	2nd	3rd	4th	5th
1	1 1 1 1	1 2 1 2 4 2 1 2 1	1 3 3 1 3 9 9 3 3 9 9 3 1 3 3 1	1 4 6 4 1 4 16 24 16 4 6 24 36 24 6 4 16 24 16 4 1 4 6 4 1

The sum of the numbers on the outermost blocks of the 10th layer is [Question ID = 6571]

1. 1016 [Option ID = 26278]
2. 1020 [Option ID = 26277]
3. 512 [Option ID = 26276]
4. 508 [Option ID = 26275]

Correct Answer :-

65) A pyramid is made out of blocks, where the first layer has 1 block, the second layer is a square made up of 4 blocks, and the third layer is a square made up of 9 blocks, and so on, so that each n^{th} layer is a square made from n^2 blocks.



Each block has a number written on it. The top block has the number 1 written on it, but every other block has the sum of all the blocks that touch its top side written on it. The first five layers are as follows:

1st	2nd	3rd	4th	5th
1	1 1 1 1	1 2 1 2 4 2 1 2 1	1 3 3 1 3 9 9 3 3 9 9 3 1 3 3 1	1 4 6 4 1 4 16 24 16 4 6 24 36 24 6 4 16 24 16 4 1 4 6 4 1

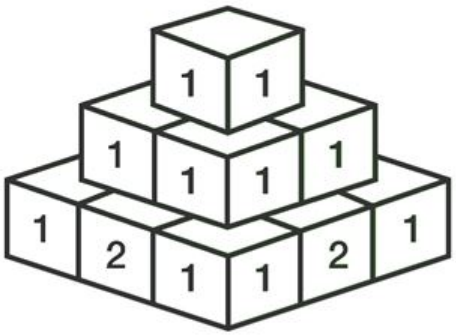
The sum of the numbers on the diagonal blocks in the 9th layer is [Question ID = 6573]

1. 20840 [Option ID = 26285]
2. 97240 [Option ID = 26283]
3. 25740 [Option ID = 26286]
4. 81364 [Option ID = 26284]

Correct Answer :-

- 20840 [Option ID = 26285]

66) A pyramid is made out of blocks, where the first layer has 1 block, the second layer is a square made up of 4 blocks and the third layer is a square made up of 9 blocks, and so on, so that each n^{th} layer is a square made from n^2 blocks.



Each block has a number written on it. The top block has the number 1 written on it, but every other block has the sum of all the blocks that touch its top side written on it. The first five layers are as follows:

1st	2nd	3rd	4th	5th
1	1 1 1 1	1 2 1 2 4 2 1 2 1	1 3 3 1 3 9 9 3 3 9 9 3 1 3 3 1	1 4 6 4 1 4 16 24 16 4 6 24 36 24 6 4 16 24 16 4 1 4 6 4 1

The sum of the numbers on the diagonal blocks in the 10th layer is [Question ID = 6572]

1. 306008 [Option ID = 26282]
2. 369260 [Option ID = 26281]
3. 369512 [Option ID = 26280]
4. 97240 [Option ID = 26279]

Correct Answer :-

- 97240 [Option ID = 26279]

67) If λ be an integer and α, β be the roots of $4x^2-16x+\lambda=0$ such that $1<\alpha<2$ and $2<\beta<3$, then possible values of λ are

[Question ID = 6586]

1. {62, 65, 68, 71, 75} [Option ID = 26338]
2. {60, 64, 68} [Option ID = 26335]
3. {61, 62, 63} [Option ID = 26336]
4. {49, 50,..., 62, 63} [Option ID = 26337]

Correct Answer :-

- {49, 50,..., 62, 63} [Option ID = 26337]

68)

Shukla, Mishra, Singh, Kulkarni, Rao, Joshi and Nair are to conduct interviews simultaneously either alone or in pairs at four different locations—Surat, Chandigarh, Delhi and Lucknow. If they travel in pair, they take the same mode of travel. Only one travels by rail, two are travelling by car and the rest travel by air.

- Shukla is going to Lucknow but neither by car nor by air.
- Mishra prefers to travel by car.
- Neither Joshi nor Nair is going to Delhi.
- Only those going to Surat travel by road.
- Kulkarni will assist his friend Mishra.
- The two managers who go to Delhi travel by air.

In which of the following pair, both of the managers have same mode of travel? [Question ID = 6624]

1. Shukla-Mishra [Option ID = 26487]
2. Rao-Mishra [Option ID = 26488]
3. Nair-Rao [Option ID = 26489]
4. Kulkarni-Joshi [Option ID = 26490]

Correct Answer :-

- Nair-Rao [Option ID = 26489]

69) Shukla, Mishra, Singh, Kulkarni, Rao, Joshi and Nair are to conduct interviews simultaneously either alone or in pairs at four different locations—Surat, Chandigarh, Delhi and Lucknow. If they travel in pair, they take the same mode of travel. Only one travels by rail, two are travelling by car and the rest travel by air.

- Shukla is going to Lucknow but neither by car nor by air.
- Mishra prefers to travel by car.
- Neither Joshi nor Nair is going to Delhi.
- Only those going to Surat travel by road.
- Kulkarni will assist his friend Mishra.
- The two managers who go to Delhi travel by air.

Which of the following is true? [Question ID = 6622]

1. Joshi travels by road [Option ID = 26482]
2. Nair will assist Rao [Option ID = 26480]
3. Shukla conducts interviews alone [Option ID = 26481]
4. Kulkarni travels by air [Option ID = 26479]

Correct Answer :-

- Shukla conducts interviews alone [Option ID = 26481]

70) Shukla, Mishra, Singh, Kulkarni, Rao, Joshi and Nair are to conduct interviews simultaneously either alone or in pairs at four different locations—Surat, Chandigarh, Delhi and Lucknow. If they travel in pair, they take the same mode of travel. Only one travels by rail, two are travelling by car and the rest travel by air.

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- Neither Joshi nor Nair is going to Delhi.
- Only those going to Surat travel by road.
- Kulkarni will assist his friend Mishra.
- The two managers who go to Delhi travel by air.

Who will conduct interviews at Chandigarh? [Question ID = 6623]

1. Mishra [Option ID = 26486]
2. Nair [Option ID = 26483]

3. Singh [Option ID = 26484]
4. Rao [Option ID = 26485]

Correct Answer :-

- Nair [Option ID = 26483]

71) Shukla, Mishra, Singh, Kulkarni, Rao, Joshi and Nair are to conduct interviews simultaneously either alone or in pairs at four different locations—Surat, Chandigarh, Delhi and Lucknow. If they travel in pair, they take the same mode of travel. Only one travels by rail, two are travelling by car and the rest travel by air.

- Shukla is going to Lucknow but neither by car nor by air.
- Mishra prefers to travel by car.
- Neither Joshi nor Nair is going to Delhi.
- Only those going to Surat travel by road.
- Kulkarni will assist his friend Mishra.
- The two managers who go to Delhi travel by air.

Who goes to Delhi? [Question ID = 6621]

1. Data inadequate [Option ID = 26478]
2. Mishra-Kulkarni [Option ID = 26475]
3. Kulkarni-Joshi [Option ID = 26477]
4. Rao-Singh [Option ID = 26476]

Correct Answer :-

- Rao-Singh [Option ID = 26476]

72) Shukla, Mishra, Singh, Kulkarni, Rao, Joshi and Nair are to conduct interviews simultaneously either alone or in pairs at four different locations—Surat, Chandigarh, Delhi and Lucknow. If they travel in pair, they take the same mode of travel. Only one travels by rail, two are travelling by car and the rest travel by air.

- Shukla is going to Lucknow but neither by car nor by air.
- Mishra prefers to travel by car.
- Neither Joshi nor Nair is going to Delhi.
- Only those going to Surat travel by road.
- Kulkarni will assist his friend Mishra.
- The two managers who go to Delhi travel by air.

Where will Kulkarni conduct the interviews? [Question ID = 6620]

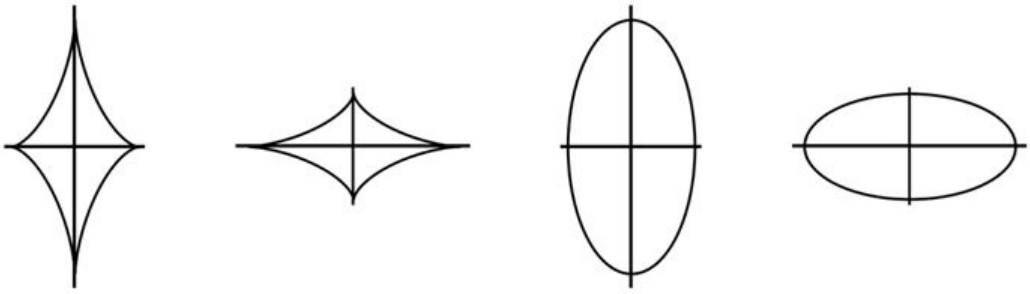
1. Chandigarh [Option ID = 26473]
2. Surat [Option ID = 26471]
3. Cannot be determined [Option ID = 26474]
4. Lucknow [Option ID = 26472]

Correct Answer :-

- Surat [Option ID = 26471]

73)

The curve defined by the parametric equation $x = 3\cos t, y = 4\sin t$ is



GRAPH I GRAPH II GRAPH III GRAPH IV

[Question ID = 6548]

1. GRAPH III [Option ID = 26185]
2. GRAPH I [Option ID = 26183]
3. GRAPH II [Option ID = 26184]
4. GRAPH IV [Option ID = 26186]

Correct Answer :-

- GRAPH III [Option ID = 26185]

74) Which of the following is a function? (Note: [.] & {.} denote the greatest integer and fractional part function respectively)

[Question ID = 6532]

1. $x!\ \{x\}$ [Option ID = 26121]
2. $\frac{\ln(x-1)}{\sqrt{1-x^2}}$ [Option ID = 26122]
3. $\frac{x!}{\{x\}}$ [Option ID = 26120]
4. $\frac{1}{ln[1-|x|]}$ [Option ID = 26119]

Correct Answer :-

- $x!\ \{x\}$ [Option ID = 26121]

75) Let $f(x)=\begin{vmatrix} 1+\sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 1+\cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 1+4\sin 2x \end{vmatrix}$, $f(a)$ and $f(b)$ be the least and greatest values of $f(x)$, then

[Question ID = 6601]

1. $f(a)=2, f(b)=6$ and period of $f(x)$ is π [Option ID = 26395]
2. $f(a)=-2, f(b)=6$ and period of $f(x)$ is π [Option ID = 26396]
3. $f(a)=2, f(b)=-6$ and period of $f(x)$ is $\pi/2$ [Option ID = 26398]
4. $f(a)=2, f(b)=-6$ and period of $f(x)$ is $\pi/2$ [Option ID = 26397]

Correct Answer :-

- $f(a)=-2, f(b)=6$ and period of $f(x)$ is π [Option ID = 26396]

76) The solution of $x-1=(x-[x])(x-\{x\})$ (where $[x]$ and $\{x\}$ are the integral and fractional part of x) is

[Question ID = 6587]

1. $x \in R \sim [1,2]$ [Option ID = 26342]
2. $x \in R \sim [1,2)$ [Option ID = 26340]
3. $x \in R \sim (1,2)$ [Option ID = 26339]
4. $x \in [1,2)$ [Option ID = 26341]

Correct Answer :-

- $x \in [1,2)$ [Option ID = 26341]

77) The total number of solutions of $2^{\cos x} = |\sin x|$ in $[-2\pi, 5\pi]$ is

[Question ID = 6528]

1. 15 [Option ID = 26106]
2. 12 [Option ID = 26103]
3. 14 [Option ID = 26104]
4. 16 [Option ID = 26105]

Correct Answer :-

- 14 [Option ID = 26104]

78) Let $w \neq 1$ is nth root of unity, then value of $\sum_{k=0}^{n-1} \left|z_1 + w^k z_2\right|^2$ is

[Question ID = 6608]

1. $|z_1|^2 + |z_2|^2$ [Option ID = 26424]
2. $n(|z_1|^2 + |z_2|^2)$ [Option ID = 26423]
3. $n(|z_1| + |z_2|)^2$ [Option ID = 26426]
4. $(|z_1| + |z_2|)^2$ [Option ID = 26425]

Correct Answer :-

- $n(|z_1|^2 + |z_2|^2)$ [Option ID = 26423]

79) If a function $f(x)$ satisfies the functional equation $f(\tan\theta) = \sin^2 2\theta$ for all real θ, then $\int_0^1 f(x)\,dx =$

[Question ID = 6556]

1. $\pi - 2$ [Option ID = 26218]
2. $\frac{\pi}{4}$ [Option ID = 26215]
3. $\frac{\pi}{2}$ [Option ID = 26216]

4. $\frac{\pi}{2}-1$ [Option ID = 26217]

Correct Answer :-

- $\frac{\pi}{2}-1$ [Option ID = 26217]

80) The curve $x^3 + y^3 + x^2y + 7 = 0$ intersects the line $9x + y = 0$ at the point (a, b). The slope of the tangent to the curve $x^3 + y^3 + x^2y + 7 = 0$ at the point (a, b) is

[Question ID = 6542]

1. $\frac{23}{244}$ [Option ID = 26159]
2. $\frac{13}{244}$ [Option ID = 26162]
3. $\frac{21}{244}$ [Option ID = 26160]
4. $\frac{15}{244}$ [Option ID = 26161]

Correct Answer :-

- $\frac{15}{244}$ [Option ID = 26161]

81) The sum of the squares of three distinct real numbers which are in strictly increasing GP is S^2. their sum is αS.

If $\alpha^2 = 2$, then the value of $[r]$ is (where $[.]$ denotes the greatest integer function and r is common ratio of GP)

[Question ID = 6597]

1. 2 [Option ID = 26381]
2. 0 [Option ID = 26379]
3. 1 [Option ID = 26380]
4. 3 [Option ID = 26382]

Correct Answer :-

- 2 [Option ID = 26381]

82) Let $f(x) = 6x^2 + 7x - 5$. The average rate of change of $f(x)$ when x changes from 0 to 18 is the same as the rate of change of $f(x)$ at $x = a$. The value of $a^3 + a^2 + 90$ is

[Question ID = 6545]

1. 666 [Option ID = 26172]
2. 900 [Option ID = 26171]
3. 810 [Option ID = 26174]
4. 342 [Option ID = 26173]

Correct Answer :-

- 900 [Option ID = 26171]

83)

A straight line in the xy-plane passes through the point (3, 48) in the first quadrant and intersects the positive x-axis and y-axis at points P and Q respectively. If O is the origin, the minimum value of $OP \times OQ$ is

[Question ID = 6558]

1. 144 [Option ID = 26223]
2. 72 [Option ID = 26226]
3. 576 [Option ID = 26225]
4. 288 [Option ID = 26224]

Correct Answer :-

- 576 [Option ID = 26225]

84) If $x^a = y^b = z^c$, where a,b,c are unequal positive numbers and x,y,z are in GP, then a^3+c^3 is

[Question ID = 6593]

1. $>2b^3$ [Option ID = 26364]
2. $\geq 3b^3$ [Option ID = 26363]
3. $<2b^3$ [Option ID = 26366]
4. $\leq 2b^3$ [Option ID = 26365]

Correct Answer :-

- $>2b^3$ [Option ID = 26364]

85) Period of $f(x) = x - [x + a] - b$, where $a, b \in R^+$ and, [.] denotes the greatest integer function, is

[Question ID = 6529]

1. 1 [Option ID = 26109]
2. b [Option ID = 26108]
3. $|a - b|$ [Option ID = 26110]
4. a [Option ID = 26107]

Correct Answer :-

- 1 [Option ID = 26109]

86) If $ab^2c^3, a^2b^3c^4, a^3b^4c^5$ are in AP $(a,b,c>0)$, then the minimum value of $a+b+c$ is

[Question ID = 6592]

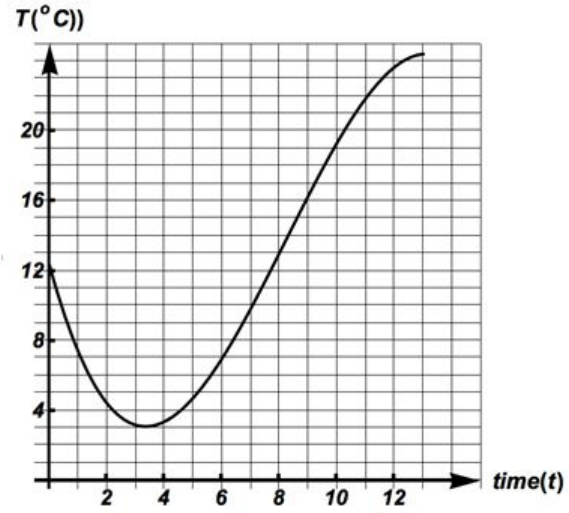
1. 1 [Option ID = 26359]
2. 5 [Option ID = 26361]
3. 3 [Option ID = 26360]
4. 9 [Option ID = 26362]

Correct Answer :-

- 3 [Option ID = 26360]

87)

The maximum temperature (T) of a city X for the first two weeks of January (1^{st} – 14^{th}) is plotted as a function of time t.



The approximate rate of change of temperature on 9^{th} January is

[Question ID = 6551]

1. 3.5 [Option ID = 26195]
2. 1 [Option ID = 26196]
3. -3 [Option ID = 26197]
4. 2 [Option ID = 26198]

Correct Answer :-

- 3.5 [Option ID = 26195]

88) A game is played with the following rules:

- Player X starts with 1 chip
- In each round of play, a fair six-sided die is rolled. If the result is 1, 2, or 3, the player loses a chip. If the result is 4 or 5, the player gains a chip. If the result is 6, 2 chips are gained.
- If at any time the player X has no chips, the game is lost.
- If at any time the player has 4 or more chips, he wins the game.

What is the probability that the player will win the game?

[Question ID = 6578]

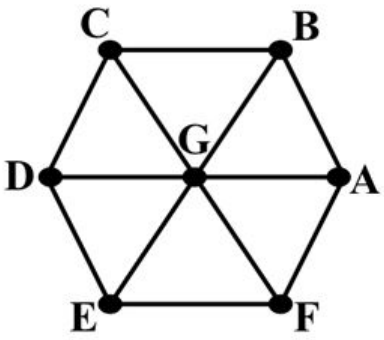
1. 7/36 [Option ID = 26306]
2. 19/108 [Option ID = 26305]
3. 1/3 [Option ID = 26303]
4. 4/27 [Option ID = 26304]

Correct Answer :-

- 1/3 [Option ID = 26303]

89)

A bug stands on a random point of the lattice below. Each point is equally likely to be the starting point. Every minute, the bug selects an adjacent point at random and moves to it. Each point is equally likely to be the bug's starting point and each adjacent point is equally likely to be chosen. Also, assume starting at A will "reach" the point A in 0 moves.



If the bug starts from point G, the probability of reaching A in 2 moves or less is

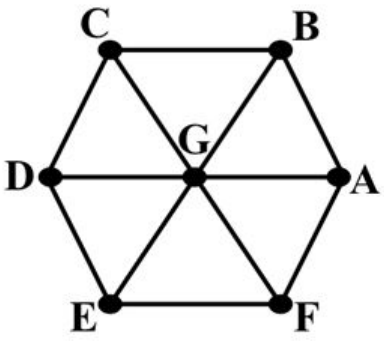
[Question ID = 6580]

1. 1 [Option ID = 26314]
2. 5/9 [Option ID = 26311]
3. 1/3 [Option ID = 26312]
4. 5/18 [Option ID = 26313]

Correct Answer :-

- 5/18 [Option ID = 26313]

90) A bug stands on a random point of the lattice below. Each point is equally likely to be the starting point. Every minute, the bug selects an adjacent point at random and moves to it. Each point is equally likely to be the bug's starting point and each adjacent point is equally likely to be chosen. Also, assume starting at A will "reach" the point A in 0 moves.



Starting form any point, what is the probability that the bug reaches point A in 2 moves or less? [Question ID = 6581]

1. 5/18 [Option ID = 26318]
2. 1/6 [Option ID = 26315]
3. 22/63 [Option ID = 26316]
4. 1/18 [Option ID = 26317]

Correct Answer :-

- 22/63 [Option ID = 26316]

91) A and B are points in the first quadrant such that the slopes of the line segments OA and OB are 3 and 1/3, respectively, where O is the origin. If $|OA| = |OB|$ then the equation of line which is parallel to the line segment AB and passes through the point (-3, 7) is

[Question ID = 6555]

1. $y = 2x + 13$ [Option ID = 26213]
2. $y = -2x + 1$ [Option ID = 26214]
3. $y = -x + 4$ [Option ID = 26212]
4. $y = x + 10$ [Option ID = 26211]

Correct Answer :-

- $y = -x + 4$ [Option ID = 26212]

92) Let $f(x) = 3x^{10} - 7x^8 + 5x^6 - 21x^3 + 3x^2 - 7$. The value of $\lim_{h \to 0} \frac{f(1-h) - f(1)}{h^3 + 3h}$ is

[Question ID = 6543]

1. 53/3 [Option ID = 26163]
2. 13 [Option ID = 26165]
3. 22/3 [Option ID = 26166]
4. 13/3 [Option ID = 26164]

Correct Answer :-

- 53/3 [Option ID = 26163]

93) **Directions**

P = Q means Q is the father of P
P * Q means P is the sister of Q
P ? Q means Q is the mother P
P $ Q means P is the brother of Q
P @ Q means Q is son of P
P # Q means P is the daughter of Q

Which of the following is correct? [Question ID = 6625]

1. V # T * P means P is maternal uncle of V [Option ID = 26491]
2. L @ M $ R means R is paternal uncle of L [Option ID = 26493]
3. D ? V # T means D is granddaughter of T [Option ID = 26492]
4. M @ R $ D ? V means M and D are husband and wife [Option ID = 26494]

Correct Answer :-

- M @ R $ D ? V means M and D are husband and wife [Option ID = 26494]

94) **Directions**

P = Q means Q is the father of P
P * Q means P is the sister of Q
P ? Q means Q is the mother P
P $ Q means P is the brother of Q
P @ Q means Q is son of P
P # Q means P is the daughter of Q

Which of the following indicates A is grandfather of B? [Question ID = 6626]

1. B # L # A [Option ID = 26497]
2. M # A = N = B [Option ID = 26495]
3. L * B = S $ Q =A [Option ID = 26498]
4. B $ L # Q # A [Option ID = 26496]

Correct Answer :-

- L * B = S $ Q =A [Option ID = 26498]

95) The sum of the squares of three distinct real numbers which are in strictly increasing GP is S^2. their sum is αS.

If we drop the condition that the GP is strictly increasing and take $r^2 = 1$, (where r is common ratio of GP) then the value of α can be

[Question ID = 6600]

1. 0 [Option ID = 26391]
2. $\pm\frac{1}{\sqrt{3}}$ [Option ID = 26394]
3. ± 1 [Option ID = 26392]
4. $\pm\frac{1}{\sqrt{2}}$ [Option ID = 26393]

Correct Answer :-

- $\pm\frac{1}{\sqrt{3}}$ [Option ID = 26394]

96) If β is the root of the polynomial $x^2 + 24x + 1$, then

$$\lim_{x\to\beta}\frac{1-\cos(x^2+24x+1)}{(x-\beta)^2}$$ is

[Question ID = 6537]

1. 144 [Option ID = 26142]
2. 286 [Option ID = 26139]
3. 12 [Option ID = 26141]
4. 576 [Option ID = 26140]

Correct Answer :-

- 286 [Option ID = 26139]

97) A function $f(x)$ is defined by $f(x)=\frac{1}{2}\left(f(xy)+f\left(\frac{x}{y}\right)\right)$ for all $x,y \in R^+$, the set of positive real numbers. If $f(1)=0, f'(5)=5$ then $f''(5)=$

[Question ID = 6541]

1. – 1 [Option ID = 26156]
2. 1 [Option ID = 26155]
3. – 5 [Option ID = 26158]
4. 5 [Option ID = 26157]

Correct Answer :-

- – 1 [Option ID = 26156]

98) If $f(x)$ is defined in$(0,1)$, then the domain of definition of $f(\sin x)$ is

[Question ID = 6530]

1. $(2n\pi,\ (2n+1)\pi), n \in Z$ [Option ID = 26111]
2. $\left((n-1)\pi,\ (n+1)\pi\right), n \in Z$ [Option ID = 26113]
3. $\left((2n-1)\frac{\pi}{2},\ (2n+3)\frac{\pi}{2}\right), n \in Z$ [Option ID = 26114]
4. $\left((2n+1)\frac{\pi}{2},\ (2n+3)\frac{\pi}{2}\right), n \in Z$ [Option ID = 26112]

Correct Answer :-

- $(2n\pi,\ (2n+1)\pi), n \in Z$ [Option ID = 26111]

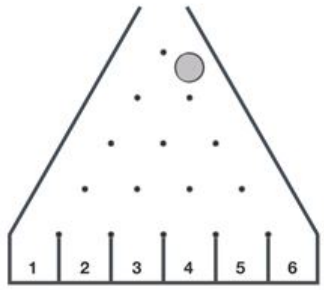
99) A batsman in his 16th innings makes a score of 70 runs and thereby increases his average by 2 runs. If he has never been not out, then his average after 16th inning is [Question ID = 6582]

1. 38 [Option ID = 26320]
2. 36 [Option ID = 26319]
3. 42 [Option ID = 26322]
4. 40 [Option ID = 26321]

Correct Answer :-

- 40 [Option ID = 26321]

100) The figure shows a peg board used for a game show. Whenever the gray chip falls onto a peg, it has an equal chance to bounce either to the left or the right peg right.



The probability of the chip falling in slot 2 is

[Question ID = 6577]

1. 1/16 [Option ID = 26299]
2. 1/8 [Option ID = 26300]
3. ¼ [Option ID = 26302]
4. 3/8 [Option ID = 26301]

Correct Answer :-

- 1/16 [Option ID = 26299]