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IPMAT INDORE 2020

QA Short Answer (SA)

1. In a division problem, product of quotient and the remainder is 24 while their sum is 10. If the divisor is 5 then dividend is_____.

Solution

We know, Dividend = Divisor × Quotient + Remainder

Given, Divisor = 5

$\left.\begin{matrix} Q.R = 24 \\ Q + R = 10 \end{matrix}\right]$ Using hit and trial Q = 6 and R = 4

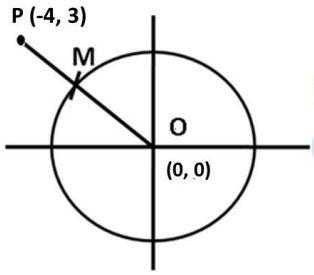
R will be 4 as remainder cannot be greater than the divisor.

Substituting, we get Dividend (n) = 5 × 6 + 4 = 34.

2. The shortest distance from the point (-4, 3) to the circle $x^2 + y^2 = 1$ *is* _____.

Solution

Given equation is of a circle with centre at (0, 0) and radius = 1 unit.



$x^2 + y^2 = 1^2$

PM = PO – MO

= PO – Radius

$= \sqrt{(-4-0)^2 + (3-0)^2}$

$= \sqrt{16+9}$

$= \sqrt{25}$

$= 5$

So, PM = 5 – 1 = 4 units.

3. The value of $0.04^{log_{\sqrt{5}}\left(\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\cdots\right)}$ *is* _____.

Solution

$0.04^{\log_{\sqrt{5}}\left(\frac{1}{4}+\frac{1}{8}+\frac{1}{16}\ldots\ldots\right)}$

$= \left(\frac{4}{100}\right)^{\log_{\sqrt{5}}\left(\frac{\frac{1}{4}}{1-\frac{1}{2}}\right)}$

$= \left(\frac{1}{5^2}\right)^{\log_{\sqrt{5}}\left(\frac{1}{2}\right)}$

$= 5^{-2\times 2\log_5\left(\frac{1}{2}\right)}$ $(\because log_{b^x}a = \frac{1}{x}log_b a)$

$= 5^{-4.\log_5\left(\frac{1}{2}\right)}$

$= 5^{\log_5\left(\frac{1}{2}\right)^{-4}}$

$= 5^{\log_5 2^4}$

$= 5^{\log_5 16}$

$= 16$ $(\because a^{\log_a x} = x)$

4. Suppose $\begin{vmatrix} a & a^2 & a^3-1 \\ b & b^2 & b^3-1 \\ c & c^2 & c^3-1 \end{vmatrix} = 0$, where a, b and c are distinct real numbers. If a = 3, then the value of abc is_____.

Solution

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

$$\Rightarrow \begin{vmatrix} a & a^2 & a^3 \\ b & b^2 & b^3 \\ c & c^2 & c^3 \end{vmatrix} + \begin{vmatrix} a & a^2 & -1 \\ b & b^2 & -1 \\ c & c^2 & -1 \end{vmatrix} = 0 \quad \text{(using sum property)}$$

$$\Rightarrow abc\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} - \begin{vmatrix} a & a^2 & 1 \\ b & b^2 & 1 \\ c & c^2 & 1 \end{vmatrix} = 0 \quad \text{(using scalar multiple property)}$$

$$\Rightarrow abc\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} + \begin{vmatrix} 1 & a^2 & a \\ 1 & b^2 & b \\ 1 & c^2 & c \end{vmatrix} = 0 \quad \text{(using switching property twice)}$$

$$\Rightarrow abc\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} - \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = 0$$

$$\Rightarrow (abc - 1)\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = 0$$

$$\Rightarrow \text{either } (abc - 1) = 0 \text{ or } \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = 0$$

Value of determinant cannot be 0 as a, b and c are distinct real numbers therefore abc -1 =0. Thus abc = 1.

5. The minimum value of $f(x) = |3 - x| + |2 + x| + |5 - x|$is equal to_____.

Solution

Minimum value of such function always comes at a critical point. In the equation, there are three critical points

$\left.\begin{matrix} 3 - x = 0 & x = 3 \\ 2 + x = 0 & x = -2 \\ 5 - x = 0 & x = 5 \end{matrix}\right]$ 3 critical points

Arrange these critical point in increasing order, -2, 3, 5

So, minimum value will be obtained at middle critical point i.e. at 3.

$f(3) =$ Minimum value of the function

$f(3) = |3 - 3| + |2 + 3| + |5 - 3|$

$= 0 + 5 + 2 = 7$

6. Ashok purchased pens and pencils in the ratio 2:3 during his first visit and paid Rs. 86 to the shopkeeper. During his second visit, he purchased pens and pencils in the ratio 4:1 and paid Rs. 112. The cost of a pen

as well as a pencil in rupees is a positive integer. If Ashok purchased four pens during his second visit, then the amount he paid in rupees for the pens during the second visit is_____.

Solution

On 2nd day the equation of total cost will be 4A+ 1B = 112
where A and B are the cost of a pen and a pencil respectively.
1st day, he bought pen and pencil in the ratio 2 : 3 so
Case I : Let us assume he bought 2 Pens and 3 pencils
We will get the equation 2A + 3B = 86.
Case II : Let us assume he bought 4 Pen and 6 pencils.
Then the equation of total cost will be 4A + 6B = 86
We can say, that Case II Is not possible on 2nd day as
4A + B = 112 (by 2nd day equation)
∴ 4A + 6B > 112
It cannot be 86.
So only case I is possible
∴ we get two simultaneous equations,
2A + 3B = 86
4A + B = 112
Solving these two equations for A, we get
A = 25
So the cost of 4 pens on 2nd day will be ₹ 100.

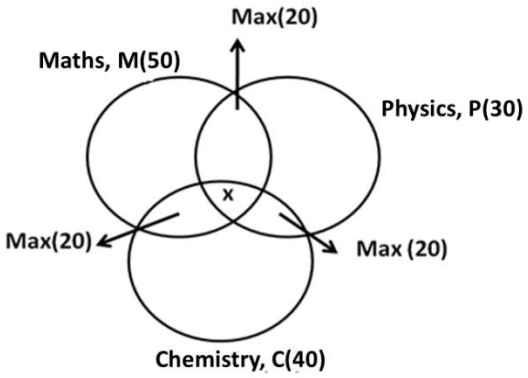
7. In a four-digit number, the product of thousands digit and units digit is zero while their difference is 7. Product of the middle digits is 18. The thousands digit is as much more than the units digit as the hundreds digit is more than the tens digit. The four-digit number is_____.

Solution

Let the 4 digit number be A, B, C, D
Condition 1: A × D =0
It mean either A or D is '0'
But A cannot be zero, as a 4 digit no. cannot start with 0 therefore D = 0.
Condition 2: A – D = 7
Therefore A – 0 = 7
A = 7
Condition 3: B × C = 18
either 9 × 2
or 6 × 3
Condition 4: B – C = A – D = 7
So B and C Should be only be 9 and 2 respectively. So the number is 7920.

8. Out of 80 students who appeared for the school exams in Mathematics (M), Physics (P) and Chemistry (C), 50 passed M, 30 passed P and 40 passed C. At most 20 students passed M and P, at most 20 students passed P and C and at most 20 students passed C and M. The maximum number of students who could have passed all three exams is _____.

Solution



$n(M \cup P \cup C) = n(M) + n(P) + n(C) - n(M \cap P) - n(M \cap C) - n(P \cup C) + n(M \cap P \cap C)$
$n(M \cup P \cup C) + [n(M \cap P) + n(M \cap C) + n(P \cap C)] - [n(M) + n(P) + n(C)] = n(M \cap P \cap C)$
In order the maximize $= n(M \cap P \cap C)$,

$$\left.\begin{matrix} n(M \cup P \cup C)\& \\ n(M \cap P), n(M \cap C) \\ n(P \cap C) \end{matrix}\right] \text{ should be maximum.}$$

Substituting their maximum value we get
$80 + [20 + 20 + 20] - [50 + 30 + 40] = n(M \cap P \cap C)max$
$n(M \cap P \cap C)max = 20$

9. Two friends run a 3 kilometer race along a circular course of length 300 meters. If their speeds are in ratio 3:2, the number of times the winner passes the other is_____.

Solution

Total length of race = 3000 m
One who completes 10 rounds first will win the race.
The ratio of their speed = 3 : 2
It means they will meet only at 1(by doing 3-2) point which is starting point.
Let the speed be $3x\&2x$.
Time for their 1st meeting at starting point
=LCM $\left(\frac{300}{3x}, \frac{300}{2x}\right)$
$= \frac{300}{x}$
By this time, distance by the faster one is $\frac{300}{x} \times 3x = 900$m. By 3rd meeting he would have covered 2700m.
So, by the time faster one finishes the race (3000m) he would have met slower person 3 times.

10. Out of 13 objects, 4 are indistinguishable and rest are distinct. The number of ways we can choose 4 objects out of 13 objects is _____.

Solution

	Distinct Objects (9)	Number of ways of selection		Identical Objects (4)	Number of ways of selection
Case I	Choose 4	9_{C_4} ways	×	Choose 0	1 way
Case II	Choose 3	9_{C_3} ways	×	Choose 1	1 way
Case III	Choose 2	9_{C_2} ways	×	Choose 2	1 way
Case IV	Choose 1	9_{C_1} ways	×	Choose 3	1 way
Case V	Choose 0	9_{C_0} ways	×	Choose 4	1 way

After adding all these cases we get,
$9_{C_4} \times 1 + 9_{C_3} \times 1 + 9_{C_2} \times 1 + 9_{C_1} \times 1 + 9_{C_0} \times 1 = 256$

QA Multiple Choice Questions (MCQ)

11. The probability that a randomly chosen factor of 10^{19} is a multiple of $10^{15}$is

(a) $\frac{1}{25}$ (b) $\frac{1}{12}$ (c) $\frac{1}{20}$ (d) $\frac{1}{16}$

Solution

$10^{19}=5^{19} \times 2^{19}$

Total no. of factors of $10^{19} = (19 + 1)(19 + 1)$

$=20\times 20$

$= 400$

We can write $10^{19} = 10^{15}(10^4)$

$= 10^{15} \times (5^4 \times 2^4)$

So we can say, number of factors which are multiple of 10^5as well = (4+1)(4+1)

$= 5 \times 5 = 25$

So, the probability = $\frac{25}{400} = \frac{1}{16}$

12. The number of acute angled triangles whose sides are three consecutive positive integers and whose perimeter is at most 100 is

(a) 28 (b) 29 (c) 31 (d) 33

Solution

Properties of acute angle triangle is

$c^2 < a^2 + b^2$

Where, c is the largest side of the triangle

Given: Perimeter should be less than or equal to 100.

Let the sides be a, b & c

$a + b + c \leq 100$

Set of sides satisfying above condition will be

$\Rightarrow \underbrace{(1,2,3,)(2,3,4)(3,4,5)(4,5,6) \ldots\ldots (32,33,34)}_{\text{Total 32 cases}}$

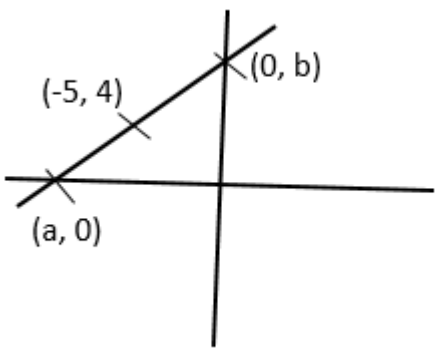
Out of these, first 3 cases can be eliminated as they do not follow properties of acute angle triangle.

13. The equation of the straight line passing through the point M (-5, 4), such that the portion of it between the axes is divided by the point M is to two equal halves, is

(a) 10y-8x=80 (b) 8y+10x=80

(c) 10y+8x=80 (d) 8y+10x+80=0

Solution



Using mid point formula,

$\frac{a+0}{2} = -5$ | a = -10

$\frac{b+0}{2} = 4$ | b=8

So, the equation of line passing through (-10,0) and (0,8) is given by

$y - 0 = \frac{8-0}{0-(-10)} \times (x+10)$

$10y = 8(x+10)$

$10y - 8x = 20$

Alternatively,

Check which of the given equation is satisfied by point (-5,4). Only 1st option is satisfied.

14. The value of $\cos^2\frac{\pi}{8} + \cos^2\frac{3\pi}{8} + \cos^2\frac{5\pi}{8} + \cos^2\frac{7\pi}{8} +$ is

(a) 1 (b) $\frac{3}{2}$ (c) 2 (d) $\frac{9}{4}$

Solution

$\cos^2\frac{\pi}{8} + \cos^2\frac{3\pi}{8} + \cos^2\frac{5\pi}{8} + \cos^2\frac{7\pi}{8}$

$\cos^2\frac{\pi}{8} + \cos^2\frac{3\pi}{8} + \cos^2\left(\pi - \frac{3\pi}{8}\right) + \cos^2\left(\pi - \frac{\pi}{8}\right)$

$\because -\cos\theta = \cos(\pi-\theta)$

or

$\cos^2\theta = \cos^2(\pi - \theta)$

$= \cos^2\frac{\pi}{8} + \cos^2\frac{3\pi}{8} + \cos^2\frac{3\pi}{8} + \cos^2\frac{\pi}{8}$

$= 2\cos^2\frac{\pi}{8} + 2\cos^2\frac{3\pi}{8}$

$= 2\left[\cos^2\frac{\pi}{8} + \cos^2\frac{3\pi}{8}\right] = 2 \times 1 = 2$

$\because \cos^2 A + \cos^2 B = 1$

If $A + B = 90^0$

15. If $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \cdots$ upto $\infty = \frac{\pi^2}{6}$, then value of $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$ upto ∞ is

(a) $\frac{\pi^2}{8}$ (b) $\frac{\pi^2}{16}$ (c) $\frac{\pi^2}{12}$ (d) $\frac{\pi^2}{36}$

Solution

Given $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \cdots \propto = \frac{x^2}{6}$

$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots \propto + \left(\frac{1}{2^2} + \frac{1}{4^2} + \frac{1}{6^2} + \cdots \propto\right) = \frac{x^2}{6}$

$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots \propto = \frac{x^2}{6} - \left(\frac{1}{2^2} + \frac{1}{4^2} + \frac{1}{6^2} + \cdots \propto\right)$

$= \frac{x^2}{6} - \frac{1}{2^2}\left(1 + \frac{1}{2^2} + \frac{1}{3^2} + \cdots \propto\right)$

$= \frac{x^2}{6} - \frac{1}{2^2}\left(1 + \frac{1}{2^2} + \frac{1}{3^2} + \cdots \propto\right)$

$= \frac{x^2}{6} - \frac{1}{4}\left(\frac{x^2}{6}\right)$

$= \frac{3}{4}.\frac{x^2}{6} = \frac{x^2}{8}$

16. A man is known to speak the truth on an average 4 out of 5 times. He throws a die and reports that it is a five. The probability that it is actually a five is

(a) $\frac{4}{9}$ (b) $\frac{5}{9}$ (c) $\frac{4}{15}$ (d) $\frac{2}{15}$

Solution

P (S_1) = Probability that men speaks truth = $\frac{4}{5}$

P (S_2) = Probability that men speaks lies

= 1 – P (S_1) = 1 -$\frac{4}{5}$=$\frac{1}{5}$

P (E/s_1) = Probability that five appears on the die, if the man speaks the truth. = $\frac{1}{6}$

P (E/S_2) = Probability that, 5 appears on the die, if the men lies = 1 - $\frac{1}{6}$ = $\frac{5}{6}$

Required Probability

$$= \frac{P\,(S_1).\ P\left(\frac{E}{S_1}\right)}{P\,(S_1).\ P\left(\frac{E}{S_1}\right) + P\,(S_2)\,P\left(\frac{E}{S_2}\right)}$$

$$= \frac{\left(\frac{4}{5}\right) \times \frac{1}{6}}{\frac{4}{5} \times \frac{1}{6} + \frac{1}{5} \times \frac{5}{6}} = \frac{\frac{4}{30}}{\frac{9}{30}}$$

$$= \frac{4}{9}$$

17. If $log_5 log_8(x^2 - 1) = 0$, then a possible value of x is

(a) $2\sqrt{2}$ (b) $\sqrt{2}$ (c) 2 (d) 3

Solution

Given $log_5 log_8(x^2 - 1) = 0$

$log_8(x^2 - 1) = 5^0 = 1$ (we know if $log_x a = n, then\ a = x^n$)

$x^2 - 1 = 8^1$

$x^2 = 9$

x= ± 3

Out of given choices x = 3 will be right option.

18. Consider the following statements:

(i) When 0 < x < 1, then $\frac{1}{1+x} < 1 - x + x^2$.

(ii) When 0 < x < 1, then $\frac{1}{1+x} > 1 - x + x^2$.

(iii) When -1 < x < 0, then $\frac{1}{1+x} < 1 - x + x^2$.

(iv) When -1 < x < 0, then $\frac{1}{1+x} > 1 - x + x^2$.

Then the correct statements are

(a) (i) and (ii) (b) (ii) and (iv)

(c) (i) and (iv) (d) (ii) and (iii)

Solution

Consider (i) and (ii)

Let x = ½

$$\frac{1}{1+x} = \frac{1}{1+\frac{1}{2}} = \frac{1}{\frac{3}{2}} = \frac{2}{3}$$

&

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

$\because \frac{1}{2} < \frac{3}{4}$

$\frac{1}{1+x} < 1 - x + x^2$

∴ (i) is correct (ii) is incorrect

Consider (iii) & (iv)

Let x = $-\frac{1}{2}$

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

$1 - x + x^2 = 1 - \left(\frac{-1}{2}\right) + \left(\frac{-1}{2}\right)^2 = 1 + \frac{1}{2} + \frac{1}{4}$

$= \frac{7}{4}$

$2 > \frac{7}{4}$

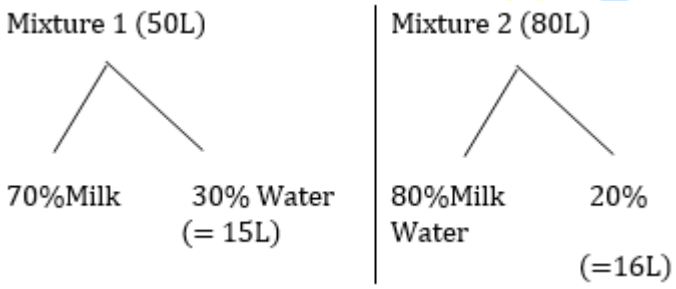
∴ $\frac{1}{1+x} > 1 - x + x^2$

∴ (iii) is incorrect & (iv) is correct therefore i & iv satisfy the condition.

19. Fifty litres of a mixture of milk and water contains 30 percent of water. This mixture is added to eighty litres of another mixture of milk and water that contains 20 percent of water. Then, how many litres of water should be added to the resulting mixture to obtain a final mixture that contains 25 percent of water?

(a) 1 (b) 2 (c) 3 (d) 4

Solution



So adding these two solution,

We get 130L of resultant solution.

Quantity of water = (15+16)L = 31L

Now, if 'x' L of water be added to above 130L of resultant solution,

Total quantity of water = 31 + x = 25% (130 + x)

$31+x = \frac{1}{4}(130 + x)$

124+4x=130+x

3x=6

x= 2L.

20 Three workers working together need 1 hour to construct a wall. The first worker, working alone, can construct the wall twice as fast at the third worker, and can complete the task an hour sooner than the second worker. Then, the average time in hours taken by the three workers, when working along, to construct the wall is

(a) $(\sqrt{33} + 4)/3$ (b) $(\sqrt{33} + 5)/3$

(c) $(\sqrt{33} + 6)/3$ (d) $(\sqrt{33} + 7)/3$

Solution

Let the 1st worker takes t hours to complete the work.

Then, the hours taken by 3rd worker to complete the work = 2t
& by 2nd worker = t + 1
As per the question,
$\frac{1}{t}+\frac{1}{t+1}+\frac{1}{2t}=\frac{1}{1}$

Solving above equation we get
t = $\frac{3+\sqrt{33}}{4}$.
Then, average of time taken by each of the worker will be = $\frac{t+t+1+2t}{3}$
Substituting value of 't', we get = $\frac{\sqrt{33}+4}{3}$

21. In a class, students are assigned roll numbers from 1 to 140. All students with even roll numbers opted for cricket, all those whose roll numbers are divisible by 5 opted for football, and all those whose roll numbers are divisible by 3 opted for basketball. The number of students who did not opt for any of the three sports is
(a) 102 (b) 38 (c) 98 (d) 42

Solution
Student opted for cricket = Even roll numbers = $\left[\frac{140}{2}\right]$ = 70 ; where[x] is Greatest Integer Function.
Student opted for football = multiple of 5 = $\left[\frac{140}{5}\right]$ = 28.
Student opted for football = multiple of 3 = $\left[\frac{140}{3}\right]$ = 46.
Students opted for cricket & football
= multiple of 2 & 5 = multiple of 10 = $\left[\frac{140}{10}\right]$ = 14
Students opted for cricket & basketball
= multiple of 2 & 3 = multiple of 6 = $\left[\frac{140}{6}\right]$ = 23
Student opted for football & basketball
= multiple 3&5 = multiple of 15 = $\left[\frac{140}{15}\right]$ = 9
Student opted for all 3 sports.
= multiple of 2&3 & 5 = multiple of 30 = $\left[\frac{140}{30}\right]$ = 4
So, students opted for at least one of the sport =
n(CUFUB) = n(C) + n(P) + n(B) − n (C ∪ F) − n(F ∩ B) − n (C ∩ B) + n (C ∩ F ∩ B).
=70+28+46 – 14 – 23 – 9+ 4 = 148 - 46= 102
So the student who did not opted for any sport
= 140-102 = 38

22 Given f(x) = $x^2 + \log_3 x +$ and g(y) = 2y + f(y), the value of g(3)equals
(a) 16 (b) 15 (c) 25 (d) 26

Solution
$f(x) = x^2 + \log_3 x$; g(y) = 2y + f(y)
We have to find g(3)
$g(3) = 2 \times 3 + f(3)$
= 6 + f(3) … ……. (1)
Again $f(3) = 3^2 + \log_3 3$
= 9+ 1 = 10
Substituting in equation (1)
g(3)=6+10 = 16.

23. A 2 × 2 matrix is filled with four distinct integers randomly chosen from the set {1,2,3,4,5,6}. Then the probability that the matrix generated in such a way is singular is

(a) $\frac{2}{45}$ (b) $\frac{1}{45}$ (c) $\frac{4}{15}$ (d) $\frac{1}{15}$

Solution

Let A = $\begin{vmatrix} a & c \\ d & b \end{vmatrix}$

For singular matrix, |A| = 0

ad – bc = 0

Desired Probability = $\frac{\text{Number of favourable outcome}}{\text{Number of total outcome}}$

Total outcome = ${}^6C_4 \times 4! = {}^6P_4 = \frac{6!}{2!}$

= 360

Let us assume a, b, c, d. which satisfy required condition i.e., ad – bc = 0 or ad = bc.

5 cannot be used in place of a, b, c or d. Their values can only be chosen from (1, 2, 3, 4, 6)

Case I $\begin{vmatrix} 1 & 2 \\ 3 & 6 \end{vmatrix}$. These 4 can be arranged in 4 ways

Case II $\begin{vmatrix} 2 & 3 \\ 4 & 6 \end{vmatrix}$. These 4 can again be arranged in 4 ways

Total number of favourable outcome = 8

∴ Required probability = $\frac{8}{360} = \frac{1}{45}$

24 Ashok started a business with a certain investment. After few months, Bharat joined him investing half amount of Ashok's initial investment. At the end of the first year, the total profit was divided between them in ratio 3:1. Bharat joined Ashok after

(a) 2 months (b) 3 months (c) 4 months (d) 6 months

Solution

We know Profit share ∝ Investment ×Time of Investment

P ∝ I × T

$P_A : P_B = (I_A \times 12) : \left(\frac{I_A}{2} \times x\right)$

3 :1=12 :$\frac{x}{2}$

3 : 1=24 : x

when, 'x' is time of investment of Bharat (in months)

3 :1 = 24 : x

∴ x = 8 month.

It means Bharat join Ashok after 4 months.

25 The average marks of 6 students in a test is 64. All the students got different marks, one of the students obtained 70 marks and all other students scored 40 or above. The maximum possible difference between the second highest and the second lowest marks is

(a) 50 (b) 54 (c) 57 (d) 58

Solution

Sum of scores of 6 students = 6 × 64

Let A,B,C,D,E be the distinct scores of rest of the 5 students in increasing order.

(A < B < C < D < E)

A+B+C+D+E+70 = 384

A+B+C+D+E = 314

We have to find maximum difference between second highest & second smallest score.
So by observing above equation, it can be said that in order to maximize both D and E we need to keep the values of A, B and C as low as possible.
So let A = 40, B = 41& C = 42
Substituting these values in the equation we get
40+41+42 + D+E = 314.
D+E = 314 -123
D+E= 191
In order to get maximum number of D
D & E should be as close as possible.
So D= 95 and E = 96
Therefore, D – B = 95 - 41= 54

Directions (Q.26-Q30): The table below presents the quoted buy and sell prices of five stocks during the five trading days of a given week. The quoted sell price is the price at which an investor can sell a stock in the market. The quoted buy price is the price at which an investor can buy a stock from the market. All the quoted numbers are in Indian Rupees.

Day	Monday		Tuesday		Wednesday		Thursday		Friday	
Quote	**Sell**	**Buy**	**Sell**	**Buy**	**Sell**	**Buy**	**Sell**	**Buy**	**Sell**	**Buy**
Dabur	460	462	455	458	432	433	444	447	461	462
Marico	345	346	335	336	365	368	372	375	372	374
HUL	1931	1933	1952	1955	1979	1981	2044	2048	1966	1969
ITC	237	238	238	239	246	251	221	225	253	256
Britannia	3044	3046	3100	3101	3110	3115	3025	3027	3140	3144

26 If an investor had Rs. 36,00,000 to invest in any particular single stock, and she could buy the stock only on Monday and sell it off only on Friday, then the stock she should buy on Monday to earn the maximum possible profit during the week is
(a) Marico (b) HUL (c) ITC (d) Britannia

Solution
Investment = ₹36 lakh.
In order to get maximum profit, final income should be maximum.
Option (a) Marico.
No. of shares purchase on Monday (N)=$\frac{36\text{ lakh}}{346}$
Income on selling these shares on Friday = N × share price on Friday
=$\frac{36\text{ lakh}}{346} \times 372$
= 36 lakh × $\frac{372}{346}$ = 36 lakh × 1.07
Option (b) Income from selling HUL shares = 36 lakh × $\frac{1966}{1933}$ = 36 lakh × 1.01
Option (c) Income from selling ITC shares = 36 lakh × $\frac{253}{238}$ = 36 lakh × 1.06
Option (d) Income from selling Britannia shares = 36 lakh × $\frac{314}{3046}$ = 36 lakh × 1.03
We can say that she should buy shares of Marico to get maximum profit.

27 If an investor planned to invest Rs. 36,00,000 in purchasing the stocks of HUL on Monday, sell them off on Wednesday and use the entire proceeds to purchase the stocks of Britannia on the same day and sell them off again on Friday, then the total investment return during the week would be

(a) 2.80 percent (b) 3.00 percent
(c) 3.20 percent (d) 3.40 percent

Solution

Investment amount = 36 lakhs.

Number of HUL shares bought on Monday (n)

$= \frac{36\ lakh}{1933.}$

Above number of shares were sold on Wednesday,

So Income on Wednesday = $(\frac{36\ \text{lakh}}{1933} \times 1979)$₹

With above amount Britannia shares were bought on same day (Wednesday)

Example:-

No. of shares of Britannia purchase = $\left(\frac{36\ \text{lakh}}{1993} \times 1979\right) \times 3115$

Income by selling Britannia shares on Friday = $\left(\frac{36\ \text{lakh} \times 1979}{1933 \times 3115}\right) \times 3140.$

= 37.15 lakh.

% return $= \frac{\text{Income} - \text{investment}}{\text{investment}} \times 100$

$= \left(\frac{37.15-36}{36}\right) \times 100 = 3.19\%$

28 The difference between the quoted buy and sell price of a stock is referred to as the spread of the stock. The average spread of the stocks is lowest on

(a) Monday (b) Tuesday (c) Thursday (d) Friday

Solution

As the spread of each stock is observed to be less on Monday as compared to on other days, their average too will also be less on Monday.

29. A brokerage firm charges 0.1 percent trading commission on the value of shares bought or sold through its trading platform. If an investor bought 1000 shares of Britannia on Tuesday, and sold all of them on Thursday, then the total brokerage fee that will be charged from the investor is

(a) 6,125 (b) 6,126 (c) 6,127 (d) 6,128

Solution

Amount invested for buying 1000 share of Britannia of Tuesday = ₹ (1000× 3101)

Income by selling 1000 share of Britannia of Thursday

= ₹ (1000× 3025)

Total brokerage = 0.1% [3101000+3025000]

= ₹ 6126

30 If you had decided to invest Rs. 36,00,000 worth of ITC stocks on Monday, then the day of the week you should choose to sell the stocks to earn the maximum possible profit would be

(a) Tuesday (b) Wednesday (c) Thursday (d) Friday

Solution

Higher the selling price, higher the profit.

Then, by observation it is Friday.

VERBAL ABILITY

Directions (Q.31-Q.36): Read (he following passage and choose the answer that is closest for each of the questions that are based on the passage.

"John Muir, Earth-planet, Universe." — These words are written on the inside cover of the notebook from which the contents of this volume have been taken. They reflect the mood in which the late author and explorer undertook his thousand-mile walk to the Gulf of Mexico a half-century ago. Mo less does this refreshingly cosmopolitan address, which might have startled any finder of the book, reveal the temper and the comprehensiveness of Mr. Muir's mind. Even at the early age of twenty-nine his eager interest in every aspect of the natural world had made him a citizen of the universe.

On these expeditions he had disciplined himself to endure hardship, for his notebooks disclose the fact that he often went hungry and slept in the woods, or on the open prairies, with no cover except the clothes he wore.

"Oftentimes," Mr. Muir writes in some unpublished biographical notes, "I had to sleep mil without blankets, and also without supper or breakfast. But usually I had no great difficulty in finding a loaf of bread in the widely scattered clearings of the farmers. With one of these big backwoods loaves I was able to wander many a long, wild mile, free as the winds in the glorious forests and bogs, gathering plants and feeding on God's abounding, inexhaustible spiritual beauty bread. Only once in my long Canada wanderings was the deep peace of the wilderness savagely broken. It happened in the maple woods about midnight, when I was cold and my fire was low. I was awakened by the awfully dismal howling of the wolves, and got up in haste to replenish the fire,"

Had it not been for the accidental injury to his right eye in the month of March, 1867, he probably would have started somewhat earlier than he did. In a letter written to Indianapolis friends on the day after the accident, he refers mournfully to the interruption of a long-cherished plan, "For weeks," he writes, "I have daily consulted maps in locating a route through the Southern States, the West Indies, South America, and Europe - a botanical journey studied for years. But, alas, I am half blind. My right eye, trained to minute analysis, is lost and I have scarce heart to open the other."

The injury to his eye proved to be less serious than he had at first supposed. In June he was writing to a friend: "I have been reading and botanizing for some weeks, and find that for such work I am not very much disabled."

In an account written after the excursion he says: "I was eager to see Illinois prairies on my way home, so we went to Decatur, near the center of the State, thence, I botanized one week on the prairie about seven miles southwest of Pecatonica….. To me all plants are more precious than before. My poor eye is not better, nor worse, A cloud is over it, but in gazing over the widest landscapes, I am not always sensible of its presence."

31. "John Muir, Earth-planet, Universe," Muir wrote this in his notebook because
(a) He did not have a permanent address.
(b) He wanted to be a traveller all his life.
(c) His love for botany went beyond borders.
(d) He wanted to live in the open all his life.

Ans. c
Solution:
Option a, b and d will be eliminated as the passage doesn't state any of these explicitly or implicitly. Read the last line of the first para.. Even at the…universe. This line clearly suggests that his love for botony (nature) went beyond borders (made him the citizen of the world).

32. Which of these did John Muir have no great difficulty in doing?
(a) Finding food among the farmers.
(b) Bating regularly every day.
(c) Sleeping without blankets on certain nights.
(d) Chasing wolves that howled through the nights.

Ans. a
Solution:
This is a direct answer to a direct question. Read the 2nd line of the third paragraph.

33. How did the experience with nature affect John Muir?
(a) He felt spiritually fulfilled.
(b) He became a better botanist.
(c) He felt successful after collecting rare plants.
(d) He enjoyed the breeze in the glorious forests.

Ans. a
Solution:
Option b can be eliminated as the passage doesn't talk about him becoming a better botanist. Similarly, it doesn't talk about Muir feeling successful after collecting rare plants. Option d is a distortion. Option a is the closest correct option as per the 4th and 5th line of the third paragraph.

34. According to the passage, in what way was Muir affected by his injury?
(a) His injured eye healed well very slowly.
(b) He could not open his left eye during his exploration.
(c) His eyesight was affected, but he was able to carry on.
(d) He took a long time to consult maps and study them.

Ans. d
Solution:
The last part of the fourth paragraph clearly suggests that due to the injury in his right eye, he could no longer consult the maps as he usually did.

35. When Muir said that he 'botanized', he meant that he
(a) studied plants and made notes on them.
(b) studied plants in their natural habitat
(c) studied plants during his exploration.
(d) studied plants and classified them.

Ans. b
Solution:
Option a and d can be eliminated as nothing is mentioned in the passage about Muir making notes or classifying the plants. Option b is a better choice than option c as the latter suggests that he went exploring and studied plants on the way when it was the other way around (as clearly stated in the last line of the first paragraph that his love for nature made him an explorer). Therefore option b is the most appropriate option.

36. Which of these sentences is not true?
(a) John Muir explored several new places even on his way home.
(b) There was a cloud over the landscape he travelled.
(c) He was committed to being a botanist more than ever.
(d) He recorded his adventures in the notebook.

Ans. b
Solution:
Option d is true. Read the last paragraph. He recorded his adventures in his notebook. This is mentioned clearly in the second paragraph. Option C is not mentioned anywhere in the passage.
To have a cloud over your head means a situation that makes you worry or feel unhappy. So the line A cloud is over it in the last paragraph doesn't literally mean that there was a cloud over his head. Therefore option b is the right answer.

Directions (Q.37-Q.42): Complete the following sentences by choosing the appropriate word/phrase from the options given below.

37. It came as a shock to me that my friend had lost the _____ he had built carefully over the years when in a moment of madness he lent all of it to his neighbour.
(a) nest egg
(b) nests and eggs
(c) bird's nest
(d) nestled eggs

Ans. a
Solution:
A nest egg means sum of money saved for the future.

38. During the debate, when the minister appeared to be vague about his stand on the controversial energy project, his opponent asked him to _____ and declare outright if the government would go ahead with the project or not.
(a) be curt to the face
(b) cut to the chase
(c) curb the farce
(d) cut globe

Ans. b
Solution:
cut to the chase means come to the point.

39. It is irritating when co-workers dismiss your ideas as worthless, and later, present those very ideas as their own. They just want to _____
(a) steal your credit
(b) steal your crown
(c) steal your thunder
(d) steal your gloating

Ans. c
Solution:
Steal your thunder means to take the credit for someone else's idea.

40. Before the start of the meeting, I am _____ on the latest developments.
(a) taking you through
(b) going to share
(c) going to bring you up to speed
(d) going to be explaining

Ans. c
Solution:

"going to bring you up to speed" means to give the latest information.

41. Despite statistics to prove that there was *a* slowdown in the economy of the country, the professor was _____ about it.
(a) in affirmation
(b) in denial
(c) in protest
(d) in shock

Ans. b

The use of despite suggests that there will be a contrast so the professor will not agree with the first statement. Therefore option b is the most appropriate choice.

42. After the unearthing of relics at the archaeological site, the historian was asked to _____ the significance of the discovery.
(a) throw light on
(b) shed meaning on
(c) turn light on
(d) focus meaning on

Ans. a
Solution:
Throw light on means to explain something by providing further information about it. Option b and d are grammatically wrong. Turn light on means to actually switch on the light.

Directions (Q.43-Q.45): Choose the alternative so that the underlined part of the sentence is rendered correct.

43. The pharmaceutical company hired a consultant to supervise a taskforce <u>studying lower salaries as to their effects on employees' morale.</u>
(a) studying what the effects lower salaries would have on employees' morale
(b) studying the effects of lower salaries on employee morale
(c) for studying what are the effects in employees' morale that lower salaries would cause
(d) studying the effects of employee morale on lower salaries

Ans. b
Solution:
Option a is grammatically wrong as the effects lower salaries would have isn't right as per the rule of parallelism. Option d is a distortion therefore it is wrong. Again option c is grammatically incorrect.

44. Besides offering physiological rewards such as toned muscles, <u>when regular karate is practiced the body can be turned into a dangerous weapon.</u>
(a) one can turn the body into a dangerous weapon through karate, if it is practiced regularly
(b) the body can be turned into a dangerous weapon as a result of karate if practiced regularly
(c) when karate is practiced regularly, the body can be turned into a dangerous weapon
(d) karate, if practiced regularly, can turn the body into a dangerous weapon

Ans. d
Solution:
Besides means in addition to, example; besides food she gave him money. So, we need a subject to make the sentence grammatically correct. Bearing this in mind, option a, b and c can be eliminated.

45. The animal activist has raised awareness <u>not only on the plight of abandoned dogs, but also on overworked bulls</u> and temple elephants.
(a) on the plight of not only the abandoned dogs, but also on those of overworked bulls
(b) not only on the plight of the abandoned dogs, but also on that of overworked bulls
(c) the plight of abandoned dogs, as well as the over worked bulls
(d) the plight of abandoned dogs, but also on overworked bulls

Ans. b
Solution:
Not only ..but also, will take noun in both the clauses. So if the animal activists are raising awareness not only of the **plight o**f something…it should be followed by," but also on the **plight/that of** bulls and temple elephants." Therefore, option b is the most appropriate answer choice.

Directions(Q.46-Q.47): Each of the paragraphs given below has a sentence missing which is indicated by a blank. From the choices given below each paragraph, choose the sentence that seems most logically appropriate to complete the paragraph.

46. When people move from one city or country to another, the spread of diseases may result. People often bring in germs which may not have been present there before. These new germs can spread quickly and cause previously unknown diseases. _____ . They become ill more easily and could even die. In turn, newcomers may catch diseases which were not present where they came from.
(a) If they had gone back, they would have started an epidemic.
(b) Pollution also can lead to the spread of disease.
(c) If a germ is completely new to a region, people have no natural protection against it.
(d) Such changes may result in enhancing conditions for people who live in big cities.

Ans. c
Solution:
Option c very comfortably talks about germs in the first clause which matches with the preceding information and people in the second clause which goes well with the succeeding sentence.

47. Samar, a young man from a village in Tripura is a social media star who hopes to make it big as a model and actor. While his minute-long videos are very popular, his series titled, "Who wore it better?" showcases his creative side. He uses a variety of filters and visual effects to improve his videos.
_____
(a) It is clear that short videos arc very popular among the youth than television.
(b) This is one of the ways young men make money on the internet.
(c) It is possible to *be* popular on the internet, although making money here is difficult.
(d) This shows how it is possible today for people with limited resources to express their creativity.

Ans. d
Solution:
The passage essentially talks about Samar being creative and popular. Option a,b and c can be easily eliminated as the passage makes no reference to television or making money on the internet. Therefore, option d is a clear cut choice.

Directions (Q.48-Q.52): The sentences below have words that are missing. Choose the best option from those given below to complete the sentence.

48. Coral reefs are one of the most _____ , biologically complex, and diverse marine ecosystems on Earth. This ecosystem is one of the _____ paradoxes of the biosphere: how do clear, and thus nutrient-poor, waters support such _____and productive communities?
(a) common, sensitive, fruitful
(b) fragile, fascinating, prolific
(c) deep, strange, exuberant
(d) frail, unrecognised, wealthy

Ans. b
Solution:
Option d can be eliminated as wealthy won't fit in the last blank. The productive communities in the water can't be wealthy and since fruitful and productive mean the same option a can also be eliminated. Now if we choose option c, deep won't fit in the first blank as we can't say one of the most deep. Therefore, option b is the most suitable answer.
Fragile – can be broken easily
Fascinating – extremely interesting
Prolific - plentiful
Exuberant – full of energy
Frail – weak and delicate

49. It is a _____to live in a land without _____. Even with all the technological advancement and economic growth, there are still millions who live in war zones where life every day is filled with _____.
(a) coincidence, prejudice, adventures
(b) privilege, bigotry, terror
(c) lovely, pride, episodes
(d) punishment, hate, agony

Ans. b
Solution:
Option a can be eliminated as adventures doesn't go well contextually in the last blank. Similarly, option c and can also be eliminated as punishment, hate and lovely, pride won't fit contextually in the first two blanks.
Privilege – advantage
Bigotry - the fact of having and expressing strong, unreasonable beliefs.
Terror – extreme fear

50. The ability to _____ and _____ a cohesive team is particularly critical in hi-tech firms where the _____ landscape can shift dramatically in the face of disruptive technologies.
(a) mentor, keep, sustainable
(b) shape, guide, competitive
(c) drive, maintain, tectonic
(d) involve, manage, green

Ans. b
Solution:
Option c and d will be eliminated as tectonic and green won't fit in the last blank as these refer to literal landscape.
Option a can be deleted as sustainable won't fit contextually in the last blank, reason being, a sustainable landscape won't shift dramatically. Option b is the correct answer.
Shape – form
Guide – advise
Competitive - characterized by competition.
sustainable - able to be maintained at a certain rate or level

51. Cool-headed and rational, Jo Eun-cha is a talented and driven anchorman who commands as well as demands respect. After _____ to gel elected as a news director, he aims to _____to his job as the top news anchor to increase his _____ of being elected the next year.
(a) happening, quit, hopes
(b) failing, return, chances
(c) hoping, upgrade, certainty
(d) going, give up, luck

Ans. b
Solution:
Option a can be eliminated as 'happening' won't fit grammatically in the first blank. Similarly, the middle word, give up in option d won't be an appropriate fit if luck is to be filled in the last blank, therefore option d can also be eliminated. Out of b and c, former is a better choice as chances fit more appropriately than certainly in the last blank.

52. A collective investment fund (CIF), also known as a collective investment trust (CIT), is a group of _____ accounts held by a bank or trust company. The financial institution assets from individuals and organizations to _____ a single larger, diversified portfolio.
(a) diverse, discounts, conceive
(b) different, collected, simulate
(c) financial, covered, synthesise
(d) pooled, groups, develop

Ans. d
Solution:
Option b and c can be eliminated as the middle words collected and covered are in past tense therefore these won't go with the flow of the whole paragraph which is in present tense. Option a should be eliminated as middle option discount doesn't fir contextually in the given scenario. Option d is the answer.
Pooled – accumulated (used as an adjective here)
Group - category
Develop – expand, grow

Directions (Q.53-Q.57): One of the statements below contains a word used incorrectly. Choose the option which has the incorrect or inappropriate usage of the word.

53.
(a) The President of the City Chamber of Commerce is an urbane, kindly and generous man.
(b) The writer's next book deals with the life of an urbane intellectual as seen through the eyes of a lawyer,
(c) My uncle who lives in New York turned out to be the exact opposite of the urbane, wealthy gentleman that I was expecting to meet,
(d) Over 70% of the people living in urbane areas said that they wanted belter roads and more schools.

Ans. d
Solution:
The word urbane is an adjective which means of a person) courteous and refined in manner., therefore it's used appropriately in option a, b and c. The word urban which means characteristic of a town and city should have been used here.

54.
(a) The young scientist built a small, low-cost machine to recycle waste water. It was a simple but ingenious solution to die problem of water shortage in the city.
(b) My friend is an ingenious cook - she can make very delicious dishes from the most ordinary ingredients.
(c) The young man lost all his savings because he was rather ingenious to believe the agent's promises of a well-paid job and a comfortable life in a foreign country,
(d) Teachers say that some children are very ingenious when it comes to finding excuses for not completing their work.

Ans. c
Solution:
Ingenious means clever, original, and inventive where as ingenuous means innocent and unsuspecting

55.

(a) After several rounds of meetings, the city council passed an ordinance to limit the number of cafes near the seaside.
(b) As per a royal ordinance, all men under 18 had to join die army and fight the war.
(c) Military aircrafts can he used to curry a wide variety of ordinance.
(d) The people pro tested a city ordinance that all parks must be closed by9 pm.

Ans. c
Solution:
Ordinance means an authoritative order or a rule to be followed ordnance means artillery, guns etc.

56.

(a) It is a pleasure when we are all together for a meal at home.
(b) Her son is not interested in watching movies, which is not all together a bad thing.
(c) The three hundred guests sat all together in the large dining hall of the hotel.
(d) The facilitator asked the participant to stand up, all together.

Ans. b
Solution:
All together means everyone or everything together; altogether means all in all, completely

57.

(a) The sickness of a family member can affect the lives of everyone at home.
(b) Kerala was affected by severe Hood all through the year.
(c) Taking this medicine for a prolonged period can have severe after affects.
(d) The popular star was not a natural actor; his style was rather affected.

Ans. C
Solution:
Affect is a verb which means impact or change therefore has been aptly used in sentence a, b and d. However, effect is a noun. After effect would have been appropriate in option c.

Directions(Q.58-Q.60): The sentences given below, when properly sequence*!, form a coherent paragraph. Each sentence is labelled with a number. Decide on the most logical order and enter the sequence of numbers in the space provided.

58.

(A) However, they stand out because they help the film maker realize his personal artistic vision.
(B) An Indie film refers to independent films made outside a major studio system.
(C) Their release is also limited to a few screens, although there have been films with a wide release.
(D) Most of such dims arc low budget films produced and distributed by small companies.

Solution: BADC
Option b introduces the premise and option a takes the thought further. Option d and c are compulsory pairs as they take about low budget films. Therefore, the correct sequence is BADC

59.

(A) Mental illness continues to struggle for recognition as a significant contributor to poor health in spite of the existence of the Mental Healthcare Act 2017.
(B) The data reveals that an estimated one in seven Indians -or 197 million persons- suffered from mental disorders, at varying degrees of severity, in 2017.
(C) There is always more to human health than meets the eye.
(D) This is particularly important in the Indian cultural and political context, where the outward appearance of physical well-being is often considered the only visible marker of overall health.

Solution: CDAB

60.

(A) It was felt that the major polluters had a moral obligation to deliver on the agreements reached some years ago during a similar convention on Climate Change.
(B) The papers presented indicated that the impacts of current warming are much more severe than previously understood.
(C) It appears that the planet's ability to adapt to and cope with how it is being treated is fraying.
(D) For example, the acceleration of sea level rise and ocean warming, and increasing risks of reaching limits to adaptation.
(e) This is what emerged at a recent conference attended by the largest scientific community on climate science.

Solution: CEBDA