CUET UG 2024 Mathematics Question Paper 319 E SET D

Q1.If the objective function Z=ax+byZ = ax + byZ=ax+by is maximum at points (8, 2) and (4, 6) and if a≥0a \\\\geq 0a≥0, b≥0b \\\\geq 0b≥0, and ab=25ab = 25ab=25 then the maximum value of the function is
(1) 60 (2) 50 (3) 40 (4) 80

Answer : (1) 60
Solution:
The objective function is Z=ax+byZ = ax + byZ=ax+by. Maximum occurs at points (8, 2) and (4, 6). Thus we have two equations:
Z=8a+2bZ = 8a + 2bZ=8a+2b Z=4a+6bZ = 4a + 6bZ=4a+6b
Now, ab=25ab = 25ab=25
From the above values of aaa and bbb satisfy the conditions. Given that, ZZ for maximum value is 60.

Q2.The region bounded by the lines x+2y=12x + 2y = 12x+2y=12, x=2x = 2x=2, x=6x = 6x=6, and the x-axis is:
(1) 34 sq units (2) 20 sq units (3) 24 sq units (4) 16 sq units

Answer: (1) 34 sq units
Solution:
The given lines are x+2y=12x + 2y = 12x+2y=12, x=2x = 2x=2, x=6x = 6x=6, and the x-axis (i.e., y=0y = 0y=0).
For the line x+2y=12x + 2y = 12x+2y=12, when x=2x = 2x=2, y=5y = 5y=5, and when x=6x = 6x=6, y=3y = 3y=3.
The coordinates of the vertices of the region are given as (2,0),(2,5),(6,3), and (6,0).
The formula for the area of this trapezium is defined by:
Area=12×(6−2)×(5+3)=34 square units.\\\\text{Area} = \\\\frac{1}{2} \\\\times (6 - 2) \\\\times (5 + 3) = 34 \\\\text{ square units}.Area=21×(6−2)×(5+3)=34 square units.

Q3.A die is rolled thrice. Find the probability that the number obtained on the first and the second throw is greater than 4 and on the third is less than 4.
(1) 13\\\\frac{1}{3}31 (2) 16\\\\frac{1}{6}61 (3) 19\\\\frac{1}{9}91 (4) 118\\\\frac{1}{18}181

Answer: (2) 16\\\\frac{1}{6}61
Solution:
For a number greater than 4 on a die, the possibilities are 5 and 6, so the probability is 13\\\\frac{1}{3}31.

For the third roll, the probability of the number is less than 4 which includes 1, 2, and 3. Therefore, the probability is 12\\\\frac{1}{2}21.The probability that we require is:nnP=(13×13×12)=16P = \\\\left(\\\\frac{1}{3} \\\\times \\\\frac{1}{3} \\\\times \\\\frac{1}{2} \\\\right) = \\\\frac{1}{6}P=(31×31×21)=61

Q4.The corner points of the feasible region determined by x + y ≤ 8 x + y ≤ 8x + y ≤ 8, 2x + y ≥ 8 2x + y ≥ 8x + y ≥ 8, x ≥ 0 x ≥ 0x≥0, y≥0y≥0 are A(0, 8), B(4, 0), and C(8, 0). If the objective function Z = ax + byZ = ax + byZ=ax+by has its maximum value on the line segment AB, then the relation between aaaa and bbbb is:
(1) 8a+4=b8a + 4 = b8a+4=b (2) a=2ba = 2ba=2b (3) b=2ab = 2ab=2a (4) 8b+4=a8b + 4 = a8b+4=a

Answer: (3) b=2ab = 2ab=2a
Solution:
The optimal value of the objective function Z=ax+byZ = ax + byZ=ax+by occurs at one of the points of the line segment AB that connects the points A(0, 8) and B(4, 0).
The slope of AB is 0−84−0=−2\\\\frac{0 - 8}{4 - 0} = -24−00−8=−2. So, for the objective function to attain a maximum on this line, the ratio of aaa to bbb must satisfy b=2ab = 2ab=2a.

Q5.Given t=e2xt=t=e^{2x}t=e2x and y=loget2y=y = \\log_e t^2y=loget2, then d2ydx2\\\\frac{d^2y}{dx^2}dx2d2y is:
(1) 0 (2) 4t (3) 2t4e4xt\\\\frac{2t 4e^{4x}}{t}t2t4e4x (4) 2t2e4x−1t\\\\frac{2t^2e^{4x} - 1}{t}t2t2e4x−1

Answer: (4) 2t2e4x−1t\\\\frac{2t^2e^{4x} - 1}{t}t2t2e4x−1
Solution:
Given, t=e2xt = e^{2x}t=e2x and y=loget2y = \\\\log_e t^2y=loget2. Now differentiate twice with respect to xxx to find d2ydx2\\\\frac{d^2y}{dx^2}dx2d2y.This differentiation gives 2t2e4x−1t\\\\frac{2t^2e^{4x} - 1}{t}t2t2e4x−1.

Q6. In case, AAA and BBB are symmetric matrices of the same order then AB−BAAB - BAAB−BA is a:
(1) symmetric matrix (2) zero matrix (3) skew symmetric matrix (4) identity matrix

Answer: (3) Skew symmetric matrix
Solution:
If AAA and BBB are symmetric matrices, then AB−BAAB - BAAB−BA is a skew symmetric matrix. This is because (AB−BA)T=−(AB−BA)(AB - BA)^T = - (AB - BA)(AB−BA)T=−(AB−BA), which is the condition for a skew symmetric matrix .

Q7.
If AAA is a square matrix of order 4 and ∣A∣=4|A| = 4∣A∣=4, then ∣2A∣|2A|∣2A∣ will be:
(1) 8 (2) 64 (3) 16 (4) 4

Answer: (2) 64
Solution:
For a square matrix A of order 4; the determinant of 2A2A2A is:
∣2A∣=24×∣A∣=16×4=64|2A| = 2^4 \\\\times |A| = 16 \\\\times 4 = 64∣2A∣=24×∣A∣=16×4=64

Q8.
If [A]3×2[B]x×y=[C]3×1[A]_{3 \\\\times 2} [B]_{x \\\\times y} = [C]_{3 \\\\times 1}[A]3×2[B]x×y=[C]3×1, then:
(1) x=1,y=3x = 1, y = 3x=1,y=3 (2) x=2,y=1x = 2, y = 1x=2,y=1 (3) x=3,y=3x = 3, y = 3x=3,y=3 (4) x=3,y=1x = 3, y = 1x=3,y=1

Answer: (4) x=3,y=1x = 3, y = 1x=3,y=1
Solution:
The matrix product [A]3×2×[B]x×y=[C]3×1[A]_{3 \\\\times 2} \\\\times [B]_{x \\\\times y} = [C]_{3 \\\\\\\\ times 1}[A]3×2×[B]x×y=[C]3×1 can be computed only if the number of columns of A equals the number of rows of B, which yields x=2x = 2x=2. Further, the product matrix C has dimensions 3 by 1, which implies y=1y = 1y=1.

Q9.
If a function f(x) = x2 + bx + 1f(x) = x^2 + bx + 1f(x)=x2+bx+1 is increasing in the interval [1, 2], then the least value of bbb is:
(1) 5 (2) 0 (3) – 2 (4) – 4

Answer: (3) –2
Solution:
The function f(x)=x2+bx+1f(x) = x^2 + bx + 1f(x)=x2+bx+1 is increasing in the interval [1, 2]. For this function to be increasing, its derivative f′(x)=2x+bf'(x) = 2x + bf′(x)=2x+b must be non-negative. Solving f′(x)≥0f'(x) \\geq 0f′(x)≥0 at the endpoints of the interval, we find that the least value of bbb is –2.

Q10.
Two dice are thrown simultaneously. If XXX denotes the number of fours, then the expectation of XXX will be:
(1) 5995 (2) 1331 (3) 4774 (4) 3883

Answer: (2) 1331
Solution:
The random variable XXX denotes the number of fours obtained when two dice are thrown. The probability of getting a four on each die is 61, so the expectation E(X)E(X)E(X) is:
E(X)=61+61=31

Q11.For the function f(x)=2x3−9x2+12x−5f(x) = 2x^3 - 9x^2 + 12x - 5f(x)=2x3−9x2+12x−5, x∈[0,3]x \\in [0, 3]x∈[0,3], match List-I with List-II:

List-I
List-II
(A) Absolute maximum value
(I) 3
(B) Absolute minimum value
(II) 0
(C) Point of maxima
(III) -5
(D) Point of minima
(IV) 4

Choose the correct answer from the options given below:
(1) (A) - (IV), (B) - (II), (C) - (I), (D) - (III)
(2) (A) - (II), (B) - (III), (C) - (I), (D) - (IV)
(3) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
(4) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

Answer: (4) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)
Solution:
To solve this we first find the critical points by differentiating f(x)f(x)f(x) and solving f′(x)=0f'(x) = 0f′(x)=0:
nnf′(x)=6x2−18x+12f'(x) = 6x^2 - 18x + 12f′(x)=6x2−18x+12
Setting f′(x)=0f'(x) = 0f′(x)=0 yields critical numbers x=1x = 1x=1 and x=2x = 2x=2. Now, we will assess the values of f(x)f(x)f(x) for the critical numbers and the endpoints x=0x = 0x=0 and x=3x = 3x=3:end
Thus, the absolute maximum value is 4 at x=3x = 3x=3 (A-IV), the absolute minimum value is -5 at x=0x = 0x=0 (B-III), the point of maxima is x=1x = 1x=1 (C-I), and the point of minima is x=2x = 2x=2 (D-II).

Q12.
The second-order derivative of which of the following functions is 5x5x5x?
(1) 5xloge55\\\\frac{5^x \\\\log_e 5}{5}55xloge5
(2) 5x(loge5)25\\\\frac{5^x (\\\\log_e 5)^2}{5}55x(loge5)2
(3) xe5xlog5x e^{5x} \\\\log 5xe5xlog5
(4) x2e5xlog5x^2 e^{5x} \\\\log 5x2e5xlog5

Answer: (4) x2e5xlog5x^2 e^{5x} \\\\log 5x2e5xlog5
Solution:Differentiating the given options twice and comparing them with 5x5x5x, the second derivative of x2e5xlog5x^2 e^{5x} \\\\log 5x2e5xlog5 matches 5x5x5x. Therefore, the correct answer is option (4).

Q13.
The degree of the differential equation

(d3ydx3)2=1−k(d2ydx2)2\\\\left(\\\\frac{d^3y}{dx^3} \\\\right)^2 = 1 - k \\\\left(\\\\frac{d^2y}{dx^2} \\\\right)^2(dx3d3y)2=1−k(dx2d2y)2
is:
(1) 1 (2) 2 (3) 3 (4) 32\\\\frac{3}{2}23

Answer: (1) 1
Solution:
The degree of a differential equation is the power of the highestorder derivative after having been cleared of fractions. Here, the highestoderivative is d3ydx3\\\\frac{d^3y}{dx^3}dx3d3y and its degree is 1.

Q14.
∫1n1xlogx dx\\\\int_1^n \\\\frac{1}{x \\\\log x} \\\\, dx∫1nxlogx1dx
The answer is:
(1) nlogn−1nx\\\\frac{n \\\\log n - 1}{n x}nxnlogn−1
(2) logn\\\\log nlogn
(3) nlognn \\\\log nnlogn
(4) None of these

Answer: (2) logn\\\\log nlogn
Solution:
This is a standard integral which evaluates to logn\\\\log nlogn. By substitution and simplification we get the answer to be logn\\\\log nlogn.

Q15.
The value of
∫01a−bxa+bx dx\\\\int_0^1 \frac{a - bx}{a + bx} \, dx∫01a+bxa−bxdx
is:
(1) a−ba+b\\\\frac{a - b}{a + b}a+ba−b
(2) 1a−b\\\\frac{1}{a - b}a−b1
(3) a+b2\\\\frac{a + b}{2}2a+b
(4) 1a+b\\\\frac{1}{a + b}a+b1

Answer: (1) a−ba+b\\\\frac{a - b}{a + b}a+ba−b
Solution:
This is a standard integral which can be solved as follows through the method of substitution: The result of the integration is a−ba+b\frac{a-b}{a+b}a+ba−b.

Q16. The distance between the lines

r=i^−2j^+3k^+λ(2i^+3j^+6k^)\\\\mathbf{r} = \\\\hat{i} - 2\\\hat{j} + 3\\\hat{k} + \\\\lambda(2\\\hat{i} + 3\\\hat{j} + 6\\\hat{k})r=i^−2j^+3k^+λ(2i^+3j^+6k^) and rmozrn=3i^−2j^+1k^+μ(4i^+6j^+12k^)\\\\mathbf{r} = 3\\\hat{i} - 2\\\hat{j} + 1\\\hat{k} + \\\\mu(4\\\hat{i} + 6\\\hat{j} + 12\\\hat{k})r=3i^−2j^+1k^+μ(4i^+6j^+12k^) is:

(1) 728\frac{7}{28}287
(2) 7199\frac{7}{199}1997
(3) 7328\frac{7}{328}3287
(4) 7421\frac{7}{421}4217

Answer: (1)
Solution:
The distance between two skew lines is given by:
Distance=|(r1−r2)⋅(d1×d2)|∣d1×d2∣
Distance = ((r1 − r2) ⋅ (d1 × d2))|d1 × d2|
Distance=∣d1×d2∣∣(r1−r2)⋅(d1×d2)∣
Where d1 =⟨2,3,6⟩
d1 = ⟨2, 3, 6⟩ and d2 =⟨4,6,12⟩
d2 = ⟨4, 6, 12⟩. After computing cross product and putting the values in the expression we get the distance as 728\\frac{7}{28}287.

Q20. If f(x)=2tan−1(eπ4−x)−1f(x) = 2
f(x) = 2 tan−1
f(x) = 2 tan−1 (e4π − x) − 1, then f(x)f(x)f(x) is:

(1) even and is strictly increasing in (0,∞)(0, \\\\infty)(0,∞)
(2) even and is strictly decreasing in (0,∞)(0, \\\\infty)(0,∞)
(3) odd and is strictly increasing in (−∞,∞)(-\\\\infty, \\\\infty)(−∞,∞)
(4) odd and is strictly decreasing in (−∞,∞)(-\\\\infty, \\\\infty)(−∞,∞)
Answer: (2)
Solution:
The function f(x)f(x)f(x) is even because f(−x)=f(x)f(-x) = f(x)f(−x)=f(x). If we differentiate f(x)f(x)f(x) then it is strictly decreasing in (0,∞)(0, \\\\infty)(0,∞).

Q21. For the differential equation (xlogex)dy=(logex−y)dx(x \\\\log_e x) dy = (\\\\log_e x - y) dx(xlogex)dy=(logex−y)dx:
(A) Degree of the given differential equation is 1.
(B) It is a homogeneous differential equation.
(C) Solution is 2yloge x+ A = (logex)22y
logex + A = (logex)22y
where A is an arbitrary constant.
(D) Solution is 2yloge x+ A = loge(logex)2y
logex + A = loge(loge x)2y
logex + A =loge (loge x)
where A is an arbitrary constant.
Select the correct answer from the options given below:

(1) (A) and (C) only
(2) (A), (B) and (C) only
(3) (A), (B) and (D) only
(4) (A) and (D) only
Answer: (2)
Solution:
The given differential equation is homogeneous; the degree of the given differential equation is 1, and the proper solution is 2ylogex+A=(logex)22y \\\\log_e x + A = (\\\\log_e x)^22ylogex+A=(logex)2, so statements (A), (B), and (C) are correct.

Q22. There are two bags. Bag-1 contains 4 white and 6 black balls, and Bag-2 contains 5 white and 5 black balls. A die is rolled, and if it shows a number which is divisible by 3, then ball is picked from bag-1; otherwise, a ball is picked from bag-2. If the drawn ball is not black then the probability that ball was not drawn from bag-2 is:

Answer: (1)
Solution:
We have calculated the number of probability with Bayes' Theorem. The event of drawing a white ball from either of the bags depends on the number drawn and the proportion of white balls in each of the two bags.
After applying the formula, the probability that it was not drawn from Bag-2 is 49494.

Q23. Let a1,a2,a3,…,ana_1, a_2, a_3, \\dots, a_na1,a2,a3,…,an be positive real numbers such that ∑i=1nai=1\\sum_{i=1}^{n} a_i = 1∑i=1nai=1. The minimum value of ∑i=1nai2\\sum_{i=1}^{n} a_i^2∑i=1nai2 is:\
(1) 1n\\\\frac{1}{n}n1\
(2) 111\
(3) nnn\
(4) n2n^2n2\

Answer: (1)\
Solution:\
By applying the Cauchy-Schwarz inequality or using the method of Lagrange multipliers we get the minimum value of the sum ∑i=1nai2\\sum_{i=1}^{n} a_i^2∑i=1nai2 occurs when all the aia_iai's are equal, i.e., ai=1na_i = \\\\frac{1}{n}ai=n1. Thus the minimum value of the sum is 1n\\\\frac{1}{n}n1.

Q24. If y = sin−1(x) + cos−1(x)y = \\sin^{-1}(x) + \\cos^{-1}(x)y=sin−1(x)+cos−1(x), then:
(A) y=π2y = \\frac{\\pi}{2}y=2π
(B) dydx=0\\frac{dy}{dx} = 0dxdy=0
(C) y=1y = 1y=1
(D) dydx=1\\frac{dy}{dx} = 1dxdy=1
Choose the correct answer from the options given below:
(1) (A) and (B) only

(2) (C) and (D) only
(3) (A) and (D) only
(4) (C) and (B) only

Answer: (1)
Solution:
We can see that sin−1(x)+cos−1(x)=π2\\\\sin^{-1}(x) + \\\\cos^{-1}(x) = \\\\frac{\\\\pi}{2}sin−1(x)+cos−1(x)=2π for all x∈[−1,1]x \\\\in [-1, 1]x∈[−1,1]. Differentiating this equation toxxx, we obtain dydx=0\\\\frac{dy}{dx} = 0dxdy=0. Thus, (A) and (B) are correct.

Q25. A particle moves in the xyxyxy-plane in such a way that its velocity at time ttt is given by v(t)=(−4t2+3)i^+(6t−4t3)j^v(t) = (-4t^2 + 3)\\hat{i} + (6t - 4t^3)\\hat{j}v(t)=(−4t2+3)i^+(6t−4t3)j^. The acceleration of the particle at t=1t = 1t=1 is:
(1) −8i^+6j^-8\\\\hat{i} + 6\\hat{j}−8i^+6j^
(2) −8i^−6j^-8\\hat{i} - 6\\hat{j}−8i^−6j^
(3) 8i^+6j^8\\hat{i} + 6\\hat{j}8i^+6j^
(4) 8i^−6j^8\\hat{i} - 6\\hat{j}8i^−6j^

Answer: (1)
Solution:
The acceleration is the derivative of the velocity. Taking the derivative of v(t)v(t)v(t) with respect to ttt, we have the acceleration vector:
na(t)=ddt[(−4t2+3)i^+(6t−4t3)j^]=(−8t)i^+(6−12t2)j^a(t) = ddt[(−4t2+3)i^+(6t−4t3)j^]=(-8t)i^+(6−12t2)j^
At t=1t=1t=1, the acceleration is a(1)=−8i^+6j^a(1) = -8i^ + 6j^a(1)=−8i^+6j^.

Q26. Consider the function f:R→Rf: \\\\mathbb{R} \\\\to \\\\mathbb{R}f:R→R defined as f(x)=2x3+9x2+12x+5f(x) = 2x^3 + 9x^2 + 12x + 5f(x)=2x3+9x2+12x+5, then one of the following statements is true?
(A)f(x)f(x)f(x) has a local maximum at x=−2x=-2x=−2
(B)f(x)f(x)f(x) has a local minimum at x=−2x=-2x=−2
(C)f(x)f(x)f(x) has a local maximum at x=2x=2x=2
(D)f(x)f(x)f(x) has no local extrema
Select the correct answer from the given options :
(1) (A) only
(2) (B) only
(3) (C) only
(4) (D) only

Answer: (2)
Solution:
To find the local extrema, we differentiate f(x)f(x)f(x):
f′(x)=6x2+18x+12f'(x) = 6x^2 + 18x + 12f′(x)=6x2+18x+12

We set f′(x)=0f'(x) = 0f′(x)=0 and solve for x=−2x = -2x=−2 and x=−1x = -1x=−1. To determine the nature of these points we apply the second derivative test. For x=−2x = -2x=−2, we have the second derivative f′′(x)=12x+18f''(x) = 12x + 18f′′(x)=12x+18 that is positive. Thus this point is a local minimum.

Q27. Let P=sin−1(35)P = \\\\sin^{-1}\\\\left(\\\\frac{3}{5}\\\\right)P=sin−1(53) and Q=cos−1(45)Q = \\\\cos^{-1}\\\\left(\\\\frac{4}{5}\\\\right)Q=cos−1(54), then:

(1) P=QP = QP=Q

(2) P+Q=π2P + Q = \\\\frac{\\\\pi}{2}P+Q=2π

(3) P+Q=π3P + Q = \\\\frac{\\\\pi}{3}P+Q=3π

(4) P−Q=1P - Q = 1P−Q=1

Answer: (2)
Solution:
We know that sin−1(x)+cos−1(x)=π2\\\\sin^{-1}(x) + \\\\cos^{-1}(x) = \\\\frac{\\\\pi}{2}sin−1(x)+cos−1(x)=2π for all x∈[−1,1]x \\\\in [-1, 1]x∈[−1,1]. Since sin−1(35)\\\\sin^{-1}\\\\left(\\\\frac{3}{5}\\\\right)sin−1(53) and cos−1(45)\\\\cos^{-1}\\\\left(\\\\frac{4}{5}\\\\right)cos−1(54) refer to the same angle in a right triangle, P+Q=π2P + Q = \\\\frac{\\\\pi}{2}P+Q=2π.

Q28. If the line 2x+3y=12x + 3y = 12x+3y=1 is tangent to the curve y=ax2+bx+cy = ax^2 + bx + cy=ax2+bx+c at the point where x=1x = 1x=1, then the values of aaa, bbb, and ccc are:
(1) a=0,b=−23,c=53a = 0, b = -\\\\frac{2}{3}, c = \\\\frac{5}{3}a=0,b=−32,c=35
(2) a=12,b=−2,c=2a = \\\\frac{1}{2}, b = -2, c = 2a=21,b=−2,c=2
(3) a=13,b=2,c=−32a = \\\\frac{1}{3}, b = 2, c = -\\\\frac{3}{2}a=31,b=2,c=−23
(4) a=23,b=−1,c=12a=32,b=−1,c=21

Answer: (1)
Solution:
The conditions for tangency are that the line and the curve should be tangent to each other at the point x=1x = 1x=1. Their solutions give a=0a = 0a=0, b=−23b = -\\frac{2}{3}b=−32 and c=53c = \\frac{5}{3}c=35.

Q29. If the lines 2x−3y+4=02x - 3y + 4 = 02x−3y+4=0 and ax+by+c=0ax + by + c = 0ax+by+c=0 are perpendicular to each other, then:
(1) ab=−6ab = -6ab=−6
(2) ab=6ab = 6ab=6
(3) ab=−1ab = -1ab=−1
(4) ab=1ab = 1ab=1

Answer: (3)
Solution :
For two lines to be perpendicular, the product of their slopes must equal −1-1−1. The slope of the line 2x−3y+4=02x - 3y + 4 = 02x−3y+4=0 is 23\\\\frac{2}{3}32. Let the slope of the line ax+by+c=0ax + by + c = 0ax+by+c=0 be −ab-\\\\frac{a}{b}−ba. Then the condition for perpendicularity reads
23×(−ab)=−1\\\\frac{2}{3} \\\\times \\\\left(-\\\\frac{a}{b}\\\\right) = -132×(−ba)=−1
That is to say, ab=−3ab = -3ab=−3, so the correct answer is (3).

Q30. The number of solutions of the equation sin2x−sinx=0\\\\sin^2 x - \\\\sin x = 0sin2x−sinx=0 in the interval [0,2π][0, 2\\\\pi][0,2π] is:
(1) 0
(2) 1
(3) 2
(4) 3

Answer: (3)
Solution:
Factor the equation sin2x−sinx=0\\\\sin^2 x - \\\\sin x = 0sin2x−sinx=0:
sinx(sinx−1)=0\\\\sin x (\\\\sin x - 1) = 0sinx(sinx−1)=0
Therefore sinx=0\\\\sin x = 0sinx=0 or sinx=1\\\\sin x = 1sinx=1. Solving in the interval [0,2π][0, 2\\\\pi][0,2π]:
sinx=0\\\\sin x = 0sinx=0 gives x=0,π,2πx = 0, \\\\pi, 2\\\\pix=0,π,2π
sinx=1\\\\sin x = 1sinx=1 gives x=π2x = \\\\frac{\\\\pi}{2}x=2π
So there are three solutions: 0,π,π20, \\\\pi, \\\\frac{\\\\pi}{2}0,π,2π.

Q31. The value of limx→0ex−e−xx\\\\lim_{x \\\\to 0} \\\\frac{e^x - e^{-x}}{x}limx→0xex−e−x is:
(1) 0
(2) 1
(3) 2
(4) None of the above

Answer: (3)
Solution:
We can write the limit as:
limx→0ex−e−xx=limx→02sinh(x)x\\\\lim_{x \\\\to 0} \\\\frac{e^x - e^{-x}}{x} = \\\\lim_{x \\\\to 0} \\\\frac{2\\\\sinh(x)}{x}x→0limxex−e−x=x→0limx2sinh(x)
By making use of the fact that sinh(x)≈x\\\\sinh(x) \\\\approx xsinh(x)≈x when x→0x \\\\to 0x→0 we find,
limx→02xx=2\\\\lim_{x \\\\to 0} \\\\frac{2x}{x} = 2x→0limx2x=2

Q32. Assume that f(x)=4x3+ax2+bx+6f(x) = 4x^3 + ax^2 + bx + 6f(x)=4x3+ax2+bx+6. Graph of f(x)f(x)f(x) has local maximum at x=−1x=-1x=−1 and local minimum at x=2x=2x=2. Determine the values for aaa and bbb.
(1) a=3,b=−12a=3, b= -12a=3,b=−12
(2) a=−3,b=12a=-3, b=12a=−3,b=12
(3) a=12,b=−3a=12, b= -3a=12,b=−3
(4) a=−12,b=3a=-12, b=3a=−12,b=3
Solution:
We differentiate f(x)f(x)f(x) to determine aaa and bbb. Setting nf′(x)=12x2+2ax+bf′(x)=12x^2 + 2ax + bf′(x)=12x2+2ax+b, since f(x)f(x)f(x) has a local maximum at x=−1x = -1x=−1 and a local minimum at x=2x = 2x=2, it follows that f′(−1)=0f'(-1) = 0f′(−1)=0 and f′(2)=0f'(2) = 0f′(2)=0. We substitute these values into the derivative and solve for aaa and bbb in the resulting system of equations: the solution is a=−3a = -3a=−3 and b=12b = 12b=12.

Q33. If curve y=ax2+bx+cy = ax^2 + bx + cy=ax2+bx+c passes through points (−1,1),(0,0)(-1, 1), (0, 0)(−1,1),(0,0), and (1,1)(1, 1)(1,1), then values of aaa, bbb, and ccc are:
(1) a=1,b=0,c=0a = 1, b = 0, c = 0a=1,b=0,c=0
(2) a=−1,b=0,c=1a = -1, b = 0, c = 1a=−1,b=0,c=1
(3) a=0,b=1,c=1a = 0, b = 1, c = 1a=0,b=1,c=1
(4) a=1,b=1,c=1a = 1, b = 1, c = 1a=1,b=1,c=1

Answer: (2)
Explanation:
Now substitute the coordinates of the points into the equation y=ax2+bx+cy = ax^2 + bx + cy=ax2+bx+c to create a system of equations. Solving for aaa, bbb, and ccc, we get that a=−1a = -1a=−1, b=0b = 0b=0, and c=1c = 1c=1.

Q34. The area of the region bounded by the curve y=x2y = x^2y=x2, the line y=xy = xy=x, and the xxx-axis is:
(1) 161/6
(2) 131/3
(3) 121/2
(4) 111

Answer: (2)
Solution:
Find the points of intersection of the curves given by y=x2y = x^2y=x2 and y=xy = xy=x. Solve for the value of the expression x2=xx^2 = xx2=x. This gives you the solutions x=0x = 0x=0 and x=1x = 1x=1. Area is calculated using the integral:
Area=∫01(x−x2) dxArea = \\\\int_0^1 (x - x^2) \, dxArea=∫01(x−x2)dx
Evaluating the integral, we have,
Area=[x22−x33]01=12−13=16Area = \\left[\frac{x^2}{2} - \frac{x^3}{3} \\right]_0^1 = \frac{1}{2} - \frac{1}{3} = \frac{1}{6}Area=[2x2−3x3]01=21−31=61

Q35. The distance of the point P(1,2,3)P(1, 2, 3)P(1,2,3) from the plane 2x−y+2z+4=02x - y + 2z + 4 = 02x−y+2z+4=0 is:\
(1) 53\\\\frac{5}{3}35\
(2) 35\\\\frac{3}{5}53\
(3) 555\
(4) 333\

Answer: (1)
Solution:
The formula for the distance of a point P(x1,y1,z1)P(x_1, y_1, z_1)P(x1,y1,z1) from a plane Ax+By+Cz+D=0Ax + By + Cz + D = 0Ax+By+Cz+D=0 is:\
Distance=∣Ax1+By1+Cz1+D∣A2+B2+C2\\\\text{Distance} = \\\\frac{|Ax_1 + By_1 + Cz_1 + D|}{\\\\sqrt{A^2 + B^2 + C^2}}Distance=A2+B2+C2∣Ax1+By1+Cz1+D∣
Substituting the values for the point P(1,2,3)P(1, 2, 3)P(1,2,3) and the plane 2x−y+2z+4=02x - y + 2z + 4 = 02x−y+2z+4=0, we get:
Distance=∣2(1)−1(2)+2(3)+4∣22+(−1)2+22=∣2−2+6+4∣9=103\\\\text{Distance} = \\\\frac{|2(1) - 1(2) + 2(3) + 4|}{\\\\sqrt{2^2 + (-1)^2 + 2^2}} = \\\\frac{|2 - 2 + 6 + 4|}{\\\\sqrt{9}} = \\\\frac{10}{3}Distance=22+(−1)2+22∣2(1)−1(2)+2(3)+4∣=9∣2−2+6+4∣=310
So the distance is 103\\\\frac{10}{3}310.

Q36. The value of ∫01x21+x2 dx\\\\int_0^1 \\\\frac{x^2}{1 + x^2} \\\\, dx∫011+x2x2dx is:
(1) 12\\\\frac{1}{2}21
(2) 14\\\\frac{1}{4}41
(3) 13\\\\frac{1}{3}31
(4) None of the above

Answer: (3)
Solution:
Let I=∫01x21+x2 dxI = \\\\int_0^1 \\\\frac{x^2}{1 + x^2} \, dxI=∫011+x2x2dx.We can write this as:
I=∫01(1−11+x2) dx=∫011 dx−∫0111+x2 dxI = \\\\int_0^1 \\\\left(1 - \\frac{1}{1 + x^2} \right) \, dx = \\int_0^1 1 \, dx - \\int_0^1 \\\\frac{1}{1 + x^2} \, dxI=∫01(1−1+x21)dx=∫011dx−∫011+x21dx
The first integral evaluates to:
∫011 dx=1\\\\int_0^1 1 \, dx = 1∫011dx=1
The second integral is the standard integral ∫0111+x2 dx=tan−1(1)−tan−1(0)=π4\\\\int_0^1 \\\\frac{1}{1 + x^2} \, dx = \\\\tan^{-1}(1) - \\\\tan^{-1}(0) = \\\\frac{\\pi}{4}∫011+x21dx=tan−1(1)−tan−1(0)=4π.
So,
I=1−π4I = 1 - \\\\frac{\\pi}{4}I=1−4π
On computation of 1−π41 - \\\\frac{\\\\pi}{4}1−4π, we get approximately 0.250.250.25, that solves option (3).

Q37. The distance between the points (2,3,5)(2, 3, 5)(2,3,5) and (3,5,7)(3, 5, 7)(3,5,7) is:

(1) 111
(2) 222
(3) 333
(4) 14\\\\sqrt{14}14

Answer: (4)
Solution:
The distance between two points (x1,y1,z1)(x_1, y_1, z_1)(x1,y1,z1) and (x2,y2,z2)(x_2, y_2, z_2)(x2,y2,z2) is defined by the formula
Distance=(x2−x1)2+(y2−y1)2+(z2−z1)2
Distance = \\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}
Distance=(x2−x1)2+(y2−y1)2+(z2−z1)2
Substitute the values for(x1,y1,z1)=(2,3,5)(x_1, y_1, z_1) = (2, 3, 5)(x1,y1,z1)=(2,3,5) and(x2,y2,z2)=(3,5,7)(x_2, y_2, z_2) = (3, 5, 7)\
:Distance=(3−2)2+(5−3)2+(7−5)2=12+22+22=1+4+4=9=3\\\\text{Distance} = \\\\sqrt{(3 - 2)^2 + (5 - 3)^2 + (7 - 5)^2} = \\\\sqrt{1^2 + 2^2 + 2^2} = \\\\sqrt{1 + 4 + 4} = \\\\sqrt{9} = 3Distance=(3−2)2+(5−3)2+(7−5)2=12+22+22=1+4+4=9=3\
Thus, the distance is 333.

Q38. IfA⃗=2i^+3j^\\\\vec{A} = 2\\\\hat{i} + 3\\\\hat{j}A=2i^+3j^ andB⃗=i^+4j^\\\\vec{B} = \\\\hat{i} + 4\\\\hat{j}B=i^+4j^, thenA⃗·B⃗\\\\vec{A} \\\\cdot \\\\vec{B}A·B is:\
(1) 14
(2) 12
(3) 13
(4) 15
Dot product of two vectors A⃗=a1i^+a2j^+a3k^\\\\vec{A} = a_1\\\\hat{i} + a_2\\\\hat{j} + a_3\\\\hat{k}A=a1i^+a2j^+a3k^ and B⃗=b1i^+b2j^+b3k^\\\\vec{B} = b_1\\\\hat{i} + b_2\\\\hat{j} + b_3\\\\hat{k}B=b1i^+b2j^+b3k^ is given by:
A⃗·B⃗=a1b1+a2b2+a3b3\\\\vec{A} \\\\cdot \\\\vec{B} = a_1b_1 + a_2b_2 + a_3b_3A·B=a1b1+a2b2+a3b3
For A⃗=2i^+3j^\\\\vec{A} = 2\\\\hat{i} + 3\\\\hat{j}A=2i^+3j^ and B⃗=i^+4j^\\\\vec{B} = \\\\hat{i} + 4\\\\hat{j}B=i^+4j^, the dot product is:
A⃗·B⃗=(2)(1)+(3)(4)=2+12=14\\\\vec{A} \\\\cdot \\\\vec{B} = (2)(1) + (3)(4) = 2 + 12 = 14A·B=(2)(1)+(3)(4)=2+12=14

Q39. The value of limx→0sin3xx\\\\lim_{x \\\\to 0} \\\\frac{\\\\sin 3x}{x}limx→0xsin3x is:
(1) 1
(2) 2
(3) 3
(4) 0

Answer: (3)
Solution:

Using the standard limit limx→0sinxx=1\\\\lim_{x \\\\to 0} \\\\frac{\\\\sin x}{x} = 1limx→0xsinx=1, we can rewrite the given limit as:
limx→0sin3xx=3×limx→0sin3x3x=3×1=3\\\\lim_{x \\\\to 0} \\\\frac{\\\\sin 3x}{x} = 3 \\\\times \\\\lim_{x \\\\to 0} \\\\frac{\\\\sin 3x}{3x} = 3 \\\\times 1 = 3x→0limxsin3x=3×x→0lim3xsin3x=3×1=3
So, the value of the limit is 3.

Q40. If the vectors A⃗=2i^−j^+4k^\\vec{A} = 2\\hat{i} - \\hat{j} + 4\\hat{k}A=2i^−j^+4k^ and B⃗=i^+2j^−k^\\vec{B} = \\hat{i} + 2\\hat{j} - \\hat{k}B=i^+2j^−k^, then A⃗×B⃗\\vec{A} \\times \\vec{B}A×B is:
(1) 6i^+j^+5k^6\\hat{i} + \\hat{j} + 5\\hat{k}6i^+j^+5k^
(2) 5i^+6j^+k^5\\hat{i} + 6\\hat{j} + \\hat{k}5i^+6j^+k^
(3) 6i^+5j^+k^6\\hat{i} + 5\\hat{j} + \\hat{k}6i^+5j^+k^
(4) None of the above

Answer: (3)
Solution:
The cross product of two vectors A=a1i^+a2j^+a3k^\vec{A} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}A=a1i^+a2j^+a3k^ and B=b1i^+b2j^+b3k^\vec{B} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}B=b1i^+b2j^+b3k^ is given by the determinant:
A×B=∣i^j^k^a1a2a3b1b2b3∣\\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \\hat{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\\\end{vmatrix}A×B=i^a1b1j^a2b2k^a3b3
Substituting A⃗=2i^−j^+4k^\\vec{A} = 2\\hat{i} - \\hat{j} + 4\\hat{k}A=2i^−j^+4k^ and B⃗=i^+2j^−k^\\vec{B} = \\hat{i} + 2\\hat{j} - \\\\hat{k}B=i^+2j^−k^,A⃗×B⃗=∣i^j^k^2−1412−1∣\\\\vec{A} \\\\times \\\\vec{B} = \\\\begin{vmatrix} \\\\hat{i} & \\\\hat{j} & \\\\hat{k} \\\\\\\\ 2 & -1 & 4 \\\\\\\\ 1 & 2 & -1 \\\\end{vmatrix}A×B=i^21j^−12k^4−1. The determinant is
i^((−1)(−1)−(4)(2))−j^((2)(−1)−(4)(1))+k^((2)(2)−(−1)(1))\\hat{i}((-1)(-1) - (4)(2)) - \\hat{j}((2)(-1) - (4)(1)) + \\hat{k}((2)(2) - (-1)(1))i^((−1)(−1)−(4)(2))−j^((2)(−1)−(4)(1))+k^((2)(2)−(−1)(1))
This simplifies to:
ni^(1−8)−j^(−2−4)+k^(4+1)\\hat{i}(1 - 8) - \\hat{j}(-2 - 4) + \\hat{k}(4 + 1)i^(1−8)−j^(−2−4)+k^(4+1) = −7i^+6j^+5k^ = -7\\hat{i} + 6\\hat{j} + 5\\hat{k} = −7i^+6j^+5k^
So the result is −7i^+6j^+5k^−7\\hat{i} + 6\\hat{j} + 5\\hat{k}−7i^+6j^+5k^.

Q41. If A=(1234)A = \\begin{pmatrix} 1 & 2 \\\\ 3 & 4 \\end{pmatrix}A=(1324), then the determinant of AAA, i.e., det(A)\\det(A)det(A), is:
(1) 2
(2) -2
(3) 1
(4) 0

Answer: (2)
Solution:

The determinant of a 2x2 matrix A=(abcd)A = \\begin{pmatrix} a & b \\\\ c & d \\end{pmatrix}A = (acbd) is defined as:det(A)=ad−bc\\\\det(A) = ad - bcdét(A)=ad−bc for the given matrix A=(1234)A = \\begin{pmatrix} 1 & 2 \\\\ 3 & 4 \\end{pmatrix}A = (1324), we have:det(A)=(1)(4)−(2)(3)=4−6=−2\\\\det(A) = (1)(4) - (2)(3) = 4 - 6 = -2det(A)=(1)(4)−(2)(3)=4−6=−2. Therefore, det(A)=−2\\\\det(A) = -2det(A)=−2.

Q42. If y=e2xy = e^{2x}y = e2x, then dydx \\frac{dy}{dx} \\frac{d x}{dy} is:
(1) e2xe^{2x} e2x
(2) 2e2x2e^{2x}2e2x
(3) 3e2x3e^{2x}3e2x
(4) None of the above

Answer: (2)
Solution:
Using the chain rule for differentiation:

\frac{dy}{dx} = \frac{d}{dx}\left(e^{2x} \right) = 2e^{2x}dxdy=dxd(e2x)=2e2x

Thus, the derivative of e2x,e^{2x}e2x with respect to xxx is 2e2x2e^{2x}2e2x.

Q43. If matrix AAA has an inverse, then A · A−1A \\\\cdot A^{-1}A · A−1 is equal to:

(1) The identity matrix
(2) A zero matrix
(3) A scalar matrix
(4) None of the above

Answer: (1)
Solution:
From definition, if AAA be an invertible matrix, then
A · A−1=IA \\\\cdot A^{-1} = IA · A−1=I
where III is the identity matrix.

Q44. The derivative of sin2x\\\\sin^2 xsin2x with respect to xxx is:
(1) 2sinxcosx2\\\\sin x \\\\cos x2sinxcosx
(2) 2sinx2\\\\sin x2sinx
(3) 2cosx2\\\\cos x2cosx
(4) 2sinxtanx2\\\\sin x \\\\tan x2sinxtanx

Answer: (1)
We will apply the chain rule to differentiate sin2x\\\\sin^2 xsin2x, respectively.
ddx(sin2x)=2sinx · ddx(sinx)=2sinx · cosx\\\\frac{d}{dx} (\\\\sin^2 x) = 2\\\\sin x \\\\cdot \\\\frac{d}{dx}(\\\\sin x) = 2\\\\sin x \\\\cdot \\\\cos xdxd(sin2x)=2sinx · dxd(sinx)=2sinx · cosx
So, the derivative is 2sinxcosx2\\\\sin x \\\\cos x2sinxcosx.

Q45. The integration of ∫x2ex dx\\\\int x^2 e^x \\\\, dx∫x2exdx is:
(1) x2ex+Cx^2 e^x + Cx2ex+C
(2) x2ex−2xex+2ex+Cx2ex−2xex+2ex+C
(3) ex(x2−x+1)+Ce^x(x^2 - x + 1) + Cex(x2−x+1)+C
(4) ex(x2+1)+Ce^x(x^2 + 1) + Cex(x2+1)+C

Answer: (2)
Solution:
We can do this by integration by parts. Let:
v=x2u = x^2u=x2 and dv=exdxdv = e^x dxdv=exdx
Then du=2xdxdu = 2x dxdu=2xdx and v=exv = e^xv=ex
Applying the integration by parts formula ∫u dv=uv−∫v du∫ u \\\\, dv = uv - \\\\int v \\\\, du∫udv=uv−∫vdu:
∫x2ex dx=x2ex−∫2xex dx\\\\int x^2 e^x \\\\, dx = x^2 e^x - \\\\int 2x e^x \\\\, dx∫x2exdx=x2ex−∫2xexdx\
Now, we apply integration by parts again for ∫2xex dx\\\\int 2x e^x \\\\, dx∫2xexdx:\
Let u=2xu = 2xu=2x and dv=exdxdv = e^x dxdv=exdx\
Then du=2dxdu = 2 dxdu=2dx and v=exv = e^xv=ex\
So,,\
∫2xex dx=2xex−∫2ex dx=2xex−2ex\\\\int 2x e^x \\\\, dx = 2x e^x - \\\\int 2 e^x \\\\, dx = 2x e^x - 2e^x∫2xexdx=2xex−∫2exdx=2xex−2ex\
Substitute this back into the original equation:
∫x2ex dx=x2ex−(2xex−2ex)=x2ex−2xex+2ex∫ x^2 e^x \\\\, dx = x^2 e^x - (2x e^x - 2e^x) = x^2 e^x - 2x e^x + 2e^x∫x2exdx=x2ex−(2xex−2ex)=x2ex−2xex+2ex, end

Q46. The sum of the first nnn terms of an arithmetic series is given by the formula Sn=n2(2a+(n−1)d)S_n = \\\\frac{n}{2}(2a + (n-1)d)Sn=2n(2a+(n−1)d). If a=5a = 5a=5 and d=3d = 3d=3, what is S4S_4S4?\
(1) 38\
(2) 36\
(3) 40\
(4) 42\

Answer: (2)\
Solution:\
Using the formula for the sum of the first nnn terms Sn=n2(2a+(n−1)d)S_n = \\\\frac{n}{2}(2a + (n-1)d)Sn=2n(2a+(n−1)d):
S4=42(2⋅5+(4−1)⋅3)S_4 = \\\\frac{4}{2}(2 \\\\cdot 5 + (4-1) \\\\cdot 3)S4=24(2⋅5+(4−1)⋅3) =2(10+3⋅3)=2(10+9)=2⋅19=38= 2(10 + 3 ⋅ 3) = 2(10 + 9) = 2 ⋅ 19 = 38=2(10+3⋅3)=2(10+9)=2⋅19=38
So, S4=38S_4 = 38S4=38.

Q47. The value of log101000\\\\log_{10} 1000log101000 is:

(1) 2
(2) 3
(3) 1
(4) 0

Answer: (2)
Solution:
We can represent 100010001000 as 10310^3103. Thus:
log101000=log10(103)=3\\\\log_{10} 1000 = \\\\log_{10} (10^3) = 3log101000=log10(103)=3
So, the value is 333.

Q48. The radius of a circle is 7 cm. What is its area?
(1) 154 cm^2
(2) 140 cm^2
(3) 147 cm^2
(4) 153.86 cm^2

Answer: (1)
Solution:
Area AAA of a circle is given by formula:
A=πr2A = \\\\pi r^2A=πr2
Substitute r=7r = 7r=7:
A=π(72)=π⋅49≈154 cm2A = \\\\pi (7^2) = \\\\pi \\\\cdot 49 \\\\approx 154 \\\\, \\\\text{cm}^2A=π(72)=π⋅49≈154cm2
Thus, the area is about 154 cm2154 \\\\, \\\\text{cm}^2154cm2.

Q49. If the angles of a triangle are in ratio 2:3:5, then what is the measure of largest angle?
(1) 100°
(2) 90°
(3) 80°
(4) 70°

Answer: (1)
Let the angles are 2x,3x,2x, 3x,2x,3x, and 5x5x5x. Since the sum of angles in a triangle is 180°180°180°:
2x+3x+5x=180°2x + 3x + 5x = 180°2x+3x+5x=180° 10x=180° ⟹ x=18°10x = 180° \\\\implies x = 18°10x=180°⟹x=18°
Therefore, the angles are:
2x=36°,3x=54°,5x=90°2x = 36°, \\\\quad 3x = 54°, \\\\quad 5x = 90°2x=36°,3x=54°,5x=90°
The largest angle is 90°90°90°.

Q50. What is the value of sin30°\\\\sin 30°sin30°?
(1) 0

(2) 12\\\\frac{1}{2}21
(3) 1
(4) 32\\\\frac{\\\\sqrt{3}}{2}23

Answer: (2)
Solution:
From trigonometric values, we know:
sin30°=12\\\\sin 30° = \\\\frac{1}{2}sin30°=21
So, the value is 1221.
.
Q51. A car travels 240 km in 3 hours. What is its average speed?
(1) 80 km/h
(2) 60 km/h
(3) 70 km/h
(4) 90 km/h

Answer: (1)
Average speed is calculated by
Average SpeedTotal DistanceTotal Time=240 km3 hours=80 km/h
Average Speed = Total DistanceTotal Time=3hours240km=80km/h

Q52. What is the value of 505^050?
(1) 0
(2) 1
(3) 5
(4) Undefined

Answer: (2)
Solution:
Any non-zero number raised to the power of zero is equal to 1. Thus:
50=15^0 = 150=1

Q53. If a triangle has a base of 8 cm and a height of 5 cm, what is its area?
(1) 20 cm²
(2) 40 cm²
(3) 30 cm²
(4) 25 cm²

Answer: (1)
Solution:
The area AAA of a triangle is given by the formula:
A=12×base×heightA = \\\\frac{1}{2} \\\\times \\\\text{base} \\\\times \\\\text{height}A=21×base×height
Substituting the values:

A =12×8 cm×5 cm=12×40 cm2=20 cm2A = \\frac{1}{2} × 8, \\text{cm} × 5, \\text{cm} = \\frac{1}{2} × 40, \\text{cm}^2 = 20, \\text{cm}^2A=21×8cm×5cm=21×40cm2=20cm2

Q54. The perimeter of a rectangle is 50 cm. If the length is 15 cm, what is the width?
(1) 10 cm
(2) 15 cm
(3) 20 cm
(4) 25 cm

Answer: (1)
Solution:
The perimeter PPP of a rectangle is given by:
P=2(length+width)P = 2(\\\text{length} + \\\\text{width})P=2(length+width)
Given P=50 cmP = 50 \\\\, \\\\text{cm}P=50cm and length = 15 cm:
50=2(15+width) ⟹ 25=15+width ⟹ width=25−15=10 cm50 = 2(15 + \\\\text{width}) \\\\implies 25 = 15 + \\\\text{width} \\\\implies \\\\text{width} = 25 - 15 = 10 \\\\, \\\\text{cm}50=2(15+width)⟹25=15+width⟹width=25−15=10cm

Q55. What is the median of the following data set: 3, 7, 9, 12, 14?
(1) 9
(2) 10
(3) 12
(4) 11

Answer: (1)
Solution:
To find the median, arrange the numbers in ascending order (already done):
3,7,9,12,143, 7, 9, 12, 143,7,9,12,14
Since there are 5 numbers (an odd count), the median is the middle number:
Median=9

Q56. If x+3=10x + 3 = 10x+3=10, what is the value of xxx?
(1) 5
(2) 7
(3) 3
(4) 10

Answer: (2)
Solution:
To solve for xxx:
x+3=10 ⟹ x=10−3=7x + 3 = 10 \\\\implies x = 10 - 3 = 7x+3=10⟹x=10−3=7

Q57. The value of 64
Its square root is:\sqrt{64}64 is:

(1) 6
(2) 7
(3) 8
(4) 9

Answer: (3)
Solution:
The square root of 64 is:
64=8
It equals 64=8=8

Q58. One angle of a right triangle measures 30°30°30°. How many degrees is a measure of the other non-right angle?
(1) 60°
(2) 90°
(3) 45°
(4) 30°

Answer: (1)
Solution:
A right triangle has two angles and one right angle whose sum is 180°180°180°. So, if one angle is 30°30°30°:
Other angle = 180° − 90° − 30° = 60°
Other angle = 180° - 90° - 30° = 60°
Other angle = 180° − 90° − 30° = 60°

Q59. For the equation y=2x+3y = 2x + 3y=2x+3 given that x=4x = 4x=4, what is the value of yyy?
(1) 10
(2) 11
(3) 12
(4) 13

Answer: (2)
Step
Substituting the value of x=4x = 4x=4 in the equation:
y=2(4)+3=8+3=11y = 2(4) + 3 = 8 + 3 = 11y=2(4)+3=8+3=11

Q60. What is 15%15\\\\%15% of 200200200?
(1) 25
(2) 30
(3) 20
(4) 15
Answer: (2)

Step
To obtain 15%15\\\\%15% of 200200200:
15%×200=15100×200=3015\\\\% \\\\times 200 = \\frac{15}{100} \\times 200 = 3015%×200=10015×200=30