School Connect Online

SCO INTERNATIONAL MATHS OLYMPIAD

CLASS 12 SAMPLE PAPER

Practice Paper with Answer Key & Explanations

SCO International Olympiad practice, assessment, reporting, and future-ready academic growth.

- relations, functions, algebra, calculus, vectors, 3D geometry, linear programming, and probability
- conceptual problem-solving with real-world modelling, proof logic, and multi-step calculations
- PDF-ready academic layout with compact question labels and explanations for transparent learning

Relations & Functions	Algebra	Calculus	Vectors & 3D	Probability
Matrices	Determinants	Integration	Differential Equations	Olympiad Reasoning

Sample Paper - Practice Edition

Class	12
Exam	SCO International Maths Olympiad
Question Paper Set	H
Academic Session	Sample / Practice
Total Questions	35
Time	60 minutes
Format	General Mathematics, Case Study, Assertion-Reason, Achievers Section

School Connect Online

General Mathematics

Q1. If R is a relation on integers defined by aRb if a and b have the same parity, then R is:

A. reflexive only
B. symmetric only
C. equivalence relation
D. not transitive

Answer: C
Explanation: Same parity is reflexive, symmetric, and transitive; hence it is an equivalence relation.

Q2. The principal value of $\tan^{-1}(1)$ is:

A. π/6
B. π/4
C. π/3
D. π/2

Answer: B
Explanation: tan(π/4)=1 and the principal value lies in (−π/2, π/2).

Q3. If A = [[1, 1], [0, 1]], then A^2 equals:

A. [[1,2],[0,1]]
B. [[2,1],[0,2]]
C. [[1,1],[0,1]]
D. [[0,1],[1,0]]

Answer: A
Explanation: Multiplying A by itself gives first row [1,2] and second row [0,1].

Q4. For the determinant | x 1; 4 x | = 0, find x.

A. ±1
B. ±2
C. ±4
D. 0 only

Answer: B
Explanation: The determinant is $x^2 - 4$. Setting it to zero gives x = ±2.

Q5. Find d/dx (ln(sin x)).

A. tan x
B. cot x
C. sec x
D. cosec x

Answer: B
Explanation: d/dx ln(sin x) = (cos x)/(sin x) = cot x.

Q6. If y = e^{2x}, then d^2y/dx^2 equals:

A. e^{2x}
B. 2e^{2x}
C. 4e^{2x}
D. 8e^{2x}

Answer: C
Explanation: First derivative is 2e^{2x}; differentiating again gives 4e^{2x}.

School Connect Online

Q7. Find the minimum value of $f(x)=x^2-6x+10$.

A. 0
B. 1
C. 3
D. 10

Answer: B
Explanation: $f(x)=(x-3)^2+1$, so the minimum value is 1.

Q8. Evaluate $\int (1/x)\,dx$ for $x>0$.

A. x
B. ln x + C
C. $1/x^2 + C$
D. $e^x + C$

Answer: B
Explanation: The antiderivative of $1/x$ on $x>0$ is ln x + C.

Q9. Evaluate $\int_0$^π sin x dx.

A. 0
B. 1
C. 2
D. π

Answer: C
Explanation: $\int \sin x\,dx = -\cos x$. From 0 to π: $-\cos\pi - (-\cos 0)=1+1=2$.

Q10. Area under y = 2x from x = 0 to x = 3 is:

A. 3
B. 6
C. 9
D. 12

Answer: C
Explanation: Area = $\int_0^3 2x\,dx = [x^2]_0^3 = 9$.

Q11. The solution of $dy/dx = 2x$ with $y(1)=5$ is:

A. $y=x^2+4$
B. $y=2x^2+3$
C. $y=x+4$
D. $y=5x^2$

Answer: A
Explanation: Integrating gives $y=x^2+C$. Using $y(1)=5$ gives $C=4$.

Q12. For $a=(2,1,-2)$, find $|a|$.

A. 2
B. 3
C. 4
D. 5

Answer: B
Explanation: $|a|=\sqrt{(2^2+1^2+(-2)^2)}=\sqrt{9}=3$.

School Connect Online

Q13. Direction ratios of the line joining A(1,2,3) and B(3,5,7) are:

A. (1,2,3)
B. (2,3,4)
C. (3,5,7)
D. (4,3,2)

Answer: B

Explanation: B−A=(3−1,5−2,7−3)=(2,3,4).

Q14. The feasible region of a linear programming problem is bounded. Which statement is true?

A. An optimum can occur only inside the region
B. An optimum occurs at a corner point if it exists
C. No optimum is possible
D. Every point gives the same value

Answer: B

Explanation: For a linear objective over a bounded polygonal region, the optimum occurs at one or more corner points.

Q15. If P(A)=0.4, P(B)=0.5 and A and B are independent, then P(A∩B) is:

A. 0.1
B. 0.2
C. 0.4
D. 0.9

Answer: B

Explanation: For independent events, P(A∩B)=P(A)P(B)=0.4×0.5=0.2.

Q16. If A is a square matrix and $A^2 = I$, then A^{-1} equals:

A. A
B. I
C. −A
D. A^2

Answer: A

Explanation: $A^2=I$ means A·A=I, so A is its own inverse.

Q17. Find the derivative of sin(3x).

A. cos(3x)
B. 3cos(3x)
C. −3cos(3x)
D. 3sin(3x)

Answer: B

Explanation: By chain rule, d/dx sin(3x)=3cos(3x).

Q18. Evaluate $\int_0^1 (x+1)^2\,dx$.

A. 4/3
B. 7/3
C. 2
D. 3

Answer: B

Explanation: $(x+1)^2=x^2+2x+1$. Integral from 0 to 1 is 1/3+1+1=7/3.

Q19. A fair die is thrown twice. What is the probability that the sum is 7?

A. 1/12
B. 1/9
C. 1/6
D. 1/3

Answer: C

Explanation: Favourable ordered pairs are (1,6),(2,5),(3,4),(4,3),(5,2),(6,1): 6 out of 36, so probability = 1/6.

Q20. The angle between the planes $x+y+z=1$ and $x-y+z=2$ depends on the angle between their normals. What is the dot product of the normals?

A. 0
B. 1
C. 2
D. 3

Answer: B

Explanation: Normals are (1,1,1) and (1,−1,1). Their dot product is $1-1+1=1$.

Case Study

Q21. Case: A bank models an investment by $A(t)=10000e^{0.05t}$. What is the instantaneous rate of growth at t=0?

A. 50
B. 100
C. 500
D. 10000

Answer: C

Explanation: $A'(t)=0.05\times10000e^{0.05t}=500e^{0.05t}$. At t=0, the rate is 500.

Q22. Case: A drone's position is $r(t)=(t, t^2, 2t)$. What is its velocity vector at t=2?

A. (1,2,2)
B. (1,4,2)
C. (2,4,4)
D. (4,1,2)

Answer: B

Explanation: Velocity is $r'(t)=(1,2t,2)$. At t=2, it is (1,4,2).

Q23. Case: A manufacturer produces x units of Product A and y units of Product B with $x+y\leq10$, $x\leq7$, $y\leq6$, $x,y\geq0$. Which point is feasible?

A. (8,3)
B. (7,4)
C. (5,5)
D. (4,7)

Answer: C

Explanation: (5,5) satisfies $x+y=10$, $x\leq7$, $y\leq6$, and non-negativity. The other options violate at least one constraint.

Q24. Case: A survey finds that 30% of students take Maths, 20% take Physics, and 10% take both. What is the probability that a randomly chosen student takes Maths or Physics?

A. 0.30
B. 0.40

C. 0.50
D. 0.60

Answer: B

Explanation: $P(M \cup P)=P(M)+P(P)-P(M \cap P)=0.30+0.20-0.10=0.40$.

Q25. Case: A water tank empties according to $dV/dt = -4$ for V in litres and t in minutes. If $V(0)=100$, when will the tank be empty?

A. 20 min
B. 25 min
C. 30 min
D. 40 min

Answer: B

Explanation: $V=100-4t$. Setting $V=0$ gives $t=25$ minutes.

Assertion-Reason

Q26. Assertion (A): The derivative of a constant function is zero. Reason (R): A constant function has no change in output as x changes.

A. A and R are true, and R explains A
B. A and R are true, but R does not explain A
C. A is true, R is false
D. A is false, R is true

Answer: A

Explanation: The rate of change of a constant function is zero, so the reason explains the assertion.

Q27. Assertion (A): For independent events A and B, $P(A|B)=P(A)$, provided $P(B)>0$. Reason (R): B occurring does not alter the likelihood of A.

A. A and R are true, and R explains A
B. A and R are true, but R does not explain A
C. A is true, R is false
D. A is false, R is true

Answer: A

Explanation: This is the conditional-probability meaning of independence.

Q28. Assertion (A): The cross product of two parallel vectors is the zero vector. Reason (R): The sine of the angle between parallel vectors is zero.

A. A and R are true, and R explains A
B. A and R are true, but R does not explain A
C. A is true, R is false
D. A is false, R is true

Answer: A

Explanation: $|a \times b|=|a||b|\sin\theta$. For parallel vectors, $\theta=0$ or π, so $\sin\theta=0$.

Q29. Assertion (A): Every square matrix has an inverse. Reason (R): A matrix with determinant zero is singular.

A. A and R are true, and R explains A
B. A and R are true, but R does not explain A
C. A is true, R is false
D. A is false, R is true

Answer: D
Explanation: Not every square matrix is invertible; only non-singular matrices are. The reason is true.

Q30. Assertion (A): The area under a curve can be found by a definite integral. Reason (R): Integration is the inverse process of differentiation.

A. A and R are true, and R explains A
B. A and R are true, but R does not explain A
C. A is true, R is false
D. A is false, R is true

Answer: B
Explanation: Both statements are true, but the reason alone does not directly explain the geometric area interpretation.

Achievers Section

Q31. Find the value of $\int_0^1 x^2(1-x)\,dx$.

A. 1/12
B. 1/10
C. 1/6
D. 1/4

Answer: A
Explanation: $\int_0^1 (x^2-x^3)dx = 1/3-1/4 = 1/12$.

Q32. If $\det(A)=-2$ for a 3×3 matrix, then $\det(-A)$ equals:

A. −2
B. 2
C. 6
D. −6

Answer: B
Explanation: For a 3×3 matrix, $\det(kA)=k^3\det(A)$. $\det(-A)=-1^3\times(-2)=2$.

Q33. Find the shortest distance from the origin to the plane $3x+4y-12=0$.

A. 12/5
B. 5/12
C. 3
D. 4

Answer: A
Explanation: Distance $= |-12|/\sqrt{(3^2+4^2+0^2)}=12/5$.

Q34. If X has binomial distribution with $n=4$ and $p=1/2$, find $P(X=2)$.

A. 1/8
B. 3/8
C. 1/2
D. 5/8

Answer: B
Explanation: $P(X=2)=C(4,2)(1/2)^2(1/2)^2=6/16=3/8$.

Q35. The function $f(x)=x^3-6x^2+9x$ has local extrema at:

A. x=0 and x=3
B. x=1 and x=3
C. x=1 and x=4
D. x=2 only

Answer: B

Explanation: $f'(x)=3x^2-12x+9=3(x-1)(x-3)$, so critical points are x=1 and x=3.

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	2	B	3	A	4	B	5	B
6	C	7	B	8	B	9	C	10	C
11	A	12	B	13	B	14	B	15	B
16	A	17	B	18	B	19	C	20	B
21	C	22	B	23	C	24	B	25	B
26	A	27	A	28	A	29	D	30	B
31	A	32	B	33	A	34	B	35	B