AME CET Mathematics

Sample Paper – 1

Duration: 20 Minutes **Maximum Marks: 80**

Instructions

- This paper contains **20** Multiple Choice Questions (Single Correct Answer), modelled on the Mathematics section of **AME CET** entrance.
- Each correct answer carries **+4 marks**. Each wrong answer carries -1 **mark**. Unattempted questions carry **0 marks**.
- Only **one** option is correct per question. Choose carefully.
- Syllabus level: **Class 11 and 12 NCERT Mathematics** (Sets and Relations to Probability and Statistics).
- Use of mobile phones, calculators, or any electronic gadget is strictly prohibited.

Q1. The value of $\displaystyle\int_0^1 x\, e^x\, dx$ is:

(A) 1

(B) e

(C) $e - 1$

(D) $2e - 1$

Q2. The value of $\displaystyle\int_0^{\pi} \sin^2 x\, dx$ is:

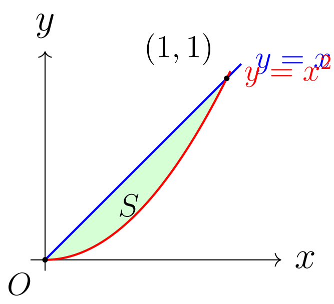
(A) π

(B) $\dfrac{\pi}{2}$

(C) 0

(D) 1

Q3. The area of the region enclosed between the curves $y = x$ and $y = x^2$, shown in the figure, is:



(A) $\frac{1}{4}$

(B) $\frac{1}{3}$

(C) $\frac{1}{2}$

(D) $\frac{1}{6}$

Q4. The equation of the circle with centre $(3, -2)$ and radius 5 is:

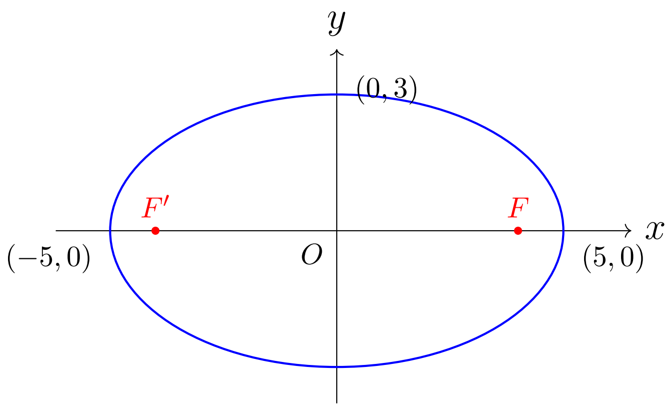
(A) $x^2 + y^2 + 6x - 4y - 12 = 0$

(B) $x^2 + y^2 - 6x + 4y + 12 = 0$

(C) $x^2 + y^2 - 6x + 4y - 12 = 0$

(D) $x^2 + y^2 - 6x - 4y - 12 = 0$

Q5. The eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$, sketched below, is:



(A) $\frac{4}{5}$

(B) $\frac{3}{5}$

(C) $\frac{5}{4}$

(D) $\frac{5}{3}$

Q6. The coordinates of the focus of the parabola $y^2 = 12x$ are:

(A) $(0,\ 3)$

(B) $(3,\ 0)$

(C) $(-3,\ 0)$

(D) $(0,\ -3)$

Q7. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, then $\det(A)$ equals:

(A) 2

(B) -4

(C) -2

(D) 4

Q8. If $A = \begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}$, then A^{-1} equals:

(A) $\begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix}$

(B) $\begin{pmatrix} -1 & 1 \\ 1 & -2 \end{pmatrix}$

(C) $\begin{pmatrix} 2 & -1 \\ -1 & 1 \end{pmatrix}$

(D) $\begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix}$

Q9. $\lim_{x \to 0} \frac{\sin 3x}{\sin 5x}$ equals:

(A) 3
(B) $\frac{3}{5}$
(C) $\frac{5}{3}$
(D) 5

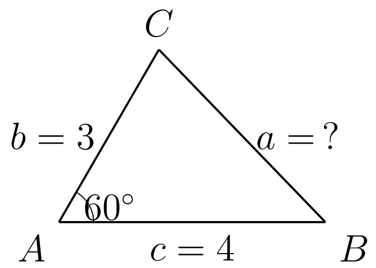
Q10. If $y = \ln(\sin x)$, then $\frac{dy}{dx}$ is:

(A) $\cot x$
(B) $-\cot x$
(C) $\tan x$
(D) $-\tan x$

Q11. $\sin(A + B) \cdot \sin(A - B)$ equals:

(A) $\cos^2 A - \cos^2 B$
(B) $\sin^2 A + \sin^2 B$
(C) $\sin^2 A - \sin^2 B$
(D) $\cos^2 A + \cos^2 B$

Q12. In triangle ABC, $\angle A = 60°$, $b = 3$ and $c = 4$. The length of side a is:



(A) $\sqrt{7}$
(B) $\sqrt{19}$
(C) $\sqrt{21}$
(D) $\sqrt{13}$

Q13. A bag contains 3 red and 4 blue balls. Two balls are drawn one after another **without** replacement. The probability that both balls are red is:

(A) $\frac{1}{7}$

(B) $\frac{1}{6}$

(C) $\frac{3}{7}$

(D) $\frac{2}{7}$

Q14. An urn contains 5 red and 3 green balls. Two balls are drawn simultaneously at random. The probability that the two balls are of **different** colours is:

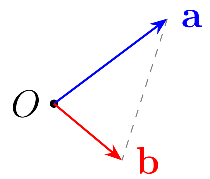
(A) $\frac{5}{14}$

(B) $\frac{15}{28}$

(C) $\frac{5}{28}$

(D) $\frac{3}{14}$

Q15. If $\mathbf{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\mathbf{b} = \hat{i} - \hat{j} + 2\hat{k}$, the value of $\mathbf{a} \cdot \mathbf{b}$ is:



(A) -5

(B) 5

(C) -3

(D) 3

Q16. If $|\mathbf{a}| = 3$, $|\mathbf{b}| = 4$ and the angle between $\mathbf{a}$ and $\mathbf{b}$ is $30°$, then $|\mathbf{a} \times \mathbf{b}|$ equals:

(A) 12

(B) $6\sqrt{3}$

(C) $3\sqrt{3}$

(D) 6

Q17. The number of ways to select a committee of 3 students from a group of 10 students is:

(A) 120

(B) 720

(C) 360

(D) 240

Q18. The sum of the first 6 terms of a geometric progression with first term 2 and common ratio 3 is:

(A) 364

(B) 728

(C) 1456

(D) 182

Q19. A line makes angles 90°, 60°, and 30° with the positive x-, y-, and z-axes respectively. Its direction cosines (l, m, n) are:

(A) $\left(0, \frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

(B) $\left(1, \frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

(C) $\left(0, \frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

(D) $\left(\frac{1}{\sqrt{2}}, \frac{1}{2}, \frac{1}{2}\right)$

Q20. The general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x}$ is:

(A) $y = x + C$

(B) $y = Ce^x$

(C) $y = x^2$

(D) $y = Cx$

Detailed Solutions

Q1.

Solution

Concept – Integration by Parts:
$\int u\,dv = uv - \int v\,du$. Choose $u = x$, $dv = e^x\,dx$.

Step 1 – Assign u and dv:

$$u = x \;\Rightarrow\; du = dx, \qquad dv = e^x\,dx \;\Rightarrow\; v = e^x$$

Step 2 – Apply the formula:

$$\int_0^1 x\,e^x\,dx = \Big[x\,e^x\Big]_0^1 - \int_0^1 e^x\,dx$$

Step 3 – Evaluate the first term:

$$\Big[x\,e^x\Big]_0^1 = 1 \cdot e^1 - 0 \cdot e^0 = e$$

Step 4 – Evaluate the integral:

$$\int_0^1 e^x\,dx = \Big[e^x\Big]_0^1 = e - 1$$

Step 5 – Combine:

$$e - (e - 1) = 1$$

Why other options are wrong:

- (B) e: omitting the subtracted integral.
- (C) $e - 1$: result of $\int_0^1 e^x\,dx$ alone.
- (D) $2e - 1$: sign error in the IBP formula.

Answer: (A) ← Go Back to Q1

Q2.

Solution

Concept – Half-angle identity:

$$\sin^2 x = \frac{1 - \cos 2x}{2}$$

Step 1 – Rewrite the integrand:

$$\int_0^{\pi} \sin^2 x\, dx = \frac{1}{2}\int_0^{\pi} (1 - \cos 2x)\, dx$$

Step 2 – Integrate term by term:

$$= \frac{1}{2}\left[x - \frac{\sin 2x}{2}\right]_0^{\pi}$$

Step 3 – Substitute limits:

$$= \frac{1}{2}\left[\left(\pi - \frac{\sin 2\pi}{2}\right) - \left(0 - \frac{\sin 0}{2}\right)\right]$$

$$= \frac{1}{2}(\pi - 0 - 0) = \frac{\pi}{2}$$

Why other options are wrong:

- (A) π: forgetting the $\frac{1}{2}$ factor from the identity.
- (C) 0: treating $\sin^2 x$ as if it were symmetric to zero over $[0, \pi]$.
- (D) 1: evaluating without the identity.

Answer: (B) ← Go Back to Q2

Q3.

Solution

Concept – Area between two curves:

$$A = \int_a^b [f(x) - g(x)]\, dx \quad \text{where } f(x) \geq g(x) \text{ on } [a, b]$$

Step 1 – Find intersection points (set $y = x$ equal to $y = x^2$):

$$x = x^2 \;\Rightarrow\; x(x-1) = 0 \;\Rightarrow\; x = 0,\; x = 1$$

Step 2 – Identify the upper curve on $[0, 1]$:

At $x = 0.5$: line gives 0.5, parabola gives 0.25. So $y = x$ is above $y = x^2$.

Step 3 – Set up the integral:

$$A = \int_0^1 (x - x^2)\,dx$$

Step 4 – Integrate:

$$= \left[\frac{x^2}{2} - \frac{x^3}{3}\right]_0^1$$

Step 5 – Evaluate:

$$= \frac{1}{2} - \frac{1}{3} = \frac{3}{6} - \frac{2}{6} = \frac{1}{6}$$

Why other options are wrong:

- (A) $\frac{1}{4}$: using $\int_0^1 x^2\,dx = \frac{1}{3}$ and dividing incorrectly.
- (B) $\frac{1}{3}$: computing $\int_0^1 x^2\,dx$ alone.
- (C) $\frac{1}{2}$: computing $\int_0^1 x\,dx$ alone.

Answer: (D) ← Go Back to Q3

Q4.

Solution

Concept – Standard circle equation:
$(x-h)^2 + (y-k)^2 = r^2$ for centre (h, k) and radius r.

Step 1 – Write the equation with centre $(3, -2)$, $r = 5$:

$$(x-3)^2 + (y+2)^2 = 25$$

Step 2 – Expand $(x-3)^2$:

$$x^2 - 6x + 9$$

Step 3 – Expand $(y+2)^2$:

$$y^2 + 4y + 4$$

Step 4 – Collect all terms:

$$x^2 - 6x + 9 + y^2 + 4y + 4 = 25$$

$$x^2 + y^2 - 6x + 4y + 13 = 25$$

Step 5 – Rearrange:

$$x^2 + y^2 - 6x + 4y - 12 = 0$$

Why other options are wrong:

- (A) has $+6x$: sign of the x-coefficient is wrong.
- (B) has $+12$: constant on the right side is not moved correctly.
- (D) has $-4y$: sign of the y-coefficient is wrong.

Answer: (C) ← Go Back to Q4

Q5.

Solution

Concept – Eccentricity of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with $a > b$:

$$c^2 = a^2 - b^2, \qquad e = \frac{c}{a}$$

Step 1 – Read off a^2 and b^2:

$$a^2 = 25, \quad b^2 = 9$$

Step 2 – Compute c^2:

$$c^2 = 25 - 9 = 16$$

Step 3 – Compute c:

$$c = 4$$

Step 4 – Compute eccentricity:

$$e = \frac{c}{a} = \frac{4}{5}$$

Why other options are wrong:

- (B) $\frac{3}{5}$: using b/a instead of c/a.
- (C) $\frac{5}{4}$: inverting the ratio.
- (D) $\frac{5}{3}$: using a/b.

Answer: (A) ← Go Back to Q5

Q6.

Solution

Concept – Standard parabola $y^2 = 4ax$:
Focus is at $(a, 0)$ and the axis is the x-axis.

Step 1 – Match $y^2 = 12x$ to $y^2 = 4ax$:

$$4a = 12 \;\Rightarrow\; a = 3$$

Step 2 – State the focus:

$$\text{Focus} = (a, 0) = (3, 0)$$

Why other options are wrong:

- (A) $(0, 3)$: confusing this parabola with $x^2 = 4ay$ (vertical axis).
- (C) $(-3, 0)$: focus of the leftward parabola $y^2 = -12x$.
- (D) $(0, -3)$: incorrect axis.

Answer: (B) ← Go Back to Q6

Q7.

Solution

Concept – 2×2 determinant:

$$\det\begin{pmatrix} a & b \\ c & d \end{pmatrix} = ad - bc$$

Step 1 – Identify elements:

$$a = 1,\; b = 2,\; c = 3,\; d = 4$$

Step 2 – Compute:

$$\det(A) = 1 \times 4 - 2 \times 3 = 4 - 6 = -2$$

Why other options are wrong:

- (A) 2: reversing the subtraction order.
- (B) -4: computing $-(b \cdot c)$ only.
- (D) 4: taking only the main diagonal product.

Answer: (C) ← Go Back to Q7

Q8.

Solution

Concept – 2×2 matrix inverse:

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}^{-1} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

Step 1 – Compute $\det(A)$:

$$\det(A) = 2 \times 1 - 1 \times 1 = 1$$

Step 2 – Form the adjugate (swap main diagonal, negate off-diagonal):

$$\text{adj}(A) = \begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix}$$

Step 3 – Divide by $\det(A) = 1$:

$$A^{-1} = \begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix}$$

Step 4 – Verify $A \cdot A^{-1} = I$:

$$\begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} 1 & -1 \\ -1 & 2 \end{pmatrix} = \begin{pmatrix} 2-1 & -2+2 \\ 1-1 & -1+2 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \checkmark$$

Why other options are wrong:

- (A): no sign change on off-diagonal elements.
- (B): wrong signs on both entries.
- (C): this is A itself with rows swapped, not A^{-1}.

Answer: (D) ← Go Back to Q8

Q9.

Solution

Concept – Standard trigonometric limit:

$$\lim_{\theta\to 0}\frac{\sin\theta}{\theta}=1$$

Step 1 – Rewrite by introducing $3x$ and $5x$ denominators:

$$\lim_{x\to 0}\frac{\sin 3x}{\sin 5x}=\lim_{x\to 0}\frac{\frac{\sin 3x}{3x}\cdot 3x}{\frac{\sin 5x}{5x}\cdot 5x}$$

Step 2 – Simplify the x factors:

$$=\lim_{x\to 0}\frac{\sin 3x}{3x}\cdot\frac{5x}{\sin 5x}\cdot\frac{3}{5}$$

Step 3 – Apply the standard limit to each factor as $x\to 0$:

$$=1\cdot 1\cdot\frac{3}{5}=\frac{3}{5}$$

Why other options are wrong:

- (A) 3: taking only the numerator coefficient.
- (C) $\frac{5}{3}$: inverting the ratio.
- (D) 5: taking only the denominator coefficient.

Answer: (B) ← Go Back to Q9

Q10.

Solution

Concept – Chain rule:

$$\frac{d}{dx}\left[\ln f(x)\right]=\frac{f'(x)}{f(x)}$$

Step 1 – Identify $f(x)=\sin x$:

$$y=\ln(\sin x)$$

Step 2 – Differentiate $f(x)$:

$$\frac{d}{dx}(\sin x)=\cos x$$

Step 3 – Apply the chain rule:

$$\frac{dy}{dx} = \frac{\cos x}{\sin x} = \cot x$$

Why other options are wrong:

- (B) $-\cot x$: sign error, arises from differentiating $\ln(-\sin x)$.
- (C) $\tan x$: confusing $\cos / \sin$ with $\sin / \cos$.
- (D) $-\tan x$: both inverted and negated.

Answer: (A) ← Go Back to Q10

Q11.

Solution

Concept – Difference of squares identity from compound angles.

Step 1 – Expand $\sin(A+B)$**:**

$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$

Step 2 – Expand $\sin(A-B)$**:**

$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$

Step 3 – Multiply using $(p+q)(p-q) = p^2 - q^2$**:**

$$\sin(A+B)\cdot\sin(A-B) = (\sin A\cos B)^2 - (\cos A\sin B)^2$$

$$= \sin^2 A\cos^2 B - \cos^2 A\sin^2 B$$

Step 4 – Substitute $\cos^2\theta = 1 - \sin^2\theta$**:**

$$= \sin^2 A(1-\sin^2 B) - (1-\sin^2 A)\sin^2 B$$

$$= \sin^2 A - \sin^2 A\sin^2 B - \sin^2 B + \sin^2 A\sin^2 B$$

$$= \sin^2 A - \sin^2 B$$

Why other options are wrong:

- (A) $\cos^2 A - \cos^2 B$: result of $\cos(A-B)\cdot\cos(A+B)$, not sin.
- (B) $\sin^2 A + \sin^2 B$: missing the sign change in the difference-of-squares step.
- (D): sum of cosines – no relation to this product.

Answer: (C) ← Go Back to Q11

Q12.

Solution

Concept – Cosine Rule:

$$a^2 = b^2 + c^2 - 2bc\cos A$$

Step 1 – Substitute $A = 60°$, $b = 3$, $c = 4$:

$$a^2 = 3^2 + 4^2 - 2(3)(4)\cos 60°$$

Step 2 – Compute each part:

$$a^2 = 9 + 16 - 24 \times \frac{1}{2}$$

Step 3 – Simplify:

$$a^2 = 25 - 12 = 13$$

Step 4 – Take positive square root:

$$a = \sqrt{13}$$

Why other options are wrong:

- (A) $\sqrt{7}$: using $+2bc\cos A$ (wrong sign in the rule).
- (B) $\sqrt{19}$: using $\cos 60° = \frac{\sqrt{3}}{2}$ (confusing with $\cos 30°$).
- (C) $\sqrt{21}$: using $24\cos 60° = 4$ instead of 12.

Answer: (D) ← Go Back to Q12

Q13.

Solution

Concept – Multiplication rule for dependent events:

$$P(A \cap B) = P(A) \cdot P(B \mid A)$$

Step 1 – Total balls: $3 + 4 = 7$.

Step 2 – Probability first ball is red:

$$P(\text{1st red}) = \frac{3}{7}$$

Step 3 – After removing one red, the bag has 2 red and 4 blue (6 total). Probability second ball is red:

$$P(\text{2nd red} \mid \text{1st red}) = \frac{2}{6} = \frac{1}{3}$$

Step 4 – Combined probability:

$$P(\text{both red}) = \frac{3}{7} \times \frac{1}{3} = \frac{3}{21} = \frac{1}{7}$$

Why other options are wrong:

- (B) $\frac{1}{6}$: only computing the conditional probability $P(\text{2nd red} \mid \text{1st red})$.
- (C) $\frac{3}{7}$: only computing $P(\text{1st red})$ and ignoring the second draw.
- (D) $\frac{2}{7}$: using $2/7$ as if 2 of the original 7 balls were counted.

Answer: (A) ← Go Back to Q13

Q14.

Solution

Concept – Classical probability using combinations:

$$P = \frac{\text{favourable outcomes}}{\text{total outcomes}}$$

Step 1 – Total ways to choose 2 balls from 8:

$$\binom{8}{2} = \frac{8 \times 7}{2} = 28$$

Step 2 – Ways to choose 1 red from 5 AND 1 green from 3:

$$\binom{5}{1} \times \binom{3}{1} = 5 \times 3 = 15$$

Step 3 – Probability:

$$P = \frac{15}{28}$$

Why other options are wrong:

- (A) $\frac{5}{14}$: this equals $\binom{5}{2}/\binom{8}{2} = 10/28$, the probability *both* are red.
- (C) $\frac{5}{28}$: under-counts the favourable cases by a factor of 3.
- (D) $\frac{3}{14}$: equals $\binom{3}{2}/\binom{8}{2} = 3/28 \times 2$, not this event.

Answer: (B) ← Go Back to Q14

Q15.

Solution

Concept – Dot product:

$$\mathbf{a}\cdot\mathbf{b} = a_1b_1 + a_2b_2 + a_3b_3$$

Step 1 – Write components:

$$\mathbf{a} = (2,\ 3,\ -1), \quad \mathbf{b} = (1,\ -1,\ 2)$$

Step 2 – Multiply component pairs:

$$2 \times 1 = 2$$

$$3 \times (-1) = -3$$

$$(-1) \times 2 = -2$$

Step 3 – Sum:

$$\mathbf{a}\cdot\mathbf{b} = 2 + (-3) + (-2) = -3$$

Why other options are wrong:

- (A) -5: sign error in one component, e.g. $2 - 3 - 4 = -5$.
- (B) 5: treating all products as positive: $2+3+2 = 7 \neq 5$, or sign error giving $+5$.
- (D) 3: error such as $2 - 3 + 4 = 3$.

Answer: (C) ← Go Back to Q15

Q16.

Solution

Concept – Magnitude of cross product:

$$|\mathbf{a}\times\mathbf{b}| = |\mathbf{a}||\mathbf{b}|\sin\theta$$

Step 1 – State given values:

$$|\mathbf{a}| = 3, \quad |\mathbf{b}| = 4, \quad \theta = 30^\circ$$

Step 2 – Recall $\sin 30^\circ$:

$$\sin 30^\circ = \frac{1}{2}$$

Step 3 – Substitute:

$$|\mathbf{a} \times \mathbf{b}| = 3 \times 4 \times \frac{1}{2} = 12 \times \frac{1}{2} = 6$$

Why other options are wrong:

- (A) 12: using $\sin 30^\circ = 1$ or confusing cross with dot product.
- (B) $6\sqrt{3}$: using $\sin 60^\circ = \frac{\sqrt{3}}{2}$ instead of $\sin 30^\circ$.
- (C) $3\sqrt{3}$: halving option (B) without justification.

Answer: (D) ← Go Back to Q16

Q17.

Solution

Concept – Combination (order does not matter):

$$\binom{n}{r} = \frac{n!}{r!\,(n-r)!}$$

Step 1 – Identify $n = 10$, $r = 3$**:**

Step 2 – Expand (cancel $7!$**):**

$$\binom{10}{3} = \frac{10 \times 9 \times 8}{3 \times 2 \times 1}$$

Step 3 – Compute numerator and denominator:

$$= \frac{720}{6} = 120$$

Why other options are wrong:

- (B) 720: computing $P(10, 3) = 10 \times 9 \times 8$ (permutations, not combinations).
- (C) 360: halving the permutation without the full denominator.
- (D) 240: incorrect partial product.

Answer: (A) ← Go Back to Q17

Q18.

Solution

Concept – Sum of n terms of a GP ($r \neq 1$):

$$S_n = a \cdot \frac{r^n - 1}{r - 1}$$

Step 1 – Identify $a = 2$, $r = 3$, $n = 6$.

Step 2 – Compute $r^n = 3^6$:

$$3^1 = 3,\ 3^2 = 9,\ 3^3 = 27,\ 3^4 = 81,\ 3^5 = 243,\ 3^6 = 729$$

Step 3 – Substitute:

$$S_6 = 2 \cdot \frac{729 - 1}{3 - 1} = 2 \cdot \frac{728}{2} = 2 \times 364$$

Step 4 – Final value:

$$S_6 = 728$$

Why other options are wrong:

- (A) 364: forgetting to multiply by $a = 2$.
- (C) 1456: doubling the correct answer.
- (D) 182: halving option (A).

Answer: (B) ← Go Back to Q18

Q19.

Solution

Concept – Direction cosines:

$$l = \cos\alpha, \quad m = \cos\beta, \quad n = \cos\gamma$$

where α, β, γ are angles with x-, y-, z-axes.

Step 1 – Angles given: $\alpha = 90°$, $\beta = 60°$, $\gamma = 30°$.

Step 2 – Evaluate:

$$l = \cos 90° = 0$$

$$m = \cos 60° = \frac{1}{2}$$

$$n = \cos 30° = \frac{\sqrt{3}}{2}$$

Step 3 – Verify $l^2 + m^2 + n^2 = 1$:

$$0 + \frac{1}{4} + \frac{3}{4} = 1\checkmark$$

Result: $(l, m, n) = \left(0, \frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

Why other options are wrong:

- (A): m and n are swapped — $\cos 60°$ and $\cos 30°$ are interchanged.
- (B): $l = 1$ implies $\alpha = 0°$, not $90°$.
- (D): $l = \frac{1}{\sqrt{2}}$ implies $\alpha = 45°$, not $90°$.

Answer: (C) ← Go Back to Q19

Q20.

Solution

Concept – Separation of variables:
Rewrite so all y terms are on one side and all x terms on the other, then integrate.

Step 1 – Separate variables:

$$\frac{dy}{y} = \frac{dx}{x}$$

Step 2 – Integrate both sides:

$$\int \frac{dy}{y} = \int \frac{dx}{x}$$

$$\ln|y| = \ln|x| + C_1$$

Step 3 – Exponentiate:

$$|y| = e^{C_1} \cdot |x|$$

Step 4 – Let $C = \pm e^{C_1}$ (arbitrary constant):

$$y = Cx$$

Why other options are wrong:

- (A) $y = x + C$: general solution of $\frac{dy}{dx} = 1$, not $\frac{y}{x}$.
- (B) $y = Ce^x$: general solution of $\frac{dy}{dx} = y$.
- (C) $y = x^2$: particular form, not the general solution, and only satisfies if $C = x$.

Answer: (D) ← Go Back to Q20

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	B	3	D	4	C	5	A
6	B	7	C	8	D	9	B	10	A
11	C	12	D	13	A	14	B	15	C
16	D	17	A	18	B	19	C	20	D