AME CET Mathematics

Sample Paper – 3

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 $\int_0^1 (2x+1)^3\,dx$ is:

(A) 10

(B) 8

(C) 20

(D) 40

Q2. The value of $\int_{-2}^2 x^3\,dx$ is:

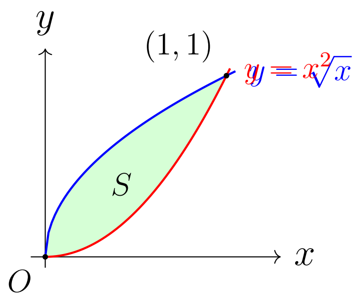
(A) 8

(B) 16

(C) 0

(D) 4

Q3. The area of the region enclosed between the curves $y = \sqrt{x}$ and $y = x^2$ from $x = 0$ to $x = 1$, shaded below, is:



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

(B) $\frac{2}{3}$

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

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

Q4. The centre and radius of the circle $x^2 + y^2 - 4x + 6y - 12 = 0$ are:

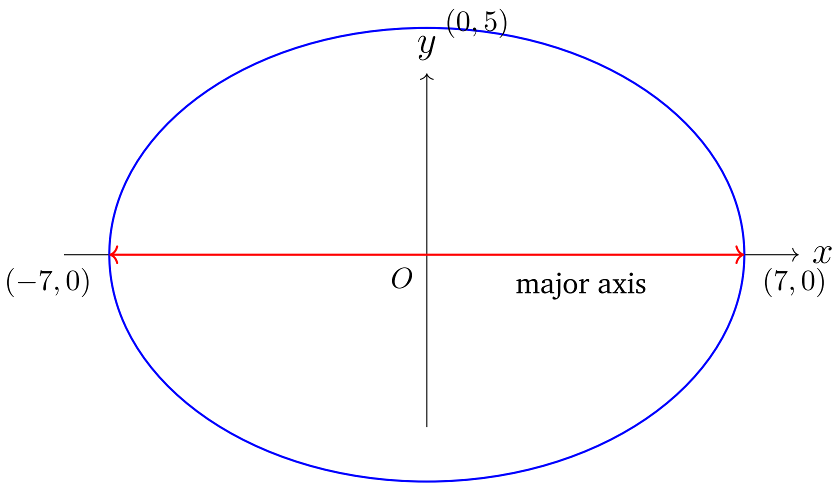
(A) centre $(-2,\ 3)$, radius 5

(B) centre $(2,\ -3)$, radius 5

(C) centre $(2,\ -3)$, radius 25

(D) centre $(-2,\ 3)$, radius $\sqrt{12}$

Q5. The length of the major axis of the ellipse $\frac{x^2}{49} + \frac{y^2}{25} = 1$, sketched below, is:



(A) 14

(B) 7

(C) 10

(D) 24

Q6. The equation of the directrix of the parabola $y^2 = 8x$ is:

(A) $x = 2$

(B) $y = -2$

(C) $x = -4$

(D) $x = -2$

Q7. If $A = \begin{pmatrix} 3 & 1 \\ 2 & 5 \end{pmatrix}$, then $\det(A)$ equals:

(A) 17

(B) 13

(C) -13

(D) 7

Q8. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, then A^2 equals:

(A) $\begin{pmatrix} 1 & 4 \\ 9 & 16 \end{pmatrix}$

(B) $\begin{pmatrix} 7 & 10 \\ 10 & 22 \end{pmatrix}$

(C) $\begin{pmatrix} 7 & 10 \\ 15 & 22 \end{pmatrix}$

(D) $\begin{pmatrix} 2 & 4 \\ 6 & 8 \end{pmatrix}$

Q9. $\lim_{x \to 0} \frac{\tan 4x}{3x}$ equals:

(A) $\frac{3}{4}$

(B) $\frac{4}{3}$

(C) 4

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

Q10. If $y = \tan x$, then $\frac{dy}{dx}$ is:

(A) $\sec^2 x$

(B) $-\csc^2 x$

(C) $\sec x \tan x$

(D) $\cot x$

Q11. The value of $\sin 75^\circ$ is:

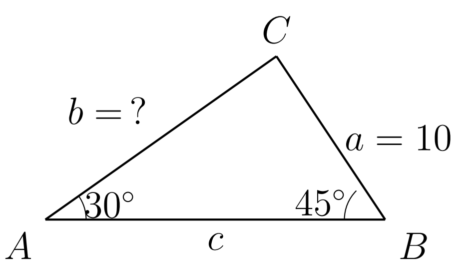
(A) $\frac{\sqrt{6}-\sqrt{2}}{4}$

(B) $\frac{\sqrt{3}+1}{2}$

(C) $\frac{\sqrt{6}+\sqrt{2}}{4}$

(D) $\frac{\sqrt{6}+\sqrt{2}}{2}$

Q12. In triangle ABC, side $a = 10$, $\angle A = 30^\circ$ and $\angle B = 45^\circ$. The length of side b is:



(A) $5\sqrt{2}$

(B) 20

(C) 10

(D) $10\sqrt{2}$

Q13. A card is drawn at random from a well-shuffled pack of 52 playing cards. The probability that it is a King is:

(A) $\frac{1}{52}$

(B) $\frac{1}{26}$

(C) $\frac{1}{13}$

(D) $\frac{4}{13}$

Q14. Two cards are drawn at random, without replacement, from a pack of 52 cards. The probability that both are aces is:

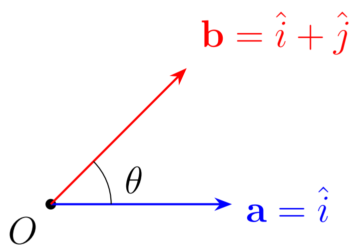
(A) $\frac{1}{169}$

(B) $\frac{1}{221}$

(C) $\frac{2}{221}$

(D) $\frac{1}{13}$

Q15. The angle between the vectors $\mathbf{a} = \hat{i}$ and $\mathbf{b} = \hat{i} + \hat{j}$ is:



(A) 30°

(B) 60°

(C) 90°

(D) 45°

Q16. If $\mathbf{a} = \hat{i}$ and $\mathbf{b} = \hat{j}$, then $\mathbf{a} \times \mathbf{b}$ equals:

(A) $\hat{k}$

(B) $\hat{i}$

(C) $\hat{j}$

(D) $-\hat{k}$

Q17. The number of ways to arrange 3 objects taken from 6 distinct objects (i.e. ${}^6P_3$) is:

(A) 18

(B) 216

(C) 20

(D) 120

Q18. The 10th term of the arithmetic progression $3,\ 7,\ 11,\ \ldots$ is:

(A) 39

(B) 43

(C) 40

(D) 36

Q19. The direction ratios of the line joining the points $(1, 2, 3)$ and $(4, 5, 6)$, in simplest form, are:

(A) $(3,\ 3,\ 3)$

(B) $(5,\ 7,\ 9)$

(C) $(1,\ 1,\ 1)$

(D) $(4,\ 5,\ 6)$

Q20. The general solution of the differential equation $\dfrac{dy}{dx} = e^x$ is:

(A) $y = \dfrac{e^x}{2} + C$

(B) $y = e^x + C$

(C) $y = x\,e^x + C$

(D) $y = e^x$

Detailed Solutions

Q1.

Solution

Concept – Substitution for a linear inner function:
For $\int (ax+b)^n\,dx$, substitute $u = ax+b$ so $du = a\,dx$.

Step 1 – Substitute $u = 2x+1$:

$$u = 2x+1 \;\Rightarrow\; du = 2\,dx \;\Rightarrow\; dx = \frac{du}{2}$$

Step 2 – Change the limits:

$$x = 0 \Rightarrow u = 1, \qquad x = 1 \Rightarrow u = 3$$

Step 3 – Rewrite the integral:

$$\int_0^1 (2x+1)^3\,dx = \int_1^3 u^3 \cdot \frac{du}{2} = \frac{1}{2}\int_1^3 u^3\,du$$

Step 4 – Integrate:

$$= \frac{1}{2}\left[\frac{u^4}{4}\right]_1^3 = \frac{1}{8}\left[u^4\right]_1^3$$

Step 5 – Evaluate:

$$= \frac{1}{8}(3^4 - 1^4) = \frac{1}{8}(81-1) = \frac{80}{8} = 10$$

Why other options are wrong:

- (B) 8: forgetting the 1^4 term, giving $81/8$ rounded wrongly.
- (C) 20: omitting the $\frac{1}{2}$ from $dx = \frac{du}{2}$.
- (D) 40: integrating without dividing by the power-raised 4.

Answer: (A) ← Go Back to Q1

Q2.

Solution

Concept – Symmetry property of definite integrals:
If $f(x)$ is odd, i.e. $f(-x) = -f(x)$, then $\int_{-a}^{a} f(x)\,dx = 0$.

Step 1 – Test the integrand for oddness:

$$f(x) = x^3 \;\Rightarrow\; f(-x) = (-x)^3 = -x^3 = -f(x)$$

So x^3 is an odd function.

Step 2 – Apply the symmetry property over $[-2, 2]$:

$$\int_{-2}^{2} x^3\,dx = 0$$

Step 3 – Verify directly:

$$\left[\frac{x^4}{4}\right]_{-2}^{2} = \frac{2^4}{4} - \frac{(-2)^4}{4} = \frac{16}{4} - \frac{16}{4} = 0$$

Why other options are wrong:

- (A) 8: evaluating $\int_0^2 x^3\,dx = 4$ and doubling incorrectly.
- (B) 16: adding the two equal antiderivative values instead of subtracting.
- (D) 4: computing only $\int_0^2 x^3\,dx$.

Answer: (C) ← Go Back to Q2

Q3.

Solution

Concept – Area between two curves:

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

Step 1 – Confirm the intersection points (set $\sqrt{x} = x^2$):

$$\sqrt{x} = x^2 \;\Rightarrow\; x = x^4 \;\Rightarrow\; x(x^3 - 1) = 0 \;\Rightarrow\; x = 0,\; x = 1$$

Step 2 – Identify the upper curve on $[0, 1]$:
At $x = 0.25$: $\sqrt{x} = 0.5$, $x^2 = 0.0625$. So $y = \sqrt{x}$ is above $y = x^2$.

Step 3 – Set up the integral:

$$A = \int_0^1 \left(\sqrt{x} - x^2\right) dx = \int_0^1 \left(x^{1/2} - x^2\right) dx$$

Step 4 – Integrate:

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

Step 5 – Evaluate:

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

Why other options are wrong:

- (A) $\frac{1}{6}$: this is the area between $y = x$ and $y = x^2$, a different region.
- (B) $\frac{2}{3}$: computing $\int_0^1 \sqrt{x}\, dx$ alone.
- (C) $\frac{1}{2}$: an arithmetic slip when subtracting the fractions.

Answer: (D) ← Go Back to Q3

Q4.

Solution

Concept – General equation of a circle:
$x^2 + y^2 + 2gx + 2fy + c = 0$ has centre $(-g, -f)$ and radius $\sqrt{g^2 + f^2 - c}$.

Step 1 – Match coefficients of $x^2 + y^2 - 4x + 6y - 12 = 0$:

$$2g = -4 \Rightarrow g = -2, \qquad 2f = 6 \Rightarrow f = 3, \qquad c = -12$$

Step 2 – Find the centre $(-g, -f)$:

$$(-(-2),\ -(3)) = (2,\ -3)$$

Step 3 – Find the radius $\sqrt{g^2 + f^2 - c}$:

$$r = \sqrt{(-2)^2 + 3^2 - (-12)} = \sqrt{4 + 9 + 12}$$

Step 4 – Simplify:

$$r = \sqrt{25} = 5$$

Why other options are wrong:

- (A): centre signs read directly from coefficients instead of negated.
- (C): radius left as $r^2 = 25$ rather than r.

- (D): radius taken as $\sqrt{4+9-1}$ with a sign error on the constant.

Answer: (B) ← Go Back to Q4

Q5.

Solution

Concept – Major axis of $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ (with $a>b$):
The major axis lies along the x-axis and has length $2a$.

Step 1 – Read off a^2 and b^2:

$$a^2 = 49, \quad b^2 = 25$$

Since $49 > 25$, the major axis is along the x-axis.

Step 2 – Compute a:

$$a = \sqrt{49} = 7$$

Step 3 – Compute the length of the major axis:

$$2a = 2 \times 7 = 14$$

Why other options are wrong:

- (B) 7: this is the semi-major axis a, not the full length $2a$.
- (C) 10: using $2b = 2 \times 5$, the length of the minor axis.
- (D) 24: using $2(a+b)/\ldots$ or adding a^2 pieces incorrectly.

Answer: (A) ← Go Back to Q5

Q6.

Solution

Concept – Standard parabola $y^2 = 4ax$:
Its directrix is the line $x = -a$.

Step 1 – Match $y^2 = 8x$ to $y^2 = 4ax$:

$$4a = 8 \;\Rightarrow\; a = 2$$

Step 2 – Write the directrix:

$$x = -a = -2$$

Why other options are wrong:

- (A) $x = 2$: this is the line through the focus, not the directrix.
- (B) $y = -2$: directrix of a vertically-opening parabola $x^2 = 8y$, not this one.
- (C) $x = -4$: using $a = 4$ from $4a = 8$ read as $a = 8/2$ wrongly.

Answer: (D) ← 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:

$$a = 3,\ b = 1,\ c = 2,\ d = 5$$

Step 2 – Apply the formula:

$$\det(A) = 3 \times 5 - 1 \times 2$$

Step 3 – Compute:

$$= 15 - 2 = 13$$

Why other options are wrong:

- (A) 17: adding instead of subtracting $(15 + 2)$.
- (C) -13: reversing the subtraction order $(bc - ad)$.
- (D) 7: subtracting the wrong product pair.

Answer: (B) ← Go Back to Q7

Q8.

Solution

Concept – Matrix multiplication:
$A^2 = A \cdot A$; the (i, j) entry is the dot product of row i of A with column j of A.

Step 1 – Write $A^2 = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$.

Step 2 – Compute entry $(1, 1)$:

$$1 \times 1 + 2 \times 3 = 1 + 6 = 7$$

Step 3 – Compute entry $(1, 2)$:

$$1 \times 2 + 2 \times 4 = 2 + 8 = 10$$

Step 4 – Compute entry $(2, 1)$:

$$3 \times 1 + 4 \times 3 = 3 + 12 = 15$$

Step 5 – Compute entry $(2, 2)$:

$$3 \times 2 + 4 \times 4 = 6 + 16 = 22$$

Step 6 – Assemble:

$$A^2 = \begin{pmatrix} 7 & 10 \\ 15 & 22 \end{pmatrix}$$

Why other options are wrong:

- (A): squaring each entry individually, not matrix multiplication.
- (B): symmetric guess with $(2, 1) = 10$ instead of 15.
- (D): this is $2A$, not A^2.

Answer: (C) ← Go Back to Q8

Q9.

Solution

Concept – Standard trigonometric limit:

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

Step 1 – Introduce $4x$ in numerator and denominator:

$$\lim_{x \to 0} \frac{\tan 4x}{3x} = \lim_{x \to 0} \frac{\tan 4x}{4x} \cdot \frac{4x}{3x}$$

Step 2 – Simplify the x factor:

$$= \lim_{x \to 0} \frac{\tan 4x}{4x} \cdot \frac{4}{3}$$

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

$$= 1 \cdot \frac{4}{3} = \frac{4}{3}$$

Why other options are wrong:

- (A) $\frac{3}{4}$: inverting the ratio of coefficients.
- (C) 4: dropping the denominator coefficient 3.
- (D) $\frac{1}{3}$: treating $\tan 4x/4x$ as if it tends to $\frac{1}{4}$.

Answer: (B) ← Go Back to Q9

Q10.

Solution

Concept – Standard derivative:

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

Step 1 – Write $\tan x$ as a quotient:

$$\tan x = \frac{\sin x}{\cos x}$$

Step 2 – Apply the quotient rule $\left(\frac{u}{v}\right)' = \frac{u'v - uv'}{v^2}$:

$$\frac{d}{dx}\left(\frac{\sin x}{\cos x}\right) = \frac{\cos x \cdot \cos x - \sin x \cdot (-\sin x)}{\cos^2 x}$$

Step 3 – Simplify the numerator:

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

Why other options are wrong:

- (B) $-\csc^2 x$: this is the derivative of $\cot x$.
- (C) $\sec x \tan x$: this is the derivative of $\sec x$.
- (D) $\cot x$: this is the integral-type confusion, not a derivative of $\tan x$.

Answer: (A) ← Go Back to Q10

Q11.

Solution

Concept – Compound angle (sum) formula:

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

Step 1 – Write 75° as $45^\circ + 30^\circ$:

$$\sin 75^\circ = \sin(45^\circ + 30^\circ)$$

Step 2 – Apply the formula:

$$= \sin 45^\circ \cos 30^\circ + \cos 45^\circ \sin 30^\circ$$

Step 3 – Substitute standard values:

$$= \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \cdot \frac{1}{2}$$

Step 4 – Combine over a common denominator:

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

Step 5 – Rationalise by multiplying by $\frac{\sqrt{2}}{\sqrt{2}}$:

$$= \frac{(\sqrt{3}+1)\sqrt{2}}{2 \times 2} = \frac{\sqrt{6}+\sqrt{2}}{4}$$

Why other options are wrong:

- (A) $\frac{\sqrt{6}-\sqrt{2}}{4}$: this equals $\sin 15^\circ$, not $\sin 75^\circ$.
- (B) $\frac{\sqrt{3}+1}{2}$: forgetting to rationalise the $2\sqrt{2}$ denominator.
- (D) $\frac{\sqrt{6}+\sqrt{2}}{2}$: dividing by 2 instead of 4.

Answer: (C) ← Go Back to Q11

Q12.

Solution

Concept – Sine Rule:

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

Step 1 – Rearrange to solve for b:

$$b = \frac{a \sin B}{\sin A}$$

Step 2 – Substitute $a = 10$, $A = 30°$, $B = 45°$:

$$b = \frac{10 \sin 45°}{\sin 30°}$$

Step 3 – Insert standard values $\sin 45° = \frac{1}{\sqrt{2}}$, $\sin 30° = \frac{1}{2}$:

$$b = \frac{10 \cdot \frac{1}{\sqrt{2}}}{\frac{1}{2}}$$

Step 4 – Simplify (dividing by $\frac{1}{2}$ means multiplying by 2):

$$b = 10 \cdot \frac{1}{\sqrt{2}} \cdot 2 = \frac{20}{\sqrt{2}}$$

Step 5 – Rationalise:

$$b = \frac{20}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{20\sqrt{2}}{2} = 10\sqrt{2}$$

Why other options are wrong:

- (A) $5\sqrt{2}$: dividing by 2 instead of multiplying when handling $\sin 30°$.
- (B) 20: using $\sin 45° = 1$.
- (C) 10: taking $b = a$ by ignoring the differing angles.

Answer: (D) ← Go Back to Q12

Q13.

Solution

Concept – Classical probability:

$$P(E) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$

Step 1 – Count total outcomes:
There are 52 cards, so 52 equally likely outcomes.

Step 2 – Count favourable outcomes:
A standard pack has 4 Kings.

Step 3 – Compute the probability:

$$P(\text{King}) = \frac{4}{52}$$

Step 4 – Simplify:

$$= \frac{1}{13}$$

Why other options are wrong:

- (A) $\frac{1}{52}$: counting only one King instead of all four.
- (B) $\frac{1}{26}$: counting only two Kings.
- (D) $\frac{4}{13}$: leaving 4 in the numerator while reducing the 52 to 13.

Answer: (C) ← Go Back to Q13

Q14.

Solution

Concept – Probability with combinations:

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

Step 1 – Total ways to choose 2 cards from 52:

$$\binom{52}{2} = \frac{52 \times 51}{2} = 1326$$

Step 2 – Ways to choose 2 aces from the 4 aces:

$$\binom{4}{2} = \frac{4 \times 3}{2} = 6$$

Step 3 – Compute the probability:

$$P = \frac{6}{1326}$$

Step 4 – Simplify:

$$= \frac{1}{221}$$

Why other options are wrong:

- (A) $\frac{1}{169}$: using $\left(\frac{1}{13}\right)^2$, valid only *with* replacement.
- (C) $\frac{2}{221}$: doubling the favourable count by mistreating order.
- (D) $\frac{1}{13}$: probability of just one ace on a single draw.

Answer: (B) ← Go Back to Q14

Q15.

Solution

Concept – Angle between two vectors:

$$\cos\theta = \frac{\mathbf{a}\cdot\mathbf{b}}{|\mathbf{a}|\,|\mathbf{b}|}$$

Step 1 – Write components:

$$\mathbf{a} = (1,\,0), \qquad \mathbf{b} = (1,\,1)$$

Step 2 – Compute the dot product:

$$\mathbf{a}\cdot\mathbf{b} = 1\times 1 + 0\times 1 = 1$$

Step 3 – Compute the magnitudes:

$$|\mathbf{a}| = \sqrt{1^2+0^2} = 1, \qquad |\mathbf{b}| = \sqrt{1^2+1^2} = \sqrt{2}$$

Step 4 – Substitute into the formula:

$$\cos\theta = \frac{1}{1\cdot\sqrt{2}} = \frac{1}{\sqrt{2}}$$

Step 5 – Solve for θ:

$$\theta = \cos^{-1}\frac{1}{\sqrt{2}} = 45^\circ$$

Why other options are wrong:

- (A) $30°$: would need $\cos\theta = \frac{\sqrt{3}}{2}$, not $\frac{1}{\sqrt{2}}$.
- (B) $60°$: would need $\cos\theta = \frac{1}{2}$.
- (C) $90°$: would require a zero dot product, but here it is 1.

Answer: (D) ← Go Back to Q15

Q16.

Solution

Concept – Cross products of standard unit vectors:

$$\hat{i} \times \hat{j} = \hat{k}, \quad \hat{j} \times \hat{k} = \hat{i}, \quad \hat{k} \times \hat{i} = \hat{j}$$

Step 1 – Identify the vectors:

$$\mathbf{a} = \hat{i}, \qquad \mathbf{b} = \hat{j}$$

Step 2 – Apply the right-hand rule cyclic identity:

$$\mathbf{a} \times \mathbf{b} = \hat{i} \times \hat{j} = \hat{k}$$

Step 3 – Verify using the determinant form:

$$\hat{i} \times \hat{j} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{vmatrix} = \hat{i}(0-0) - \hat{j}(0-0) + \hat{k}(1-0) = \hat{k}$$

Why other options are wrong:

- (B) $\hat{i}$ and (C) $\hat{j}$: these lie in the plane of $\mathbf{a}, \mathbf{b}$; the cross product is perpendicular to that plane.
- (D) $-\hat{k}$: this is $\hat{j} \times \hat{i}$, the reverse order, which flips the sign.

Answer: (A) ← Go Back to Q16

Q17.

Solution

Concept – Permutation (order matters):

$$^{n}P_r = \frac{n!}{(n-r)!} = n(n-1)\cdots(n-r+1)$$

Step 1 – Identify $n = 6$, $r = 3$.

Step 2 – Write the product of $r = 3$ **descending factors:**

$$^{6}P_3 = 6 \times 5 \times 4$$

Step 3 – Compute:

$$= 120$$

Why other options are wrong:

- (A) 18: computing 6×3 only.
- (B) 216: computing 6^3 (arrangements with repetition).
- (C) 20: computing $\binom{6}{3} = 20$ (combinations, where order does not matter).

Answer: (D) ← Go Back to Q17

Q18.

Solution

Concept – n**th term of an AP:**

$$a_n = a + (n-1)d$$

Step 1 – Identify the first term and common difference:

$$a = 3, \qquad d = 7 - 3 = 4$$

Step 2 – Substitute $n = 10$**:**

$$a_{10} = 3 + (10 - 1) \times 4$$

Step 3 – Simplify the bracket:

$$= 3 + 9 \times 4$$

Step 4 – Compute:

$$= 3 + 36 = 39$$

Why other options are wrong:

- (B) 43: using $n = 11$ (i.e. $a + 10d$) by miscounting the term index.
- (C) 40: computing 4×10 and forgetting the first term offset.
- (D) 36: computing 9×4 only, omitting $a = 3$.

Answer: (A) ← Go Back to Q18

Q19.

Solution

Concept – Direction ratios of a line through two points:

$$(x_2 - x_1,\ y_2 - y_1,\ z_2 - z_1)$$

Step 1 – Subtract the coordinates of $(1, 2, 3)$ from $(4, 5, 6)$:

$$(4 - 1,\ 5 - 2,\ 6 - 3) = (3,\ 3,\ 3)$$

Step 2 – Reduce to simplest form (divide by the common factor 3):

$$(3, 3, 3) \div 3 = (1,\ 1,\ 1)$$

Step 3 – Note that direction ratios are defined up to a non-zero scalar, so $(1, 1, 1)$ is the simplest form.

Why other options are wrong:

- (A) $(3, 3, 3)$: correct ratios but not in simplest form.
- (B) $(5, 7, 9)$: adding the coordinates instead of subtracting.
- (D) $(4, 5, 6)$: using one endpoint's coordinates, not the difference.

Answer: (C) ← Go Back to Q19

Q20.

Solution

Concept – Direct integration:

If $\dfrac{dy}{dx} = f(x)$, then $y = \displaystyle\int f(x)\,dx + C$.

Step 1 – Separate the variables:

$$dy = e^x\,dx$$

Step 2 – Integrate both sides:

$$\int dy = \int e^x\,dx$$

Step 3 – Evaluate the integrals (recall $\int e^x\,dx = e^x$):

$$y = e^x + C$$

Why other options are wrong:

- (A) $y = \frac{e^x}{2} + C$: dividing by 2 as if integrating e^{2x}.
- (C) $y = x\,e^x + C$: applying integration by parts where it is not needed.
- (D) $y = e^x$: omitting the arbitrary constant C, so not the *general* solution.

Answer: (B) ← Go Back to Q20

Answer Key

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