NEST Mathematics Sample Paper – 9

Duration: 45 Minutes **Maximum Marks: 60**

Instructions

- This paper contains **20 Multiple Choice Questions (single correct answer)**, modelled on the Mathematics section of **NEST 2026**.
- Each correct answer carries **+3 marks**. There is a deduction of -1 **mark** for each incorrect answer; **no marks** are deducted for an unattempted question.
- Every question has exactly **four options**, of which only **one** is correct. Choose carefully.
- Personal calculators, log tables, mobile phones, and other electronic gadgets are strictly prohibited in the examination hall.
- A simple on-screen (virtual) calculator is provided in the computer-based test interface and may be used; blank sheets for rough work are supplied at the exam centre.

Q1. The fundamental (smallest positive) period of the function $f(x) = \sin 4x + \cos 6x$ is

(A) π

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

(C) 2π

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

Q2. If θ lies in the third quadrant, then the expression $\sin\theta\,\cos\theta$ is

(A) zero

(B) negative

(C) positive

(D) sometimes positive and sometimes negative

Q3. The quadratic equation $x^2 - 4x + k = 0$ has non-real (complex) roots precisely when

(A) $k < 4$

(B) $k > 4$

(C) $k = 4$

(D) $k \leq 4$

Q4. In a rectangular grid formed by 5 horizontal lines and 4 vertical lines, the number of rectangles that can be formed is

(A) 40

(B) 100

(C) 120

(D) 60

Q5. The coefficients of three consecutive terms in the expansion of $(1 + x)^n$ are in the ratio $1 : 2 : 3$. The value of n is

(A) 10

(B) 12

(C) 14

(D) 16

Q6. The harmonic mean of the two numbers 3 and 6 is

(A) $\frac{9}{2}$

(B) 4

(C) $\frac{3\sqrt{2}}{1}$

(D) $\frac{18}{5}$

Q7. The line $x + y - 5 = 0$ divides the line segment joining the points $A(1, 1)$ and $B(4, 7)$ in the ratio (measured from A to B)

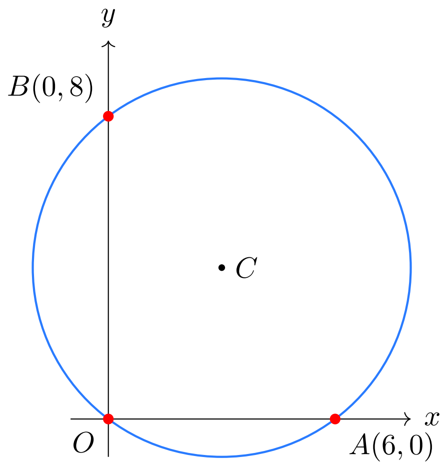
(A) $1 : 3$

(B) $2 : 1$

(C) $1 : 1$

(D) $1 : 2$

Q8. The equation of the circle passing through the three points $O(0, 0)$, $A(6, 0)$ and $B(0, 8)$ is



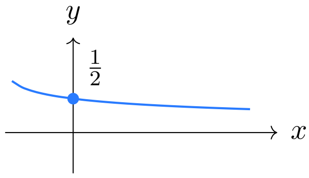
(A) $x^2 + y^2 - 6x - 8y = 0$

(B) $x^2 + y^2 + 6x + 8y = 0$

(C) $x^2 + y^2 - 6x - 8y + 24 = 0$

(D) $x^2 + y^2 - 3x - 4y = 0$

Q9. The value of $\lim_{x \to 0} \frac{\sqrt{1 + x} - 1}{x}$ is



(A) 0

(B) 1

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

(D) 2

Q10. A data set has standard deviation 5. If every observation is first multiplied by 3 and then increased by 7, the standard deviation of the new data set is

(A) 22

(B) 15

(C) 5

(D) 8

Q11. The value of x satisfying $\tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}$, with $x > 0$, is

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

(B) $\frac{1}{5}$

(C) 1

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

Q12. For the matrix $A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$, which of the following is true?

(A) $A^2 = I$ (involutory)

(B) $A^2 = A$ (idempotent)

(C) $A^2 = O$ (nilpotent)

(D) $A^2 = 2A$

Q13. The three points $(1, 2)$, $(3, k)$ and $(5, 8)$ are collinear when k equals

(A) 4

(B) 6

(C) 5

(D) 3

Q14. The function $f(x) = \dfrac{x^2 - 9}{x - 3}$ for $x \neq 3$ can be made continuous at $x = 3$ by defining $f(3)$ equal to

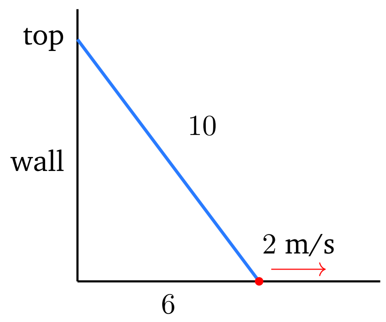
(A) 3

(B) 6

(C) 0

(D) 9

Q15. A 10 m ladder leans against a vertical wall. Its foot is pulled away from the wall at 2 m/s. When the foot is 6 m from the wall, the top is sliding down at the rate



(A) $\dfrac{3}{2}$ m/s

(B) $\dfrac{4}{3}$ m/s

(C) 2 m/s

(D) $\dfrac{8}{3}$ m/s

Q16. The value of the indefinite integral $\displaystyle\int \frac{2x + 3}{x^2 + 3x + 5}\,dx$ is (with C an arbitrary constant)

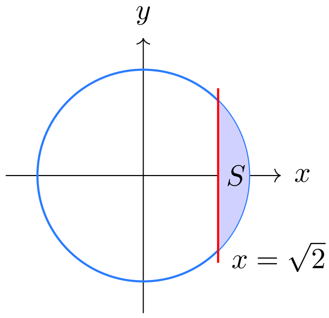
(A) $\dfrac{1}{x^2 + 3x + 5} + C$

(B) $\dfrac{1}{2}\ln\left|x^2 + 3x + 5\right| + C$

(C) $2\ln\left|x^2 + 3x + 5\right| + C$

(D) $\ln\left|x^2 + 3x + 5\right| + C$

Q17. The area of the smaller region cut off from the circle $x^2 + y^2 = 4$ by the line $x = \sqrt{2}$ (the shaded segment) is



(A) $\pi - \sqrt{2}$

(B) $2\pi - 2$

(C) $\pi - 2$

(D) $\dfrac{\pi}{2} - 1$

Q18. The general solution of the linear differential equation $\dfrac{dy}{dx} + \dfrac{y}{x} = x^2$ (for $x > 0$) is

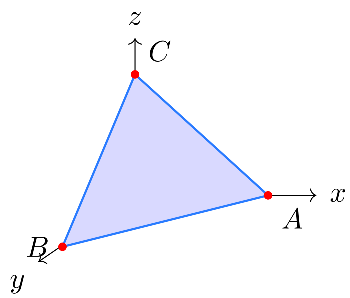
(A) $y = \dfrac{x^3}{4} + \dfrac{C}{x}$

(B) $y = \dfrac{x^4}{4} + C$

(C) $y = \dfrac{x^3}{3} + Cx$

(D) $y = x^3 + \dfrac{C}{x}$

Q19. The equation of the plane passing through the three points $A(1, 0, 0)$, $B(0, 1, 0)$ and $C(0, 0, 1)$ is



(A) $x + y + z = 0$

(B) $x + y + z = 1$

(C) $x + y + z = 3$

(D) $x - y + z = 1$

Q20. For a binomial distribution the mean is 4 and the variance is $\frac{4}{3}$. The number of trials n is

(A) 12

(B) 4

(C) 8

(D) 6

Detailed Solutions

Q1.

Solution

Concept — Period of a sum: If f has period T_1 and g has period T_2, then $f+g$ has period $\operatorname{lcm}(T_1, T_2)$. Here $\sin(kx)$ and $\cos(kx)$ have period $\dfrac{2\pi}{k}$.

Step 1 — Individual periods: $\sin 4x$ has period $\dfrac{2\pi}{4} = \dfrac{\pi}{2}$; $\cos 6x$ has period $\dfrac{2\pi}{6} = \dfrac{\pi}{3}$.

Step 2 — Take the LCM: $\operatorname{lcm}\left(\dfrac{\pi}{2}, \dfrac{\pi}{3}\right) = \dfrac{\operatorname{lcm}(\pi, \pi)}{\gcd(2,3)} = \dfrac{\pi}{1} = \pi$. (Equivalently lcm of $\frac{\pi}{2}, \frac{\pi}{3}$ is the smallest T that is an integer multiple of both, namely π.)

Why other options are wrong:

- (B) $\frac{\pi}{2}$ is only the period of $\sin 4x$, not of the sum.
- (C) 2π is a period but not the smallest.
- (D) $\frac{\pi}{3}$ is only the period of $\cos 6x$.

Final Answer: period $= \pi \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q1

Q2.

Solution

Concept — Signs by quadrant: In the third quadrant both $\sin\theta < 0$ and $\cos\theta < 0$.

Step 1 — Product of two negatives: $\sin\theta\,\cos\theta = (\text{negative}) \times (\text{negative})$, which is positive.

Step 2 — Confirm with a value: Take $\theta = \dfrac{5\pi}{4}$: $\sin\theta = -\dfrac{1}{\sqrt{2}}$, $\cos\theta = -\dfrac{1}{\sqrt{2}}$, so $\sin\theta\cos\theta = \dfrac{1}{2} > 0$.

Why other options are wrong:

- (A) zero occurs only on an axis, not strictly inside the third quadrant.
- (B) negative would need exactly one factor negative (second or fourth quadrant).
- (D) the sign is fixed positive throughout the open third quadrant.

Final Answer: $\sin\theta\cos\theta > 0 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q2

Q3.

Solution

Concept — Discriminant: A quadratic $ax^2 + bx + c = 0$ has non-real (complex) roots iff its discriminant $D = b^2 - 4ac < 0$.

Step 1 — Compute D: Here $a = 1$, $b = -4$, $c = k$, so $D = (-4)^2 - 4(1)(k) = 16 - 4k$.

Step 2 — Impose $D < 0$: $16 - 4k < 0 \Rightarrow 4k > 16 \Rightarrow k > 4$.

Why other options are wrong:

- (A) $k < 4$ gives $D > 0$: two distinct real roots.
- (C) $k = 4$ gives $D = 0$: equal real roots.
- (D) $k \leq 4$ includes the real-root cases as well.

Final Answer: non-real roots iff $k > 4 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q3

Q4.

Solution

Concept — Counting rectangles in a grid: A rectangle is fixed by choosing 2 of the horizontal lines and 2 of the vertical lines.

Step 1 — Choose the lines: From 5 horizontal lines choose 2: $\binom{5}{2} = 10$. From 4 vertical lines choose 2: $\binom{4}{2} = 6$.

Step 2 — Multiply: Number of rectangles $= 10 \times 6 = 60$.

Why other options are wrong:

- (A) 40 uses $\binom{5}{2} \times 4$ (treats vertical choice as 4, not $\binom{4}{2}$).
- (B) 100 comes from $\binom{5}{2} \times \binom{5}{2}$ (uses 5 vertical lines).
- (C) 120 multiplies $\binom{5}{2}$ by 12 or mis-counts.

Final Answer: 60 rectangles $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q4

Q5.

Solution

Concept — Ratios of consecutive binomial coefficients: For $(1+x)^n$, $\dfrac{\binom{n}{r}}{\binom{n}{r-1}} = \dfrac{n-r+1}{r}$.

Step 1 — First ratio: Let the three coefficients be $\binom{n}{r-1} : \binom{n}{r} : \binom{n}{r+1} = 1 : 2 : 3$. Then $\dfrac{\binom{n}{r}}{\binom{n}{r-1}} = \dfrac{n-r+1}{r} = 2$, so $n-r+1 = 2r$, i.e. $n+1 = 3r$.

Step 2 — Second ratio: $\dfrac{\binom{n}{r+1}}{\binom{n}{r}} = \dfrac{n-r}{r+1} = \dfrac{3}{2}$, so $2(n-r) = 3(r+1)$, i.e. $2n = 5r+3$.

Step 3 — Solve: From $n = 3r-1$, substitute into $2n = 5r+3$: $2(3r-1) = 5r+3 \Rightarrow 6r-2 = 5r+3 \Rightarrow r = 5$. Then $n = 3(5)-1 = 14$.

Step 4 — Check: $\binom{14}{4} : \binom{14}{5} : \binom{14}{6} = 1001 : 2002 : 3003 = 1 : 2 : 3$. Correct.

Why other options are wrong:

- (A) 10 fails the first ratio $\frac{n-r+1}{r} = 2$.
- (B) 12 does not satisfy both ratios simultaneously.
- (D) 16 over-shoots; its consecutive coefficients are not in $1 : 2 : 3$.

Final Answer: $n = 14 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q5

Q6.

Solution

Concept — Harmonic mean of two numbers: $H = \dfrac{2ab}{a+b}$.

Step 1 — Substitute: $a = 3$, $b = 6$: $H = \dfrac{2(3)(6)}{3+6} = \dfrac{36}{9} = 4$.

Step 2 — Sanity check (AM–GM–HM): AM $= \dfrac{3+6}{2} = 4.5$, GM $= \sqrt{18} \approx 4.24$, HM $= 4$, and indeed HM $\leq$ GM $\leq$ AM.

Why other options are wrong:

- (A) $\frac{9}{2} = 4.5$ is the arithmetic mean.
- (C) $3\sqrt{2} = \sqrt{18}$ is the geometric mean.
- (D) $\frac{18}{5} = 3.6$ uses $a+b = 10$ by mistake.

Final Answer: $H = 4 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q6

Q7.

Solution

Concept — Ratio of division by a line: If a point dividing $A(x_1, y_1)$ and $B(x_2, y_2)$ in ratio $\lambda : 1$ lies on $L : ax + by + c = 0$, then $\lambda = -\dfrac{ax_1 + by_1 + c}{ax_2 + by_2 + c}$.

Step 1 — Evaluate L at the endpoints: For $L : x+y-5$, at $A(1, 1)$: $1+1-5 = -3$. At $B(4, 7)$: $4 + 7 - 5 = 6$.

Step 2 — Form the ratio: $\lambda = -\dfrac{-3}{6} = \dfrac{3}{6} = \dfrac{1}{2}$. So the division ratio measured from A to B is $\lambda : 1 = 1 : 2$.

Step 3 — Verify the cut point: $P = \dfrac{1 \cdot B + 2 \cdot A}{3} = \left(\dfrac{4+2}{3}, \dfrac{7+2}{3}\right) = (2, 3)$, and $2 + 3 - 5 = 0$, so P lies on the line. The positive λ confirms an internal division.

Why other options are wrong:

- (A) $1 : 3$ gives $P = (1.75, 2.5)$, off the line.
- (B) $2 : 1$ reverses the weighting (point would be nearer B).
- (C) $1 : 1$ is the midpoint $(2.5, 4)$, which does not satisfy $x + y - 5 = 0$.

Final Answer: ratio $1 : 2$ from $A \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q7

Q8.

Solution

Concept — General circle through points: Use $x^2 + y^2 + Dx + Ey + F = 0$ and substitute the three points.

Step 1 — Through $O(0, 0)$: $0 + 0 + 0 + 0 + F = 0 \Rightarrow F = 0$.

Step 2 — Through $A(6, 0)$: $36 + 0 + 6D + 0 + 0 = 0 \Rightarrow D = -6$.

Step 3 — Through $B(0, 8)$: $0 + 64 + 0 + 8E + 0 = 0 \Rightarrow E = -8$.

Step 4 — Assemble: $x^2 + y^2 - 6x - 8y = 0$. (Centre $(3, 4)$, radius 5, consistent with the figure.)

Why other options are wrong:

- (B) wrong signs on D, E; would not pass through A, B.
- (C) the $+24$ breaks passage through the origin.
- (D) halved coefficients give the wrong radius.

Final Answer: $x^2 + y^2 - 6x - 8y = 0 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q8

Q9.

Solution

Concept — Rationalisation of a $0/0$ form: Multiply numerator and denominator by the conjugate $\sqrt{1+x}+1$.

Step 1 — Multiply by the conjugate:

$$\frac{\sqrt{1+x}-1}{x} \cdot \frac{\sqrt{1+x}+1}{\sqrt{1+x}+1} = \frac{(1+x)-1}{x\left(\sqrt{1+x}+1\right)} = \frac{x}{x\left(\sqrt{1+x}+1\right)}.$$

Step 2 — Cancel and take the limit: $= \dfrac{1}{\sqrt{1+x}+1} \to \dfrac{1}{\sqrt{1}+1} = \dfrac{1}{2}$ as $x \to 0$.

Why other options are wrong:

- (A) 0 treats the numerator as vanishing without the cancellation.
- (B) 1 forgets the $+1$ in the denominator after cancelling.
- (D) 2 inverts the final fraction.

Final Answer: $\frac{1}{2} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q9

Q10.

Solution

Concept — Effect of a linear transform on SD: If $y_i = ax_i + b$, then $\sigma_y = |a|\,\sigma_x$. Adding a constant b does not change the spread.

Step 1 — Apply: Here $a = 3$, $b = 7$, $\sigma_x = 5$, so $\sigma_y = |3| \times 5 = 15$.

Step 2 — Note: The $+7$ shifts every value equally and leaves the standard deviation unchanged.

Why other options are wrong:

- (A) $22 = 3 \times 5 + 7$ wrongly adds the constant to the SD.
- (C) 5 ignores the multiplication by 3.
- (D) $8 = 5 + 3$ adds instead of multiplying.

Final Answer: $\sigma_y = 15 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — Addition formula: $\tan^{-1} u + \tan^{-1} v = \tan^{-1} \dfrac{u+v}{1-uv}$ (valid when $uv < 1$).

Step 1 — Combine: $\tan^{-1}(2x) + \tan^{-1}(3x) = \tan^{-1} \dfrac{2x+3x}{1-(2x)(3x)} = \tan^{-1} \dfrac{5x}{1-6x^2}$.

Step 2 — Set equal to $\frac{\pi}{4}$: $\dfrac{5x}{1-6x^2} = \tan \dfrac{\pi}{4} = 1$, so $5x = 1 - 6x^2$, giving $6x^2 + 5x - 1 = 0$.

Step 3 — Solve: $(6x-1)(x+1) = 0 \Rightarrow x = \dfrac{1}{6}$ or $x = -1$. Since $x > 0$, $x = \dfrac{1}{6}$.

Why other options are wrong:

- (A) $\frac{1}{3}$ gives $\tan^{-1} \frac{5/3}{1-2/3} = \tan^{-1} 5 \neq \frac{\pi}{4}$.
- (B) $\frac{1}{5}$ does not satisfy $6x^2 + 5x - 1 = 0$.
- (C) 1 gives $uv = 6 > 1$ and a negative bracket; not a valid root.

Final Answer: $x = \dfrac{1}{6} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q11

Q12.

Solution

Concept — Involutory matrix: A square matrix A is involutory if $A^2 = I$.

Step 1 — Compute A^2:

$$A^2 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = I.$$

Step 2 — Classify: Since $A^2 = I$, the matrix is involutory.

Why other options are wrong:

- (B) idempotent needs $A^2 = A$; here $A^2 = I \neq A$.
- (C) nilpotent needs $A^2 = O$; clearly false.
- (D) $A^2 = 2A$ would give $I = 2A$, false.

Final Answer: $A^2 = I$, involutory $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q12

Q13.

Solution

Concept — Collinearity via determinant: Three points are collinear iff $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = 0.$

Step 1 — Set up:

$$\begin{vmatrix} 1 & 2 & 1 \\ 3 & k & 1 \\ 5 & 8 & 1 \end{vmatrix} = 0.$$

Step 2 — Expand: $1(k-8) - 2(3-5) + 1(24-5k) = k - 8 + 4 + 24 - 5k = -4k + 20.$ Set $-4k + 20 = 0 \Rightarrow k = 5.$

Why other options are wrong:

- (A) 4 gives a nonzero determinant.
- (B) 6 also fails the collinearity condition.
- (D) 3 does not satisfy $-4k + 20 = 0$.

Final Answer: $k = 5 \Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q13

Q14.

Solution

Concept — Removable discontinuity: If $\lim_{x \to a} f(x)$ exists but $f(a)$ is undefined, define $f(a)$ equal to that limit to restore continuity.

Step 1 — Simplify: For $x \neq 3$, $\frac{x^2 - 9}{x - 3} = \frac{(x-3)(x+3)}{x-3} = x + 3$.

Step 2 — Take the limit: $\lim_{x \to 3}(x+3) = 6$. So set $f(3) = 6$.

Why other options are wrong:

- (A) 3 is the point, not the limit value.
- (C) 0 comes from cancelling incorrectly.
- (D) 9 uses x^2 at $x = 3$ without dividing.

Final Answer: $f(3) = 6 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — Related rates (ladder): With $x^2 + y^2 = L^2$ constant, differentiate: $x\frac{dx}{dt} + y\frac{dy}{dt} = 0$.

Step 1 — Geometry: $L = 10$, $x = 6 \Rightarrow y = \sqrt{100 - 36} = 8$. Given $\frac{dx}{dt} = 2$ m/s.

Step 2 — Differentiate: $6(2) + 8\frac{dy}{dt} = 0 \Rightarrow \frac{dy}{dt} = -\frac{12}{8} = -\frac{3}{2}$ m/s.

Step 3 — Interpret: The top slides *down* at $\frac{3}{2}$ m/s (the minus sign indicates decreasing height).

Why other options are wrong:

- (B) $\frac{4}{3}$ swaps x and y.
- (C) 2 just repeats the given foot speed.
- (D) $\frac{8}{3}$ mis-divides 12 by 4.5.

Final Answer: top slides down at $\frac{3}{2}$ m/s $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q15

Q16.

Solution

Concept — $\int \frac{f'(x)}{f(x)}dx = \ln|f(x)|$: Recognise the numerator as the derivative of the denominator.

Step 1 — Check: With $f(x) = x^2 + 3x + 5$, $f'(x) = 2x + 3$, exactly the numerator.

Step 2 — Integrate: $\displaystyle\int \frac{2x+3}{x^2+3x+5}\,dx = \ln\left|x^2+3x+5\right| + C.$

Why other options are wrong:

- (A) is the form for $\int f'/f^2$, not $\int f'/f$.
- (B) the $\frac{1}{2}$ factor is unnecessary since f' matches exactly.
- (C) the factor 2 double-counts.

Final Answer: $\ln|x^2+3x+5| + C \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q16

Q17.

Solution

Concept — Area of a circular segment: Integrate the right half of the circle from $x = \sqrt{2}$ to $x = 2$, doubling for symmetry about the x-axis: $A = 2\displaystyle\int_{\sqrt{2}}^{2}\sqrt{4-x^2}\,dx.$

Step 1 — Antiderivative: $\displaystyle\int \sqrt{4-x^2}\,dx = \frac{x}{2}\sqrt{4-x^2} + 2\sin^{-1}\frac{x}{2}.$

Step 2 — Evaluate from $\sqrt{2}$ to 2: At $x = 2$: $0 + 2\sin^{-1}1 = 2\cdot\frac{\pi}{2} = \pi$. At $x = \sqrt{2}$: $\frac{\sqrt{2}}{2}\sqrt{2} + 2\sin^{-1}\frac{\sqrt{2}}{2} = 1 + 2\cdot\frac{\pi}{4} = 1 + \frac{\pi}{2}$. Difference $= \pi - \left(1 + \frac{\pi}{2}\right) = \frac{\pi}{2} - 1$.

Step 3 — Double: $A = 2\left(\frac{\pi}{2} - 1\right) = \pi - 2.$

Why other options are wrong:

- (A) $\pi - \sqrt{2}$ mishandles the $\frac{x}{2}\sqrt{4-x^2}$ term at $x = \sqrt{2}$.
- (B) $2\pi - 2$ forgets to subtract the lower limit fully.
- (D) $\frac{\pi}{2} - 1$ is the half-segment (above the axis only), not doubled.

Final Answer: $A = \pi - 2 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q17

Q18.

Solution

Concept — Linear ODE via integrating factor: For $\frac{dy}{dx} + P(x)y = Q(x)$, the integrating factor is $\mu = e^{\int P\,dx}$ and $y\,\mu = \int Q\,\mu\,dx$.

Step 1 — Integrating factor: $P = \frac{1}{x}$, so $\mu = e^{\int \frac{1}{x}dx} = e^{\ln x} = x$.

Step 2 — Multiply and integrate: $\frac{d}{dx}(xy) = x{\cdot}x^2 = x^3$, so $xy = \int x^3\,dx = \frac{x^4}{4} + C$.

Step 3 — Solve for y: $y = \frac{x^3}{4} + \frac{C}{x}$.

Why other options are wrong:

- (B) $\frac{x^4}{4} + C$ forgets to divide through by $\mu = x$.
- (C) $\frac{x^3}{3} + Cx$ uses the wrong integrating factor.
- (D) $x^3 + \frac{C}{x}$ drops the $\frac{1}{4}$ factor.

Final Answer: $y = \frac{x^3}{4} + \frac{C}{x} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q18

Q19.

Solution

Concept — Intercept form of a plane: A plane with x-, y-, z-intercepts a, b, c is $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$.

Step 1 — Read intercepts: The points $(1,0,0), (0,1,0), (0,0,1)$ give intercepts $a = b = c = 1$.

Step 2 — Write the plane: $\frac{x}{1} + \frac{y}{1} + \frac{z}{1} = 1$, i.e. $x + y + z = 1$. (Each point satisfies it: $1 + 0 + 0 = 1$, etc.)

Why other options are wrong:

- (A) $x + y + z = 0$ passes through the origin, not through the three given points.
- (C) $x + y + z = 3$ fails at every listed point.
- (D) $x - y + z = 1$ fails at $B(0,1,0)$ since $-1 \neq 1$.

Final Answer: $x + y + z = 1 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q19

Q20.

Solution

Concept — Binomial mean and variance: For $B(n,p)$, mean $= np$ and variance $= npq$ with $q = 1 - p$.

Step 1 — Form the ratio: $\dfrac{\text{variance}}{\text{mean}} = \dfrac{npq}{np} = q = \dfrac{4/3}{4} = \dfrac{1}{3}$.

Step 2 — Find p then n: $q = \dfrac{1}{3} \Rightarrow p = \dfrac{2}{3}$. From $np = 4$: $n \cdot \dfrac{2}{3} = 4 \Rightarrow n = 6$.

Why other options are wrong:

- (A) 12 would need $p = \frac{1}{3}$, giving variance $\frac{8}{3}$.
- (B) 4 confuses n with the mean.
- (C) 8 would need $p = \frac{1}{2}$, giving variance 2, not $\frac{4}{3}$.

Final Answer: $n = 6 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q20

Answer Key

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