SAAT Mathematics

Sample Paper – 7

Duration: 40 Minutes **Maximum Marks: 40**

Instructions

- This paper contains **40** Multiple Choice Questions (Single Correct Answer), modelled on the Mathematics section of the **SAAT** (Siksha 'O' Anusandhan Admission Test).
- Each correct answer carries **+1 mark**. There is **no negative marking** for incorrect or unattempted answers.
- Only **one** option is correct. Attempt every question, since wrong answers are not penalised.
- Use of mobile phones, calculators, or other electronic gadgets is strictly prohibited.

Q1. If $A = \{2, 4, 6, 8\}$ and $B = \{4, 8, 12\}$, then the number of elements in $A \cup B$ is

(A) 4

(B) 5

(C) 6

(D) 7

Q2. The domain of the real function $f(x) = \dfrac{1}{\sqrt{x-3}}$ is

(A) $(3, \infty)$

(B) $[3, \infty)$

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

(D) $\mathbb{R}$

Q3. The argument of the complex number $z = 1 + i$ is

(A) 0

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

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

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

Q4. The value of i^{10}, where $i = \sqrt{-1}$, is

(A) 1

(B) i

(C) -1

(D) $-i$

Q5. The quadratic equation whose roots are 3 and -2 is

(A) $x^2 - x - 6 = 0$

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

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

(D) $x^2 - 5x + 6 = 0$

Q6. If I is the identity matrix of order n and A is any square matrix of order n, then AI equals

(A) I

(B) A

(C) 0

(D) A^2

Q7. If A and B are square matrices of the same order with $|A| = 3$ and $|B| = 4$, then $|AB|$ is

(A) 7

(B) 1

(C) 12

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

Q8. A square matrix A is invertible (non-singular) if and only if

(A) $|A| = 1$

(B) A is symmetric

(C) $|A| = 0$

(D) $|A| \neq 0$

Q9. The number of distinct arrangements of the letters of the word "LEVEL" is

(A) 30

(B) 60

(C) 120

(D) 20

Q10. If ${}^{12}C_r = {}^{12}C_5$ and $r \neq 5$, then the value of r is

(A) 5

(B) 7

(C) 12

(D) 17

Q11. In the expansion of $(x + 2)^6$, the general term T_{r+1} is

(A) ${}^6C_r\, x^r\, 2^{6-r}$

(B) ${}^6C_r\, x^{6-r}$

(C) ${}^6C_r\, x^{6-r}\, 2^r$

(D) ${}^6C_r\, 2^{6-r}$

Q12. The sum of the first 20 terms of the arithmetic progression $3, 7, 11, \ldots$ is

(A) 780

(B) 800

(C) 760

(D) 820

Q13. The 5th term of the geometric progression $2, 6, 18, \ldots$ is

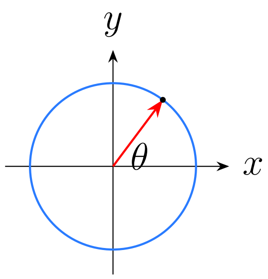
(A) 162

(B) 54

(C) 486

(D) 108

Q14. Given $\cos\theta = \frac{3}{5}$ for an acute angle θ on the unit circle shown, the value of $\cos 2\theta$ is



(A) $\frac{7}{25}$

(B) $-\frac{7}{25}$

(C) $\frac{24}{25}$

(D) $\frac{18}{25}$

Q15. The general solution of the equation $\tan\theta = 1$ is $(n \in \mathbb{Z})$

(A) $n\pi + \frac{\pi}{3}$

(B) $2n\pi + \frac{\pi}{4}$

(C) $n\pi + \frac{\pi}{4}$

(D) $n\pi$

Q16. The principal value of $\sin^{-1}(1)$ is

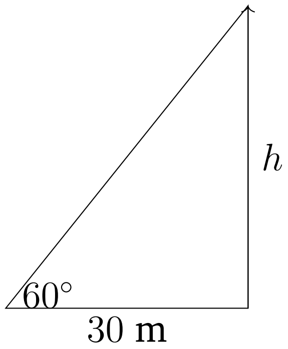
(A) 0

(B) π

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

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

Q17. The angle of elevation of the top of a tower from a point 30 m from its base is 60°, as shown. The height of the tower is



(A) 30 m

(B) $30\sqrt{3}$ m

(C) $15\sqrt{3}$ m

(D) 60 m

Q18. The value of $\lim_{x\to 0} \frac{e^x - 1}{x}$ is

(A) 0

(B) e

(C) 1

(D) does not exist

Q19. At the point $x = 0$, the function $f(x) = |x|$ is

(A) continuous

(B) discontinuous with a jump

(C) undefined

(D) discontinuous with an infinite limit

Q20. If $f(x) = 7$ for all real x, then $f'(x)$ equals

(A) 7

(B) $7x$

(C) 1

(D) 0

Q21. The derivative of $y = x^2 \sin x$ with respect to x is

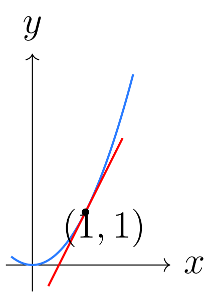
(A) $2x \cos x$

(B) $2x \sin x + x^2 \cos x$

(C) $x^2 \cos x$

(D) $2x \sin x - x^2 \cos x$

Q22. The slope of the normal to the curve $y = x^2$ at the point $(1, 1)$, shown below, is



(A) $-\frac{1}{2}$

(B) 2

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

(D) -2

Q23. The function $f(x) = -x^2 + 6x - 5$ attains its maximum value at $x =$

(A) 0

(B) 6

(C) 3

(D) -3

Q24. The value of $\int \cos x \, dx$ is

(A) $-\sin x + C$

(B) $\cos x + C$

(C) $-\cos x + C$

(D) $\sin x + C$

Q25. The value of $\int x e^x \, dx$ is

(A) $xe^x + C$

(B) $(x-1)e^x + C$

(C) $(x+1)e^x + C$

(D) $\dfrac{x^2}{2}e^x + C$

Q26. The value of $\int_0^{\pi} \sin x \, dx$ is

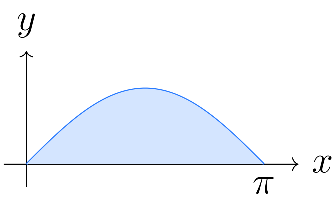
(A) 2

(B) 0

(C) 1

(D) π

Q27. The area of the shaded region bounded by $y = \sin x$ and the x-axis from $x = 0$ to $x = \pi$, shown below, is



(A) 1

(B) 0

(C) 2

(D) π

Q28. The differential equation of the family of curves $y = Cx$ (where C is an arbitrary constant) is

(A) $\frac{dy}{dx} = x$

(B) $x\frac{dy}{dx} = 1$

(C) $\frac{dy}{dx} = C$

(D) $x\frac{dy}{dx} = y$

Q29. The general solution of the differential equation $\frac{dy}{dx} = x$ is

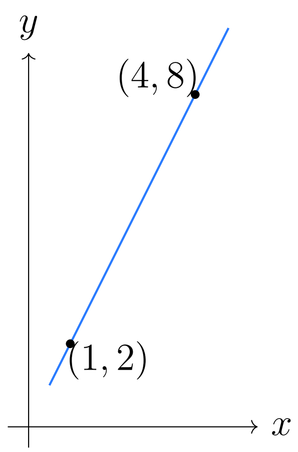
(A) $y = \frac{x^2}{2} + C$

(B) $y = x^2 + C$

(C) $y = Ce^x$

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

Q30. The slope of the line passing through the points $(1, 2)$ and $(4, 8)$, shown below, is



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

(B) 2

(C) 3

(D) 6

Q31. The distance between the parallel lines $3x+4y-5=0$ and $3x+4y+5=0$ is

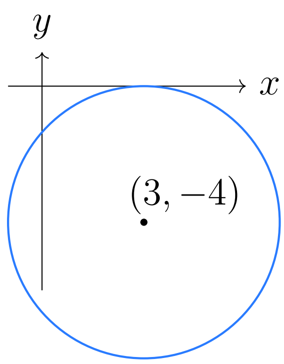
(A) 1

(B) 5

(C) 2

(D) 10

Q32. The centre of the circle $x^2+y^2-6x+8y+9=0$, shown below, is



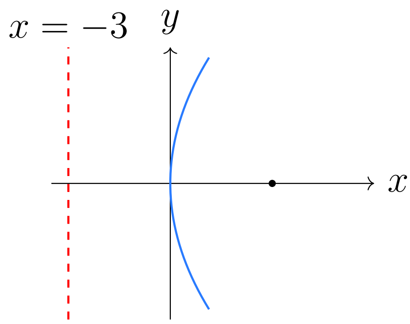
(A) $(6,-8)$

(B) $(-3,4)$

(C) $(3,4)$

(D) $(3,-4)$

Q33. The directrix of the parabola $y^2=12x$, shown below, is the line



(A) $x = -3$

(B) $x = 3$

(C) $y = -3$

(D) $x = -12$

Q34. The equations of the asymptotes of the hyperbola $\dfrac{x^2}{9} - \dfrac{y^2}{4} = 1$ are

(A) $y = \pm\dfrac{3}{2}x$

(B) $y = \pm\dfrac{2}{3}x$

(C) $y = \pm\dfrac{4}{9}x$

(D) $y = \pm\dfrac{9}{4}x$

Q35. The angle between the vectors $\vec{a} = \hat{i} + \hat{j}$ and $\vec{b} = \hat{i} - \hat{j}$ is

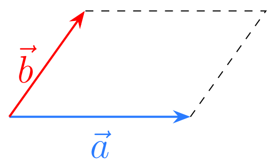
(A) $0°$

(B) $45°$

(C) $60°$

(D) $90°$

Q36. For the vectors $\vec{a}$ and $\vec{b}$ shown forming adjacent sides of a parallelogram, the area of the parallelogram is given by



(A) $\vec{a} \cdot \vec{b}$

(B) $\frac{1}{2}|\vec{a} \times \vec{b}|$

(C) $|\vec{a} \times \vec{b}|$

(D) $|\vec{a}| + |\vec{b}|$

Q37. The midpoint of the line segment joining the points $(2, 4, 6)$ and $(4, 8, 2)$ in space is

(A) $(3, 6, 4)$

(B) $(6, 12, 8)$

(C) $(1, 2, 2)$

(D) $(2, 4, 4)$

Q38. The median of the data $7, 3, 9, 5, 11$ is

(A) 9

(B) 7

(C) 5

(D) 11

Q39. A fair die is rolled once. The probability of getting the number 4 is

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

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

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

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

Q40. If $P(A \cap B) = 0.2$ and $P(B) = 0.5$, then the conditional probability $P(A \mid B)$ is

(A) 0.1

(B) 0.7

(C) 0.5

(D) 0.4

Detailed Solutions

Q1.

Solution

Concept — Union of sets: The union $A \cup B$ is the set of all elements that belong to A, or to B, or to both. Each distinct element is written down only once, even if it appears in both sets.

Step 1 — Write out set A: $A = \{2, 4, 6, 8\}$.

Step 2 — Write out set B: $B = \{4, 8, 12\}$.

Step 3 — List every element of A: Start the union with all of A: $2, 4, 6, 8$.

Step 4 — Add elements of B not already listed: From $B = \{4, 8, 12\}$, the element 4 is already listed, the element 8 is already listed, but 12 is new, so add 12.

Step 5 — Form the union: $A \cup B = \{2, 4, 6, 8, 12\}$.

Step 6 — Count the elements: Counting them one by one: 2 (first), 4 (second), 6 (third), 8 (fourth), 12 (fifth).

Step 7 — State the count: $n(A \cup B) = 5$.

Why other options are wrong: 4 counts only the elements of A and ignores 12; 6 comes from adding both lists without removing the repeated 4 and 8; 7 comes from adding the sizes $4 + 3 = 7$ without removing the two common elements.

Final Answer: $n(A \cup B) = 5 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q1

Q2.

Solution

Concept — Domain of a function: The domain is the set of all real x for which $f(x)$ gives a real, defined value. Here two rules apply: the quantity inside a square root cannot be negative, and a denominator can never equal 0.

Step 1 — Look at the square root: The expression under the root is $x - 3$. For the root to be real we need

$$x - 3 \geq 0.$$

Step 2 — Look at the denominator: The square root $\sqrt{x-3}$ sits in the denominator, so it cannot be 0. This means

$$x - 3 \neq 0.$$

Step 3 — Combine the two conditions: We need $x - 3 \geq 0$ and $x - 3 \neq 0$ at the same time, which together give

$$x - 3 > 0.$$

Step 4 — Solve for x: Add 3 to both sides:

$$x - 3 + 3 > 0 + 3,$$

$$x > 3.$$

Step 5 — Write the domain in interval form: All x strictly greater than 3 give the interval $(3, \infty)$.

Why other options are wrong: $[3, \infty)$ wrongly includes $x = 3$, where the denominator becomes 0; $(-\infty, 3)$ makes $x - 3$ negative, so the root is not real; $\mathbb{R}$ ignores both restrictions entirely.

Final Answer: Domain $= (3, \infty) \Rightarrow \boxed{\text{A}}$

Answer: (A) **Go Back to Q2**

Q3.

Solution

Concept — Argument of a complex number: For a complex number $z = a + bi$, the argument is the angle the point (a, b) makes with the positive x-axis. When both $a > 0$ and $b > 0$ (first quadrant), it is given by $\arg z = \tan^{-1}\frac{b}{a}$.

Step 1 — Identify the real part a: Comparing $z = 1 + i$ with $a + bi$, the real part is

$$a = 1.$$

Step 2 — Identify the imaginary part b: The coefficient of i gives

$$b = 1.$$

Step 3 — Form the ratio $\frac{b}{a}$:

$$\frac{b}{a} = \frac{1}{1} = 1.$$

Step 4 — Take the inverse tangent:

$$\arg z = \tan^{-1}(1).$$

Step 5 — Evaluate: Since $\tan\frac{\pi}{4} = 1$,

$$\arg z = \frac{\pi}{4}.$$

Why other options are wrong: 0 is the argument of a positive real number ($b = 0$); $\frac{\pi}{2}$ belongs to a purely imaginary number ($a = 0$); $\frac{\pi}{3}$ would require $\tan = \sqrt{3} \neq 1$.

Final Answer: $\arg z = \frac{\pi}{4} \Rightarrow \boxed{\text{D}}$

Answer: (D) **Go Back to Q3**

Q4.

Solution

Concept — Powers of i: The powers of i repeat in a cycle of length 4:

$$i^1 = i, \qquad i^2 = -1, \qquad i^3 = -i, \qquad i^4 = 1.$$

To find any power, divide the exponent by 4 and use the remainder.

Step 1 — Divide the exponent by 4:

$$10 \div 4 = 2 \text{ remainder } 2.$$

Step 2 — Write the exponent using the quotient and remainder:

$$10 = 4 \times 2 + 2.$$

Step 3 — Split the power:

$$i^{10} = i^{4\times2+2} = (i^4)^2 \cdot i^2.$$

Step 4 — Substitute the known values: Using $i^4 = 1$ and $i^2 = -1$,

$$(i^4)^2 \cdot i^2 = (1)^2 \cdot (-1).$$

Step 5 — Evaluate:

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

Why other options are wrong: 1 is the value of i^{4k} (remainder 0); i is i^{4k+1} (remainder 1); $-i$ is i^{4k+3} (remainder 3). Our remainder is 2.

Final Answer: $i^{10} = -1 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q4

Q5.

Solution

Concept — Equation from roots: If a quadratic has roots α and β, then it can be written as

$$x^2 - (\alpha + \beta)\,x + (\alpha\beta) = 0,$$

that is, $x^2 - (\text{sum of roots})\,x + (\text{product of roots}) = 0$.

Step 1 — Write down the two roots:

$$\alpha = 3, \qquad \beta = -2.$$

Step 2 — Compute the sum of the roots:

$$\alpha + \beta = 3 + (-2) = 1.$$

Step 3 — Compute the product of the roots:

$$\alpha\beta = 3 \times (-2) = -6.$$

Step 4 — Substitute into the standard form:

$$x^2 - (1)\,x + (-6) = 0.$$

Step 5 — Simplify the signs:

$$x^2 - x - 6 = 0.$$

Why other options are wrong: $x^2 + x - 6$ would need sum -1; $x^2 - x + 6$ would need product $+6$; $x^2 - 5x + 6$ has roots 2 and 3, not 3 and -2.

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

Answer: (A) Go Back to Q5

Q6.

Solution

Concept — Identity matrix: The identity matrix I has 1's along the main diagonal and 0's elsewhere. It behaves like the number 1 in multiplication, so multiplying any matrix by I does not change it.

Step 1 — State the identity property: For any square matrix A of the same order as I,

$$AI = A \qquad \text{and} \qquad IA = A.$$

Step 2 — Apply it to the product asked: The question asks for AI, and by the property above,

$$AI = A.$$

Step 3 — Conclude: The product equals the original matrix A.

Why other options are wrong: I would only happen if $A = I$; 0 is the result of multiplying by the null matrix, not the identity; A^2 would need a second factor of A in place of I.

Final Answer: $AI = A \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q6

Q7.

Solution

Concept — Determinant of a product: The determinant of a product of two square matrices equals the product of their determinants:

$$|AB| = |A|\,|B|.$$

Step 1 — Write down the given values:

$$|A| = 3, \qquad |B| = 4.$$

Step 2 — Substitute into the rule:

$$|AB| = |A|\,|B| = 3 \times 4.$$

Step 3 — Multiply:

$$3 \times 4 = 12.$$

Why other options are wrong: 7 comes from adding $3+4$ instead of multiplying; 1 and $\frac{3}{4}$ come from dividing the determinants, which is not the correct rule.

Final Answer: $|AB| = 12 \Rightarrow \boxed{C}$

Answer: (C) Go Back to Q7

Q8.

Solution

Concept — Invertibility: A square matrix has an inverse exactly when it is non-singular, which means its determinant is not zero.

Step 1 — Write the inverse formula: The inverse of A is

$$A^{-1} = \frac{1}{|A|}\,\text{adj}\,A.$$

Step 2 — Identify the requirement: This formula divides by $|A|$, and division by 0 is undefined, so we must have

$$|A| \neq 0.$$

Step 3 — Conclude: The inverse A^{-1} exists if and only if $|A| \neq 0$.

Why other options are wrong: $|A| = 1$ does allow an inverse but is only one special case, not the general condition; symmetry of A has nothing to do with invertibility; $|A| = 0$ makes A singular, so the inverse does *not* exist.

Final Answer: $|A| \neq 0 \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Arrangements with repetition: The number of distinct arrangements of n objects, where some are identical, is

$$\frac{n!}{p!\,q!\,\cdots},$$

where $p, q, \ldots$ are how many times each repeated object occurs.

Step 1 — Count the total letters: The word "LEVEL" has letters L, E, V, E, L, so $n = 5$.

Step 2 — Count the repeated letters: L appears 2 times and E appears 2 times (V appears once).

Step 3 — Write the formula:

$$\text{arrangements} = \frac{5!}{2!\,2!}.$$

Step 4 — Expand the factorials:

$$5! = 120, \qquad 2! = 2, \qquad 2! = 2.$$

Step 5 — Multiply the denominator:

$$2! \times 2! = 2 \times 2 = 4.$$

Step 6 — Divide:

$$\frac{120}{4} = 30.$$

Why other options are wrong: 60 divides by only one $2!$ (forgets one repeat); 120 is $5!$ with no division (treats all letters as different); 20 comes from dividing by too much.

Final Answer: 30 arrangements $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q9

Q10.

Solution

Concept — Symmetry of combinations: Choosing r objects is the same as leaving out $n-r$ objects, so

$$^{n}C_r = {}^{n}C_{n-r}.$$

Step 1 — Apply the rule with $n = 12$:

$$^{12}C_5 = {}^{12}C_{12-5}.$$

Step 2 — Compute the subtraction:

$$12 - 5 = 7.$$

Step 3 — Rewrite:

$$^{12}C_5 = {}^{12}C_7.$$

Step 4 — Read off the values of r: So $^{12}C_r = {}^{12}C_5$ holds for $r = 5$ or $r = 7$.

Step 5 — Use the condition $r \neq 5$: Since $r = 5$ is excluded, the only remaining value is

$$r = 7.$$

Why other options are wrong: 5 is ruled out by the condition $r \neq 5$; 12 and 17 do not satisfy $^{12}C_r = {}^{12}C_5$.

Final Answer: $r = 7 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — General term of a binomial expansion: In the expansion of $(a+b)^n$, the general term is

$$T_{r+1} = {}^{n}C_r \, a^{n-r} \, b^r.$$

Note that the first quantity a gets the power $n-r$ and the second quantity b gets the power r.

Step 1 — Match the expression to $(a+b)^n$: Here $(x+2)^6$ means

$$a = x, \qquad b = 2, \qquad n = 6.$$

Step 2 — Substitute $a = x$ with power $n - r$: The first factor is x^{6-r}.

Step 3 — Substitute $b = 2$ with power r: The second factor is 2^r.

Step 4 — Write the full general term:

$$T_{r+1} = {}^6C_r \, x^{6-r} \, 2^r.$$

Why other options are wrong: The first option swaps the exponents (x^r and 2^{6-r}); the second and fourth drop one of the required factors (2^r or x^{6-r}).

Final Answer: $T_{r+1} = {}^6C_r \, x^{6-r} \, 2^r \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Sum of an AP: The sum of the first n terms of an arithmetic progression is

$$S_n = \frac{n}{2}\left[2a + (n-1)d\right],$$

where a is the first term and d is the common difference.

Step 1 — Find the first term: The progression is $3, 7, 11, \ldots$, so

$$a = 3.$$

Step 2 — Find the common difference:

$$d = 7 - 3 = 4.$$

Step 3 — Note the number of terms:

$$n = 20.$$

Step 4 — Substitute into the formula:

$$S_{20} = \frac{20}{2}\left[\,2(3) + (20-1)(4)\,\right].$$

Step 5 — Simplify the fraction in front:

$$\frac{20}{2} = 10.$$

Step 6 — Simplify inside the bracket, first piece:

$$2(3) = 6.$$

Step 7 — Simplify inside the bracket, second piece:

$$(20-1)(4) = 19 \times 4 = 76.$$

Step 8 — Add inside the bracket:

$$6 + 76 = 82.$$

Step 9 — Multiply:

$$S_{20} = 10 \times 82 = 820.$$

Why other options are wrong: 780, 800 and 760 all come from arithmetic slips in evaluating $2a + (n-1)d$ or in the final multiplication.

Final Answer: $S_{20} = 820 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q12

Q13.

Solution

Concept — nth term of a GP: The nth term of a geometric progression is

$$a_n = a\,r^{\,n-1},$$

where a is the first term and r is the common ratio.

Step 1 — Find the first term: The progression is $2, 6, 18, \ldots$, so

$$a = 2.$$

Step 2 — Find the common ratio:

$$r = \frac{6}{2} = 3.$$

Step 3 — Note which term is wanted:

$$n = 5.$$

Step 4 — Substitute into the formula:

$$a_5 = 2 \cdot 3^{5-1}.$$

Step 5 — Simplify the exponent:

$$5 - 1 = 4, \qquad \text{so} \qquad a_5 = 2 \cdot 3^4.$$

Step 6 — Evaluate the power:

$$3^4 = 81.$$

Step 7 — Multiply:

$$a_5 = 2 \times 81 = 162.$$

Why other options are wrong: 54 is the 4th term $(2 \cdot 3^3)$; 486 is the 6th term $(2 \cdot 3^5)$; 108 comes from using a wrong power of 3.

Final Answer: $a_5 = 162 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q13

Q14.

Solution

Concept — Double-angle identity: One form of the double-angle formula for cosine is

$$\cos 2\theta = 2\cos^2\theta - 1.$$

Step 1 — Write the given value:

$$\cos\theta = \frac{3}{5}.$$

Step 2 — Square it:

$$\cos^2\theta = \left(\frac{3}{5}\right)^2 = \frac{9}{25}.$$

Step 3 — Substitute into the formula:

$$\cos 2\theta = 2\cdot\frac{9}{25} - 1.$$

Step 4 — Multiply:

$$2\cdot\frac{9}{25} = \frac{18}{25}.$$

Step 5 — Write 1 as a fraction with denominator 25:

$$1 = \frac{25}{25}.$$

Step 6 — Subtract:

$$\cos 2\theta = \frac{18}{25} - \frac{25}{25} = \frac{18-25}{25} = -\frac{7}{25}.$$

Why other options are wrong: $\frac{7}{25}$ drops the negative sign; $\frac{24}{25}$ is the value of $\sin 2\theta$, not $\cos 2\theta$; $\frac{18}{25}$ forgets to subtract the 1.

Final Answer: $\cos 2\theta = -\frac{7}{25} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — General solution of $\tan\theta = k$: Because the tangent function repeats every π, every solution of $\tan\theta = k$ has the form

$$\theta = n\pi + \alpha, \qquad n \in \mathbb{Z},$$

where α is the principal angle satisfying $\tan\alpha = k$.

Step 1 — Read off k: Here the equation is $\tan\theta = 1$, so

$$k = 1.$$

Step 2 — Find the principal angle α: We need $\tan\alpha = 1$. Since $\tan\frac{\pi}{4} = 1$,

$$\alpha = \frac{\pi}{4}.$$

Step 3 — Substitute into the general form:

$$\theta = n\pi + \frac{\pi}{4}, \qquad n \in \mathbb{Z}.$$

Why other options are wrong: $n\pi + \frac{\pi}{3}$ would require $\tan = \sqrt{3}$; $2n\pi + \frac{\pi}{4}$ uses period 2π and so misses half the solutions; $n\pi$ gives $\tan\theta = 0$, not 1.

Final Answer: $\theta = n\pi + \frac{\pi}{4} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Principal value of $\sin^{-1}$: The function $\sin^{-1}$ returns the unique angle in the range $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ whose sine equals the given value.

Step 1 — Set up the equation: Let $\theta = \sin^{-1}(1)$. Then

$$\sin\theta = 1.$$

Step 2 — Find the angle in the principal range: Within $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, the angle whose sine is 1 is

$$\theta = \frac{\pi}{2} \qquad \text{since} \qquad \sin\frac{\pi}{2} = 1.$$

Step 3 — Conclude:

$$\sin^{-1}(1) = \frac{\pi}{2}.$$

Why other options are wrong: 0 gives $\sin 0 = 0$; π lies outside the principal range; $\frac{\pi}{4}$ gives $\sin = \frac{1}{\sqrt{2}}$, not 1.

Final Answer: $\sin^{-1}(1) = \frac{\pi}{2} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q16

Q17.

Solution

Concept — Angle of elevation: In the right triangle formed by the tower, the ground, and the line of sight, the angle of elevation θ satisfies

$$\tan\theta = \frac{\text{opposite (height)}}{\text{adjacent (base distance)}}.$$

Step 1 — Label the triangle: The height is h, the base distance is 30 m, and the angle of elevation is 60°.

Step 2 — Write the tangent equation:

$$\tan 60^\circ = \frac{h}{30}.$$

Step 3 — Substitute the value of $\tan 60^\circ$: Since $\tan 60^\circ = \sqrt{3}$,

$$\sqrt{3} = \frac{h}{30}.$$

Step 4 — Solve for h: Multiply both sides by 30:

$$h = 30\sqrt{3}\text{ m}.$$

Why other options are wrong: 30 comes from using $\tan 45^\circ = 1$; $15\sqrt{3}$ comes from wrongly halving; 60 ignores the tangent ratio altogether.

Final Answer: Height $= 30\sqrt{3}$ m $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q17

Q18.

Solution

Concept — Standard limit: A well-known limit is

$$\lim_{x\to 0}\frac{e^x - 1}{x} = 1.$$

We can see why using the series for e^x.

Step 1 — Write the series for e^x:

$$e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \cdots$$

Step 2 — Subtract 1 in the numerator:

$$e^x - 1 = x + \frac{x^2}{2} + \frac{x^3}{6} + \cdots$$

Step 3 — Divide every term by x:

$$\frac{e^x - 1}{x} = 1 + \frac{x}{2} + \frac{x^2}{6} + \cdots$$

Step 4 — Let $x \to 0$: Every term containing x vanishes, leaving

$$\lim_{x\to 0} \frac{e^x - 1}{x} = 1.$$

Why other options are wrong: 0 ignores the leading term 1; e confuses the limit with the base; the limit is finite and exists, so "does not exist" is false.

Final Answer: The limit is $1 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q18

Q19.

Solution

Concept — Continuity at a point: A function f is continuous at $x = 0$ if all three agree: the left-hand limit, the right-hand limit, and the value $f(0)$.

Step 1 — Right-hand limit ($x \to 0^+$): For $x > 0$, $|x| = x$, so

$$\lim_{x\to 0^+} |x| = \lim_{x\to 0^+} x = 0.$$

Step 2 — Left-hand limit ($x \to 0^-$): For $x < 0$, $|x| = -x$, so

$$\lim_{x\to 0^-} |x| = \lim_{x\to 0^-} (-x) = 0.$$

Step 3 — The two side limits match: Both equal 0, so the limit exists:

$$\lim_{x\to 0} |x| = 0.$$

Step 4 — Evaluate the function at 0:

$$f(0) = |0| = 0.$$

Step 5 — Compare limit and value: Since $\lim_{x\to 0} |x| = 0 = f(0)$, the function is continuous at 0.

Why other options are wrong: There is no jump (both side limits are equal), the function is defined at 0, and the limit is finite, so each of the other choices fails.

Final Answer: $f(x) = |x|$ is continuous at $0 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q19

Q20.

Solution

Concept — Derivative of a constant: A constant function has the same value everywhere, so its graph is a horizontal line. Its slope, and therefore its derivative, is 0:

$$\frac{d}{dx}(c) = 0.$$

Step 1 — Identify the function: Here $f(x) = 7$, which is a constant (it does not depend on x).

Step 2 — Apply the rule: Differentiating a constant gives 0:

$$f'(x) = \frac{d}{dx}(7) = 0.$$

Step 3 — State the result:

$$f'(x) = 0.$$

Why other options are wrong: 7 just repeats the constant; $7x$ is the integral of 7, not its derivative; 1 would be the derivative of x, treating 7 as if it were x.

Final Answer: $f'(x) = 0 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — Product rule: The derivative of a product of two functions is

$$(uv)' = u'v + uv'.$$

Step 1 — Split the product: Write $y = x^2 \sin x$ as a product with

$$u = x^2, \qquad v = \sin x.$$

Step 2 — Differentiate u:

$$u' = \frac{d}{dx}(x^2) = 2x.$$

Step 3 — Differentiate v:

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

Step 4 — Substitute into the product rule:

$$y' = u'v + uv' = (2x)(\sin x) + (x^2)(\cos x).$$

Step 5 — Write the result:

$$y' = 2x \sin x + x^2 \cos x.$$

Why other options are wrong: $2x \cos x$ and $x^2 \cos x$ each keep only one of the two terms; the last option has a wrong minus sign where a plus is required.

Final Answer: $y' = 2x \sin x + x^2 \cos x \Rightarrow \boxed{\text{B}}$

Answer: (B) **Go Back to Q21**

Q22.

Solution

Concept — Slope of the normal: The normal is perpendicular to the tangent, so its slope is the negative reciprocal of the tangent slope:

$$m_{\text{normal}} = -\frac{1}{m_{\text{tangent}}}.$$

Step 1 — Differentiate the curve: For $y = x^2$,

$$\frac{dy}{dx} = 2x.$$

Step 2 — Find the tangent slope at the point: At $x = 1$,

$$m_{\text{tangent}} = 2(1) = 2.$$

Step 3 — Take the negative reciprocal:

$$m_{\text{normal}} = -\frac{1}{2}.$$

Why other options are wrong: 2 is the tangent slope itself; $\frac{1}{2}$ takes the reciprocal but drops the minus sign; -2 just negates the tangent slope without taking the reciprocal.

Final Answer: Slope of normal $= -\dfrac{1}{2} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q22

Q23.

Solution

Concept — Maximum of a function: A turning point occurs where the first derivative is zero, $f'(x) = 0$. The second derivative test then tells us whether it is a maximum ($f'' < 0$) or minimum ($f'' > 0$).

Step 1 — Differentiate f: For $f(x) = -x^2 + 6x - 5$,

$$f'(x) = -2x + 6.$$

Step 2 — Set the derivative equal to zero:

$$-2x + 6 = 0.$$

Step 3 — Move the constant term:

$$-2x = -6.$$

Step 4 — Divide by -2:

$$x = \frac{-6}{-2} = 3.$$

Step 5 — Confirm it is a maximum: The second derivative is

$$f''(x) = -2 < 0,$$

so $x = 3$ gives a maximum.

Why other options are wrong: 0, 6 and -3 do not satisfy $f'(x) = 0$, so they are not the turning point.

Final Answer: Maximum at $x = 3 \Rightarrow \boxed{C}$

Answer: (C) Go Back to Q23

Q24.

Solution

Concept — Antiderivative: An integral asks for a function whose derivative is the integrand. We add a constant C because the derivative of a constant is 0.

Step 1 — Find a function whose derivative is $\cos x$: Recall the derivative rule

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

Step 2 — Read it backwards as an integral: Since differentiating $\sin x$ gives $\cos x$, integrating $\cos x$ gives $\sin x$:

$$\int \cos x \, dx = \sin x + C.$$

Why other options are wrong: $-\sin x + C$ would integrate $-\cos x$; $\cos x + C$ and $-\cos x + C$ are wrong-sign forms whose derivatives are $-\sin x$ and $\sin x$, not $\cos x$.

Final Answer: $\sin x + C \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q24

Q25.

Solution

Concept — Integration by parts: For a product of two functions,

$$\int u\,dv = uv - \int v\,du.$$

Choose u to be the part that gets simpler when differentiated.

Step 1 — Choose u and dv:

$$u = x, \qquad dv = e^x\,dx.$$

Step 2 — Differentiate u to get du:

$$du = dx.$$

Step 3 — Integrate dv to get v:

$$v = \int e^x\,dx = e^x.$$

Step 4 — Substitute into the formula:

$$\int xe^x\,dx = xe^x - \int e^x\,dx.$$

Step 5 — Integrate the remaining term:

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

Step 6 — Write the result so far:

$$\int xe^x\,dx = xe^x - e^x + C.$$

Step 7 — Factor out e^x:

$$xe^x - e^x + C = (x-1)e^x + C.$$

Why other options are wrong: xe^x forgets the $-e^x$ term; $(x+1)e^x$ has the wrong sign; $\frac{x^2}{2}e^x$ wrongly treats e^x as a constant while integrating x.

Final Answer: $(x-1)e^x + C \Rightarrow \boxed{B}$

Answer: (B) Go Back to Q25

Q26.

Solution

Concept — Definite integral: First find the antiderivative, then evaluate it at the upper limit minus the lower limit.

Step 1 — Antiderivative of $\sin x$: Since $\frac{d}{dx}(-\cos x) = \sin x$,

$$\int \sin x \, dx = -\cos x.$$

Step 2 — Write with the limits:

$$\int_0^{\pi} \sin x \, dx = \big[-\cos x\big]_0^{\pi}.$$

Step 3 — Substitute the upper limit $x = \pi$:

$$-\cos \pi = -(-1) = 1.$$

Step 4 — Substitute the lower limit $x = 0$:

$$-\cos 0 = -(1) = -1.$$

Step 5 — Subtract (upper minus lower):

$$1 - (-1) = 1 + 1 = 2.$$

Why other options are wrong: 0 would be the value over a full period $[0, 2\pi]$; 1 corresponds to $[0, \frac{\pi}{2}]$; π confuses the upper limit with the answer.

Final Answer: The integral $= 2 \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q26

Q27.

Solution

Concept — Area under a curve: When a curve lies above the x-axis on $[a, b]$, the area between it and the axis is $\int_a^b y\,dx$. On $[0, \pi]$, $\sin x \geq 0$, so the area is the integral itself.

Step 1 — Write the area as an integral:

$$\text{Area} = \int_0^\pi \sin x\,dx.$$

Step 2 — Find the antiderivative:

$$\int \sin x\,dx = -\cos x.$$

Step 3 — Apply the limits:

$$\text{Area} = \big[-\cos x\big]_0^\pi.$$

Step 4 — Substitute the upper limit $x = \pi$:

$$-\cos\pi = -(-1) = 1.$$

Step 5 — Substitute the lower limit $x = 0$:

$$-\cos 0 = -(1) = -1.$$

Step 6 — Subtract:

$$1 - (-1) = 1 + 1 = 2.$$

Why other options are wrong: 1 uses only half the interval; 0 would result over a full period where positive and negative areas cancel; π confuses the limit with the area value.

Final Answer: Area $= 2 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q27

Q28.

Solution

Concept — Forming a differential equation: To form the DE of a family of curves, differentiate the equation and then eliminate the arbitrary constant. The final DE must not contain C.

Step 1 — Start from the family:

$$y = Cx.$$

Step 2 — Differentiate both sides with respect to x:

$$\frac{dy}{dx} = C.$$

Step 3 — Solve the original equation for C: From $y = Cx$, divide by x:

$$C = \frac{y}{x}.$$

Step 4 — Substitute this C into the derivative:

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

Step 5 — Clear the fraction: Multiply both sides by x:

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

Why other options are wrong: The first two equations are not consistent with $y = Cx$; the third, $\frac{dy}{dx} = C$, still contains the arbitrary constant C and so is not the final differential equation.

Final Answer: $x\frac{dy}{dx} = y \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q28

Q29.

Solution

Concept — Solving by direct integration: If $\frac{dy}{dx}$ depends only on x, integrate both sides with respect to x to recover y.

Step 1 — Separate and integrate: From $\frac{dy}{dx} = x$,

$$y = \int x\,dx.$$

Step 2 — Apply the power rule of integration: Using $\int x^n\,dx = \frac{x^{n+1}}{n+1}$ with $n = 1$,

$$\int x\,dx = \frac{x^2}{2} + C.$$

Step 3 — State the general solution:

$$y = \frac{x^2}{2} + C.$$

Why other options are wrong: $x^2 + C$ forgets the factor $\frac{1}{2}$; Ce^x is the solution of $y' = y$; $\frac{x^3}{3} + C$ is the integral of x^2, not x.

Final Answer: $y = \frac{x^2}{2} + C \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q29

Q30.

Solution

Concept — Slope from two points: The slope of the line through (x_1, y_1) and (x_2, y_2) is

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

Step 1 — Label the points:

$$(x_1, y_1) = (1, 2), \qquad (x_2, y_2) = (4, 8).$$

Step 2 — Compute the change in y:

$$y_2 - y_1 = 8 - 2 = 6.$$

Step 3 — Compute the change in x:

$$x_2 - x_1 = 4 - 1 = 3.$$

Step 4 — Form the ratio:

$$m = \frac{6}{3}.$$

Step 5 — Simplify:

$$m = 2.$$

Why other options are wrong: $\frac{1}{2}$ inverts the ratio $(\Delta x/\Delta y)$; 3 and 6 use only one of the two differences instead of dividing them.

Final Answer: Slope $= 2 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q30

Q31.

Solution

Concept — Distance between parallel lines: For two parallel lines $ax+by+c_1 = 0$ and $ax + by + c_2 = 0$ (same a and b), the distance between them is

$$d = \frac{|c_1 - c_2|}{\sqrt{a^2 + b^2}}.$$

Step 1 — Read off the coefficients: From $3x + 4y - 5 = 0$ and $3x + 4y + 5 = 0$,

$$a = 3, \quad b = 4, \quad c_1 = -5, \quad c_2 = 5.$$

Step 2 — Compute the numerator:

$$|c_1 - c_2| = |-5 - 5| = |-10| = 10.$$

Step 3 — Compute $a^2 + b^2$:

$$3^2 + 4^2 = 9 + 16 = 25.$$

Step 4 — Take the square root:

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

Step 5 — Divide:

$$d = \frac{10}{5} = 2.$$

Why other options are wrong: 1 halves the answer; 5 is just the denominator; 10 skips dividing by $\sqrt{a^2+b^2}$.

Final Answer: Distance $= 2 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q31

Q32.

Solution

Concept — Centre of a circle: For a circle written as $x^2 + y^2 + 2gx + 2fy + c = 0$, the centre is

$$(-g,\ -f).$$

Step 1 — Match the x-coefficient: Comparing $-6x$ with $2gx$,

$$2g = -6.$$

Step 2 — Solve for g:

$$g = \frac{-6}{2} = -3.$$

Step 3 — Match the y-coefficient: Comparing $8y$ with $2fy$,

$$2f = 8.$$

Step 4 — Solve for f:

$$f = \frac{8}{2} = 4.$$

Step 5 — Apply the centre formula:

$$\text{Centre} = (-g,\ -f) = (-(-3),\ -(4)) = (3,\ -4).$$

Why other options are wrong: $(6, -8)$ uses the raw coefficients -6 and 8 without halving and sign-changing; $(-3, 4)$ forgets to negate g and f; $(3, 4)$ keeps f positive instead of negating it.

Final Answer: Centre $= (3, -4) \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q32

Q33.

Solution

Concept — Directrix of a parabola: For the standard right-opening parabola $y^2 = 4ax$, the directrix is the vertical line

$$x = -a.$$

Step 1 — Compare with the standard form: Matching $y^2 = 12x$ with $y^2 = 4ax$,

$$4a = 12.$$

Step 2 — Solve for a:

$$a = \frac{12}{4} = 3.$$

Step 3 — Write the directrix:

$$x = -a = -3.$$

Why other options are wrong: $x = 3$ is on the focus side, not the directrix; $y = -3$ is a horizontal line (wrong orientation); $x = -12$ wrongly uses $4a$ instead of a.

Final Answer: Directrix $x = -3 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q33

Q34.

Solution

Concept — Asymptotes of a hyperbola: For $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, the asymptotes are the two lines

$$y = \pm\frac{b}{a}x.$$

Step 1 — Read off a^2 and find a: The denominator under x^2 is 9, so

$$a^2 = 9 \;\Rightarrow\; a = \sqrt{9} = 3.$$

Step 2 — Read off b^2 and find b: The denominator under y^2 is 4, so

$$b^2 = 4 \;\Rightarrow\; b = \sqrt{4} = 2.$$

Step 3 — Form the ratio $\frac{b}{a}$:

$$\frac{b}{a} = \frac{2}{3}.$$

Step 4 — Write the asymptotes:

$$y = \pm\frac{2}{3}\,x.$$

Why other options are wrong: $\pm\frac{3}{2}x$ inverts the ratio to $\frac{a}{b}$; $\pm\frac{4}{9}x$ and $\pm\frac{9}{4}x$ use the squares b^2, a^2 instead of b, a.

Final Answer: $y = \pm\frac{2}{3}x \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q34

Q35.

Solution

Concept — Angle via the dot product: The angle θ between two vectors satisfies

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

Step 1 — Write the components:

$$\vec{a} = (1,\ 1), \qquad \vec{b} = (1,\ -1).$$

Step 2 — Multiply matching components:

$$x\text{-products: } (1)(1) = 1, \qquad y\text{-products: } (1)(-1) = -1.$$

Step 3 — Add to get the dot product:

$$\vec{a}\cdot\vec{b} = 1 + (-1) = 0.$$

Step 4 — Substitute into the cosine formula: The magnitudes are non-zero, so

$$\cos\theta = \frac{0}{|\vec{a}|\,|\vec{b}|} = 0.$$

Step 5 — Find the angle: The angle with $\cos\theta = 0$ is

$$\theta = 90^\circ.$$

Why other options are wrong: 0° would need parallel vectors (dot product equal to $|\vec{a}||\vec{b}|$); 45° and 60° would need a non-zero dot product.

Final Answer: $\theta = 90^\circ \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q35

Q36.

Solution

Concept — Area of a parallelogram from vectors: When two vectors $\vec{a}$ and $\vec{b}$ form adjacent sides of a parallelogram, the area equals the magnitude of their cross product.

Step 1 — Write the magnitude of the cross product:

$$|\vec{a} \times \vec{b}| = |\vec{a}|\,|\vec{b}|\,\sin\theta,$$

where θ is the angle between the two vectors.

Step 2 — Identify base and height: Taking $|\vec{a}|$ as the base, the height of the parallelogram is $|\vec{b}|\sin\theta$, so

$$\text{base} \times \text{height} = |\vec{a}| \cdot |\vec{b}|\sin\theta.$$

Step 3 — Match the two expressions: This is exactly $|\vec{a} \times \vec{b}|$, so

$$\text{Area} = |\vec{a} \times \vec{b}|.$$

Why other options are wrong: $\vec{a}\cdot\vec{b}$ is a scalar (a projection), not an area; $\frac{1}{2}|\vec{a} \times \vec{b}|$ is the area of the triangle, half the parallelogram; $|\vec{a}| + |\vec{b}|$ is just a sum of lengths.

Final Answer: Area $= |\vec{a} \times \vec{b}| \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q36

Q37.

Solution

Concept — Midpoint in 3D: The midpoint of the segment joining (x_1, y_1, z_1) and (x_2, y_2, z_2) is the average of each coordinate:

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right).$$

Step 1 — Average the x-coordinates:

$$\frac{2+4}{2} = \frac{6}{2} = 3.$$

Step 2 — Average the y-coordinates:

$$\frac{4+8}{2} = \frac{12}{2} = 6.$$

Step 3 — Average the z-coordinates:

$$\frac{6+2}{2} = \frac{8}{2} = 4.$$

Step 4 — Write the midpoint:

$$M = (3,\ 6,\ 4).$$

Why other options are wrong: $(6, 12, 8)$ adds but forgets to halve; $(1, 2, 2)$ and $(2, 4, 4)$ use differences or wrong sums instead of averaging.

Final Answer: Midpoint $= (3, 6, 4) \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q37

Q38.

Solution

Concept — Median: The median is the middle value once the data is arranged in increasing order. For an odd number of values n, the median is the value at position $\frac{n+1}{2}$.

Step 1 — Arrange the data in increasing order: From $7, 3, 9, 5, 11$,

$$3,\ 5,\ 7,\ 9,\ 11.$$

Step 2 — Count the values:

$$n = 5.$$

Step 3 — Find the middle position:

$$\frac{n+1}{2} = \frac{5+1}{2} = 3.$$

Step 4 — Read the value at position 3: The 3rd value in the sorted list is

$$7.$$

Why other options are wrong: 9, 5 and 11 are not at the central position 3 of the sorted list.

Final Answer: Median $= 7 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q38

Q39.

Solution

Concept — Classical probability: When all outcomes are equally likely,

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

Step 1 — Count the total outcomes: A die has 6 faces, so

$$\text{total} = 6.$$

Step 2 — Count the favourable outcomes: Only one face shows the number 4, so

$$\text{favourable} = 1.$$

Step 3 — Form the probability:

$$P = \frac{1}{6}.$$

Why other options are wrong: $\frac{1}{2}$ and $\frac{1}{3}$ treat more than one face as favourable; $\frac{2}{3}$ is far too large for a single face.

Final Answer: $P = \frac{1}{6} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q39

Q40.

Solution

Concept — Conditional probability: The probability of A given that B has occurred is

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}.$$

Step 1 — Write the given values:

$$P(A \cap B) = 0.2, \qquad P(B) = 0.5.$$

Step 2 — Substitute into the formula:

$$P(A \mid B) = \frac{0.2}{0.5}.$$

Step 3 — Simplify the fraction: Multiply top and bottom by 10 to clear decimals:

$$\frac{0.2}{0.5} = \frac{2}{5}.$$

Step 4 — Convert to a decimal:

$$\frac{2}{5} = 0.4.$$

Why other options are wrong: 0.1 comes from multiplying 0.2×0.5 instead of dividing; 0.7 comes from adding $0.2 + 0.5$; 0.5 is just $P(B)$ itself.

Final Answer: $P(A \mid B) = 0.4 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q40

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	A	3	D	4	C	5	A
6	B	7	C	8	D	9	A	10	B
11	C	12	D	13	A	14	B	15	C
16	D	17	B	18	C	19	A	20	D
21	B	22	A	23	C	24	D	25	B
26	A	27	C	28	D	29	A	30	B
31	C	32	D	33	A	34	B	35	D
36	C	37	A	38	B	39	C	40	D