SAAT Mathematics

Sample Paper – 9

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 has 2 elements and B has 3 elements, then the number of relations from A to B is

(A) 64

(B) 6

(C) 8

(D) 32

Q2. Which one of the following functions $f : \mathbb{R} \to \mathbb{R}$ is the identity function?

(A) $f(x) = 5$

(B) $f(x) = x$

(C) $f(x) = x^2$

(D) $f(x) = -x$

Q3. For a complex number z, the product $z\,\bar{z}$ is equal to

(A) $\bar{z}$

(B) $2\,\mathrm{Re}(z)$

(C) $|z|^2$

(D) z^2

Q4. If ω is a non-real cube root of unity, then $(1+\omega)^3$ equals

(A) 1

(B) 0

(C) ω

(D) -1

Q5. If the roots of $2x^2 - 5x + 3 = 0$ are α and β, then the equation whose roots are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$ is

(A) $3x^2 - 5x + 2 = 0$

(B) $2x^2 - 5x + 3 = 0$

(C) $3x^2 + 5x + 2 = 0$

(D) $2x^2 - 3x + 5 = 0$

Q6. If I is the 3×3 identity matrix and A is any 3×3 matrix, then AI equals

(A) I

(B) A

(C) A^2

(D) 0

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. If A and B are invertible matrices of the same order, then $(AB)^{-1}$ equals

(A) $A^{-1}B^{-1}$

(B) AB

(C) BA

(D) $B^{-1}A^{-1}$

Q9. The value of ${}^{8}P_2$ is

(A) 16

(B) 56

(C) 28

(D) 64

Q10. In a party of 10 people, every person shakes hands with every other person exactly once. The total number of handshakes is

(A) 100

(B) 90

(C) 45

(D) 20

Q11. The sum of all the coefficients in the binomial expansion of $(1+x)^6$ is

(A) 64

(B) 12

(C) 32

(D) 6

Q12. In an arithmetic progression whose 3rd term is 11 and 7th term is 27, the common difference d is

(A) 2

(B) 5

(C) 16

(D) 4

Q13. The geometric mean of the two numbers 4 and 16 is

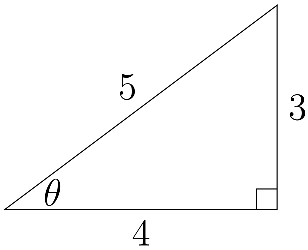
(A) 10

(B) 8

(C) 64

(D) 6

Q14. In the right-angled triangle shown, $\sin\theta = \dfrac{3}{5}$ and $\cos\theta = \dfrac{4}{5}$. The value of $\sin 2\theta$ is



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

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

(C) $\frac{12}{25}$

(D) $\frac{6}{5}$

Q15. The general solution of the trigonometric 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 $\cos^{-1}\left(-\frac{1}{2}\right)$ is

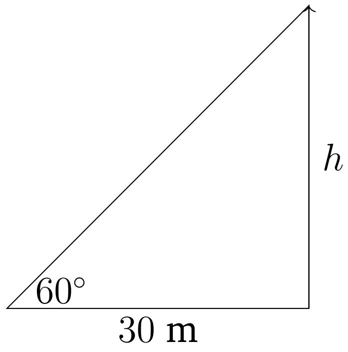
(A) $\frac{\pi}{3}$

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

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

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

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



(A) 30 m

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

(C) 15 m

(D) 60 m

Q18. The value of $\lim_{x\to 0} \dfrac{1-\cos x}{x^2}$ is

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

(B) 1

(C) 0

(D) 2

Q19. If the function $f(x) = \begin{cases} \dfrac{x^2-9}{x-3}, & x \neq 3 \\ k, & x = 3 \end{cases}$ is continuous at $x = 3$, then k equals

(A) 3

(B) 0

(C) 6

(D) 9

Q20. At the point $x = 2$, the function $f(x) = |x - 2|$ is

(A) discontinuous

(B) differentiable with $f'(2) = 0$

(C) neither continuous nor differentiable

(D) continuous but not differentiable

Q21. The derivative of a^x (with $a > 0$) with respect to x is

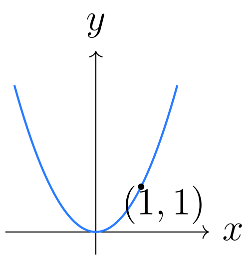
(A) $a^x \ln a$

(B) $x\, a^{x-1}$

(C) a^x

(D) $\dfrac{a^x}{\ln a}$

Q22. The slope of the normal to the curve $y = x^2$ at the point where $x = 1$ is



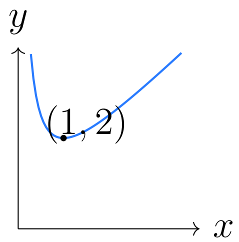
(A) 2

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

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

(D) -2

Q23. The minimum value of $f(x) = x + \dfrac{1}{x}$ for $x > 0$, whose graph is shown, is



(A) 0

(B) 1

(C) 2

(D) 4

Q24. The value of $\int \frac{1}{\sqrt{1-x^2}}\,dx$ is

(A) $\tan^{-1} x + C$

(B) $\sqrt{1-x^2} + C$

(C) $\cos^{-1} x + C$

(D) $\sin^{-1} x + C$

Q25. The value of $\int \frac{2}{x}\,dx$ (for $x > 0$) is

(A) $2\ln|x| + C$

(B) $-\frac{2}{x^2} + C$

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

(D) $2x + C$

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

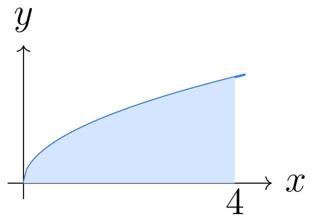
(A) 0

(B) 2

(C) 1

(D) -2

Q27. The area of the shaded region bounded by the curve $y = \sqrt{x}$, the x-axis and $x = 4$, shown below, is



(A) 8

(B) 4

(C) $\frac{8}{3}$

(D) $\frac{16}{3}$

Q28. The order of the differential equation $\dfrac{dy}{dx} + 3y = e^x$ is

(A) 3

(B) 2

(C) 1

(D) 0

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

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

(B) $y = x + C$

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

(D) $y = Ce^x$

Q30. The slope of the straight line passing through the points $(1, 2)$ and $(4, 11)$ is

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

(B) 3

(C) 9

(D) -3

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

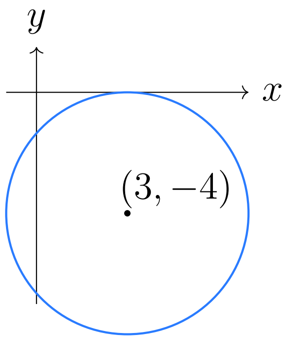
(A) 5

(B) 10

(C) 2

(D) 1

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



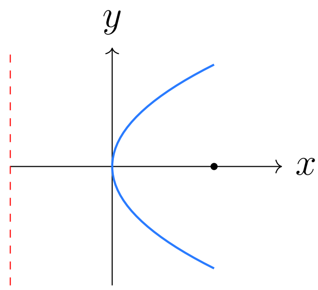
(A) $(6,-8)$

(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) $x = -6$

Q34. The equations of the asymptotes of the hyperbola $\frac{x^2}{9} - \frac{y^2}{16} = 1$ are

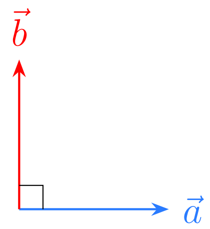
(A) $y = \pm\frac{4}{3}x$

(B) $y = \pm\frac{3}{4}x$

(C) $y = \pm\frac{9}{16}x$

(D) $y = \pm x$

Q35. If two non-zero vectors $\vec{a}$ and $\vec{b}$ are perpendicular, as shown, then $\vec{a} \cdot \vec{b}$ equals



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

(B) 1

(C) -1

(D) 0

Q36. The area of the triangle with adjacent sides $\vec{a}$ and $\vec{b}$, where $|\vec{a} \times \vec{b}| = 10$, is

(A) 10

(B) 20

(C) 5

(D) $\frac{1}{10}$

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

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

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

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

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

Q38. The median of the data $3, 7, 8, 5, 12, 14, 21, 13, 18$ is

(A) 13

(B) 12

(C) 8

(D) 14

Q39. A fair die is rolled once. The probability of getting the number 3 is

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

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

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

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

Q40. For two events A and B with $P(B) = 0.4$ and $P(A \cap B) = 0.2$, the conditional probability $P(A \mid B)$ is

(A) 0.08

(B) 0.4

(C) 0.2

(D) 0.5

Detailed Solutions

Q1.

Solution

Concept — Number of relations: A relation from A to B is any subset of the Cartesian product $A \times B$. If a set has m elements, it has 2^m subsets. So the number of relations equals $2^{n(A) \cdot n(B)}$.

Step 1 — Write down the given sizes:
$n(A) = 2$.
$n(B) = 3$.

Step 2 — Find the number of elements in $A \times B$:
$n(A \times B) = n(A) \times n(B)$.
$n(A \times B) = 2 \times 3$.
$n(A \times B) = 6$.

Step 3 — Count the subsets of $A \times B$:
Number of relations $= 2^{n(A \times B)}$.
Number of relations $= 2^6$.
$2^6 = 64$.

Why other options are wrong: 6 is just $n(A \times B)$, not the number of subsets; $8 = 2^3$ uses exponent 3; $32 = 2^5$ uses exponent 5. All use the wrong exponent.

Final Answer: 64 relations $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q1

Q2.

Solution

Concept — Identity function: The identity function is the function that returns its input unchanged. That is, $f(x) = x$ for every x, so $f(a) = a$ for every input a.

Step 1 — Test $f(x) = 5$:
$f(1) = 5$, but the input was 1.
Output $\neq$ input, so this is not the identity (it is a constant function).

Step 2 — Test $f(x) = x$:
$f(1) = 1$.
$f(2) = 2$.
Output $=$ input for every value, so this is the identity function.

Step 3 — Test $f(x) = x^2$:

$f(2) = 2^2 = 4 \neq 2$, so not the identity.

Step 4 — Test $f(x) = -x$:
$f(2) = -2 \neq 2$, so not the identity.

Why other options are wrong: $f(x) = 5$ is constant; $f(x) = x^2$ squares the input; $f(x) = -x$ negates the input. None return the input unchanged.

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

Answer: (B) Go Back to Q2

Q3.

Solution

Concept — Conjugate product: Write the complex number as $z = a + bi$. Its conjugate flips the sign of the imaginary part: $\bar{z} = a - bi$. The modulus is $|z| = \sqrt{a^2 + b^2}$, so $|z|^2 = a^2 + b^2$.

Step 1 — Write the two factors:
$z = a + bi$.
$\bar{z} = a - bi$.

Step 2 — Multiply them out:
$z\bar{z} = (a + bi)(a - bi)$.
Use $(p + q)(p - q) = p^2 - q^2$ with $p = a$, $q = bi$.
$z\bar{z} = a^2 - (bi)^2$.

Step 3 — Simplify the imaginary square:
$(bi)^2 = b^2 i^2$.
$i^2 = -1$, so $(bi)^2 = -b^2$.
$z\bar{z} = a^2 - (-b^2) = a^2 + b^2$.

Step 4 — Recognise the modulus:
$a^2 + b^2 = |z|^2$.
So $z\bar{z} = |z|^2$.

Why other options are wrong: $\bar{z}$ and z^2 are not real numbers in general; $2\,\mathrm{Re}(z) = z + \bar{z}$, which is the sum, not the product.

Final Answer: $z\bar{z} = |z|^2 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q3

Q4.

Solution

Concept — Cube roots of unity: The non-real cube roots of unity satisfy two key facts: $1+\omega+\omega^2=0$ and $\omega^3=1$.

Step 1 — Rewrite $1+\omega$ using the first fact:
$1+\omega+\omega^2=0$.
Subtract ω^2 from both sides: $1+\omega=-\omega^2$.

Step 2 — Substitute into the expression:
$(1+\omega)^3=(-\omega^2)^3$.

Step 3 — Expand the cube:
$(-\omega^2)^3=(-1)^3\,(\omega^2)^3$.
$(-1)^3=-1$.
$(\omega^2)^3=\omega^6$.
So $(1+\omega)^3=-\omega^6$.

Step 4 — Simplify ω^6 using $\omega^3=1$:
$\omega^6=(\omega^3)^2$.
$(\omega^3)^2=1^2=1$.
So $(1+\omega)^3=-1$.

Why other options are wrong: 1 ignores the negative sign; 0 and ω come from misusing the identity.

Final Answer: $(1+\omega)^3=-1 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q4

Q5.

Solution

Concept — Reciprocal-root equation: If α,β are roots of $ax^2+bx+c=0$, then $\frac{1}{\alpha},\frac{1}{\beta}$ are roots of the equation obtained by reversing the coefficients, namely $cx^2+bx+a=0$.

Step 1 — Read off the coefficients:
From $2x^2-5x+3=0$: $a=2$, $b=-5$, $c=3$.

Step 2 — Reverse the coefficients:
New equation $=cx^2+bx+a=0$.
$=3x^2+(-5)x+2=0$.
$=3x^2-5x+2=0$.

Step 3 — Verify with the sum of the new roots:
Sum of original roots: $\alpha + \beta = -\frac{b}{a} = -\frac{-5}{2} = \frac{5}{2}$.
Product of original roots: $\alpha\beta = \frac{c}{a} = \frac{3}{2}$.
Sum of new roots: $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{5/2}{3/2} = \frac{5}{3}$.
For $3x^2 - 5x + 2 = 0$, sum of roots $= -\frac{-5}{3} = \frac{5}{3}$. It matches.

Why other options are wrong: The original equation $2x^2 - 5x + 3 = 0$ keeps the same roots, not the reciprocals; the others change a sign or swap the coefficients incorrectly.

Final Answer: $3x^2 - 5x + 2 = 0 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q5

Q6.

Solution

Concept — Identity matrix: The identity matrix I acts like the number 1 for matrix multiplication. For any square matrix A of the same order, multiplying by I changes nothing: $AI = A$ and $IA = A$.

Step 1 — Recall the multiplication rule:
I has 1s on the diagonal and 0s elsewhere.
Multiplying any matrix by I leaves it unchanged.

Step 2 — Apply it to AI:
$AI = A$.

Why other options are wrong: I is the identity, not A; $A^2 = A \cdot A$ requires multiplying A by itself, not by I; 0 would need a zero matrix.

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 determinants:
$|A| = 3$.
$|B| = 4$.

Step 2 — Apply the rule:
$|AB| = |A|\,|B|$.
$|AB| = 3 \times 4$.

Step 3 — Multiply:
$3 \times 4 = 12$.
So $|AB| = 12$.

Why other options are wrong: $7 = 3 + 4$ adds instead of multiplying; 1 and $\frac{3}{4}$ come from dividing the determinants.

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

Answer: (C) Go Back to Q7

Q8.

Solution

Concept — Inverse of a product: When you invert a product of matrices, the order of the factors reverses: $(AB)^{-1} = B^{-1}A^{-1}$.

Step 1 — State what we must check:
A matrix M is the inverse of AB if $(AB)\,M = I$.
We test $M = B^{-1}A^{-1}$.

Step 2 — Multiply AB by $B^{-1}A^{-1}$:
$(AB)(B^{-1}A^{-1}) = A\,(B\,B^{-1})\,A^{-1}$.

Step 3 — Simplify the inner product:
$B\,B^{-1} = I$.
$A\,(B\,B^{-1})\,A^{-1} = A\,I\,A^{-1}$.

Step 4 — Finish simplifying:
$A\,I\,A^{-1} = A\,A^{-1}$.
$A\,A^{-1} = I$.
Since the product is I, indeed $(AB)^{-1} = B^{-1}A^{-1}$.

Why other options are wrong: $A^{-1}B^{-1}$ has the factors in the wrong order; AB and BA are not inverses at all.

Final Answer: $(AB)^{-1} = B^{-1}A^{-1} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Permutations: The number of ways to arrange r objects out of n is ${}^nP_r = \frac{n!}{(n-r)!}$. In practice this is the product of r numbers counting down from n.

Step 1 — Write the formula with $n = 8$, $r = 2$:

$${}^8P_2 = \frac{8!}{(8-2)!}.$$
$$= \frac{8!}{6!}.$$

Step 2 — Cancel the common factorial:

$$\frac{8!}{6!} = \frac{8 \times 7 \times 6!}{6!}.$$
$$= 8 \times 7.$$

Step 3 — Multiply:

$8 \times 7 = 56.$

So ${}^8P_2 = 56.$

Why other options are wrong: $16 = 8 \times 2$ multiplies by r instead of $(n-1)$; $28 = {}^8C_2$ is the combination (it divides by $2!$); $64 = 8^2$ squares n.

Final Answer: ${}^8P_2 = 56 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q9

Q10.

Solution

Concept — Handshakes: A handshake involves a pair of people, and order does not matter (A with B is the same handshake as B with A). So the count is the number of ways to choose 2 people from n, i.e. ${}^nC_2 = \frac{n(n-1)}{2}$.

Step 1 — Write the formula with $n = 10$:

$${}^{10}C_2 = \frac{10!}{2!\,(10-2)!}.$$
$$= \frac{10 \times 9}{2}.$$

Step 2 — Multiply the numerator:

$10 \times 9 = 90.$

$${}^{10}C_2 = \frac{90}{2}.$$

Step 3 — Divide:

$$\frac{90}{2} = 45.$$

So there are 45 handshakes.

Why other options are wrong: $100 = 10^2$ counts ordered pairs including a person with themselves; $90 = 10 \times 9$ counts ordered pairs and forgets to halve; 20 is unrelated.

Final Answer: 45 handshakes $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q10

Q11.

Solution

Concept — Sum of coefficients: To get the sum of all coefficients of a polynomial, substitute $x = 1$, because then every power of x becomes 1 and only the coefficients remain.

Step 1 — Substitute $x = 1$ into $(1 + x)^6$:
$(1 + x)^6\big|_{x=1} = (1 + 1)^6$.
$= 2^6$.

Step 2 — Evaluate the power step by step:
$2^2 = 4$.
$2^4 = 16$.
$2^6 = 2^4 \times 2^2 = 16 \times 4 = 64$.

Why other options are wrong: $12 = 2 \times 6$ multiplies instead of raising to a power; $32 = 2^5$ uses the wrong exponent; 6 is just the value of n.

Final Answer: Sum of coefficients $= 64 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q11

Q12.

Solution

Concept — Common difference: In an AP the nth term is $a_n = a + (n - 1)d$. Subtracting two terms removes a and leaves a multiple of d, so $d = \dfrac{a_p - a_q}{p - q}$.

Step 1 — Write the two given terms:
$a_3 = a + 2d = 11$.
$a_7 = a + 6d = 27$.

Step 2 — Subtract the first from the second:
$a_7 - a_3 = (a + 6d) - (a + 2d)$.
$= 6d - 2d$.
$= 4d$.

Step 3 — Put in the numbers:
$a_7 - a_3 = 27 - 11 = 16.$
So $4d = 16$.

Step 4 — Solve for d:
$d = \frac{16}{4}.$
$d = 4.$

Why other options are wrong: 2 divides by 8 instead of 4; 5 is a guess; 16 forgets to divide by 4.

Final Answer: $d = 4 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q12

Q13.

Solution

Concept — Geometric mean: The geometric mean of two positive numbers a and b is $\sqrt{ab}$, the square root of their product.

Step 1 — Substitute the values:
$\text{GM} = \sqrt{a\,b}.$
$= \sqrt{4 \times 16}.$

Step 2 — Multiply inside the root:
$4 \times 16 = 64.$
$\text{GM} = \sqrt{64}.$

Step 3 — Take the square root:
$\sqrt{64} = 8.$
So $\text{GM} = 8$.

Why other options are wrong: $10 = \frac{4+16}{2}$ is the arithmetic mean; 64 is the product (not its root); 6 is unrelated.

Final Answer: $\text{GM} = 8 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q13

Q14.

Solution

Concept — Double-angle formula: The sine of a doubled angle is $\sin 2\theta = 2\sin\theta\cos\theta$.

Step 1 — Write the given values:
$\sin\theta = \frac{3}{5}$.
$\cos\theta = \frac{4}{5}$.

Step 2 — Substitute into the formula:
$\sin 2\theta = 2\sin\theta\cos\theta$.
$= 2 \cdot \dfrac{3}{5} \cdot \dfrac{4}{5}$.

Step 3 — Multiply the numerators and denominators:
Numerator: $2 \times 3 \times 4 = 24$.
Denominator: $5 \times 5 = 25$.
$\sin 2\theta = \dfrac{24}{25}$.

Why other options are wrong: $\frac{7}{25}$ is $\cos 2\theta$; $\frac{12}{25}$ forgets the factor 2; $\frac{6}{5}$ drops one of the denominators.

Final Answer: $\sin 2\theta = \dfrac{24}{25} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q14

Q15.

Solution

Concept — General solution of $\tan\theta = k$: The tangent function repeats every π, so all solutions are $\theta = n\pi + \alpha$, where α is one angle with $\tan\alpha = k$ and $n \in \mathbb{Z}$.

Step 1 — Find one angle (the principal value):
We need $\tan\alpha = 1$.
$\tan\frac{\pi}{4} = 1$.
So $\alpha = \frac{\pi}{4}$.

Step 2 — Attach the period:
$\theta = n\pi + \alpha$.
$\theta = n\pi + \frac{\pi}{4}$.

Why other options are wrong: $n\pi + \frac{\pi}{3}$ corresponds to $\tan = \sqrt{3}$; $2n\pi + \frac{\pi}{4}$ uses period 2π but the period of $\tan$ is π; $n\pi$ gives $\tan = 0$.

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

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Principal value of $\cos^{-1}$: The output of $\cos^{-1}$ must lie in the range $[0, \pi]$. We need the angle in that range whose cosine is $-\frac{1}{2}$.

Step 1 — Use the known reference value:
$\cos\frac{\pi}{3} = \frac{1}{2}$.

Step 2 — Get the negative cosine in the second quadrant:
Cosine is negative for angles between $\frac{\pi}{2}$ and π.
$\cos\left(\pi - \frac{\pi}{3}\right) = -\cos\frac{\pi}{3} = -\frac{1}{2}$.
$\pi - \frac{\pi}{3} = \frac{3\pi}{3} - \frac{\pi}{3} = \frac{2\pi}{3}$.

Step 3 — Conclude:
$\frac{2\pi}{3}$ lies in $[0, \pi]$, so $\cos^{-1}\left(-\frac{1}{2}\right) = \frac{2\pi}{3}$.

Why other options are wrong: $\frac{\pi}{3}$ gives $+\frac{1}{2}$; $\frac{\pi}{6}$ gives $\frac{\sqrt{3}}{2}$; $\frac{\pi}{2}$ gives 0.

Final Answer: $\cos^{-1}\left(-\frac{1}{2}\right) = \dfrac{2\pi}{3} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q16

Q17.

Solution

Concept — Angle of elevation: In the right triangle, the tower is the opposite side and the ground distance is the adjacent side. So $\tan(\text{angle}) = \dfrac{\text{height}}{\text{base distance}}$.

Step 1 — Set up the equation:
$\tan 60^\circ = \dfrac{h}{30}$.

Step 2 — Substitute the known tangent value:
$\tan 60^\circ = \sqrt{3}$.
$\sqrt{3} = \dfrac{h}{30}$.

Step 3 — Solve for h:
Multiply both sides by 30.
$h = 30\sqrt{3}$ m.

Why other options are wrong: 30 uses $\tan 45^\circ = 1$; 15 halves the base instead; 60 doubles the base wrongly.

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

Answer: (B) Go Back to Q17

Q18.

Solution

Concept — Standard limit: We use the half-angle identity $1 - \cos x = 2\sin^2 \frac{x}{2}$ together with the basic limit $\lim_{u \to 0} \dfrac{\sin u}{u} = 1$.

Step 1 — Replace the numerator using the identity:
$1 - \cos x = 2\sin^2 \frac{x}{2}$.
$\dfrac{1-\cos x}{x^2} = \dfrac{2\sin^2(x/2)}{x^2}$.

Step 2 — Rewrite x^2 to match the half-angle:
$x = 2 \cdot \frac{x}{2}$, so $x^2 = 4\left(\frac{x}{2}\right)^2$.
$\dfrac{2\sin^2(x/2)}{x^2} = \dfrac{2\sin^2(x/2)}{4\,(x/2)^2}$.

Step 3 — Factor into the standard ratio:
$= \dfrac{2}{4} \cdot \dfrac{\sin^2(x/2)}{(x/2)^2}$.
$= \dfrac{1}{2}\left(\dfrac{\sin(x/2)}{x/2}\right)^2$.

Step 4 — Take the limit as $x \to 0$:
As $x \to 0$, $\frac{x}{2} \to 0$, so $\dfrac{\sin(x/2)}{x/2} \to 1$.
$\dfrac{1}{2} \cdot (1)^2 = \dfrac{1}{2}$.

Why other options are wrong: 1, 0 and 2 all misapply the standard limit (forgetting the factor $\frac{1}{2}$ or the square).

Final Answer: The limit is $\dfrac{1}{2} \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q18

Q19.

Solution

Concept — Continuity at a point: For f to be continuous at $x = 3$, the value $f(3) = k$ must equal the limit of f as $x \to 3$. So we set $k = \lim_{x \to 3} f(x)$.

Step 1 — Factor the numerator:
$x^2 - 9$ is a difference of squares.

$x^2 - 9 = (x-3)(x+3)$.

Step 2 — Cancel the common factor (valid since $x \neq 3$):
$\frac{x^2-9}{x-3} = \frac{(x-3)(x+3)}{x-3}$.
$= x+3$.

Step 3 — Take the limit as $x \to 3$:
$\lim_{x\to3}(x+3) = 3+3$.
$= 6$.

Step 4 — Set k equal to the limit:
$k = 6$.

Why other options are wrong: 3 and 0 ignore the limit; 9 comes from squaring instead of factoring.

Final Answer: $k = 6 \Rightarrow \boxed{C}$

Answer: (C) Go Back to Q19

Q20.

Solution

Concept — Modulus function corner: The graph of $|x-2|$ is a V-shape with a sharp corner at $x = 2$. A corner means the function is continuous there but has no single slope, so it is not differentiable.

Step 1 — Check continuity at $x = 2$:
$f(2) = |2-2| = 0$.
$\lim_{x\to2}|x-2| = 0$.
Limit = function value, so f is continuous at 2.

Step 2 — Find the slope just to the left of 2:
For $x < 2$, $|x-2| = -(x-2) = 2-x$.
Its derivative is -1 (left-hand derivative).

Step 3 — Find the slope just to the right of 2:
For $x > 2$, $|x-2| = x-2$.
Its derivative is $+1$ (right-hand derivative).

Step 4 — Compare the one-sided derivatives:
Left derivative $-1 \neq$ right derivative $+1$.
Since they differ, f is not differentiable at 2.

Why other options are wrong: It is continuous (so not discontinuous), and it is not differentiable, so the only correct description is continuous but not differentiable.

Final Answer: Continuous but not differentiable $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — Derivative of a^x: An exponential with constant base a differentiates to itself times $\ln a$: $\frac{d}{dx}a^x = a^x \ln a$. We derive it by rewriting the base as e.

Step 1 — Rewrite the base using e:

$a = e^{\ln a}$.

$a^x = \left(e^{\ln a}\right)^x = e^{x \ln a}$.

Step 2 — Differentiate using the chain rule:

$\frac{d}{dx}e^u = e^u \cdot \frac{du}{dx}$ with $u = x \ln a$.

$\frac{du}{dx} = \ln a$ (since $\ln a$ is a constant).

$\frac{d}{dx}e^{x \ln a} = e^{x \ln a} \cdot \ln a$.

Step 3 — Convert back:

$e^{x \ln a} = a^x$.

$\frac{d}{dx}a^x = a^x \ln a$.

Why other options are wrong: $x\,a^{x-1}$ wrongly applies the power rule (the exponent is the variable, not the base); a^x drops $\ln a$; $\frac{a^x}{\ln a}$ divides by $\ln a$ instead of multiplying.

Final Answer: $\frac{d}{dx}a^x = a^x \ln a \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q21

Q22.

Solution

Concept — Slope of normal: The normal is perpendicular to the tangent, so its slope is the negative reciprocal of the tangent slope: normal slope $= -\frac{1}{\text{tangent slope}}$.

Step 1 — Differentiate the curve:

$y = x^2$.

$\frac{dy}{dx} = 2x$ (power rule).

Step 2 — Find the tangent slope at $x = 1$:
$\left.\frac{dy}{dx}\right|_{x=1} = 2(1) = 2.$

Step 3 — Take the negative reciprocal:
Normal slope $= -\frac{1}{2}$.

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

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

Answer: (B) Go Back to Q22

Q23.

Solution

Concept — Minimum by calculus: To find a minimum, differentiate, set the derivative to zero to locate the critical point, then check it is a minimum and evaluate the function there.

Step 1 — Differentiate $f(x) = x + \frac{1}{x}$:
Write $\frac{1}{x} = x^{-1}$.
$\frac{d}{dx}(x) = 1.$
$\frac{d}{dx}(x^{-1}) = -x^{-2} = -\frac{1}{x^2}.$
$f'(x) = 1 - \frac{1}{x^2}.$

Step 2 — Set the derivative to zero:
$1 - \frac{1}{x^2} = 0.$

Step 3 — Isolate the fraction:
$\frac{1}{x^2} = 1.$

Step 4 — Solve for x:
$x^2 = 1.$
$x = \pm 1.$
Since $x > 0$, take $x = 1$.

Step 5 — Confirm it is a minimum:
$f''(x) = \frac{2}{x^3}.$
$f''(1) = 2 > 0$, so $x = 1$ gives a minimum.

Step 6 — Evaluate the minimum value:

$f(1) = 1 + \frac{1}{1}.$

$= 1 + 1.$

$= 2.$

Why other options are wrong: 0 and 1 are smaller than the true minimum (impossible here); 4 comes from using a wrong x.

Final Answer: Minimum value $= 2 \Rightarrow \boxed{C}$

Answer: (C) Go Back to Q23

Q24.

Solution

Concept — Standard integral: Integration reverses differentiation. We look for a function whose derivative is $\frac{1}{\sqrt{1-x^2}}$.

Step 1 — Recall the matching derivative:

$\frac{d}{dx}\sin^{-1}x = \frac{1}{\sqrt{1-x^2}}.$

Step 2 — Reverse it to get the integral:

Since differentiating $\sin^{-1}x$ gives the integrand, $\int \frac{1}{\sqrt{1-x^2}}\,dx = \sin^{-1}x + C.$

Why other options are wrong: $\tan^{-1}x$ is the integral of $\frac{1}{1+x^2}$; $\sqrt{1-x^2}$ is not an antiderivative of this integrand; $\cos^{-1}x$ has derivative $-\frac{1}{\sqrt{1-x^2}}$, which is the wrong sign.

Final Answer: $\sin^{-1}x + C \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q24

Q25.

Solution

Concept — Logarithmic integral: The integral of $\frac{1}{x}$ is $\ln|x| + C$, and any constant multiplier can be taken outside the integral sign.

Step 1 — Pull the constant out:

$\int \frac{2}{x}\,dx = 2\int \frac{1}{x}\,dx.$

Step 2 — Integrate $\frac{1}{x}$:

$\int \frac{1}{x}\,dx = \ln|x| + C.$

Step 3 — Multiply back by 2:
$2\int \frac{1}{x}\,dx = 2\ln|x| + C.$

Why other options are wrong: $-\frac{2}{x^2}$ and $\frac{2}{x^2}$ are derivatives of $\frac{2}{x}$-type expressions, not integrals; $2x$ would be the integral of the constant 2.

Final Answer: $2\ln|x| + C \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q25

Q26.

Solution

Concept — Definite integral of $\sin x$: First find the antiderivative, $\displaystyle\int \sin x\,dx = -\cos x$, then apply the limits using $[F(x)]_a^b = F(b) - F(a)$.

Step 1 — Write the antiderivative with limits:
$\displaystyle\int_0^{\pi} \sin x\,dx = [-\cos x]_0^{\pi}.$

Step 2 — Substitute the upper and lower limits:
$= \big(-\cos\pi\big) - \big(-\cos 0\big).$

Step 3 — Plug in the cosine values:
$\cos\pi = -1$, so $-\cos\pi = -(-1) = 1.$
$\cos 0 = 1$, so $-\cos 0 = -1.$

Step 4 — Combine:
$= 1 - (-1).$
$= 1 + 1.$
$= 2.$

Why other options are wrong: 0 and -2 mishandle the minus signs; 1 uses incorrect limits.

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

Answer: (B) Go Back to Q26

Q27.

Solution

Concept — Area under a curve: The area between a curve $y = f(x)$, the x-axis and two vertical lines is the definite integral of $f(x)$. Here Area $= \int_0^4 \sqrt{x}\,dx$.

Step 1 — Rewrite the root as a power:
$\sqrt{x} = x^{1/2}$.

Step 2 — Integrate using the power rule:
$\int x^n\,dx = \frac{x^{n+1}}{n+1}$ with $n = \frac{1}{2}$.
$n + 1 = \frac{1}{2} + 1 = \frac{3}{2}$.
$\int x^{1/2}\,dx = \frac{x^{3/2}}{3/2} = \frac{2}{3}x^{3/2}$.

Step 3 — Apply the limits 0 to 4:
$\left[\frac{2}{3}x^{3/2}\right]_0^4 = \frac{2}{3}(4)^{3/2} - \frac{2}{3}(0)^{3/2}$.

Step 4 — Evaluate the powers:
$(4)^{3/2} = (\sqrt{4})^3 = 2^3 = 8$.
$(0)^{3/2} = 0$.

Step 5 — Combine:
$= \frac{2}{3} \times 8 - 0$.
$= \frac{16}{3}$.

Why other options are wrong: 8 forgets the factor $\frac{2}{3}$; 4 integrates x instead of $\sqrt{x}$; $\frac{8}{3}$ halves the answer wrongly.

Final Answer: Area $= \frac{16}{3} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q27

Q28.

Solution

Concept — Order of a differential equation: The order is the order of the highest derivative that appears in the equation (first derivative $\rightarrow$ order 1, second derivative $\rightarrow$ order 2, and so on).

Step 1 — List the derivatives present:
The equation $\frac{dy}{dx} + 3y = e^x$ contains only $\frac{dy}{dx}$.

Step 2 — Identify the highest derivative:
$\frac{dy}{dx}$ is a first derivative.

Step 3 — State the order:
Highest derivative is first order, so order $= 1$.

Why other options are wrong: 3 and 2 overcount (no second or third derivative is present); 0 ignores the derivative entirely.

Final Answer: Order $= 1 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q28

Q29.

Solution

Concept — Direct integration: When $\frac{dy}{dx}$ equals a function of x alone, integrate both sides with respect to x to recover y.

Step 1 — Integrate both sides:
$\frac{dy}{dx} = x.$
$y = \int x\,dx.$

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

Step 3 — Add the constant of integration:
$y = \frac{x^2}{2} + C.$

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

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

Answer: (A) Go Back to Q29

Q30.

Solution

Concept — Slope from two points: The slope is the rise over the run, $m = \frac{y_2 - y_1}{x_2 - x_1}$.

Step 1 — Label the points:
$(x_1, y_1) = (1, 2)$.
$(x_2, y_2) = (4, 11)$.

Step 2 — Substitute into the formula:
$m = \frac{y_2 - y_1}{x_2 - x_1}$.
$m = \frac{11 - 2}{4 - 1}$.

Step 3 — Simplify numerator and denominator:
Numerator: $11 - 2 = 9$.
Denominator: $4 - 1 = 3$.
$m = \frac{9}{3}$.

Step 4 — Divide:
$\frac{9}{3} = 3$.

Why other options are wrong: $\frac{1}{3}$ inverts the ratio; 9 forgets to divide by the run; -3 has the wrong sign.

Final Answer: Slope $= 3 \Rightarrow \boxed{\text{B}}$

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, b), the perpendicular distance is $d = \frac{|c_1 - c_2|}{\sqrt{a^2 + b^2}}$.

Step 1 — Read off the coefficients:
$a = 3$, $b = 4$.
$c_1 = -5$ (from $3x + 4y - 5 = 0$).
$c_2 = 5$ (from $3x + 4y + 5 = 0$).

Step 2 — Compute the numerator:
$|c_1 - c_2| = |-5 - 5| = |-10| = 10$.

Step 3 — Compute the denominator:

$a^2 + b^2 = 3^2 + 4^2 = 9 + 16 = 25.$
$\sqrt{25} = 5.$

Step 4 — Divide:
$d = \frac{10}{5}.$
$d = 2.$

Why other options are wrong: 5 is only the denominator; 10 is only the numerator (forgets to divide); 1 is incorrect arithmetic.

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

Answer: (C) Go Back to Q31

Q32.

Solution

Concept — Centre of a circle: Compare with the standard form $x^2 + y^2 + 2gx + 2fy + c = 0$; then the centre is $(-g, -f)$.

Step 1 — Match the x-coefficient:
Given $-6x$, standard $2gx$.
$2g = -6.$
$g = -3.$

Step 2 — Match the y-coefficient:
Given $+8y$, standard $2fy$.
$2f = 8.$
$f = 4.$

Step 3 — Apply the centre formula:
Centre $= (-g, -f).$
$-g = -(-3) = 3.$
$-f = -(4) = -4.$
Centre $= (3, -4).$

Why other options are wrong: $(6, -8)$ keeps the raw coefficients; $(-3, 4)$ forgets to negate; $(3, 4)$ has the wrong sign on y.

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

Answer: (D) Go Back to Q32

Q33.

Solution

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

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

Step 2 — Solve for a:
$a = \frac{12}{4}$.
$a = 3$.

Step 3 — Write the directrix:
Directrix is $x = -a$.
$x = -3$.

Why other options are wrong: $x = 3$ is the focus side ($x = +a$); $y = -3$ is horizontal (wrong orientation); $x = -6$ wrongly uses $4a$ instead of a.

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

Answer: (B) 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 lines $y = \pm\frac{b}{a}x$.

Step 1 — Find a from a^2:
$a^2 = 9$.
$a = \sqrt{9} = 3$.

Step 2 — Find b from b^2:
$b^2 = 16$.
$b = \sqrt{16} = 4$.

Step 3 — Form the ratio $\frac{b}{a}$:
$\frac{b}{a} = \frac{4}{3}$.

Step 4 — Write the asymptotes:
$y = \pm\frac{4}{3}x$.

Why other options are wrong: $\pm\frac{3}{4}x$ inverts the ratio (uses $\frac{a}{b}$); $\pm\frac{9}{16}x$ uses the squares $\frac{a^2}{b^2}$; $\pm x$ ignores a, b.

Final Answer: $y = \pm\dfrac{4}{3}x \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q34

Q35.

Solution

Concept — Dot product and perpendicularity: The dot product is $\vec{a}\cdot\vec{b} = |\vec{a}||\vec{b}|\cos\theta$, where θ is the angle between the vectors. Perpendicular vectors meet at $\theta = 90^\circ$.

Step 1 — Substitute the angle:
$\theta = 90^\circ$.
$\vec{a}\cdot\vec{b} = |\vec{a}||\vec{b}|\cos 90^\circ$.

Step 2 — Use the cosine value:
$\cos 90^\circ = 0$.
$\vec{a}\cdot\vec{b} = |\vec{a}||\vec{b}| \times 0$.

Step 3 — Multiply:
$|\vec{a}||\vec{b}| \times 0 = 0$.
So $\vec{a}\cdot\vec{b} = 0$.

Why other options are wrong: $|\vec{a}||\vec{b}|$ is the value at $\theta = 0^\circ$ (parallel); 1 and -1 ignore the magnitudes entirely.

Final Answer: $\vec{a}\cdot\vec{b} = 0 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q35

Q36.

Solution

Concept — Area of a triangle from vectors: The magnitude $|\vec{a}\times\vec{b}|$ gives the area of the parallelogram with sides $\vec{a}, \vec{b}$. The triangle is half of that parallelogram, so Area $= \dfrac{1}{2}|\vec{a}\times\vec{b}|$.

Step 1 — Substitute the given magnitude:
$|\vec{a}\times\vec{b}| = 10$.
Area $= \dfrac{1}{2} \times 10$.

Step 2 — Multiply:
$\frac{1}{2} \times 10 = 5.$
$\text{Area} = 5.$

Why other options are wrong: 10 is the parallelogram area (forgets the $\frac{1}{2}$); 20 doubles instead of halving; $\frac{1}{10}$ inverts the value.

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

Answer: (C) Go Back to Q36

Q37.

Solution

Concept — Midpoint in 3D: The midpoint is the average of the coordinates: $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right).$

Step 1 — Label the endpoints:
$(x_1, y_1, z_1) = (2, 4, 6).$
$(x_2, y_2, z_2) = (6, 8, 2).$

Step 2 — Average the x-coordinates:
$\frac{2+6}{2} = \frac{8}{2} = 4.$

Step 3 — Average the y-coordinates:
$\frac{4+8}{2} = \frac{12}{2} = 6.$

Step 4 — Average the z-coordinates:
$\frac{6+2}{2} = \frac{8}{2} = 4.$

Step 5 — Collect the result:
$M = (4, 6, 4).$

Why other options are wrong: $(8, 12, 8)$ forgets to divide by 2; $(2, 2, 2)$ and $(4, 4, 4)$ average incorrectly.

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

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 $\left(\frac{n+1}{2}\right)$th term.

Step 1 — Count the values:
There are 9 numbers, so $n = 9$.

Step 2 — Find the median position:
Position $= \dfrac{n+1}{2} = \dfrac{9+1}{2} = \dfrac{10}{2} = 5.$
So the median is the 5th value.

Step 3 — Sort the data in increasing order:
$3,\ 5,\ 7,\ 8,\ 12,\ 13,\ 14,\ 18,\ 21.$

Step 4 — Read off the 5th value:
Counting: 3(1st), 5(2nd), 7(3rd), 8(4th), 12(5th).
Median $= 12$.

Why other options are wrong: 13 and 14 are the 6th and 7th values (off by one or two); 8 is the 4th value.

Final Answer: Median $= 12 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q38

Q39.

Solution

Concept — Classical probability: For equally likely outcomes, $P = \dfrac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$.

Step 1 — Count the total outcomes:
A die has faces $1, 2, 3, 4, 5, 6$.
Total outcomes $= 6$.

Step 2 — Count the favourable outcomes:
Only the face 3 is favourable.
Favourable outcomes $= 1$.

Step 3 — Form the probability:
$P = \dfrac{1}{6}.$

Why other options are wrong: $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ all use a wrong total number of outcomes.

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

Step 1 — Write the given values:
$P(B) = 0.4$.
$P(A \cap B) = 0.2$.

Step 2 — Substitute into the formula:
$P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$.
$P(A \mid B) = \dfrac{0.2}{0.4}$.

Step 3 — Simplify the fraction:
$\dfrac{0.2}{0.4} = \dfrac{2}{4} = \dfrac{1}{2}$.
$= 0.5$.

Why other options are wrong: $0.08 = 0.2 \times 0.4$ multiplies instead of dividing; 0.4 and 0.2 are the given inputs, not the ratio.

Final Answer: $P(A \mid B) = 0.5 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q40

Answer Key

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