Karnataka Board Class 12 2026 Mathematics Question Paper with Solutions

Time Allowed : 3 Hours	Maximum Marks : 70	Total questions : 37

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The paper is divided into Section A and Section B.
2. Section A includes objective-type questions.
3. All questions in Section A are compulsory.
4. Section B includes short answer, and long answer type questions.
5. Answers must be written legibly within the word limit.
6. Use of unfair means or electronic devices is prohibited.
7. Follow the correct format and instructions for each section.

Section - A

1. If a relation R in the set $\{1, 2, 3\}$ be defined by $R = \{(1, 1), (2, 2)\}$, then R is

(A) Symmetric but not transitive

(B) Transitive but not symmetric

(C) Symmetric and transitive

(D) Neither symmetric nor transitive

Correct Answer: (C) Symmetric and Transitive

Solution:

Step 1: Write the given relation.

The relation is defined on the set

$$A = \{1, 2, 3\}$$

and

$$R = \{(1, 1), (2, 2)\}$$

Thus the relation contains only ordered pairs where each element is related to itself.

Step 2: Check the symmetric property.

A relation is symmetric if

$$(a, b) \in R \Rightarrow (b, a) \in R$$

Now check the elements:

$$(1, 1) \in R$$

Its reverse is also

$$(1, 1)$$

Similarly

$$(2, 2) \in R$$

Its reverse is also

$$(2, 2)$$

Thus the relation satisfies the symmetric condition.

Step 3: Check the transitive property.

A relation is transitive if

$$(a, b) \in R \text{ and } (b, c) \in R \Rightarrow (a, c) \in R$$

Here

$$(1,1) \in R$$

and

$$(1,1) \in R$$

Therefore

$$(1,1) \in R$$

which satisfies transitivity.

Similarly for

$$(2,2)$$

Thus the relation is transitive.

Step 4: Conclusion.

The relation satisfies both symmetric and transitive properties.

Final Answer: $\boxed{\text{Symmetric and Transitive}}$

> **Quick Tip**
>
> Pairs of the form (a, a) always satisfy symmetry and transitivity.

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2. The domain of $\tan^{-1} x$ is

(A) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

(B) $(0, \pi)$

(C) $[-1, 1]$

(D) $(-\infty, \infty)$

Correct Answer: (D) $(-\infty, \infty)$

Solution:

Step 1: Recall the definition of inverse tangent function.

The inverse tangent function is written as

$$y = \tan^{-1} x$$

This means

$$\tan y = x$$

where y lies in the principal interval

$$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$$

Step 2: Understand the domain.

The domain of a function refers to all possible values of x for which the function is defined.

For the tangent inverse function, the value of x can be any real number.

This means

$$x \in (-\infty, \infty)$$

Step 3: Range of the function.

Although the domain is all real numbers, the range is restricted to

$$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$$

Step 4: Conclusion.

Thus the inverse tangent function accepts every real value as input.

Final Answer: $\boxed{(-\infty, \infty)}$

Quick Tip

Domain of $\tan^{-1} x$ is all real numbers while its range is $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$.

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3. A matrix has 13 elements. The number of possible different orders it can have is

(A) 1

(B) 2

(C) 3

(D) 4

Correct Answer: (B) 2

Solution:

Step 1: Recall the formula for number of elements in a matrix.

If a matrix has order

$$m \times n$$

then the total number of elements in the matrix is

$$m \times n$$

Step 2: Use the given information.

The matrix contains

$$13$$

elements.

Thus

$$m \times n = 13$$

Step 3: Factorize the number 13.

The number 13 is a prime number.

Thus its only positive factor pairs are

$$1 \times 13$$

and

$$13 \times 1$$

Step 4: Determine possible matrix orders.

Thus the matrix can have the following orders:

$$1 \times 13$$

$$13 \times 1$$

Hence there are exactly two possible orders.

Step 5: Conclusion.

The number of possible matrix orders is

$$2$$

Final Answer: $\boxed{2}$

Quick Tip

If a matrix has k elements, the possible orders correspond to all factor pairs of k.

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4. For the matrix $A = \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}$, the value of $|\text{adj } A|$ is

(A) 25

(B) 5

(C) 0

(D) 1

Correct Answer: (A) 25

Solution:

Step 1: Recall the property of determinant of adjoint matrix.

For a square matrix A of order n, the following identity holds:

$$|\text{adj}(A)| = |A|^{n-1}$$

where n is the order of the matrix.

Step 2: Identify the order of the matrix.

The given matrix

$$A = \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}$$

is a 2×2 matrix. Thus

$$n = 2$$

Step 3: Compute determinant of A.

$$|A| = (5)(5) - (0)(0)$$

$$|A| = 25$$

Step 4: Apply the determinant formula for adjoint.

$$|\text{adj}(A)| = |A|^{n-1}$$

$$|\text{adj}(A)| = 25^{2-1}$$

$$|\text{adj}(A)| = 25$$

Step 5: Conclusion.

Thus the determinant of the adjoint matrix equals 25.

Final Answer: $\boxed{25}$

Quick Tip

For any square matrix A of order n: $|\text{adj}(A)| = |A|^{n-1}$.

5. The derivative of $\sin^{-1} x$ exists in the interval

(A) $[-1, 1]$

(B) $(-1, 1)$

(C) $\mathbb{R}$

(D) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

Correct Answer: (B) $(-1, 1)$

Solution:

Step 1: Recall the derivative formula.

The derivative of the inverse sine function is given by

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

Step 2: Determine where the derivative exists.

For the derivative to exist, the denominator must be defined and non-zero.

Thus

$$1 - x^2 > 0$$

Step 3: Solve the inequality.

$$1 - x^2 > 0$$

$$x^2 < 1$$

$$-1 < x < 1$$

Step 4: Interpret the result.

Therefore the derivative exists only inside the open interval

$$(-1, 1)$$

At $x = \pm 1$, the denominator becomes zero and the derivative is undefined.

Step 5: Conclusion.

Thus the derivative of $\sin^{-1} x$ exists in

$$(-1, 1)$$

Final Answer: $\boxed{(-1, 1)}$

> **Quick Tip**
>
> Derivative of $\sin^{-1} x$ is $\frac{1}{\sqrt{1-x^2}}$, so it exists only when $|x| < 1$.

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6. If $x - y = \pi$, then $\frac{dy}{dx}$ is

(A) π

(B) $-\pi$

(C) 1

(D) -1

Correct Answer: (C) 1

Solution:

Step 1: Write the given equation.

The relation between x and y is

$$x - y = \pi$$

Here π is a constant.

Step 2: Differentiate both sides with respect to x.

$$\frac{d}{dx}(x - y) = \frac{d}{dx}(\pi)$$

Step 3: Compute derivatives.

$$\frac{d}{dx}(x) = 1$$

$$\frac{d}{dx}(y) = \frac{dy}{dx}$$

Thus

$$1 - \frac{dy}{dx} = 0$$

Step 4: Solve for $\frac{dy}{dx}$.

$$\frac{dy}{dx} = 1$$

Step 5: Conclusion.

Hence the rate of change of y with respect to x is 1.

Final Answer: $\boxed{1}$

> Quick Tip
>
> When differentiating equations involving constants, remember that the derivative of any constant is zero.

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7. The minimum value of $f(x) = |x|,\ x \in \mathbb{R}$ is

(A) 0

(B) 1

(C) 2

(D) Does not exist

Correct Answer: (A) 0

Solution:

Step 1: Understand the absolute value function.

The absolute value function is defined as

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

Thus the function always gives a **non-negative value** for every real number x.

Step 2: Examine possible values of the function.

For different values of x:

$$|3| = 3$$

$$|-5| = 5$$

$$|1| = 1$$

Hence the value of $|x|$ is always **greater than or equal to zero**.

Step 3: Identify the smallest value.

The smallest value occurs when

$$x = 0$$

because

$$|0| = 0$$

No value of $|x|$ can be less than zero.

Step 4: Conclusion.

Therefore the minimum value of the function $f(x) = |x|$ is 0.

Final Answer: $\boxed{0}$

> **Quick Tip**
>
> The absolute value function always produces non-negative values, so its minimum value occurs at $x = 0$.

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8. Statement I: The function $f(x) = x^2$ is decreasing in the interval $(0, \infty)$.
Statement II: Any function $y = f(x)$ is decreasing if $\frac{dy}{dx} < 0$.

Which of the following is correct?

(A) Both the Statements I and II are true

(B) Both the Statements I and II are false

(C) Statement I is true and Statement II is false

(D) Statement I is false and Statement II is true

Correct Answer: (D) Statement I is false and Statement II is true

Solution:

Step 1: Examine Statement I.

The given function is

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

Compute its derivative

$$\frac{df}{dx} = 2x$$

For the interval

$$(0, \infty)$$

we have

$$2x > 0$$

Thus the function is **increasing** in this interval, not decreasing.

Therefore **Statement I is false**.

Step 2: Examine Statement II.

From calculus, if

$$\frac{dy}{dx} < 0$$

then the slope of the function is negative.

This means the function value decreases as x increases.

Hence the function is **decreasing** in that interval.

Thus **Statement II is true**.

Step 3: Final conclusion.

Statement I is false but Statement II is true.

Final Answer: $\boxed{\text{Statement I is false and Statement II is true}}$

Quick Tip

If $\frac{dy}{dx} > 0$, the function is increasing. If $\frac{dy}{dx} < 0$, the function is decreasing.

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9. The antiderivative of $\frac{1}{x\sqrt{x^2-1}}$, $x > 1$ **with respect to** x **is**

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

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

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

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

Correct Answer: (C) $\sec^{-1} x + C$

Solution:

Step 1: Recall the derivative of inverse secant.

From standard differentiation formulas of inverse trigonometric functions,

$$\frac{d}{dx}(\sec^{-1} x) = \frac{1}{x\sqrt{x^2-1}}, \quad x > 1$$

This derivative exactly matches the integrand given in the question.

Step 2: Compare with the given integral.

The integral provided is

$$\int \frac{1}{x\sqrt{x^2-1}}\, dx$$

Since the derivative of $\sec^{-1} x$ equals the given expression, the integral directly becomes

$$\sec^{-1} x + C$$

where C is the constant of integration.

Step 3: Conclusion.

Thus the antiderivative of the function is the inverse secant function.

Final Answer: $\boxed{\sec^{-1} x + C}$

> Quick Tip
>
> Remember the important identity: $\frac{d}{dx}(\sec^{-1} x) = \frac{1}{x\sqrt{x^2-1}}$ for $x > 1$.

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10. The value of

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x \, dx$$

is

(A) 1

(B) 0

(C) -1

(D) 7

Correct Answer: (B) 0

Solution:

Step 1: Observe the nature of the function.

The integrand is

$$f(x) = \sin^7 x$$

We know that the sine function is an **odd function**.

An odd function satisfies the property

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

Step 2: Check whether the integrand is odd.

Since $\sin x$ is odd,

$$\sin(-x) = -\sin x$$

Thus,

$$\sin^7(-x) = (-\sin x)^7$$

$$= -\sin^7 x$$

Hence $\sin^7 x$ is also an **odd function**.

Step 3: Use the property of definite integrals of odd functions.

If a function is odd and the limits of integration are symmetric about zero,

$$\int_{-a}^{a} f(x)\, dx = 0$$

Here the limits are

$$-\frac{\pi}{2} \quad \text{to} \quad \frac{\pi}{2}$$

which are symmetric about zero.

Step 4: Apply the property.

Therefore,

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x\, dx = 0$$

Step 5: Conclusion.

Thus the value of the definite integral is zero.

Final Answer: $\boxed{0}$

Quick Tip

If $f(x)$ is odd, then $\int_{-a}^{a} f(x)\, dx = 0$.

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11. If $\vec{a}$ is a nonzero vector of magnitude a and λ is a nonzero scalar, then $\lambda\vec{a}$ is a unit vector if

(A) $\lambda = 1$

(B) $\lambda = -1$

(C) $a = |\lambda|$

(D) $a = \frac{1}{|\lambda|}$

Correct Answer: (D) $a = \frac{1}{|\lambda|}$

Solution:

Step 1: Recall the definition of a unit vector.

A vector is called a unit vector if its magnitude is equal to 1.

Thus if a vector $\vec{v}$ is a unit vector, then

$$|\vec{v}| = 1$$

Step 2: Determine the magnitude of $\lambda\vec{a}$.

For any scalar λ and vector $\vec{a}$, the magnitude satisfies

$$|\lambda\vec{a}| = |\lambda|\,|\vec{a}|$$

Since the magnitude of $\vec{a}$ is given as a, we obtain

$$|\lambda\vec{a}| = |\lambda|a$$

Step 3: Apply the unit vector condition.

For $\lambda\vec{a}$ to be a unit vector, its magnitude must be 1.

Thus

$$|\lambda|a = 1$$

Step 4: Solve for a.

$$a = \frac{1}{|\lambda|}$$

Step 5: Conclusion.

Thus $\lambda\vec{a}$ becomes a unit vector only when

$$a = \frac{1}{|\lambda|}$$

Final Answer: $\boxed{a = \frac{1}{|\lambda|}}$

Quick Tip

Magnitude of a scalar multiple of a vector follows the rule $|\lambda\vec{a}| = |\lambda|\,|\vec{a}|$.

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12. The position vector of the midpoint of the line joining the points $P(2, 3, 4)$ and $Q(4, 1, -2)$ is

(A) $3\hat{i} + 2\hat{j} + \hat{k}$

(B) $3\hat{i} + 2\hat{j} - \hat{k}$

(C) $\hat{i} - \hat{j} - 3\hat{k}$

(D) $-\hat{i} + \hat{j} + 3\hat{k}$

Correct Answer: (A) $3\hat{i} + 2\hat{j} + \hat{k}$

Solution:

Step 1: Recall the midpoint formula in three dimensions.

If two points are

$$P(x_1, y_1, z_1)$$

and

$$Q(x_2, y_2, z_2)$$

then the midpoint is given by

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

Step 2: Substitute the coordinates.

For

$$P(2, 3, 4), \quad Q(4, 1, -2)$$

Compute each coordinate of the midpoint.

$$x = \frac{2+4}{2} = 3$$

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

$$z = \frac{4+(-2)}{2} = 1$$

Thus the midpoint is

$$(3, 2, 1)$$

Step 3: Write the position vector.

The position vector corresponding to the point $(3, 2, 1)$ is

$$3\hat{i} + 2\hat{j} + \hat{k}$$

Step 4: Conclusion.

Hence the position vector of the midpoint of the given line segment is

$$3\hat{i} + 2\hat{j} + \hat{k}$$

Final Answer: $\boxed{3\hat{i} + 2\hat{j} + \hat{k}}$

Quick Tip

The midpoint of two points in 3D is obtained by averaging their corresponding coordinates.

13. The direction ratios of the x-axis are

(A) $(0, k, 0)$

(B) $(0, 0, k)$

(C) $(k, 0, 0)$

(D) (k, k, k)

Correct Answer: (C) $(k, 0, 0)$

Solution:

Step 1: Recall the concept of direction ratios.

Direction ratios of a line are numbers proportional to the components of a vector that represents the direction of the line.

If a line is parallel to the x-axis, its direction is completely along the x-direction.

Step 2: Determine the components of the direction vector.

For a line along the x-axis:

$$x\text{-direction component} \neq 0$$

$$y\text{-direction component} = 0$$

$$z\text{-direction component} = 0$$

Thus a direction vector along the x-axis can be written as

$$(1, 0, 0)$$

Step 3: Express general direction ratios.

Direction ratios can be any proportional values of the direction vector.

Therefore the general form becomes

$$(k, 0, 0)$$

where k is any non-zero scalar.

Step 4: Conclusion.

Hence the direction ratios of the x-axis are $(k, 0, 0)$.

Final Answer: $\boxed{(k, 0, 0)}$

Quick Tip

A line parallel to the x-axis has direction ratios proportional to $(1, 0, 0)$.

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14. The probability of obtaining an even prime number on each die when a pair of dice is rolled is

(A) $\frac{1}{36}$
(B) $\frac{1}{6}$
(C) $\frac{1}{18}$
(D) $\frac{1}{4}$

Correct Answer: (A) $\frac{1}{36}$

Solution:

Step 1: Identify the even prime number.

Prime numbers are numbers greater than 1 having exactly two factors.

Among all prime numbers, the only even prime number is

$$2$$

Thus each die must show the number 2.

Step 2: Determine the total possible outcomes.

When two dice are rolled, the total number of possible outcomes is

$$6 \times 6 = 36$$

Step 3: Determine favourable outcomes.

To obtain an even prime number on each die:

First die = 2 Second die = 2

Thus the favourable outcome is

$$(2, 2)$$

Hence the number of favourable outcomes is

$$1$$

Step 4: Compute the probability.

$$P(\text{both even prime}) = \frac{\text{Favourable outcomes}}{\text{Total outcomes}}$$

$$= \frac{1}{36}$$

Step 5: Conclusion.

Thus the probability that both dice show an even prime number is

$$\frac{1}{36}$$

Final Answer: $\boxed{\frac{1}{36}}$

Quick Tip

The only even prime number is 2. Hence both dice must show 2.

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15. If A and B are independent events with $P(A) = 0.3$ and $P(B) = 0.4$, then $P(A \cap B)$ is

(A) 1.2

(B) 0.12

(C) 0.7

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

Correct Answer: (B) 0.12

Solution:

Step 1: Recall the definition of independent events.

Two events A and B are said to be independent if the occurrence of one event does not affect the probability of the other event.
Mathematically, for independent events we have

$$P(A \cap B) = P(A) \times P(B)$$

Step 2: Substitute the given probabilities.
We are given

$$P(A) = 0.3$$

$$P(B) = 0.4$$

Using the formula for independent events

$$P(A \cap B) = P(A) \times P(B)$$

Step 3: Perform the multiplication.

$$P(A \cap B) = 0.3 \times 0.4$$

$$P(A \cap B) = 0.12$$

Step 4: Verify the result.
Since probabilities always lie between 0 and 1, the value 0.12 is a valid probability.
Step 5: Conclusion.
Therefore the probability that both events A and B occur together is

$$P(A \cap B) = 0.12$$

Final Answer: $\boxed{0.12}$

Quick Tip

For independent events always remember the rule: $P(A \cap B) = P(A) \times P(B)$.

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket [0,3,-1,2,-2,1]

16. The left hand derivative of $|x|$ with respect to x at $x = 0$ is

Correct Answer: -1

Solution:

Step 1: Write the definition of the modulus function.

The absolute value function is defined as

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

Thus the function behaves differently on the left side and the right side of zero.

Step 2: Understand the meaning of the left hand derivative.

The left hand derivative at a point is the derivative evaluated as x approaches the point from the left side.

Mathematically it is written as

$$\lim_{h \to 0^-} \frac{f(0+h) - f(0)}{h}$$

This means we approach 0 from negative values.

Step 3: Use the definition of $|x|$ for $x < 0$.

For negative values of x

$$|x| = -x$$

Thus near the left side of zero the function behaves as

$$f(x) = -x$$

Step 4: Differentiate the function.

The derivative of

$$f(x) = -x$$

is

$$f'(x) = -1$$

Thus the slope of the curve on the left side of zero is -1.

Step 5: Conclusion.

Therefore the left hand derivative of $|x|$ at $x = 0$ is

$$-1$$

Final Answer: $\boxed{-1}$

Quick Tip

For the modulus function $|x|$, check the behavior separately on the left and right side of the point. At $x = 0$, the left hand derivative is -1 and the right hand derivative is 1.

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17. The point of inflection of the function $f(x) = x^3$ in the interval $[-1, 1]$ is

Correct Answer: 0

Solution:

Step 1: Recall the definition of a point of inflection.

A point of inflection is a point on the graph where the concavity of the function changes. This occurs when the second derivative of the function changes its sign.

Step 2: Compute the first derivative.

The given function is

$$f(x) = x^3$$

Differentiate once

$$f'(x) = 3x^2$$

Step 3: Compute the second derivative.

Differentiate again

$$f''(x) = 6x$$

Step 4: Determine where the second derivative is zero.

$$6x = 0$$

$$x = 0$$

Step 5: Check change of concavity.

For $x < 0$

$$f''(x) < 0$$

For $x > 0$

$$f''(x) > 0$$

Thus the concavity changes from downward to upward at $x = 0$.

Step 6: Conclusion.

Therefore the point of inflection occurs at

$$x = 0$$

which lies within the interval $[-1, 1]$.

Final Answer: $\boxed{0}$

> **Quick Tip**
>
> To find the point of inflection, first compute the second derivative and then check whether its sign changes at the critical value.

18. If m and n are respectively the order and degree of the differential equation $2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$, then $m + n =$

Correct Answer: 3

Solution:

Step 1: Recall the definition of order of a differential equation.

The order of a differential equation is the highest order derivative present in the equation.

Step 2: Identify the highest derivative.

The equation given is

$$2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$$

The highest derivative present is

$$\frac{d^2y}{dx^2}$$

Thus the order of the differential equation is

$$m = 2$$

Step 3: Recall the definition of degree.

The degree of a differential equation is the power of the highest order derivative when the equation is polynomial in derivatives.

Step 4: Determine the degree.

The highest derivative

$$\frac{d^2y}{dx^2}$$

appears with power 1.

Thus the degree of the equation is

$$n = 1$$

Step 5: Compute the required sum.

$$m + n = 2 + 1$$

$$m + n = 3$$

Step 6: Conclusion.

Hence the sum of order and degree of the differential equation is 3.

Final Answer: $\boxed{3}$

Quick Tip

Order means the highest derivative present, while degree means the power of that highest derivative after writing the equation in polynomial form in derivatives.

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19. The value of $\hat{i} \cdot \hat{i} + \hat{j} \cdot \hat{j}$ is

Correct Answer: 2

Solution:

Step 1: Recall the properties of unit vectors.

In vector algebra the standard unit vectors are

$$\hat{i}, \hat{j}, \hat{k}$$

These vectors represent unit directions along the x, y, and z axes respectively.

Step 2: Recall dot product rules.

The dot product of a unit vector with itself is

$$\hat{i} \cdot \hat{i} = 1$$

$$\hat{j} \cdot \hat{j} = 1$$

because the magnitude of each unit vector is 1.

Step 3: Add the two values.

$$\hat{i}\cdot\hat{i}+\hat{j}\cdot\hat{j}$$

$$=1+1$$

$$=2$$

Step 4: Conclusion.

Thus the required value equals 2.

Final Answer: $\boxed{2}$

Quick Tip

The dot product of any unit vector with itself is always 1. Therefore $\hat{i}\cdot\hat{i}=1$, $\hat{j}\cdot\hat{j}=1$, and $\hat{k}\cdot\hat{k}=1$.

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20. If F is an event of a sample space S, then $P(S|F)=$

Correct Answer: 1

Solution:

Step 1: Recall the formula of conditional probability.

The conditional probability of an event A given event B is defined as

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

provided $P(B)\neq 0$.

Step 2: Apply the formula to the given case.

Here

$$A=S$$

and

$$B = F$$

Thus

$$P(S|F) = \frac{P(S \cap F)}{P(F)}$$

Step 3: Simplify the intersection.

Since F is a subset of the sample space S,

$$S \cap F = F$$

Thus

$$P(S|F) = \frac{P(F)}{P(F)}$$

Step 4: Simplify the fraction.

$$P(S|F) = 1$$

Step 5: Conclusion.

Hence the conditional probability that the sample space occurs given event F equals 1.

Final Answer: $\boxed{1}$

> **Quick Tip**
>
> The sample space S always contains every event. So once event F has occurred, the event S is certainly true, and its conditional probability becomes 1.
