NCERT Solutions Class 12 Maths
Chapter 3: Matrices
Exercise 3.1

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Quick Summary: In NCERT Solutions Class 12 Maths Chapter 3 Exercise 3.1, students learn about different types of matrices and their fundamental properties through systematic problem-solving. This exercise covers matrix notation, element identification, matrix dimensions, and construction of matrices with given conditions, which are essential building blocks for advanced matrix operations in CBSE board exams.

Key Takeaways:

- Matrix element notation: For matrix A, element in ith row and jth column is denoted as a_ij
- Matrix order relationship: A matrix with mn elements can have multiple possible orders like m × n, n × m, etc.
- Matrix construction: Building 2 × 2 and 3 × 4 matrices using given element formulas like a_ij = f(i,j)
- Foundation concepts: Understanding matrix dimensions and element positioning is crucial for matrix multiplication and transpose operations

Complete Solutions

Question 1

QUESTION

In the matrix

$A = \begin{bmatrix} 2 & 5 & 19 & -7 \\ 35 & -2 & (5)/(2) & 12 \\ \sqrt{3} & 1 & -5 & 17 \end{bmatrix}$

write:

(i) The order of the matrix

(ii) The number of elements

(iii) Write the elements $a_{13}, a_{21}, a_{33}, a_{24}, a_{23}$.

SOLUTION

This question tests your understanding of matrix notation and how to identify elements within a matrix.

(i) The order of the matrix

The order of a matrix is defined as (number of rows) × (number of columns).

In the given matrix , we can see that there are 3 rows and 4 columns.

Therefore, the order of the matrix is .

(ii) The number of elements

The number of elements in a matrix is simply the product of the number of rows and the number of columns.

Since the matrix has an order of , the number of elements is .

(iii) Write the elements .

The notation refers to the element in the th row and th column of the matrix .

Step 1: Find

is the element in the 1st row and 3rd column, which is 19.

So, .

Step 2: Find

is the element in the 2nd row and 1st column, which is 35.

So, .

Step 3: Find

is the element in the 3rd row and 3rd column, which is -5.

So, .

Step 4: Find

is the element in the 2nd row and 4th column, which is 12.

So, .

Step 5: Find

is the element in the 2nd row and 3rd column, which is .

So, .

Final Answer:

(i)

(ii) 12

(iii)

ANSWER

(i) 3 × 4

(ii) 12

(iii) $a_{13} = 19,\ a_{21} = 35,\ a_{33} = -5,\ a_{24} = 12,\ a_{23} = (5)/(2)$

Question 2

QUESTION

If a matrix has 24 elements, what are the possible orders it can have? What, if it has 13 elements?

SOLUTION

This question explores the relationship between the number of elements in a matrix and the possible dimensions (orders) that matrix can have. The order of a matrix is defined as (number of rows) x (number of columns).

Step 1: Understanding Matrix Order

If a matrix has rows and columns, its order is , and it has a total of elements. The question requires us to find all possible pairs of and whose product equals the given number of elements.

Step 2: Finding Possible Orders for 24 Elements

We need to find all pairs of natural numbers whose product is 24. We can list the factors of 24:

1, 2, 3, 4, 6, 8, 12, 24

Now, we can form the possible orders:

-
-
-
-
-
-
-
-

Therefore, the possible orders for a matrix with 24 elements are: .

Step 3: Finding Possible Orders for 13 Elements

Now, we need to find all pairs of natural numbers whose product is 13. Since 13 is a prime number, its only factors are 1 and 13.

Therefore, the possible orders are:

-
-

Therefore, the possible orders for a matrix with 13 elements are: .

Final Answer:

For 24 elements:

For 13 elements:

ANSWER

For 24 elements: 1 × 24, 2 × 12, 3 × 8, 4 × 6, 6 × 4, 8 × 3, 12 × 2, 24 × 1

For 13 elements: 1 × 13, 13 × 1

Question 3

QUESTION

If a matrix has 18 elements, what are the possible orders it can have? What, if it has 5 elements?

SOLUTION

This question explores the relationship between the number of elements in a matrix and the possible dimensions (orders) that matrix can have. The order of a matrix is defined as (number of rows) x (number of columns).

Step 1: Understand the relationship between order and number of elements

If a matrix has order , it means it has rows and columns. The total number of elements in the matrix is given by the product .

Step 2: Find possible orders for a matrix with 18 elements

We need to find all pairs of natural numbers and such that . This involves finding all the factors of 18.

The factors of 18 are: 1, 2, 3, 6, 9, and 18.

Therefore, the possible orders are:

-
-
-
-
-
-

Step 3: Find possible orders for a matrix with 5 elements

We need to find all pairs of natural numbers and such that . This involves finding all the factors of 5.

Since 5 is a prime number, its only factors are 1 and 5.

Therefore, the possible orders are:

-
-

Final Answer:

For 18 elements:

For 5 elements:

ANSWER

For 18 elements: 1 × 18, 2 × 9, 3 × 6, 6 × 3, 9 × 2, 18 × 1

For 5 elements: 1 × 5, 5 × 1

Question 4

QUESTION

Construct a 2 × 2 matrix A = [a_ij], whose elements are given by:

(i) a_ij = ((i + j)^2)/(2)

(ii) a_ij = (i)/(j)

(iii) a_ij = ((i + 2j)^2)/(2)

SOLUTION

This question asks us to construct matrices based on different formulas for calculating the elements . We will calculate each element individually based on the given formula.

(i)

A matrix has the form:

Step 1: Calculate

Step 2: Calculate

Step 3: Calculate

Step 4: Calculate

Final Answer: The matrix is

(ii)

Step 1: Calculate

Step 2: Calculate

Step 3: Calculate

Step 4: Calculate

Final Answer: The matrix is

(iii)

Step 1: Calculate

Step 2: Calculate

Step 3: Calculate

Step 4: Calculate

Final Answer: The matrix is

ANSWER

(i) \beginbmatrix 2 & (9)/(2) \\ (9)/(2) & 8 \endbmatrix

(ii) \beginbmatrix 1 & (1)/(2) \\ 2 & 1 \endbmatrix

(iii) \beginbmatrix (9)/(2) & (25)/(2) \\ 8 & 18 \endbmatrix

Question 5

QUESTION

Construct a 3 × 4 matrix, whose elements are given by:

(i) $a_{ij} = \frac{1}{2} | -3i + j |$

(ii) $a_{ij} = 2i - j$

SOLUTION

This question asks us to construct a matrix, given the formula for its elements. We need to find each element using the provided formulas for parts (i) and (ii).

(i)

Step 1: Understand the matrix dimensions

We need to create a matrix. This means 3 rows and 4 columns. The element in the -th row and -th column is denoted by .

Step 2: Calculate each element

We will calculate each element individually using the given formula .

Step 3: Form the matrix

(ii)

Step 1: Calculate each element

We will calculate each element individually using the given formula .

Step 2: Form the matrix

ANSWER

(i) $\begin{bmatrix} \frac{1}{2} & 0 & \frac{1}{2} & 1 \\ \frac{5}{2} & 2 & \frac{3}{2} & 1 \\ 4 & \frac{7}{2} & 3 & \frac{5}{2} \end{bmatrix}$

(ii) $\begin{bmatrix} 1 & 0 & -1 & -2 \\ 3 & 2 & 1 & 0 \\ 5 & 4 & 3 & 2 \end{bmatrix}$

Question 6

QUESTION

Find the values of x, y and z from the following equations:

(i) \beginbmatrix 4 & 3 \\ x & 5 \endbmatrix = \beginbmatrix y & z \\ 1 & 5 \endbmatrix

(ii) \beginbmatrix x + y & 2 \\ 5 + z & xy \endbmatrix = \beginbmatrix 6 & 2 \\ 5 & 8 \endbmatrix

(iii) \beginbmatrix x + y + z \\ x + z \\ y + z \endbmatrix = \beginbmatrix 9 \\ 5 \\ 7 \endbmatrix

SOLUTION

This question involves finding unknown variables within matrices by equating corresponding elements. We will use the property that two matrices are equal if and only if their corresponding elements are equal.

(i)

Step 1: Equate corresponding elements

By comparing the corresponding elements of the two matrices, we get the following equations:

, , ,

Step 2: Solve for the variables

From the equations above, we directly get the values of , , and .

, ,

Final Answer:

(ii)

Step 1: Equate corresponding elements

By comparing the corresponding elements of the two matrices, we get the following equations:

, , ,

Step 2: Solve for the variables

From , we get .

Now we have and . We can express in terms of from the first equation:

Substitute this into the second equation:

Step 3: Solve the quadratic equation

We can factor the quadratic equation:

So, or .

If , then .

If , then .

Final Answer: or

(iii)

Step 1: Equate corresponding elements

By comparing the corresponding elements of the two matrices, we get the following equations:

...(1)

...(2)

...(3)

Step 2: Solve the system of equations

Substitute equation (2) into equation (1):

Substitute into equation (3):

Substitute into equation (2):

Final Answer:

ANSWER

(i) $x = 1,\ y = 4,\ z = 3$

(ii) $x = 4,\ y = 2,\ z = 0$ or $x = 2,\ y = 4,\ z = 0$

(iii) $x = 2,\ y = 4,\ z = 3$

Question 7

QUESTION

Find the value of a, b, c and d from the equation:

$$\begin{bmatrix} a - b & 2a + c \\ 2a - b & 3c + d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$$

SOLUTION

We are given a matrix equation and asked to find the values of , , , and .

Step 1: Equate corresponding elements

Since the two matrices are equal, their corresponding elements must be equal. This gives us the following system of equations:

(1)

(2)

(3)

(4)

Step 2: Solve for and using equations (1) and (3)

Subtract equation (1) from equation (3):

Substitute into equation (1):

Step 3: Solve for using equation (2)

Substitute into equation (2):

Step 4: Solve for using equation (4)

Substitute into equation (4):

Final Answer:

ANSWER

$a = 1,\ b = 2,\ c = 3,\ d = 4$

Question 8

QUESTION

A = [a_ij]_m × n is a square matrix, if

(A) m < n

(B) m > n

(C) m = n

(D) None of these

SOLUTION

The question asks us to identify the condition for a matrix to be a square matrix.

Step 1: Recall the definition of a square matrix

A square matrix is a matrix with an equal number of rows and columns. In other words, the order of the matrix must be of the form , where is any positive integer.

Step 2: Relate the definition to the given matrix

The given matrix has rows and columns. For to be a square matrix, the number of rows must be equal to the number of columns.

Step 3: Express the condition mathematically

The condition for to be a square matrix is .

Step 4: Analyze the given options

(A) : This means the number of rows is less than the number of columns, which is not a square matrix.

(B) : This means the number of rows is greater than the number of columns, which is also not a square matrix.

(C) : This means the number of rows is equal to the number of columns, which satisfies the condition for a square matrix.

(D) None of these: This is incorrect since option (C) is correct.

Final Answer: The correct answer is (C) .

Conclusion: A matrix is square if and only if the number of rows equals the number of columns. Options A and B represent rectangular matrices, while option D is incorrect because option C correctly identifies the condition for a square matrix.

ANSWER

2

Question 9

QUESTION

Which of the given values of x and y make the following pair of matrices equal?

\beginbmatrix 3x + 7 & 5 \\ y + 1 & 2 - 3x \endbmatrix, \beginbmatrix 0 & y - 2 \\ 8 & 4 \endbmatrix

(A) x = -(1)/(3), y = 7

(B) Not possible to find

(C) y = 7, x = -(2)/(3)

(D) x = -(1)/(3), y = -(2)/(3)

SOLUTION

We are given two matrices and asked to find the values of and that make them equal.

Step 1: Set up equations by equating corresponding elements

For two matrices to be equal, their corresponding elements must be equal. Thus, we have the following equations:

Step 2: Solve for from the first equation

Step 3: Solve for from the second equation

Step 4: Solve for from the third equation

Step 5: Solve for from the fourth equation

Step 6: Check for consistency

We have two different values for : and . Since cannot have two different values simultaneously for the matrices to be equal, there is no solution.

Final Answer: (B) Not possible to find

Explanation of incorrect options:

(A) : Substituting these values does not make all corresponding elements equal.

(C) : While is consistent, only satisfies one of the equations for .

(D) : Neither of these values satisfy the equations derived from equating the matrix elements.

ANSWER

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Question 10

QUESTION

The number of all possible matrices of order 3 × 3 with each entry 0 or 1 is:

(A) 27

(B) 18

(C) 81

(D) 512

SOLUTION

This question tests our understanding of how to count the total number of possible matrices given constraints on their entries.

Step 1: Determine the number of entries in the matrix

A matrix of order has 3 rows and 3 columns. Therefore, the total number of entries in the matrix is .

Step 2: Determine the number of choices for each entry

Each entry in the matrix can be either 0 or 1. This means we have 2 choices for each entry.

Step 3: Calculate the total number of possible matrices

Since there are 9 entries in the matrix, and each entry has 2 possible values, the total number of possible matrices is .

Step 4: Evaluate

.

Therefore, the number of all possible matrices of order with each entry 0 or 1 is 512.

Final Answer: (D) 512

Explanation of incorrect options:

(A) 27 is incorrect because it seems to be calculating which doesn't relate to the problem.

(B) 18 is incorrect as it might be arising from which is not the correct approach.

(C) 81 is incorrect as it might be or , which are not relevant to the problem.

ANSWER

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📐 Key Formulas

Important Formulas for Exercise 3.1

Formula / Concept	Description
Matrix	A matrix is an ordered rectangular array of numbers or functions. The numbers or functions are called the elements or the entries of the matrix.
Order of a Matrix	A matrix having 'm' rows and 'n' columns is called a matrix of order m × n.
Row Matrix	A matrix is said to be a row matrix if it has only one row. For example, A = [a_ij]_1 × n.
Column Matrix	A matrix is said to be a column matrix if it has only one column. For example, A = [a_ij]_m × 1.
Square Matrix	A matrix in which the number of rows is equal to the number of columns is called a square matrix. Thus, for a square matrix, m = n.
Diagonal Matrix	A square matrix A = [a_ij] is said to be a diagonal matrix if all its non-diagonal elements are zero. That is, a_ij = 0 for i ≠ j.
Scalar Matrix	A diagonal matrix is said to be a scalar matrix if its diagonal elements are equal. That is, a_ij = 0 for i ≠ j and a_ij = k for i = j, where k is some constant.
Identity Matrix	A square matrix in which elements in the main diagonal are all 1 and the rest are all 0 is called an identity matrix. It is denoted by I. a_ij = 1 if i = j and a_ij = 0 if i ≠ j.
Zero Matrix (Null Matrix)	A matrix is said to be a zero matrix or null matrix if all its elements are zero. It is denoted by O.
Equality of Matrices	Two matrices A = [a_ij] and B = [b_ij] are said to be equal if: (i) they are of the same order, and (ii) each element of A is equal to the corresponding element of B, that is a_ij = b_ij for all i and j.

Top FAQs

Q1. How many questions are in NCERT Solutions Class 12 Maths Chapter 3 Matrices Exercise 3.1 for CBSE board exam 2025-26?

NCERT Solutions for Class 12 Maths Chapter 3 Matrices Exercise 3.1 contains exactly 10 questions covering various types of matrices including row matrix, column matrix, square matrix, diagonal matrix, scalar matrix, identity matrix, and zero matrix. These questions are designed to help students understand the fundamental concepts of matrices for CBSE Class 12 board exam 2025-26 with step by step solutions available for comprehensive practice.

Q2. Where can I download free PDF of NCERT Solutions for Class 12 Maths Chapter 3 Matrices Exercise 3.1 with step by step solutions?

You can download the free PDF of NCERT Solutions for Class 12 Maths Chapter 3 Matrices Exercise 3.1 from official educational websites and trusted platforms offering CBSE 2025-26 study materials. These PDFs contain detailed step by step solutions for all 10 questions in Exercise 3.1, making it convenient for offline study and board exam preparation.

Q3. How many marks does Chapter 3 Matrices carry in CBSE Class 12 Maths board exam 2025-26 syllabus?

Chapter 3 Matrices carries 5 marks in the CBSE Class 12 Maths board exam 2025-26, as part of Unit II - Algebra. While Exercise 3.1 focuses on types of matrices, the entire chapter including matrix multiplication properties and transpose properties is important for scoring these marks in the board examination.

Q4. Which is the most difficult question in NCERT Solutions Class 12 Maths Chapter 3 Matrices Exercise 3.1 for CBSE board exam preparation?

Questions 9 and 10 in NCERT Solutions Class 12 Maths Chapter 3 Matrices Exercise 3.1 are considered relatively challenging as they involve constructing matrices based on given conditions and understanding multiple matrix types simultaneously. However, with step by step solutions and regular practice, students can easily master these questions for CBSE Class 12 board exam 2025-26.

Q5. What are Matrix Multiplication Properties covered in NCERT Solutions for Class 12 Maths Chapter 3 Matrices Exercise 3.1?

While Exercise 3.1 of NCERT Solutions Class 12 Maths Chapter 3 primarily focuses on types of matrices, matrix multiplication properties including non-commutativity, associativity, and distributive law are covered in subsequent exercises. Understanding types of matrices in Exercise 3.1 provides the foundation for learning these multiplication properties essential for CBSE board exam 2025-26.

More Exercises

Visit all exercises from Chapter 3:

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