

# EQUALITY OF TWO MATRICES

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## Equality of two Matrices



Two [matrices](#)  $A = [a_{ij}]$  and  $B = [b_{ij}]$  are said to be equal if they are of same [order](#) and each element of  $A$  is [equal](#) to the corresponding element of  $B$ , that is  $a_{ij} = b_{ij}$  for all  $i$  and  $j$ . Symbolically we write it as  $A = B$

For example: If 
$$\begin{pmatrix} x + 3 & z + 4 & 2y - 7 \\ -6 & a - 1 & 0 \\ b - 3 & -21 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 6 & 3y - 2 \\ -6 & -3 & 2c + 2 \\ 2b + 4 & -21 & 0 \end{pmatrix}$$

Find the values of  $a$ ,  $b$ ,  $c$ ,  $x$ ,  $y$  and  $z$

Solution: Since the matrices are equal, corresponding elements are equal

$$x + 3 = 0$$

$$x = -3$$

$$z + 4 = 6$$

$$z = 2$$

$$2y - 7 = 3y - 2$$

$$2y - 3y = -2 + 7$$

$$y = -5$$

$$a - 1 = -3$$

$$a = -2$$

$$2c + 2 = 0$$

$$c = -1$$

$$b - 3 = 2b + 4$$

$$b - 2b = 7$$

$$b = -7$$

Hence,  $a = -2$ ,  $b = -7$ ,  $c = -1$ ,  $x = -3$ ,  $y = -5$  and  $z = 2$ .

Try this:

1. Given that the following matrices are equal, find the values of  $x$  and  $y$ .

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

$$B = \begin{pmatrix} x & 2 \\ 3 & y \end{pmatrix}$$

(Answer:  $x = 1$ ,  $y = 4$ )

2. Given that the following matrices are equal, find the values of  $x$ ,  $y$ , and  $z$ .

$$A = \begin{pmatrix} 4 & 0 \\ 6 & -2 \\ 3 & 1 \end{pmatrix}$$

$$B = \begin{pmatrix} x & 0 \\ 6 & y + 4 \\ z/3 & 1 \end{pmatrix}$$

(Answer:  $x = 4$ ,  $y = -6$ , and  $z = 9$ )

## Construction of a Matrix

When the general term and the order of a matrix is given, we can easily construct a matrix.

For example: Construct a  $3 \times 4$  matrix whose elements are given by  $a_{ij} = 2i - j$

Let the matrix be  $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \end{pmatrix}$

$$a_{11} = 2 - 1 = 1 \quad a_{12} = 2 - 2 = 0 \quad a_{13} = 2 - 3 = -1 \quad a_{14} = 2 - 4 = -2$$

$$a_{21} = 4 - 1 = 3 \quad a_{22} = 4 - 2 = 2 \quad a_{23} = 4 - 3 = 1 \quad a_{24} = 4 - 4 = 0$$

$$a_{31} = 6 - 1 = 5 \quad a_{32} = 6 - 2 = 4 \quad a_{33} = 6 - 3 = 3 \quad a_{34} = 6 - 4 = 2$$

$$A = \begin{pmatrix} 1 & 0 & -1 & -2 \\ 3 & 2 & 1 & 0 \\ 5 & 4 & 3 & 2 \end{pmatrix}$$

Now try it yourself! Should you still need any help, [click here](#) to schedule live online session with e Tutor!

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## Reference Links:

- [http://en.wikipedia.org/wiki/Matrix\\_\(mathematics\)](http://en.wikipedia.org/wiki/Matrix_(mathematics))
- [http://www.mathreference.com/la-mpoly\\_order.html](http://www.mathreference.com/la-mpoly_order.html)
- [http://wiki.answers.com/Q/What\\_is\\_order\\_of\\_the\\_resultant\\_matrix\\_AB\\_when\\_two\\_matrices\\_are\\_multiplied\\_and\\_the\\_order\\_of\\_the\\_matrices](http://wiki.answers.com/Q/What_is_order_of_the_resultant_matrix_AB_when_two_matrices_are_multiplied_and_the_order_of_the_matrices)
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