

Vectors and Matrices

Spoken Tutorial Project

<http://spoken-tutorial.org>

National Mission on Education through ICT

<http://sakshat.ac.in>

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Learning Objectives



Learning Objectives

- How to draw a vector



Learning Objectives

- **How to draw a vector**
- **Arithmetic operations on vectors**



Learning Objectives

- How to draw a vector
- Arithmetic operations on vectors
- How to create a matrix



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- How to draw a vector
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- How to create a matrix
- Arithmetic operations on matrices



Learning Objectives

- How to draw a vector
- Arithmetic operations on vectors
- How to create a matrix
- Arithmetic operations on matrices
- **Transpose of a matrix**



Learning Objectives

- How to draw a vector
- Arithmetic operations on vectors
- How to create a matrix
- Arithmetic operations on matrices
- Transpose of a matrix
- Determinant of a matrix



Learning Objectives

- How to draw a vector
- Arithmetic operations on vectors
- How to create a matrix
- Arithmetic operations on matrices
- Transpose of a matrix
- Determinant of a matrix
- Inverse of a matrix



System Requirement



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- **Ubuntu Linux OS v 14.04**



System Requirement

- **Ubuntu Linux OS v 14.04**
- **Geogebra v 5.0.388.0-d**



Pre-requisites



Pre-requisites

- **Geogebra interface**



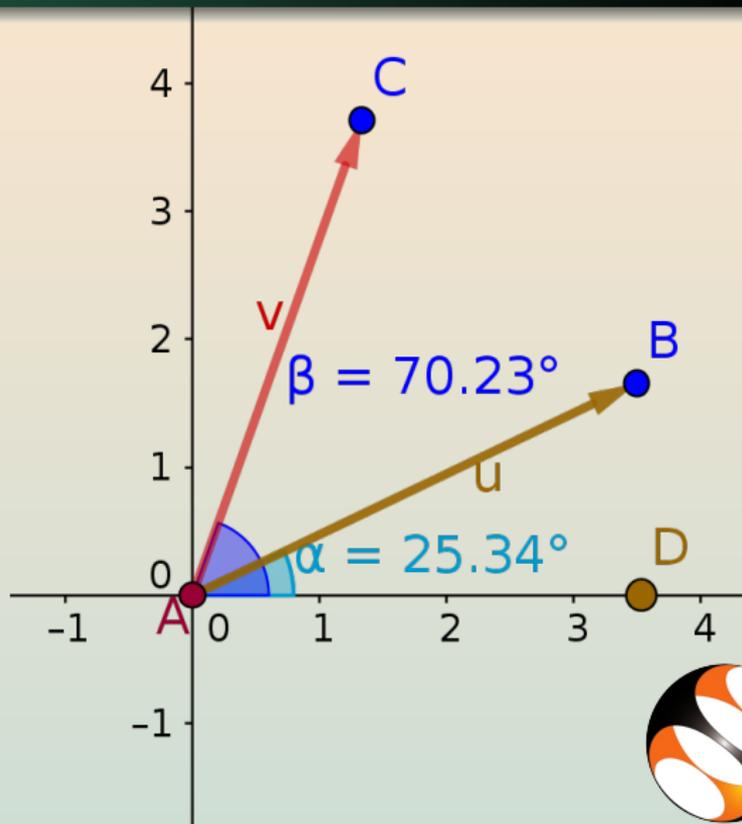
Pre-requisites

- **Geogebra** interface
- For relevant **Geogebra** tutorials, visit our website
www.spoken-tutorial.org



Vector

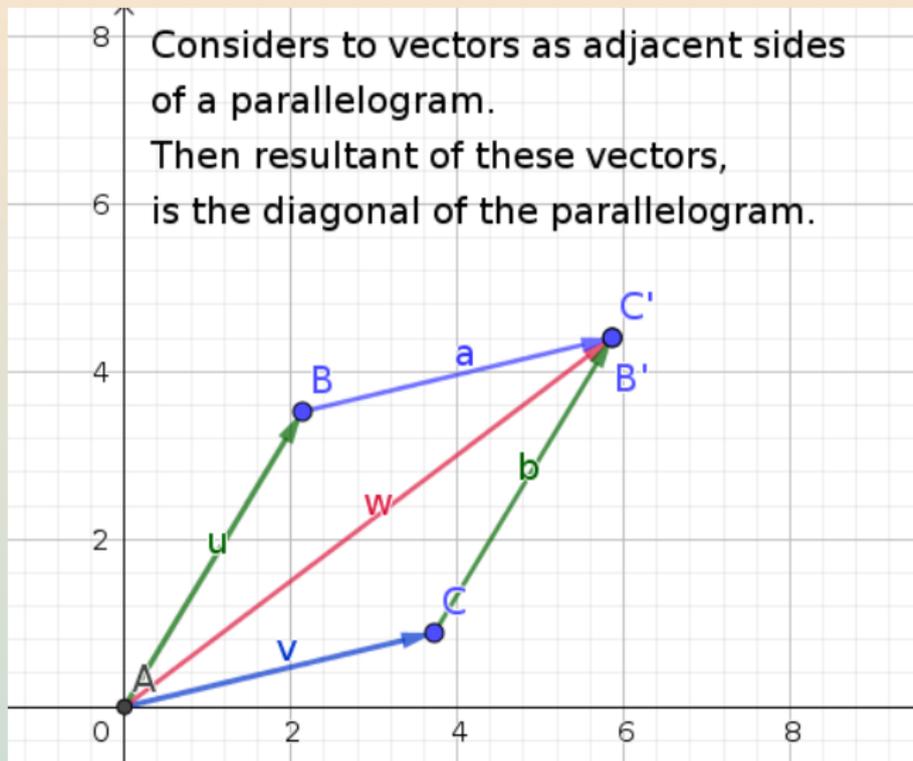
A **vector** is a quantity that has both magnitude and direction



Parallelogram Law of Vector Addition



Parallelogram Law of Vector Addition



Assignment



Assignment

- 1 Subtract the vectors u and v



Assignment

- 1 Subtract the vectors u and v
- 2 Divide a vector by a scalar (ex: $u/3$)



Matrix



Matrix

- A **matrix** is an ordered set of numbers



Matrix

- A **matrix** is an ordered set of numbers
- It is listed in a rectangular form as **m** rows and **n** columns

$$X = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1m} \\ a_{21} & a_{22} & \dots & a_{2m} \\ - & - & \dots & - - - \\ - & - & \dots & - - - \\ a_{n1} & a_{n2} & \dots & a_{nm} \end{bmatrix}$$



Identity Matrix



Identity Matrix

- A unit matrix is $I=[1]$, $m=n=1$



Identity Matrix

- A unit matrix is $I=[1]$, $m=n=1$
- An identity matrix is a square matrix



Identity Matrix

- A unit matrix is $I=[1]$, $m=n=1$
- An identity matrix is a square matrix
- It has all the diagonal elements as 1 and rest of the elements as 0



Identity Matrix



Identity Matrix

$\mathbf{X} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is a 2×2 identity matrix



Identity Matrix

$\mathbf{X} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is a 2×2 identity matrix

$\mathbf{Y} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is a 3×3 identity matrix



Create Matrices



Create Matrices

In GeoGebra we can create a matrix using,



Create Matrices

In GeoGebra we can create a matrix using,

- Spreadsheet view



Create Matrices

In GeoGebra we can create a matrix using,

- Spreadsheet view
- CAS view



Create Matrices

In GeoGebra we can create a matrix using,

- Spreadsheet view
- CAS view
- Input bar



Matrix Multiplication



Matrix Multiplication

- Two matrices X and Y can be multiplied if,



Matrix Multiplication

- Two matrices X and Y can be multiplied if,
- number of columns of X is equal to the number of rows of Y



Matrix Multiplication

- Two matrices **X** and **Y** can be multiplied if,
- number of columns of **X** is equal to the number of rows of **Y**
- **X** is $m \times n$ matrix, **Y** is $n \times p$ matrix



Matrix Multiplication

- Two matrices X and Y can be multiplied if,
- number of columns of X is equal to the number of rows of Y
- X is $m \times n$ matrix, Y is $n \times p$ matrix
- $X \times Y$ is a matrix of order $m \times p$



Assignment



Assignment

1 Subtract matrices



Assignment

- 1 Subtract matrices
- 2 Multiply matrices of same order and different order



Inverse of a Matrix



Inverse of a Matrix

- A square matrix P has an inverse,



Inverse of a Matrix

- A square matrix **P** has an inverse,
- only if the determinant of **P** is not equal to zero ($|P| \neq 0$)



Assignment



Assignment

- 1 Find the determinant and inverse of Matrices B and C



Summary



Summary

- How to draw a vector
- Arithmetic operations on vectors
- How to create a matrix
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- Transpose of a matrix
- Determinant of a matrix
- Inverse of a matrix



About the Spoken Tutorial Project

- Watch the video available at http://spoken-tutorial.org/What_is_a_Spoken_Tutorial
- It summarises the Spoken Tutorial project
- If you do not have good bandwidth, you can download and watch it



Spoken Tutorial Workshops

The Spoken Tutorial Project Team

- Conducts workshops using spoken tutorials
- Gives certificates to those who pass an online test
- For more details, please write to contact@spoken-tutorial.org



Forum for specific questions

- Do you have questions in THIS Spoken Tutorial?
- Please visit <http://forums.spoken-tutorial.org>
- Choose the minute and second where you have the question
- Explain your question briefly
- Someone from our team will answer them



Forum for specific questions

- **The Spoken Tutorial forum is for specific questions on this tutorial**
- **Please do not post unrelated and general questions on them**
- **This will help reduce the clutter**
- **With less clutter, we can use these discussion as instructional material**



Acknowledgements

- Spoken Tutorial Project is a part of the Talk to a Teacher project
- It is supported by the National Mission on Education through ICT, MHRD, Government of India
- More information on this Mission is available at

<http://spoken-tutorial.org /NMEICT-Intro>

