```
import numpy as np #importing numpy,matplotlib and math library
import math
import matplotlib.pyplot as plt
```

Representation of a vector in form of unit vectors

r=xi+yj+zk

x,y and z are the magnitude.
|r|=$\sqrt{x^2+y^2+z^2}$

Magnitude of a vector.

```
vector=np.array([2,4,7])
magnitude_vector=np.linalg.norm(vector)
print("The magnitude of this vector",vector, "is :",magnitude_vector)
```

```
The magnitude of this vector [2 4 7] is : 8.306623862918075
```

```
np.sqrt(2**2+4**2+7**2)
```

```
8.306623862918075
```

Horizontal and Vertical Components of a Vector

Ax= Acosx

Ay= Asinx

```
an=45
A= np.array([5,4])
Ax=A[0]*np.cos(an)
Ay=A[1]*np.sin(an)
Ax,Ay
```

```
(2.626609944088649, 3.4036140981364738)
```

Defining function for finding magnitude.

```
def theta(a,b): #defining a function that will derive the angle between two vectors if dim
  m1=np.linalg.norm(a)
  m2=np.linalg.norm(b)
  r=np.dot(a,b)
  print(np.arccos(r/(m1*m2))*180/math.pi)
```

Angle between a and b

```
a=np.array([5,4,-6])
b=np.array([-2,2,3])
theta(a,b) # the function has already converted the answer to degrees.
```

```
123.55862948381244
```

Angle between a and x

```
x=np.array([1,0,0])#angle from a to x-axis
theta(a,x)
```

```
55.26351871874204
```

Angle between a and y

```
y=np.array([0,1,0])#angle from a to y-axis
theta(a,y)
```

```
62.88085722661892
```

Angle between a and z

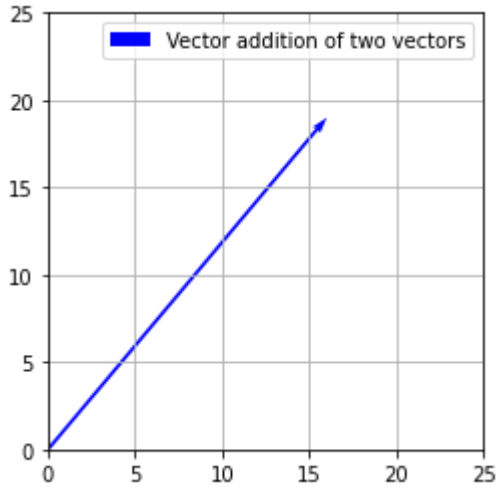
```
z=np.array([0,0,1])#angle from a to z-axis
theta(a,z)
```

```
133.13843761967107
```

Resultant Vector

```
V1=np.array([10,10])#vector 1
V2=np.array([6,9])#Vector 2
result=np.add(V1,V2)#addition of vectors
array = np.array([[0, 0,result[0], result[1]]])#making an array which hass 0 as its first
X, Y, U, V = zip(*array) #zip is saving the value of 1st index in X , 2nd in Y and so on.
fig , ax = plt.subplots()
```

```
 q = ax.quiver(X, Y, U, V,color = 'b', units='xy' ,scale=1)
 plt.grid()
 ax.set_aspect('equal') #this makes the grid equal

 plt.xlim(0,25)
 plt.ylim(0,25)
plt.legend(['Vector addition of two vectors'])
 plt.show()
```



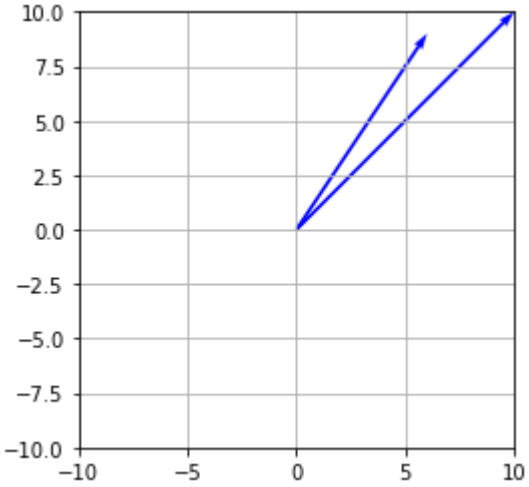
Question1

Creating a function for plotting vectors

```
def vector_plot(i,j,a,b):
 X = np.array((0,0))
 Y= np.array((0,0))    #here (x,y)=(0,0) specifes the origin. it is also the starting poin
 U = np.array((i,a))
 V = np.array((j,b)) #(u,v) is the coordinates/dimensions of the vector or the end point.

 fig, ax = plt.subplots()
 q = ax.quiver(X, Y, U, V,color = 'b', units='xy' ,scale=1)#b means blue specifying the co
 #scale decides the size of the plot and is indirectly proportional to it


 plt.grid() #this plots the grid

 ax.set_aspect('equal') #this makes the grid equal

 plt.xlim(-10,10)
 plt.ylim(-10,10) #these limits define the length of the axes in the poitive and negative
 plt.show()
```

Plotting vector 1(10i + 10j) and vector 2(6i+9j)

```
vector_plot(10,10,6,9)
```



Question 2

```
displacement=13
Horizontal_displacement=displacement*np.cos(22*math.pi/180)
Height=displacement*np.sin(22*math.pi/180)
print(Horizontal_displacement)
print(Height)
```

```
12.053390109368237
4.869885714406856
```

The block was moved 12.05m horizontally and the height of the block at that point was 4.87m.