

Angle of Vector

Use the matrix operation feature to find the angle θ which forms the standard vector and vector. The angle can be calculated at one time against the multiple vectors.

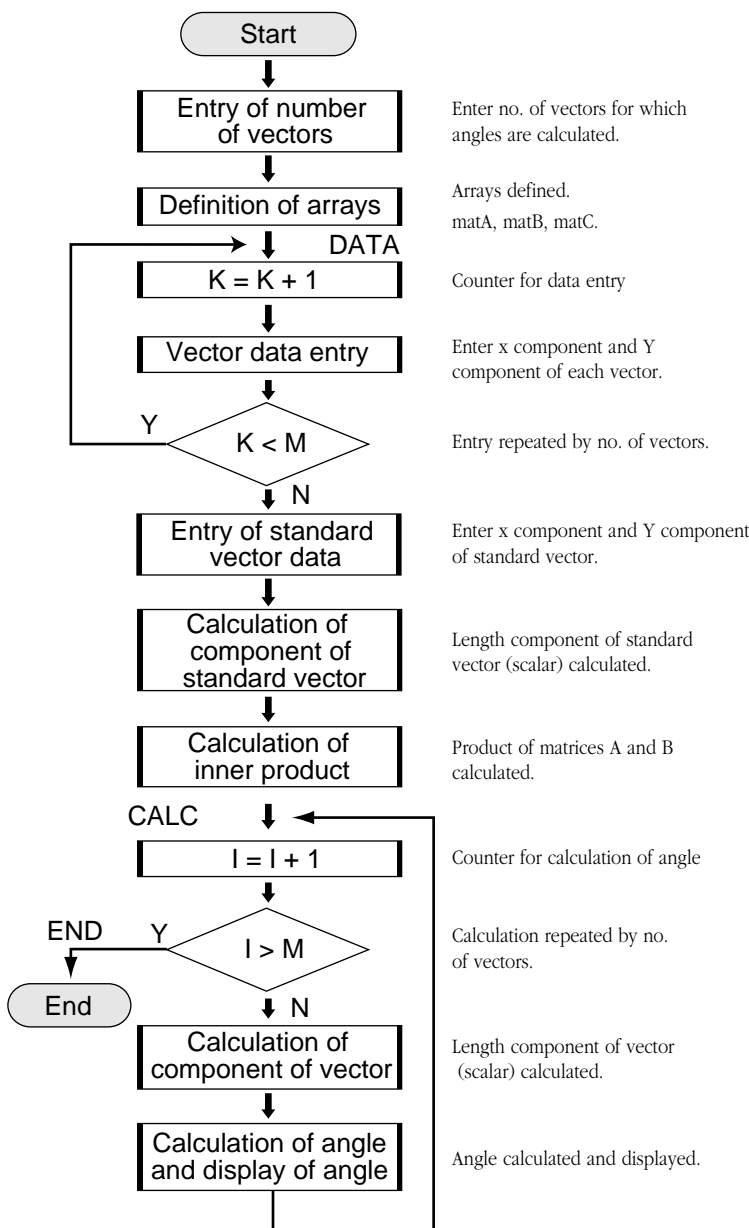
Calculation

Calculating vector inner product $\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos \theta$

Use the above expression to derive the following expression

$$\theta = \cos^{-1} \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|}$$

FLOWCHART



PROGRAM LIST (MATRIX MODE)

```

Title : VECTOR
0 ⇨ I
0 ⇨ K
Print " Input NUMBER
Input N
N ⇨ M
{M,2} ⇨ dim (mat A)
{2,1} ⇨ dim (mat B)
{M,1} ⇨ dim (mat C)
Label DATA
K + 1 ⇨ K
Print " Input VECTOR
Print K
Input X
X ⇨ mat A(K,1)
Input Y
Y ⇨ mat A(K,2)
If K < M Goto DATA
Print "Input FUNDAMENTAL VECTOR
Input X
X ⇨ mat B(1,1)
Input Y
Y ⇨ mat B(2,1)
√ (mat B(1,1)² + mat B(2,1)²) ⇨ B
mat A * mat B ⇨ mat C
Label CALC
I + 1 ⇨ I
If I > M Goto END
√ (mat A(I,1)² + mat A(I,2)²) ⇨ A
cos⁻¹ (mat C(I,1) / (A * B)) ⇨ θ
Print "ANGLE OF VECTOR
Print I
Print "θ=
Print θ
Wait
Goto CALC
Label END
End
  
```

PARAMETERS

Name of parameter	Content	Name of parameter	Content
A	vector scalar quantity	θ	vector angle
B	standard vector scalar quantity	K	display
I	calculating counter	N	input of number of vectors
K	input counter	mat A	vector components
M	number of vectors	mat B	standard vector components
X	input of x component	mat C	vector inner product
Y	input of y component		

Exercise

Calculate the angle formed by the following 3 vectors and standard vector (2,3).

vector 1 (5, 8)

vector 2 (7, 4)

vector 3 (9, 2)

Set up condition: angle unit in Deg mode, and decimal point in Float Pt mode.

2nd F **SET UP** **B*** **1*** **C*** **1*** **CL**

Step

Key Operation

Display

- | | | | |
|----------|---|--|--|
| 1 | Specify the program mode.
Select the title VECTOR. | 2nd F PRGM A * | |
| 2 | Enter the number of vectors. | 3 ENTER | |
| 3 | Enter the values of vector 1. | 5 ENTER 8 ENTER | |
| 4 | Enter the values of vectors 2 and 3. | 7 ENTER 4 ENTER
9 ENTER 2 ENTER | |
| 5 | Enter the value of standard vector.

(Display of angle of vector 1) | 2 ENTER 3 ENTER | |
| 6 | (Display of angle of vector 2)

(Display of angle of vector 3) | ENTER

ENTER | |