

## Problem 3.4.4

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## Question

**Question:** Construct a rectangle whose adjacent sides are of lengths 5cm and 3.5cm.

## Solution

**SOLUTION** as mentioned in question adjacent sides are of lengths 5cm and 3.5cm.

as nothing is mentioned in question about the points :

so we are taking rectangle as ABCD :

where position vector of respective points are :

$$\mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 5 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 3 \\ 0 \end{pmatrix},$$

## Solution

our assumed coordinates are satisfying all the properties of rectangle :

$$(\mathbf{B} - \mathbf{A})^\top (\mathbf{C} - \mathbf{B}) = 0$$

$$(\mathbf{C} - \mathbf{B})^\top (\mathbf{D} - \mathbf{C}) = 0$$

$$(\mathbf{D} - \mathbf{C})^\top (\mathbf{A} - \mathbf{D}) = 0$$

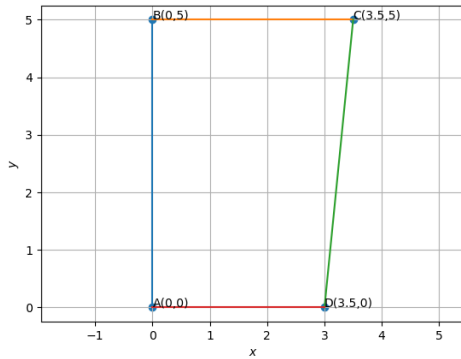
$$(\mathbf{A} - \mathbf{D})^\top (\mathbf{B} - \mathbf{A}) = 0$$

$$(\mathbf{B} - \mathbf{A})^\top (\mathbf{B} - \mathbf{A}) = 25$$

$$(\mathbf{C} - \mathbf{B})^\top (\mathbf{C} - \mathbf{B}) = 9$$

$$(\mathbf{D} - \mathbf{C})^\top (\mathbf{D} - \mathbf{C}) = 25$$

$$(\mathbf{A} - \mathbf{D})^\top (\mathbf{A} - \mathbf{D}) = 9$$



# C Code

```
#include <stdio.h>

int main() {
    // Rectangle vertices
    int Ax = 0, Ay = 0;
    int Bx = 0, By = 5;
    int Cx = 3, Cy = 5;
    int Dx = 3, Dy = 0;
```

## C Code

```
    printf("Coordinates of the rectangle are:\n");  
    printf("A(%d, %d)\n", Ax, Ay);  
    printf("B(%d, %d)\n", Bx, By);  
    printf("C(%d, %d)\n", Cx, Cy);  
    printf("D(%d, %d)\n", Dx, Dy);  
  
    return 0;  
}
```

# Python Code for Plotting

```
import numpy as np
import matplotlib.pyplot as plt
from line.funcs import *
# from triangle.funcs import *
# from conics.funcs import circ_gen
# if using termux
import subprocess
import shlex
# end if
```



# Python Code for Plotting



# Python Code for Plotting

```
# Rectangle vertices
A = np.array([0,0]).reshape(-1,1)
B = np.array([0,5]).reshape(-1,1)
C = np.array([3,5]).reshape(-1,1)
D = np.array([3,0]).reshape(-1,1)

coords = np.block([[A,B,C,D]])
# Generate only rectangle sides
AB = line_gen(A,B)
BC = line_gen(B,C)
CD = line_gen(C,D)
DA = line_gen(D,A)
```

# Python Code for Plotting

```
# Plot sides
plt.plot(AB[0,:],AB[1,:], label='AB')
plt.plot(BC[0,:],BC[1,:], label='BC')
plt.plot(CD[0,:],CD[1,:], label='CD')
plt.plot(DA[0,:],DA[1,:], label='DA')

# Scatter points
plt.scatter(coords[0,:],coords[1,:])
plt.text(A[0],A[1],"A(0,0)")
plt.text(B[0],B[1],"B(0,5)")
plt.text(C[0],C[1],"C(3,5)")
plt.text(D[0],D[1],"D(3,0)")
```

# Python Code for Plotting

```
plt.xlabel('$x$')
plt.ylabel('$y$')
plt.legend(loc='best')
plt.grid(True)
plt.axis('equal')

plt.savefig('../figs/img.png')
plt.show()
```