3.2.32

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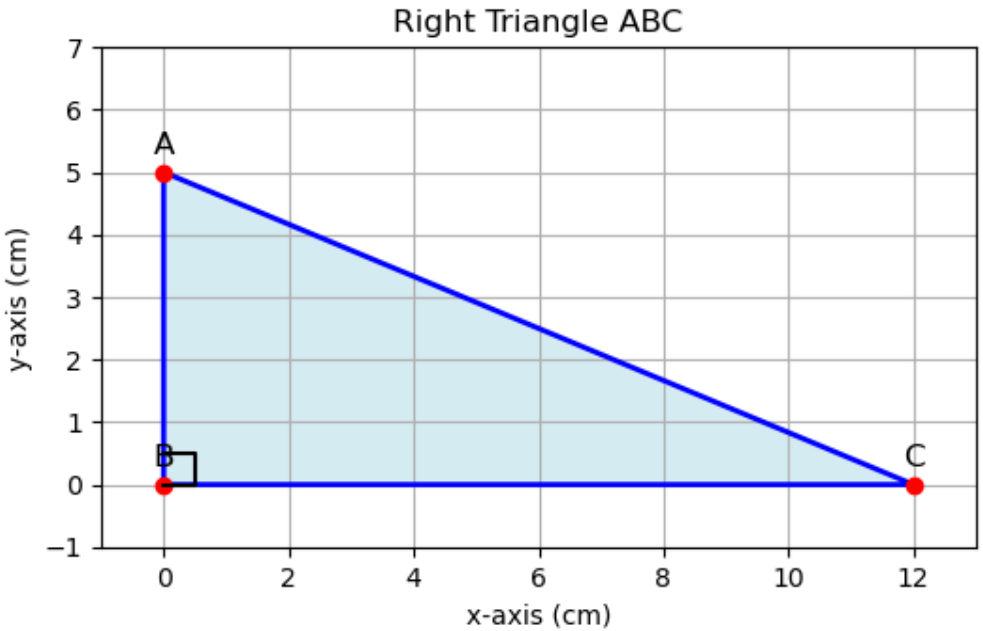
Question

Draw a right triangle ABC in which BC $= 12$ cm, AB $= 5$ cm and $\angle B = 90^\circ$.

Solution

Let's consider the triangle with vertices,

$$\mathbf{A} = \begin{pmatrix} 0 \\ 5 \end{pmatrix} \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \mathbf{C} = \begin{pmatrix} 12 \\ 0 \end{pmatrix} \tag{1}$$



C Code

```c
#include <stdio.h>

// Function to fill the coordinates of A, B, C
// coords must be a double array of size 6
// Format: [Ax, Ay, Bx, By, Cx, Cy]
void get_triangle_coords(double *coords) {
    // Right triangle with B at (0,0), C on x-axis, A on y-axis
    coords[0] = 0.0; // A.x
    coords[1] = 5.0; // A.y
    coords[2] = 0.0; // B.x
    coords[3] = 0.0; // B.y
    coords[4] = 12.0; // C.x
    coords[5] = 0.0; // C.y
}
```

C plus Py Code

```
import ctypes
import matplotlib.pyplot as plt

# Load shared library
lib = ctypes.CDLL('./libtriangle.so')

# Create array for coordinates
coords = (ctypes.c_double * 6)()

# Call C function
lib.get_triangle_coords(coords)

# Extract points
A = (coords[0], coords[1])
B = (coords[2], coords[3])
C = (coords[4], coords[5])
```

C plus Py Code

```
# Plot
x_coords = [A[0], B[0], C[0], A[0]]
y_coords = [A[1], B[1], C[1], A[1]]

plt.figure(figsize=(6,6))
plt.plot(x_coords, y_coords, 'b-', linewidth=2)
plt.fill(x_coords, y_coords, 'lightblue', alpha=0.5)

for point, name in zip([A, B, C], ['A', 'B', 'C']):
    plt.text(point[0], point[1]+0.3, name, fontsize=12, ha='
        center')
    plt.plot(point[0], point[1], 'ro')

plt.plot([0, 0.5, 0.5, 0], [0, 0, 0.5, 0.5], 'k-') # right angle
    marker
```

C plus Py Code

```
plt.gca().set_aspect('equal', adjustable='box')
plt.xlim(-1, 13)
plt.ylim(-1, 7)
plt.title(Right Triangle ABC (from C function))
plt.savefig(/sdcard/matrix/ee1030-2025/ai25btech11016/matgeo
    /3.2.32/figs/3.2.32.png)
plt.show()
```

Py Code

```
import matplotlib.pyplot as plt

# Coordinates of the vertices
B = (0, 0)
C = (12, 0)
A = (0, 5)

# Extract x and y coordinates
x_coords = [A[0], B[0], C[0], A[0]]
y_coords = [A[1], B[1], C[1], A[1]]

# Plot triangle
plt.figure(figsize=(6,6))
plt.plot(x_coords, y_coords, 'b-', linewidth=2)
plt.fill(x_coords, y_coords, 'lightblue', alpha=0.5)
```

Py Code

```
# Mark vertices
for point, name in zip([A, B, C], ['A', 'B', 'C']):
    plt.text(point[0], point[1]+0.3, name, fontsize=12, ha='
        center')
    plt.plot(point[0], point[1], 'ro')

# Right angle marker at B
plt.plot([0, 0.5, 0.5, 0], [0, 0, 0.5, 0.5], 'k-')
```

Py Code

```
# Axes setup
plt.gca().set_aspect('equal', adjustable='box')
plt.xlim(-1, 13)
plt.ylim(-1, 7)
plt.xlabel('x-axis (cm)')
plt.ylabel('y-axis (cm)')
plt.title('Right Triangle ABC')
plt.grid(True)
plt.savefig(/sdcard/matrix/ee1030-2025/ai25btech11016/matgeo
    /3.2.32/figs/3.2.32.png)
plt.show()
```