

Overview

In this lesson, you will learn how to draw **polygons directly on the Tk canvas** using the turtle library. Polygons allow you to connect multiple line segments together to form a closed shape that can be **filled**, unlike regular canvas lines which only create outlines.

Important Information

Polygons are one of the most flexible drawing tools on the canvas. They are similar to lines, but with an important difference:

- **Lines** connect points and draw only an outline
- **Polygons** connect points, automatically close the shape, and can be filled with color

Canvas Coordinates in Turtle Graphics

When using the turtle canvas:

- **(0, 0)** is the **center of the canvas**
- Positive **x** values move to the right
- Negative **x** values move to the left
- Positive **y** values move **down**
- Negative **y** values move **up**

This is different from standard Tkinter canvases, but turtle adjusts the coordinate system so the center is **(0, 0)**.

Creating a Polygon

Polygons are created using:

```
canvas.create_polygon(x1, y1, x2, y2, x3, y3)
```

Each pair of numbers represents a point:

- **(x1, y1)** → first corner
- **(x2, y2)** → second corner
- **(x3, y3)** → third corner
- Additional points can be added as needed

The canvas:

- Connects the points in order
- Automatically connects the last point back to the first
- Creates a closed shape

How Polygons Compare to Lines

Lines:

```
canvas.create_line(x1, y1, x2, y2, x3, y3)
```

- Connect multiple segments
- Do **not** fill
- Only draw outlines

Polygons:

```
canvas.create_polygon(x1, y1, x2, y2, x3, y3)
```

- Connect the same way as lines
- Automatically close the shape
- Can be filled with color

Outline Color

You can set the polygon's outline color using **outline**:

```
canvas.create_polygon(
    x1, y1, x2, y2, x3, y3,
    outline="black"
)
```

Fill Color

You can fill the inside of the polygon using **fill**:

```
canvas.create_polygon(
    x1, y1, x2, y2, x3, y3,
    fill="yellow"
)
```

If no fill color is provided, the polygon will not be filled.

Border Thickness

You can control the thickness of the polygon's outline using **width**:

```
canvas.create_polygon(
    x1, y1, x2, y2, x3, y3,
    width=4
)
```

Dashed Outlines

You can create dashed polygon outlines using **dash**:

```
canvas.create_polygon(
    x1, y1, x2, y2, x3, y3,
    dash=(8, 4)
)
```

Dashed settings affect only the outline, not the fill.

Combining Settings

All polygon settings can be combined in a single call:

```
canvas.create_polygon(
    -50, -50,
    50, -50,
    0, 50,
    outline="blue",
    fill="lightblue",
    width=3
)
```

Set Up

Create a new Python file called **canvas_polygons.py**.

Copy, Change, Challenge

Copy

Copy and run the following code.

```
import turtle

screen = turtle.Screen()
canvas = screen.getcanvas()

canvas.create_polygon(
    -50, -50,
    50, -50,
    0, 50
)

turtle.done()
```

You should see a triangle centered on the canvas.

Change

Modify the polygon so that:

- The shape has more than three points
- The polygon is filled with a color
- The outline color is different

Run the program again and observe the result.

Challenge

Create multiple polygons so that:

- One polygon is centered at **(0, 0)**
- One polygon extends into negative x and y values
- One polygon clearly demonstrates filling (outline + fill)