

Unit 5: The TI Modules

Skill Builder 2: Drawing with Python

In this lesson, you will experience the thrill of graphical programming using the drawing tools.

**Objectives:**

- Draw an emoji (smiley face)
- Use `set_window`, `set_color`, and `set_pen` options
- Drawing shapes

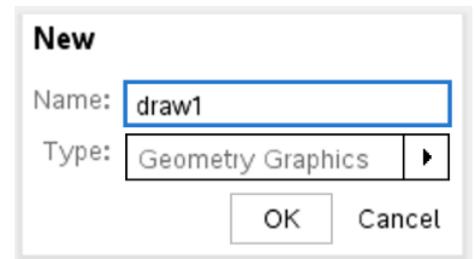
Graphics are on every electronic device we touch. The ability to make our own graphical designs and interactive animations gives us a tool to put our imaginations to work and give us an outlet for creative expression while learning programming.

Your project will be to draw an emoji: the smiley face...



1. Start a new Python file using the Type: *Geometry Graphics*

This template provides the `ti_draw` module in your program. It contains many tools to create custom graphical displays.



2. When you use any of the `ti_draw` commands a drawing 'canvas' appears on top of the Python Shell. The canvas does not go away until the program is 'Finished'.

Your first `ti_draw` command establishes the canvas coordinate system.

From **menu > More Modules > TI Draw > Control**, select `set_window()`.

Use -10, 10, -7, 7 for the window:

**`set_window(-10, 10, -7, 7)`**



# 10 Minutes of Code - Python

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## UNIT 5: SKILL BUILDER 2

### STUDENT ACTIVITY

- Run the program now and you will see the blank canvas with a title bar that says 'Finished'. Press any key to see the Shell again. Go back to the program...



the 'canvas'

- Draw a yellow filled circle. This requires two statements: one to make the color and one to draw the filled circle.

Get **set\_color** from **menu > More Modules > TI Draw>Control**.

(Notice the pop-up tool tips explaining the range of values allowed.)

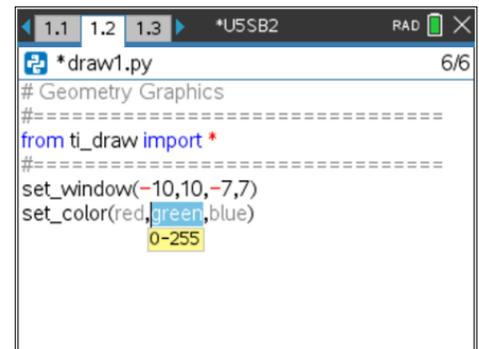
Use the color (255,255,0) to make yellow:

**set\_color(255,255,0)**

The three values are the amount of red, green, and blue, respectively, to mix together.

Each value is limited to the range 0...255 as shown in the three tool tips.

Try some other number combinations. There are over 16 million different colors available (256\*\*3)! We are mixing red and green to get yellow! Go figure.

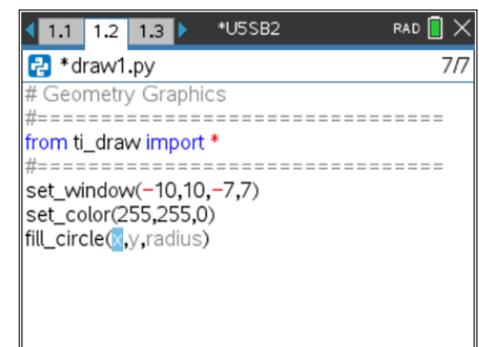


- The circle comes next.

From **menu > More Modules > TI-Draw > Shape**, select **fill\_circle()**.

Now, thinking about the window setting, make a nice big circle with center (x, y) at the origin and use a radius so that the entire circle is on the screen.

Try it now...





# 10 Minutes of Code - Python

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## UNIT 5: SKILL BUILDER 2

### STUDENT ACTIVITY

6. We chose:

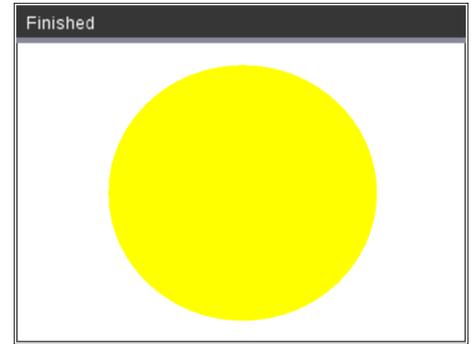
```
fill_circle(0,0,6)
```

Run the program to see the result so far.

Congratulations: your first drawing!

Try other numbers in the **fill\_circle( )** statement. Try mixing other colors in the **set\_color( )** statement.

Let's do more...



7. Before we draw the smile and the eyes, let's take a look at **draw\_rect**.

Add the two statements:

```
set_color(0,0,0)      (This is black.)
```

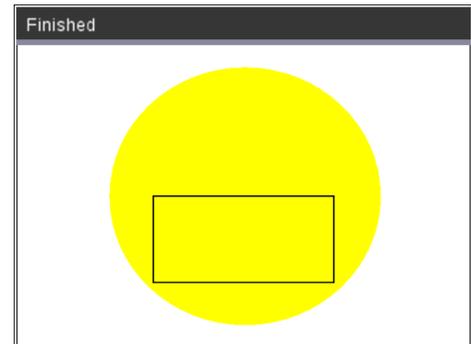
```
draw_rect(-4,-4,8,4)
```

Run the program.

**draw\_arc()** draws an arc *inside* this rectangle using *the exact same arguments* plus a *startangle* and *arcangle* (in degrees). To see an arc, add

```
draw_arc(-4,-4,8,4,0,270)
```

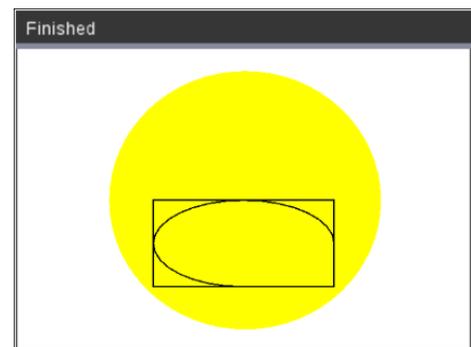
to your program below **draw\_rect**. Then, run again to see the effect.



8. Explanations:

In **draw\_rect** and **draw\_arc**, the first two numbers (x,y) or (-4,-4) are the lower left corner of the rectangle. 8 is the *width (left-to-right)* and 4 is the *height (bottom-to-top)*.

**draw\_arc** draws an *elliptical* arc inscribed in the rectangle. The center of the ellipse is the center of the rectangle. The entire ellipse is drawn when the *startangle* is 0° (or any number) and the *arcangle* is 360° (or more). A part of an ellipse is drawn when the *arcangle* is less than 360°. Our choices of a *startangle* of 0° and an *arcangle* of 270° illustrate that 0° is 'east' (to the right) and the measurement goes counterclockwise, thus drawing ¾ of the ellipse.



9. Change the `draw_arc` statement to

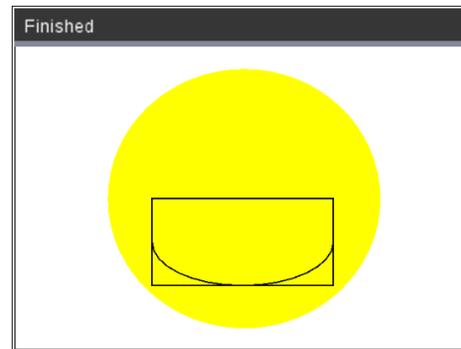
**`draw_arc(-4,-4,8,4,180,180)`**

which means 'start at 180 degrees and go 180 degrees' around (counterclockwise).

(0 degrees is to the right, 180 is to the left)

This draws the lower half of the ellipse. Try other angles.

Now, *do not erase* but...turn the `draw_rect` statement into a comment by pressing **ctrl+T** anywhere on the line. This removes the rectangle from the drawing without removing the code from the program... just in case you need it again.



10. To make the smile thicker, use (just before `draw_arc`):

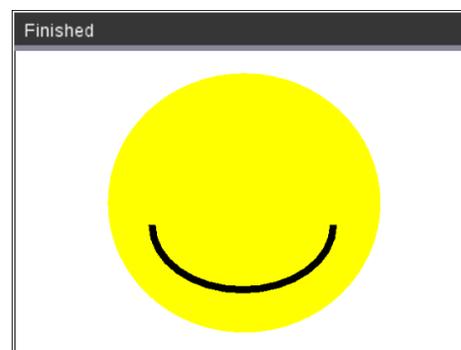
**`set_pen("thick","solid")`**

This is found on **menu > More Modules > TI Draw > Control**.

`set_pen` has two arguments:

- pen *thickness* can be one of thin, medium, or thick
- pen *style* can be one of solid, dashed, or dotted

You can also use the numbers 0, 1, or 2 for both arguments.



11. Draw the eyes using two `fill_arc` statements. Remember that the structure is:

**`fill_arc(lower-left-x, lower-left-y, width-right, height-up, 0, 360)`**

Finally, use `draw_circle()` to surround the yellow circle with a black border. Try it yourself!

What emoji can you make? How about a cartoon character?

