Unit 2: Input, Output and Functions | **Skill Builder 3: The Midpoint Formula**

In this lesson, you will write and use a function that is used more than once

Objectives:

- Review the midpoint formula
- Use uppercase in a variable
- Store the result of a function in a variable
- Return two values from a function

In coordinate geometry there is a method for determining the coordinates of the **midpoint of a line segment** given the coordinates of the endpoints. Write a program that determines the midpoint's coordinates.

There are two midpoint formulas that are really the same formula (the arith**METIC mean** of two numbers) using different variables:

$$midX = (x_1 + x_2) / 2$$
$$midY = (y_1 + y_2) / 2$$

1. In a new Python file (our file is named MIDPOINT), select **<Fns…>** and use the **def** function( )**:** template.

   Name the function **midpt**( ).

2. This time write the main program first, then come back to code the midpt( ) function last. Place your cursor at the *beginning* of a blank line below the function name. Write the four **input** statements to enter the four coordinates of the endpoints using x1, y1, x2, y2 as the four variables. Try it before moving to the next step.

   Remember to take advantage of copy/paste. You can copy once, then paste three times.

3. The image on the right shows all four input statements. The first is:

   x1 = float(input("x1 = "))

Copy and paste comes in handy here. With your cursor on the **x1=** line, select **<Tools> Copy Line** and then **select <Tools> Paste Line Below** three times. Then be sure to edit the pasted code to suit.

4. Write **two** assignment statements to store the result of the **midpt**( ) function into **two different** variables:

midX = midpt(x1, x2)
midY = midpt(y1, y2)

(We are using the *same function* for two *different* sets of variables.)

Write the **print** statement to display the complete midpoint:

print('midpoint = ',)

Can you complete this statement so that the output appears as an ordered pair? For example: midpoint = **(13, 5)**

5. Now go back to complete the **midpt( )** function.

Use two arguments. It is better to use two new variables as arguments:

midpt(**a, b**):
♦ ♦

Try completing the function now. Then compare your work to the next step.

6. The body of the function consists of one calculation:

♦ ♦**avg = (a + b) / 2**

and the **return** statement:

♦ ♦**return avg**

We use the variable **avg** *because the expression is calculating the average or arithmetic mean of the two arguments.*

Make sure that these two statements are indented the same amount. Recall that **return** is found on **<Fns…>**.

7. If you have completed the print statement, then run the program and enter four values at the prompts. Does your output resemble ours?

Summary: Python functions can be used many times during a program.

Displaying output in a pleasing format can be tricky. Our **print** statement is:

print("midpoint = (", midX, ", ", midY, ")")

with extra spacing to see where the quotes and commas belong.

Why are there decimals in the output? Because we used **float( )** *in the input statements.*