



# Python Coding Lesson

<b>Lesson Title:</b>	<b>Programming Midpoint and Distance Calculator</b>
<b>Grade Level:</b>	<b>High School</b>
<b>Subject:</b>	<b>Math</b>
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## Engagement:

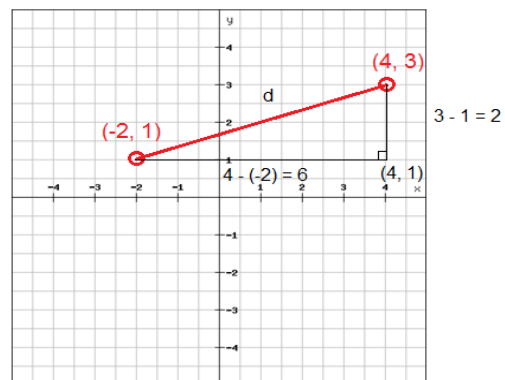
- Describe how the teacher will capture students' interest.
  - Students will watch Youtube video to review midpoint, distance, and their formulas.
    - Play video until 1:09 (midpoint video)
    - <https://youtu.be/2T7m9uYkcuQ>
    - <https://youtu.be/otljzKlnXc>
    - Play video until 1:19 (distance video)
- What kind of questions should the students ask themselves after the engagement?
  - How will I implement these equations as functions?
  - How can I use square root in python?
  - Would I be able to use this to calculate the miles between two places like the video showed the GPS?
  - How can I make my program similar or into a GPS?
  - Do they have the same parameters or variables?
  - Will I need conversion formulas if I do make this program a GPS?

**Distance Formula**

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

**Midpoint Formula**

$$\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$



Sources: <https://www.mathplanet.com/education/algebra-1/radical-expressions/the-distance-and-midpoint-formulas>

<https://www.sophia.org/tutorials/13-use-midpoint-and-distance-formula>



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## Exploration:

- Students need to code a program that calculates midpoint and distance from scratch
  - Students will work in ability based groups of two.
  - Each group will need to create two functions. One for distance, and one for midpoint.
  - Students also need to properly call functions
  - Students may use previous lessons for guidance.
- Teachers will ask big idea conceptual questions to encourage student exploration.
  - “Does order matter when defining parameters of functions?”
  - “Taking the square root of a number is the same thing as raising a number to what?”
  - “How many times do we have to ask the user for input?”

<https://repl.it/@DanMMiller/Midpoint-distance-calculator>

## Explanation:

- Students share out their code to the class
- The teacher will help students connect the explore with the material being learned
  - Ask students what each function does and how it works
  - The students will share problems they faced while creating their program
- The teacher will ask higher order thinking questions to solicit *student* explanations and help them to justify their explanations.
  - Could you run this code without using functions?
  - Why is it better to use functions for this program?
  - How many parameters did you use for each function? Why?

## Elaboration:

- The vocabulary that will be introduced and how will it connect to students' observations?
  - Function
    - Constructs to structure programs
  - Parameter



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- Arguments, when a function is called; a special variable that is used to pass information between functions
  - Emphasize the difference between positional parameters and default parameters and sufficiency when writing code
    - Elevator analogy
      - Making code shorter and more complex
- How is this knowledge applied in our daily lives?
  - Students will be asked what other potential things they would be able to code that would make this class easier?
  - What about in their everyday life?
    - GPS
- Students will be asked to code another program that is relevant to this class.
  - Students can choose any topic or formula to use
  - Students will stay in their ability based groups

## Evaluation:

- There are two main ways students will show that they achieved the lesson objective
  - Students will return the entire Python 2.7 code to be graded
  - Students will also be formatively assessed throughout the lesson through questions to test their understanding..