

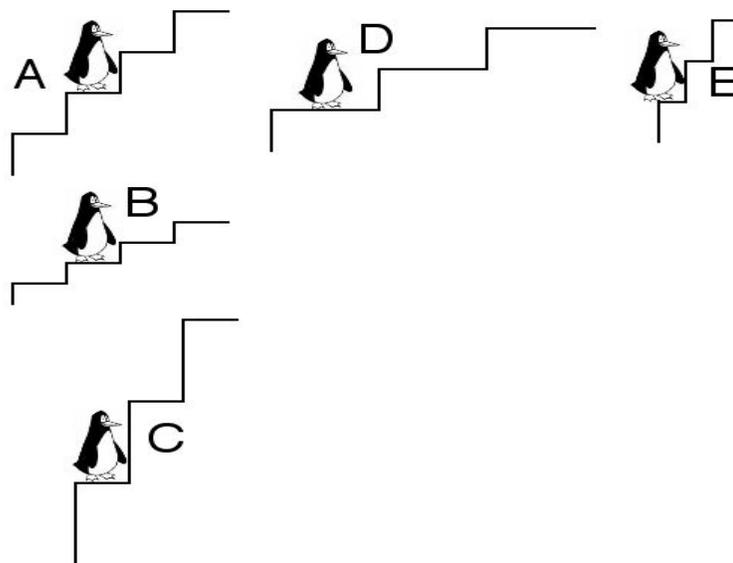


# Python Coding Lesson

Lesson Title:	Equation of a Line
Grade Level:	High School
Subject:	Mathematics
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## Engagement:

- First grab students' attention by showing any generic skateboarding video.
- What kind of slopes do skaters skate through?
- Name the different slopes: Positive, Negative, Constant
- Have students name different activities that we do that require the use different slopes
- Review: rate of change, slope, x-intercept, y-intercept
- Python Connection: Ask students why we have different terminology for these concepts? Why can't we just say, "Thing 1 equals to Thing 2?" Well, we can but it would be extremely hard for us to understand and keep track of our results. That's why we define variables. Same rule applies for Python. Show how to define variables on Python?



Source: [https://polymathematics.typepad.com/math\\_eloquently/2008/07/the-logic-of-slope-part-1.html](https://polymathematics.typepad.com/math_eloquently/2008/07/the-logic-of-slope-part-1.html)



# Python Coding Lesson

## Exploration:

- Students will be given the stairs and slope worksheet and will work in pairs.
- Students will figure out which penguin is moving up faster by figuring out the rate of change through rise over run
- Python Connection: Compare the use of variables in real life to Python: Just like walking up the ramp involves starting point A and ending point B, Python also uses variables x and y to calculate slope. Start defining variables and introduce x1, x2, y1 and y2 on to the python code.

## Explanation:

### Find the Slope and Y-intercept for Each Equation

- |                            |                                      |                            |                                      |
|----------------------------|--------------------------------------|----------------------------|--------------------------------------|
| 1) $-5x + 4y = -16$        | slope = _____<br>y-intercept = _____ | 2) $y = \frac{5}{2}x - 4$  | slope = _____<br>y-intercept = _____ |
| 3) $2x + 9y = 18$          | slope = _____<br>y-intercept = _____ | 4) $-x + 4y = -16$         | slope = _____<br>y-intercept = _____ |
| 5) $y = \frac{1}{2}x - 1$  | slope = _____<br>y-intercept = _____ | 6) $-6x + 5y = -10$        | slope = _____<br>y-intercept = _____ |
| 7) $y = -\frac{7}{5}x - 3$ | slope = _____<br>y-intercept = _____ | 8) $-3x + 2y = 6$          | slope = _____<br>y-intercept = _____ |
| 9) $y = \frac{3}{2}x + 3$  | slope = _____<br>y-intercept = _____ | 10) $y = \frac{7}{4}x - 3$ | slope = _____<br>y-intercept = _____ |

Source: <https://www.pinterest.com/pin/52002570670130078/?nic=1a>

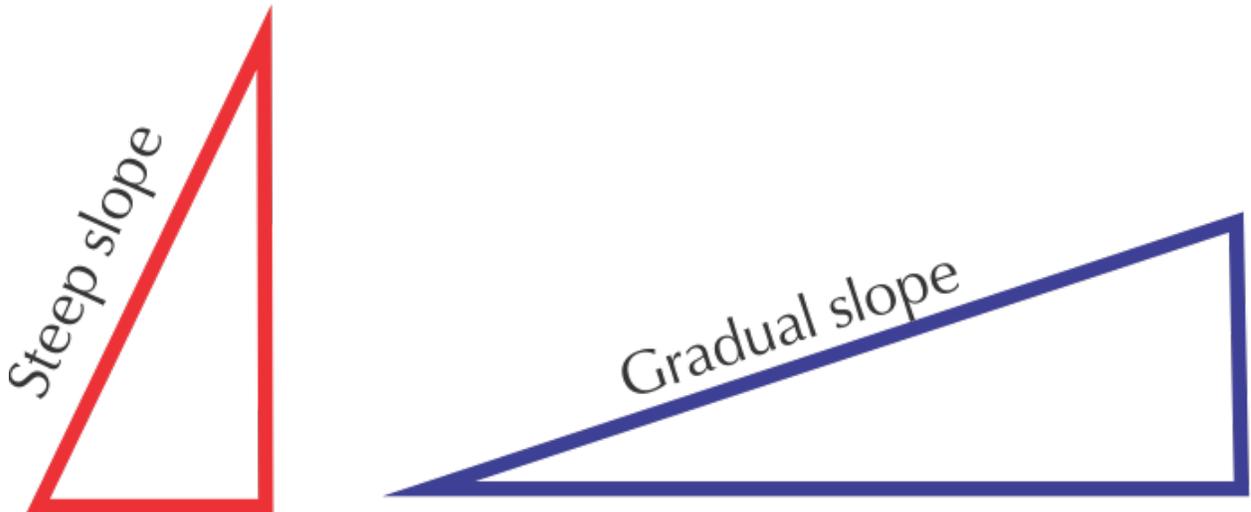




## Python Coding Lesson

- Instruct students to discuss and share their results from the slopes and stairs worksheet to the class. Also ask them what did they observe? What characteristics does the fastest moving penguin have?
- Next, introduce or expand upon the idea of equations and slopes. First, I will go over couple examples in class and then students will work in same pairs again for the slope and y-intercept worksheet.
- Build on our Python code: After finding the slope through the method of rise over run, introduce linear equations on Python that prints out slope as an output.

### Elaboration:



Source: <https://www.siyavula.com/read/maths/grade-10-mathematical-literacy/patterns-relationships-and-representations/02-patterns-relationships-and-representations-02>

- Explain what gradual vs steep slopes are.
- Ask students to compare the slopes and stairs worksheet to the slopes and y-intercept worksheet. Working in the same pairs again, students will figure out what slopes are steep vs gradual.
- After few minutes, provide them with a chi-cheat to figure out whether it is steep or gradual: "If the rise is greater than the run, a line can be generically described as "steep." If the rise is less than the run, a line can be generically described as "gradual."



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- If statements on Python: After a discussion on if-statements on Python, students will build a code where they will use rise over run as an input to print a statement that states whether the slope is steep or gradual.

## Evaluation:

- Students will answer the following three questions as their Exit Ticket:
- True or False: Steep vs Gradual slope of line is the same thing as Positive vs Negative slope of line.
- What's wrong with this code? : `def = slope(x1, y1, x2, y2):`
- What kind of slope is this? Steep or gradual? Positive or Negative?



Example of How Slopes are used in the real world

Source: <http://egoco.co/handicap-ramp-plans/>



## Python Coding Lesson

Code:

*#First teach students how to define variables on Python. This is done using "def" followed by the variable that takes on the values for x1, y1, x2 and y2.*

*#You can also set a variable equal to something. In this case, we let m, which is the slope be equal to the rise over run equation.*

*#Next you can print out your answers by typing print.*

```
def slope(x1, y1, x2, y2):
```

```
    m = (y2-y1)/(x2-x1)
```

```
    return m
```

```
print (slope(6, 7.5, 8, 9.75))
```

*#Another way of writing the code is by listing out the x and y variables:*

```
def slope(x1, y1, x2, y2):
```

```
    return (float)(y2-y1)/(x2-x1)
```

```
x1 = 6
```

```
y1 = 7.5
```

```
x2 = 8
```

```
y2 = 9.75
```

```
print ("Slope is :", slope(x1, y1, x2, y2))
```

*# After hitting run, you'll realize you'll get the same answer.*

*# Next the students will learn the if and elif statements to see if their slope is gradual steep or gradual*

```
Slope_m = int(input("Enter a number for your desired slope"))
```

```
if Slope_m == 1:
```

```
    print ("You have a positive slope. ")
```

```
elif Slope_m == 0:
```

```
    print ("Looks like you have a horizontal line!")
```



## Python Coding Lesson

```
elif Slope_m < 1:
```

```
    print("Since the rise is less than the run, your slope of line is going to be gradual.")
```

```
elif Slope_m > 1:
```

```
    print ("Since the rise is greater than the run, your slope of line is going to be steep")
```