SFWRTECH 3PR3:
Procedural and Objective Oriented Programming Concepts
(Assignment #2)

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Objective

The purpose of this Assignment 2:

1. To give students understanding python structure.
2. To write, test, and debug simple python programs.
3. To implement, and execute conditional statement iteratively until a given condition is satisfied.
4. To understand how to import module from python library.

Introduction

This report presents a design of a collision test with the equation below:

$$\mathbf{s = max(0, } vt + 0.5at^2\mathbf{)}$$

Input Specification

Input Variables	Limit
Distance (d)	[5, 10]
Initial Velocity (v)	[1, 10]
Acceleration (a)	[-100, 0]
Time (t)	A positive number less than 10

Output Specification

Conditional Statement	Result
Distance (d) = Displacement (s)	The object will collide
Distance (d) < Displacement (s)	The object will collide
Distance (d) > Displacement (s)	The object will not collide

Source Code

Part1

```
# Student name: Dojae Kim
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# Lecture: SFWRTECH 3PR3
# Assignment 2 Part 1

import math

distance = float(input('Enter your distance [5 - 10]: '))
while distance < 5 or distance > 10:
    distance = float(input('Please enter distance [5 - 10]: '))

initial_velocity = float(input('Enter initial velocity [1 - 10]: '))
while initial_velocity < 1 or initial_velocity > 10:
    initial_velocity = float(input('Please enter initial velocity [1 - 10]:
'))

acceleration = float(input('Enter acceleration [-100 - 0]: '))
while acceleration < -100 or acceleration > 0:
    acceleration = float(input('Please enter acceleration [-100 - 0]: '))

travel_time = float(input('Enter travel time less than 10: '))
while travel_time >= 10:
    travel_time = float(input('Please enter travel time less than 10: '))

displacement = (initial_velocity * travel_time) + (0.5 * acceleration) *
(math.pow(travel_time, 2))

print('\n=====================================================')

if displacement >= distance:
    print('\tThe object will collide')
    print('=====================================================')
    print('Distance \t\t\t Displacement')
    print(distance, 'm', '\t\t\t\t', displacement, 'm')


else:
    print('\tThe object will not collide')
    print('=====================================================')
    print('Distance \t\t\t Displacement')
    print(distance, 'm',  '\t\t\t\t', displacement, 'm')
print('=====================================================')
```

Part 1 Sample Output

Sample 1:

(Input: Distance: 5 m, Initial velocity: 5 m/s, Acceleration: -1 m/s^2, Time: 5 s)
(Output: Displacement 12.5 m (**Distance** < **Displacement**)
Result -> "The object will collide"

```
Enter your distance [5 - 10]: 5
Enter initial velocity [1 - 10]: 5
Enter acceleration [-100 - 0]: -1
Enter travel time less than 10: 5


=====================================================
        The object will collide
=====================================================
Distance                          Displacement
5.0 m                             12.5 m
=====================================================
```

Sample 2:

(Input: Distance: 5 m, Initial velocity: 1 m/s, Acceleration: -100 m/s^2, Time: 5 s)
(Output: Displacement -1245.0 m (**Distance** > **Displacement**)
Result -> "The object will not collide"

```
Enter your distance [5 - 10]: 5
Enter initial velocity [1 - 10]: 1
Enter acceleration [-100 - 0]: -100
Enter travel time less than 10: 5


=====================================================
        The object will not collide
=====================================================
Distance                          Displacement
5.0 m                             -1245.0 m
=====================================================
```

Part2 Source Code

```
# Student name: Dojae Kim
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# Student email: kim408@mcmaster.ca
# Lecture: SFWRTECH 3PR3
# Assignment 2 Part 2

import math
import numpy

displacement = 0

distance = float(input('\nPlease enter distance [5 - 10]: '))
while distance < 5 or distance > 10:
    distance = float(input('\nDistance is out of bounds, please enter
distance [5 - 10]: '))

initial_velocity = float(input('\nPlease enter initial velocity [1 - 10]: '))
while initial_velocity < 1 or initial_velocity > 10:
    initial_velocity = float(input('\nVelocity is out of bounds, please enter
initial velocity [1 - 10]: '))

print('\n================================================================================
========================================')
print('Distance', '\t', 'Displacement', '\t\t', 'Acceleration', '\t\t',
'Travel Time', '\t\t\t', 'Description')
print('================================================================================
========================================')
while True:
    for acc in numpy.arange(-50.0, 0.0, 0.2):
        for time in numpy.arange(0.0, 10.0, 0.1):
            displacement = (round(initial_velocity, 2) * round(time, 2)) +
(0.5 * round(acc, 2)) * (round(math.pow(time, 2), 2))
            round(displacement, 2)
            if displacement < distance:
                print(round(distance, 2), 'm', '\t\t', round(displacement,
2), 'm', '\t\t', round(acc, 2), 'm/s^2', '\t\t', round(time, 2), '\t\t',
'Object A will not hit object B')
            elif displacement >= distance:
                print(round(distance, 2), 'm', '\t\t', round(displacement,
2), 'm', '\t\t', round(acc, 2), 'm/s^2', '\t\t', round(time, 2), '\t\t',
'Object A will hit object B')

print('================================================================================
========================================')
    break
```

Part 2 Sample Output

Sample 1:

(Input : Distance: 5 m, Initial velocity: 5 m/s)

* Acceleration and Travel Time value will automatically generate based on conditional statement

    1. Acceleration : -50 to 0.0 by 0.2 increment
    2. Travel Time : 0 to 9.9 by 0.1 increment

```
Please enter distance [5 - 10]: 4

Distance is out of bounds, please enter distance [5 - 10]: 5

Please enter initial velocity [1 - 10]: 0

Velocity is out of bounds, please enter initial velocity [1 - 10]: -1

Velocity is out of bounds, please enter initial velocity [1 - 10]: 5

=============================================================================================================
Distance         Displacement           Acceleration           Travel Time                   Description
=============================================================================================================
5.0 m            0.0 m                  -50.0 m/s^2            0.0          Object A will not hit object B
5.0 m            0.25 m                 -50.0 m/s^2            0.1          Object A will not hit object B
5.0 m            0.0 m                  -50.0 m/s^2            0.2          Object A will not hit object B
5.0 m            -0.75 m                -50.0 m/s^2            0.3          Object A will not hit object B
5.0 m            -2.0 m                 -50.0 m/s^2            0.4          Object A will not hit object B
5.0 m            -3.75 m                -50.0 m/s^2            0.5          Object A will not hit object B
5.0 m            -6.0 m                 -50.0 m/s^2            0.6          Object A will not hit object B
5.0 m            -8.75 m                -50.0 m/s^2            0.7          Object A will not hit object B
5.0 m            -12.0 m                -50.0 m/s^2            0.8          Object A will not hit object B
5.0 m            -15.75 m               -50.0 m/s^2            0.9          Object A will not hit object B
5.0 m            -20.0 m                -50.0 m/s^2            1.0          Object A will not hit object B
5.0 m            -24.75 m               -50.0 m/s^2            1.1          Object A will not hit object B
5.0 m            -30.0 m                -50.0 m/s^2            1.2          Object A will not hit object B
5.0 m            -35.75 m               -50.0 m/s^2            1.3          Object A will not hit object B
5.0 m            -42.0 m                -50.0 m/s^2            1.4          Object A will not hit object B
5.0 m            -48.75 m               -50.0 m/s^2            1.5          Object A will not hit object B
5.0 m            -56.0 m                -50.0 m/s^2            1.6          Object A will not hit object B
5.0 m            -63.75 m               -50.0 m/s^2            1.7          Object A will not hit object B
5.0 m            -72.0 m                -50.0 m/s^2            1.8          Object A will not hit object B
5.0 m            -80.75 m               -50.0 m/s^2            1.9          Object A will not hit object B
5.0 m            -90.0 m                -50.0 m/s^2            2.0          Object A will not hit object B
5.0 m            -99.75 m               -50.0 m/s^2            2.1          Object A will not hit object B
5.0 m            -110.0 m               -50.0 m/s^2            2.2          Object A will not hit object B
5.0 m            -120.75 m              -50.0 m/s^2            2.3          Object A will not hit object B
5.0 m            -132.0 m               -50.0 m/s^2            2.4          Object A will not hit object B
5.0 m            -143.75 m              -50.0 m/s^2            2.5          Object A will not hit object B
5.0 m            -156.0 m               -50.0 m/s^2            2.6          Object A will not hit object B
5.0 m            -168.75 m              -50.0 m/s^2            2.7          Object A will not hit object B
5.0 m            -182.0 m               -50.0 m/s^2            2.8          Object A will not hit object B
5.0 m            -195.75 m              -50.0 m/s^2            2.9          Object A will not hit object B
5.0 m            -210.0 m               -50.0 m/s^2            3.0          Object A will not hit object B
5.0 m            -224.75 m              -50.0 m/s^2            3.1          Object A will not hit object B
5.0 m            -240.0 m               -50.0 m/s^2            3.2          Object A will not hit object B
5.0 m            -255.75 m              -50.0 m/s^2            3.3          Object A will not hit object B
5.0 m            -272.0 m               -50.0 m/s^2            3.4          Object A will not hit object B
5.0 m            -288.75 m              -50.0 m/s^2            3.5          Object A will not hit object B
5.0 m            -306.0 m               -50.0 m/s^2            3.6          Object A will not hit object B
5.0 m            -323.75 m              -50.0 m/s^2            3.7          Object A will not hit object B
```

```
5.0 m           22.5 m              -0.2 m/s^2          5.0           Object A will hit object B
5.0 m           22.9 m              -0.2 m/s^2          5.1           Object A will hit object B
5.0 m           23.3 m              -0.2 m/s^2          5.2           Object A will hit object B
5.0 m           23.69 m             -0.2 m/s^2          5.3           Object A will hit object B
5.0 m           24.08 m             -0.2 m/s^2          5.4           Object A will hit object B
5.0 m           24.48 m             -0.2 m/s^2          5.5           Object A will hit object B
5.0 m           24.86 m             -0.2 m/s^2          5.6           Object A will hit object B
5.0 m           25.25 m             -0.2 m/s^2          5.7           Object A will hit object B
5.0 m           25.64 m             -0.2 m/s^2          5.8           Object A will hit object B
5.0 m           26.02 m             -0.2 m/s^2          5.9           Object A will hit object B
5.0 m           26.4 m              -0.2 m/s^2          6.0           Object A will hit object B
5.0 m           26.78 m             -0.2 m/s^2          6.1           Object A will hit object B
5.0 m           27.16 m             -0.2 m/s^2          6.2           Object A will hit object B
5.0 m           27.53 m             -0.2 m/s^2          6.3           Object A will hit object B
5.0 m           27.9 m              -0.2 m/s^2          6.4           Object A will hit object B
5.0 m           28.28 m             -0.2 m/s^2          6.5           Object A will hit object B
5.0 m           28.64 m             -0.2 m/s^2          6.6           Object A will hit object B
5.0 m           29.01 m             -0.2 m/s^2          6.7           Object A will hit object B
5.0 m           29.38 m             -0.2 m/s^2          6.8           Object A will hit object B
5.0 m           29.74 m             -0.2 m/s^2          6.9           Object A will hit object B
5.0 m           30.1 m              -0.2 m/s^2          7.0           Object A will hit object B
5.0 m           30.46 m             -0.2 m/s^2          7.1           Object A will hit object B
5.0 m           30.82 m             -0.2 m/s^2          7.2           Object A will hit object B
5.0 m           31.17 m             -0.2 m/s^2          7.3           Object A will hit object B
5.0 m           31.52 m             -0.2 m/s^2          7.4           Object A will hit object B
5.0 m           31.88 m             -0.2 m/s^2          7.5           Object A will hit object B
5.0 m           32.22 m             -0.2 m/s^2          7.6           Object A will hit object B
5.0 m           32.57 m             -0.2 m/s^2          7.7           Object A will hit object B
5.0 m           32.92 m             -0.2 m/s^2          7.8           Object A will hit object B
5.0 m           33.26 m             -0.2 m/s^2          7.9           Object A will hit object B
5.0 m           33.6 m              -0.2 m/s^2          8.0           Object A will hit object B
5.0 m           33.94 m             -0.2 m/s^2          8.1           Object A will hit object B
5.0 m           34.28 m             -0.2 m/s^2          8.2           Object A will hit object B
5.0 m           34.61 m             -0.2 m/s^2          8.3           Object A will hit object B
5.0 m           34.94 m             -0.2 m/s^2          8.4           Object A will hit object B
5.0 m           35.28 m             -0.2 m/s^2          8.5           Object A will hit object B
5.0 m           35.6 m              -0.2 m/s^2          8.6           Object A will hit object B
5.0 m           35.93 m             -0.2 m/s^2          8.7           Object A will hit object B
5.0 m           36.26 m             -0.2 m/s^2          8.8           Object A will hit object B
5.0 m           36.58 m             -0.2 m/s^2          8.9           Object A will hit object B
5.0 m           36.9 m              -0.2 m/s^2          9.0           Object A will hit object B
5.0 m           37.22 m             -0.2 m/s^2          9.1           Object A will hit object B
5.0 m           37.54 m             -0.2 m/s^2          9.2           Object A will hit object B
5.0 m           37.85 m             -0.2 m/s^2          9.3           Object A will hit object B
5.0 m           38.16 m             -0.2 m/s^2          9.4           Object A will hit object B
5.0 m           38.48 m             -0.2 m/s^2          9.5           Object A will hit object B
5.0 m           38.78 m             -0.2 m/s^2          9.6           Object A will hit object B
5.0 m           39.09 m             -0.2 m/s^2          9.7           Object A will hit object B
5.0 m           39.4 m              -0.2 m/s^2          9.8           Object A will hit object B
5.0 m           39.7 m              -0.2 m/s^2          9.9           Object A will hit object B
=============================================================================================================
```