

## Chp.2 - Kinematics

The goal of this activity is to create a program that completes certain calculations based on given kinematics equations and user provided values. Be sure to create a header comment with the title of this program, your name, and the date, along with a short summary in your own words about the purpose of your program. Your program should be made up of the following steps:

Part 1 – Create a constant variable and assign the value 120 seconds to it. This will be the value of total time you will have to make your trips. A separate constant variable is already provided for you. It contains the conversion value necessary to convert a value in miles to be measured in meters instead.

Part 2 – Ask the user to give the program the following values: the initial velocity at the start of the trip, time elapsed during one trip, and the acceleration rate during the trip. All of these values should be stored as numbers with a decimal point. Also worth noting, unlike all of the other values given which are measured in terms of meters, the given initial velocity value is measured in terms of miles/second. Once you run your program, the questions for the user should be formatted as follows:

What's your initial velocity? █

How much time elapsed? █

You were travelling at what acceleration? █

Part 3 – As mentioned in Part 2, since the initial velocity value is measured in terms of miles/second, you need to convert it so that it is measured in terms of meters/second.

Part 4 – Given the kinematics equations listed below, utilize the values that the user provided and calculate both the distance covered during one trip, which should be measured in meters, and the final velocity at the end of the trip, which should be measured in meters/second.

$$v = v_0 + at$$
$$d = \left( \frac{v + v_0}{2} \right) t$$

Note:  $d$  stands for distance,  $v_0$  stands for initial velocity,  $t$  stands for time elapsed for one trip,  $a$  stands for acceleration, and  $v$  stands for final velocity.

Part 5a – Knowing that the user provided the amount of time elapsed for one trip to complete and given the total amount of time available, calculate the how many complete trips can be made within this time frame.

Part 5b – After all of the complete trips have been made, calculate how much of the total time available is left over.

Part 6 – Lastly, display your results. Note: the number of trips displayed should always be a whole number, whereas the time left over, distance travelled during each trip, and final velocity values should be rounded to two decimal places. When run, your program should display the following (however all of the \_\_\_\_\_ will be replaced with the correct user given value calculations):

```
Congratulations! You've done it!  
You made _____ trips.  
You had _____ seconds to spare.  
During each trip you travelled _____ meters.  
Your final velocity was _____ m/s^2.  
You're free to shout, "hurray!"
```

Overall notes: You may notice that some of the provided prompts for input and print statements have syntax errors. It is up to you to fix them so that the prompt is properly displayed. Also, considering that these calculations involve distance travelled at a certain velocity and acceleration, you can assume that the user will never provide any negative values for the initial velocity, time elapsed, and acceleration values. Also, you can assume that the time elapsed during one trip will never be zero.

*Example Test Case:*

If the user were to give the value “10” as the initial velocity, “20” as the time elapsed for one trip, and “15.5” as the acceleration value, then your program should display the following results of the various calculations:

```
What's your initial velocity? 10  
How much time elapsed? 20  
You were travelling at what acceleration? 15.5  
Congratulations! You've done it!  
You made 6 trips.  
You had 0.00 seconds to spare.  
During each trip you travelled 324968.00 meters.  
Your final velocity was 16403.40 m/s^2.  
You're free to shout, "hurray!"
```