Computer Science Courses

Project 1: The angry birds lost

- project due date: Saturday Sept 15th 11:58PM
- this is an individual project

Setup

You must create a folder **project1** under the CS177 folder you created in lab1.

You can do that using any Windows machine in B160 or G066 laboratories.

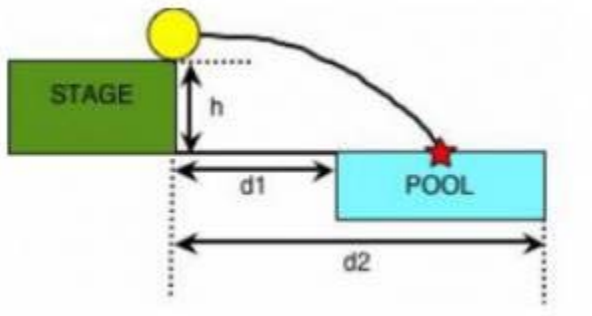
You need to write the Python code for the functions you are going to implement in Part A, B, and C in a IDLE file. You can name this file as you like, but we suggest you to name it myfirstproject.py. You **MUST** save it under the folder **project1**.

Problem Description

You are in league with the Birds in their crusade against the pigs. You are tasked to help an angry bird, who is standing on a stage, choose its trajectory so that it can hit a pig located at the middle of a pool. You are to help the birds by telling them how long it will take so that they hit the pig and what should their initial velocity be.

Part A

Assume the bird is standing on a horizontal stage. The pig is in the middle of the pool. You need to calculate how long does it take to hit the pig and what's the initial velocity.



To this end, you have to write a Python function named *horizontalHit* that has 3 input parameters:

- The first one is *d1*, which tells the distance from the left end of the pool to the stage.
- The second one is *d2*, which tells the distance from the right end of the pool to the stage.
- The third one is *h*, which tells the height of the stage.

Based on our physics knowledge, we know that we can only get the time first so we can get the velocity later. To calculate how long it takes to hit the pig, here is the formula:

- h =v0*t + 0.5*g*t^2

where *v0* is the vertical velocity of the bird. Assume that the bird is flying horizontally, and hence its vertical velocity is 0. Thus, we will use the following formula:

- h = 0.5*g*t^2.
- t = sqrt(2h/g)

Here g is the gravitational constant, which has a value of 9.8.

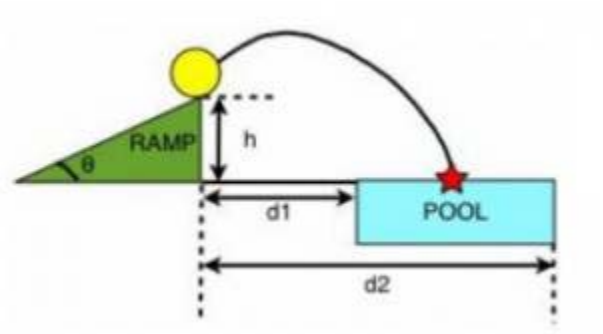
To get the velocity, we know that distance = v * t. Also, here, since the pig is in the middle of the pool, we need to use the following formula:

- v = (d1+d2)/(2t)

Finally, after you get the time and the velocity, print them out in the function.

Part B

Assume the bird is running on a ramp, of which the angle is θ. The bird can only run on the ramp, not jump. The pig is still in the middle of the pool. You need to calculate how long does it take to hit the pig and what's the initial velocity.



Define a function named rampHit that has 4 input arguments:

- The first one is d1, which tells the distance from the left end of the pool to the stage.
- The second one is d2, which tells the distance from the right end of the pool to the stage.
- The third one is h, which tells the height of the stage.
- The fourth one is a, which tells the angle θ between the ramp and the horizontal line.

Also, based on our physics knowledge, we know the following formulas.

```
vsin(a) * t + 0.5gt^2 = h
vcos(a) * t = (d1+d2)/2
```

g is the gravitational constant and it value is 9.8.

Thus, we can get:

- t = sqrt (((2h+tan (a) * (d1+d2)) / g)) .

Use this formula to get the time.

After we get the time, we know that distance = vcos(a)*t this time, so, use the following formula:

- v = (d1+d2)/(2*(cos(a))*t)

As the same, g means gravity, which is 9.8. And you also need to print out the t and v in this part.

NOTES

You need to use the functions provided by the Python math library.

Part C

Now, you need to "glue" together all you did in Part A and Part B . You have to write your *main* function. It must get *d1*, *d2*, *h* and *a* from the user.

After that, it must the call *horizontalHit* and *rampHit* functions, passing the parameters needed.

Remind that the functions of Python math library that operate on angles use the radian as the angle measure. Hence you need to convert angles from degree to radians. Here is one example to convert it:

```
* a = 45
* a = math.radians(a)
```

This way, a will become 0.78539816339744828

Grading Rubric

This project is worth 100 points.

TODO	POINTS
TODO1	40%
TODO2	40%
TODO3	20%

TURNIN INSTRUCTIONS

You must turn-in the file you created (see the Setup instructions) under the folder **project1**. The turnin command MUST be launched from the UNIX system. Hence:

- in your terminal window, login into your UNIX CS account
- then launch the following commands:

```
$ cd
$ cd CS177
$ turnin –v -c cs177=XXX -p project1 project1
```

Find the **recitation** section which you are enrolled to in the table below and substitute the XXX with the turnin-id value in column the Turnin-id of the table below:

Section	Rec Time	Rec Room	Rec Instructor	Turnin-id
R03	Wednesday, 7:30 - 8:20	LWSN B134	Goyal, Rachna	001
R05	Wednesday, 9:30 - 10:20	LWSN 1106	Gandikota, Venkata Surya S.	002
R08	Wednesday, 10:30 - 11:20	LWSN 1106	Wang, Weihang	003
R02	Wednesday, 14:30 - 15:20	LWSN B134	Ortiz,Nadya	004
R04	Wednesday, 16:30 - 17:20	LWSN B134	Tahboub ,Ruby	005

R06	Thursday, 7:30 - 8:20	LWSN B134	Fuerst, Joshua Michael	006
R07	Thursday, 10:30 - 11:20	LWSN B134	Ortiz,Nadya	007
RM1	Thursday, 12:30 - 13:20	LWSN B134	Tahboub ,Ruby	008
RM2	Thursday, 13:30 - 14:20	LWSN B134	Tahboub, Ruby	009
R09	Friday, 9:30 - 10:20	LWSN B134	Ortiz,Nadya	010
R01	Friday, 16:30 - 17:20	LWSN B134	Fuerst, Joshua Michael	011

Example If you are enrolled in recitation R05, then you must substitute XXX with 002, namely:

```
$ turnin –v -c cs177=002 -p project1 project1
```

IMPORTANT: DO NOT USE THE turnin-id you use in the lab!!!

---

cs17700/projects/project1.txt · Last modified: 2012/09/09 22:38 by cmh