

CENG113
Programming Basics
HOMEWORK #4

DUE DATE: 07.01.2018 - 23:55

You are expected to write a Python program for Santa Claus to help him distribute the gifts that the children all around the world ask for. Santa Claus is living in his house with his elves in the North Pole, where he keeps **unlimited source of toys** in his workshop to grant the children's wishes.

In our scenario, there are 2 villages, 8 houses and 15 children, each of them with a wish for Christmas from Santa. Some of the children live in the same house and some of the houses are in the same village. In Figure 1, you can see the map of the world for our program. Under every house, its coordinates (x,y) are written.

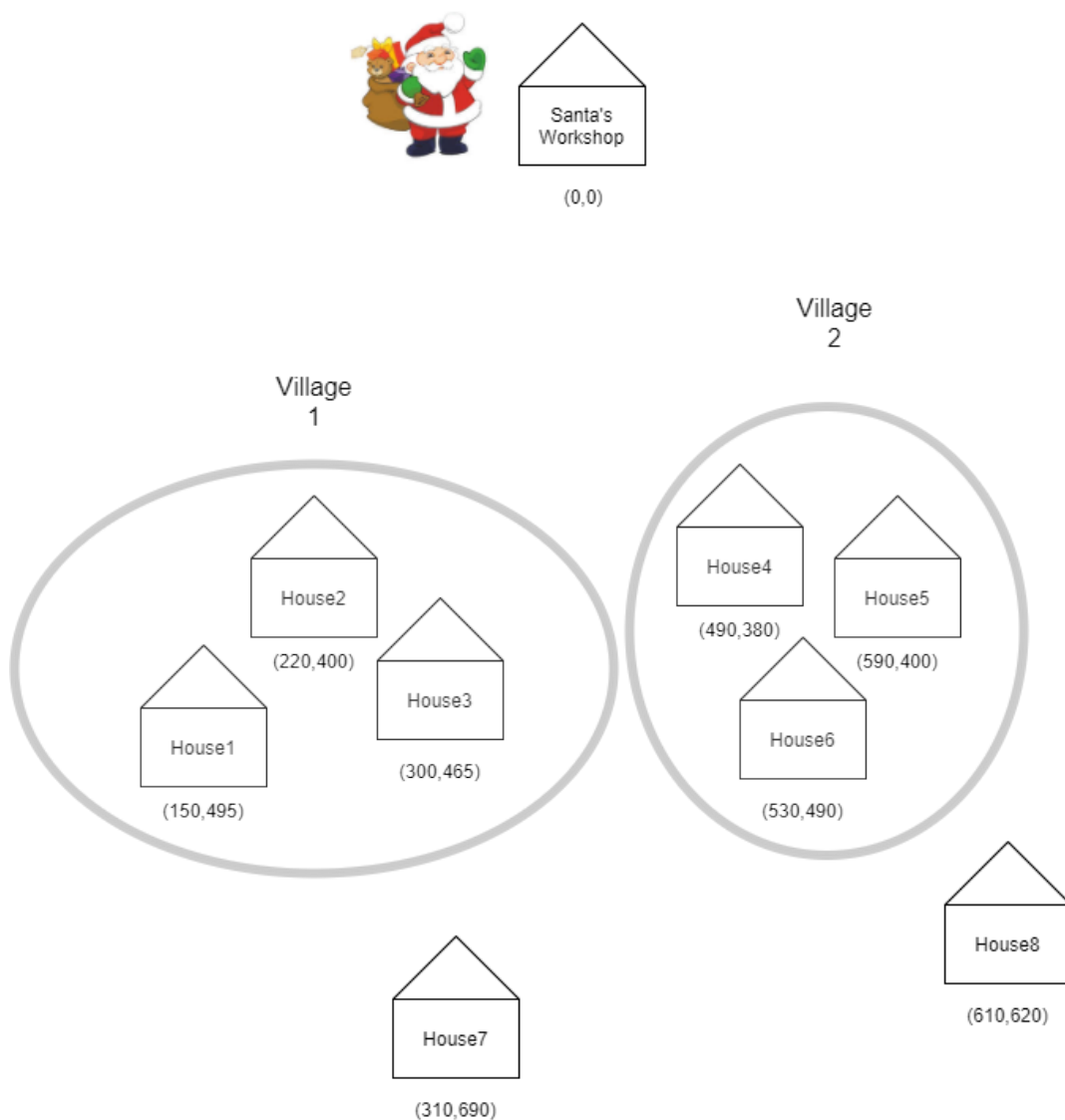


Figure 1: The map of the world

There are 3 types of items that children can wish for, and each item has different volumes: **stuffed toy**: 7 units, **train**: 5 units and **doll**: 3 units. Below, each children living in each house is listed with his/her name and wish:

	Name	Wish
House1	Sophia	Doll
	Ethan	Train
	Liam	Stuffed Toy
House2	Zoe	Doll
	Emma	Doll
House3	Emily	Doll
	William	Stuffed Toy
House4	Olivia	Train
	Jack	Stuffed Toy
House5	Hannah	Doll
	Benjamin	Train
	Michael	Stuffed Toy
House6	Sarah	Stuffed Toy
House7	Owen	Train
House8	Max	Stuffed Toy

Santa's sleigh can take maximum **15 units** of items and can only make **8.000 kilometers** until Christmas Eve. The user has to help Santa to distribute the toys before the total distance travelled exceeds that limit.

Your program should have 4 classes named as Santa, Item, Child and Sleigh.

- Santa has a sleigh, a list of children, remaining distance and the (x,y) coordinates of his current location.
- Item has a type and the corresponding volume.
- Sleigh has a capacity of 15 unit and a list of current items it holds.
- Child has a name, a wish item and an (x,y) coordinate of his/her house.

You should create instances of each class in your main program. For example,

```
wish1 = Item("Doll")
child1 = Child("Sophia",wish1,(150,495))
```

The day before Christmas Eve, Santa asks one of his elves to collect the wishes of the children. For this purpose, you have to implement `collect_wishes(world_list)` function in a **recursive** manner inside the Santa class that takes the list of our world as shown below:

```
world_list = [[["Sophia", (150,495), "Doll"], ("Ethan", (150,495), "Train"),
("Liam", (150,495), "Stuffed Toy")], [("Zoe", (220,400), "Doll"), ("Emma",
(220,400), "Doll")], [("Emily", (300,465), "Doll"), ("William", (300,465), "Stuffed
Toy")]], [("Olivia", (490,380), "Train"), ("Jack", (490,380), "Stuffed Toy")],
[("Hannah", (590,400), "Doll"), ("Benjamin", (590,400), "Train"), ("Michael",
(590,400), "Stuffed Toy")], [("Sarah", (530,490), "Stuffed Toy")]], [("Owen",
(310,690), "Train")], [("Max", (610,620), "Stuffed Toy")]]
```

and it returns the list of all child instances like shown below:

[child1, child2, child3, child4, child5, child6, child7, child8, child9, child10, child11, child12, child13, child14, child15]

At the beginning, the sleigh has 1 Stuffed Toy, 1 Doll and 1 Train. After collecting the wishes, the program should start by showing the distance of each child from Santa's Workshop (Santa's current location). You should calculate the distances by using the following formula (You should convert each distance to integer by using `int()`):

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

Then, the program should ask the user to which child Santa has to go next. Before going to the given destination, the program first checks whether the sleigh includes that child's wish. If not, the program should call `load_cargo()` function that asks the user which toys and how many of them will be loaded. (`load_cargo()` function can be called in only Santa's workshop. Otherwise, Santa has to return to his workshop in order to load the cargo.)

After giving the child's wish, the program should **remove that child** from the wish list. The program should also **update the current location** of Santa and **the remaining distance** after every move.

At each turn, the program should display the remaining children and their distances from Santa's current location, and ask for Santa's next move.

The program finishes when there is **no child left**, or the **total distance travelled exceeds 8.000 kilometers**.

IMPORTANT NOTES:

- User inputs are case insensitive.
- Be careful about **invalid** inputs! Ask each question over and over again until a valid input is entered.

Submission Rules:

STUDENTS WHO DO NOT FOLLOW THESE RULES WILL BE GRADED AS 0.

1. You should submit your assignments through CMS until due date.
2. Your homework should be named as **CENG113_hw4_studentID.py** (ie: CENG113_hw4_123456789).
3. Use comments in your code, otherwise you will **lose** some points.
4. Write your **student ID** as a comment **at the beginning of your code**.

Note: Violation of any submission rule may end up with point deduction up to 100 points. Any kind of cheating including teamwork will be penalized.

An example scenario for the given world (user inputs are given in bold):

Welcome to Santa Claus' Workshop!

Remaining Distance 8.000 kilometers.

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish
Sophia	517 km	Doll
Ethan	517 km	Train
Liam	517 km	Stuffed Toy
Zoe	456 km	Doll
Emma	456 km	Doll
Emily	553 km	Doll
William	553 km	Stuffed Toy
Olivia	620 km	Train
Jack	620 km	Stuffed Toy
Hannah	712 km	Doll
Benjamin	712 km	Train
Micheal	712 km	Stuffed Toy
Sarah	721 km	Stuffed Toy
Owen	756 km	Train
Max	869 km	Stuffed Toy

Santa's sleigh has: 1 Doll, 1 Train, 1 Stuffed Toy

Where should Santa go next? **Sophia**

Checking Cargo!

Santa is going to Sophia!

Remaining Distance: 7483 km.

Here are the children left that needs their Christmas presents and their distance from Santa:

name	distance	wish
Ethan	0 km	Train
Liam	0 km	Stuffed Toy
Zoe	118 km	Doll
Emma	118 km	Doll
Emily	152 km	Doll
William	152 km	Stuffed Toy
Olivia	358 km	Train
Jack	358 km	Stuffed Toy
Hannah	450 km	Doll
Benjamin	450 km	Train
Michael	450 km	Stuffed Toy
Sarah	380 km	Stuffed Toy
Owen	252 km	Train
Max	476 km	Stuffed Toy

Santa's sleigh has: 0 Doll, 1 Train, 1 Stuffed Toy

Where should Santa go next? **Etha**

There is no child named Etha!!!

Where should Santa go next? **Ethan**

Checking Cargo!

Santa is going to Ethan!

Remaining Distance: 7483 km

Here are the children left that need their Christmas presents and their distances

from Santa:

name	distance	wish
Liam	0 km	Stuffed Toy
Zoe	118 km	Doll
Emma	118 km	Doll
Emily	152 km	Doll
William	152 km	Stuffed Toy
Olivia	358 km	Train
Jack	358 km	Stuffed Toy
Hannah	450 km	Doll
Benjamin	450 km	Train
Michael	450 km	Stuffed Toy
Sarah	380 km	Stuffed Toy
Owen	252 km	Train
Max	476 km	Stuffed Toy

Santa's sleigh has: 0 Doll, 0 Train, 1 Stuffed Toy

Where should Santa go next? **Liam**

Checking Cargo!

Santa is going to Liam!

Remaining Distance: 7483 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish
Zoe	118 km	Doll
Emma	118 km	Doll
Emily	152 km	Doll
William	152 km	Stuffed Toy
Olivia	358 km	Train
Jack	358 km	Stuffed Toy
Hannah	450 km	Doll
Benjamin	450 km	Train
Michael	450 km	Stuffed Toy
Sarah	380 km	Stuffed Toy
Owen	252 km	Train
Max	476 km	Stuffed Toy

Santa's sleigh has: 0 Doll, 0 Train, 0 Stuffed Toy

Where should Santa go next? **Zoe**

Checking Cargo!

Santa is going to Workshop to load cargo!

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**Doll,2**

The items are added to Santa's sleigh.

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**Train,1**

The items are added to Santa's sleigh.

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**Stuffed Toy,1**

The total size of items that you entered exceeds the capacity of the sleigh!

Would you like to add an item (Enter y/n): **n**

Santa is going to Zoe!

Remaining Distance: 6510 km

Here are the children left that need their Christmas presents and their distances

from Santa:

name	distance	wish
Emma	0 km	Doll
Emily	103 km	Doll
William	103 km	Stuffed Toy
Olivia	270 km	Train
Jack	270 km	Stuffed Toy
Hannah	370 km	Doll
Benjamin	370 km	Train
Michael	370 km	Stuffed Toy
Sarah	322 km	Stuffed Toy
Owen	303 km	Train
Max	447 km	Stuffed Toy

Santa's sleigh: 1 Doll, 1 Train, 0 Stuffed Toy

Where should Santa go next? **Emma**

Checking Cargo!

Santa is going to Emma!

Remaining Distance: 6510 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish
Emily	103 km	Doll
William	103 km	Stuffed Toy
Olivia	270 km	Train
Jack	270 km	Stuffed Toy
Hannah	370 km	Doll
Benjamin	370 km	Train
Michael	370 km	Stuffed Toy
Sarah	322 km	Stuffed Toy
Owen	303 km	Train
Max	447 km	Stuffed Toy

Santa's sleigh: 0 Doll, 1 Train, 0 Stuffed Toy

Where should Santa go next? **Olivia**

Checking Cargo!

Santa is going to Olivia!

Remaining Distance: 6240 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish
Emily	208 km	Doll
William	208 km	Stuffed Toy
Jack	0 km	Stuffed Toy
Hannah	101 km	Doll
Benjamin	101 km	Train
Michael	101 km	Stuffed Toy
Sarah	117 km	Stuffed Toy
Owen	358 km	Train
Max	268 km	Stuffed Toy

Santa's sleigh: 0 Doll, 0 Train, 0 Stuffed Toy

Where should Santa go next? **Emily**

Checking Cargo!

Santa is going to Workshop to load cargo!

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**Stuffed Toy,2**

The items are added.

Would you like to add an item (Enter y/n): **n**

Santa Claus didn't go to Emily

Where should Santa go next?: **Sarah**

Checking Cargo!

Santa is going to Sarah!

Remaining Distance: 4899 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish	

Emily	231 km	Doll	
William	231 km	Stuffed Toy	
Jack	117 km	Stuffed Toy	
Hannah	108 km	Doll	
Benjamin	108 km	Train	
Michael	108 km	Stuffed Toy	
Owen	297 km	Train	
Max	152 km	Stuffed Toy	

Santa's sleigh: 0 Doll, 0 Train, 1 Stuffed Toy

Where should Santa go next? **Max**

Checking Cargo!

Santa is going to Max!

Remaining Distance: 4747 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish	

Emily	346 km	Doll	
William	346 km	Stuffed Toy	
Jack	268 km	Stuffed Toy	
Hannah	220 km	Doll	
Benjamin	220 km	Train	
Michael	220 km	Stuffed Toy	
Owen	308 km	Train	

Santa's sleigh has: 0 Doll, 0 Train, 0 Stuffed Toy

Where should Santa go next?: **Hannah**

Checking Cargo!

Santa is going to Workshop to load cargo!

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**Doll,1**

The items are added.

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**Train,1**

The items are added.

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**Stuffed Toy,1**

The items are added.

Would you like to add an item (Enter y/n): **n**

Santa is going to Hannah!

Remaining Distance: 3166 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish	

Emily	297 km	Doll	
William	297 km	Stuffed Toy	
Jack	101 km	Stuffed Toy	
Benjamin	0 km	Train	
Michael	0 km	Stuffed Toy	
Owen	403 km	Train	

Santa's sleigh has: 0 Doll, 1 Train, 1 Stuffed Toy

Where should Santa go next?:**Benjamin**

Checking Cargo!

Santa is going to Benjamin!

Remaining Distance: 3166 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish	

Emily	297 km	Doll	
William	297 km	Stuffed Toy	
Jack	101 km	Stuffed Toy	
Michael	0 km	Stuffed Toy	
Owen	403 km	Train	

Santa's sleigh has: 0 Doll, 0 Train, 1 Stuffed Toy

Where should Santa go next?: **Michael**

Checking Cargo!

Santa is going to Michael!

Remaining Distance: 3166 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish	

Emily	297 km	Doll	
William	297 km	Stuffed Toy	
Jack	101 km	Stuffed Toy	
Owen	403 km	Train	

Santa's sleigh has: 0 Doll, 0 Train, 0 Stuffed Toy

Where should Santa go next?:**Emily**

Checking Cargo!

Santa is going to Workshop to load cargo!

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**Doll,1**

The items are added.

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**Stuffed Toy,1**

The items are added.

Would you like to add an item (Enter y/n): **n**

Santa is going to Emily!

Remaining Distance: 1901 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish	

William	0 km	Stuffed Toy	
Jack	208 km	Stuffed Toy	
Owen	225 km	Train	

Santa's sleigh has: 0 Doll, 0 Train, 1 Stuffed Toy

Where should Santa go next?: **William**

Checking Cargo!

Santa is going to William!

Remaining Distance: 1901 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish	

Jack	208 km	Stuffed Toy	
Owen	225 km	Train	

Santa's sleigh has: 0 Doll, 0 Train, 0 Stuffed Toy

Where should Santa go next?: **Jack**

Checking Cargo!

Santa is going to Workshop to load cargo!

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**train,1**

The items are added.

Would you like to add an item (Enter y/n): **y**

Please enter your desired item name and number seperated with comma:**stuffed toy,1**

The items are added.

Would you like to add an item (Enter y/n): **n**

Santa is going to Jack!

Remaining Distance: 728 km

Here are the children left that need their Christmas presents and their distances from Santa:

name	distance	wish	

Owen	358 km	Train	

Santa's sleigh has: 0 Doll, 1 Train, 0 Stuffed Toy

Where should Santa go next?: **Owen**

Checking Cargo!

Santa is going to Owen!

Congratulations!!! You managed to help Santa.