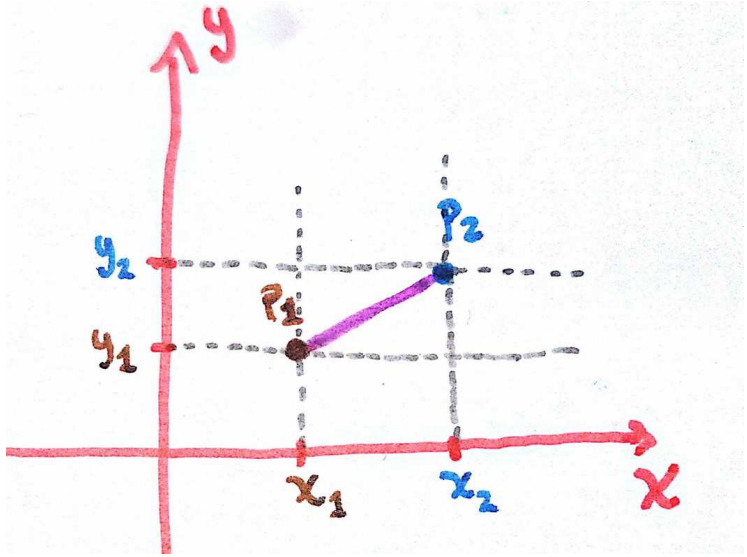
Objects and Classes

A simple exercise - Creating a 2D Point Class

- Following up on the code from last lecture
- The `Point` class
  - A `Point` has two coordinates: call them `x` and `y`
  - The coordinates should be **real** numbers (`double` type)
  - Write a class method that computes the distance to another `Point`



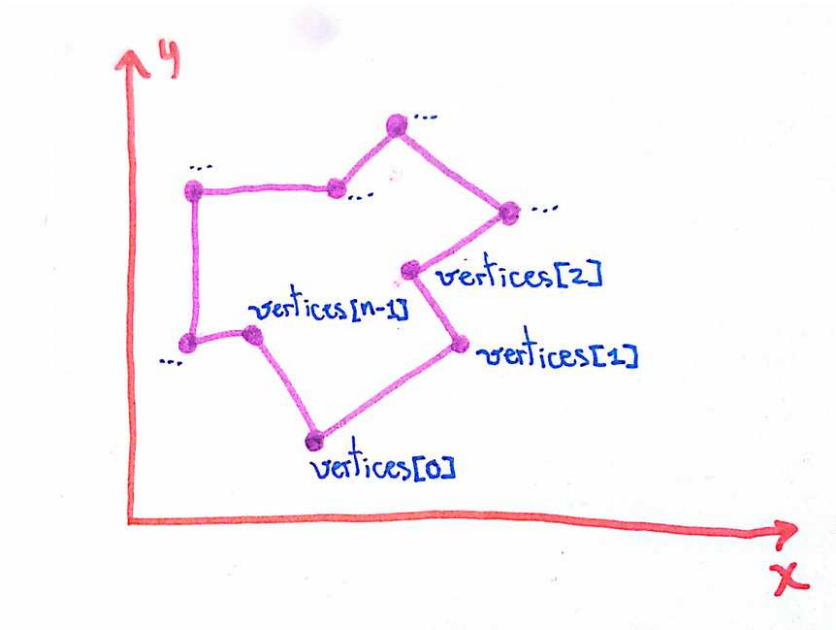
    - sqrt($(x_1 - x_2)^2 + (y_1 - y_2)^2$)

Another exercise - Creating a 2D Point Class, and using in a Polygon class

- The `Polygon` class
  - A `Polygon` has a list of `Point` objects; its vertices.
  - Write a class method that adds a new vertex to a polygon
  - Write a class method that returns `true` if the `Polygon` is **equilateral**
  - Write a class method that returns `true` if the `Polygon` is **regular**
  - Write a class method that returns the area of a polygon using the Shoelace Algorithm

Using `Point` in `Polygon`

- The `Polygon` class



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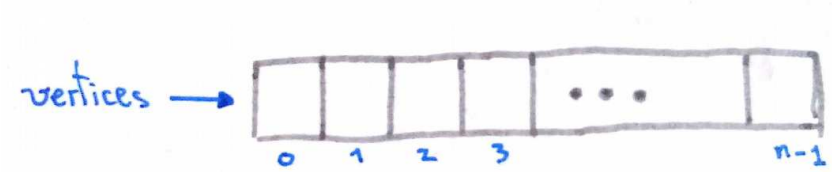

Adding a new `Point` to `vertices`

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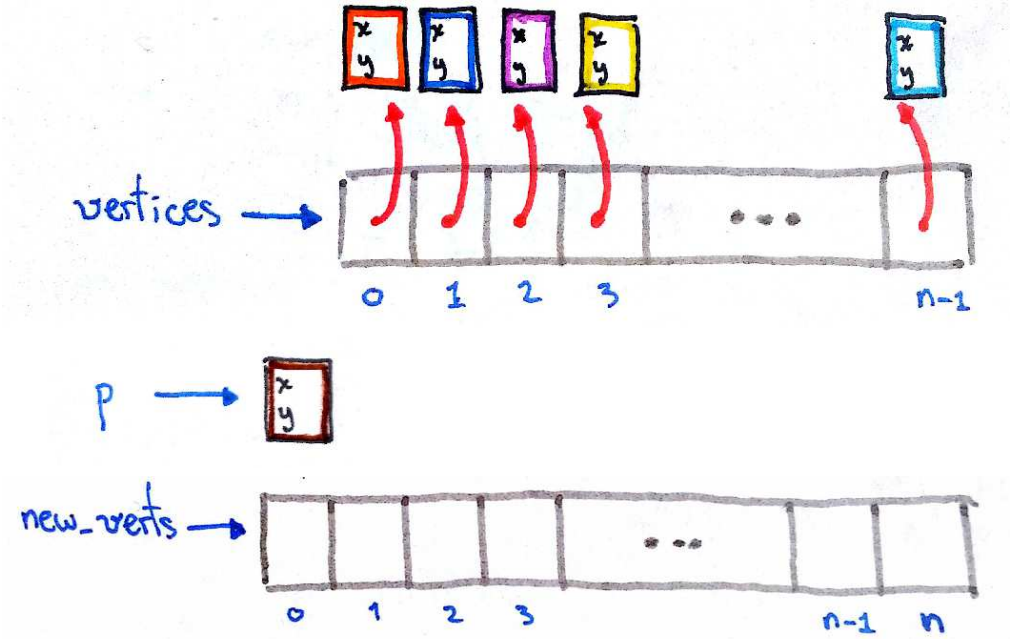

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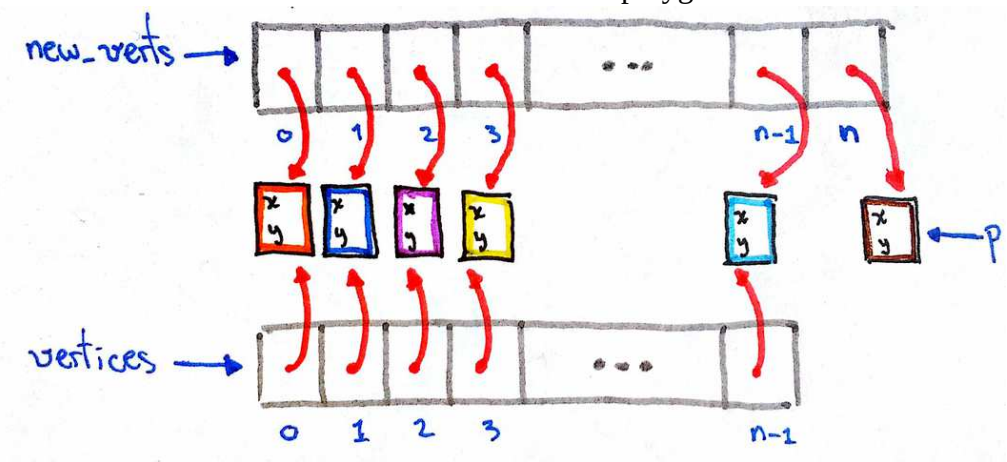

Completing the `Polygon` class

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Yet another example, a social network

Suppose you're in the year 2004 and had this great idea...

- of a website where people could spend countless hours
- uploading personal information, writing messages to people that you see daily
- and you realise that you could sell this information!

You decide you want to build the basic data infrastructure of your website first

- A social network consists of people, each individual being a `Person`
- Each `Person` has a name, location, age and a list of friends

The first step on your road to success, fame and $$$

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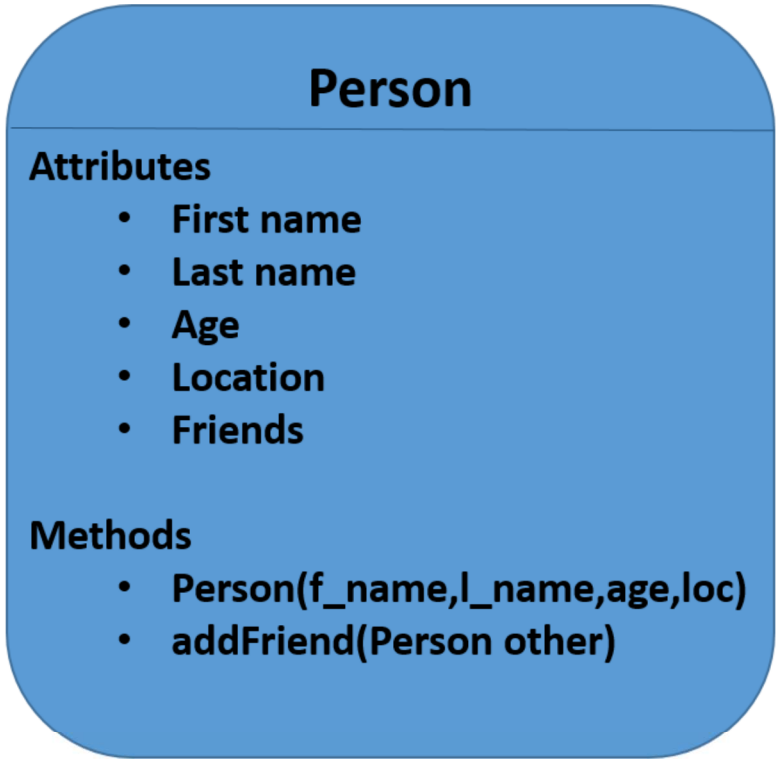
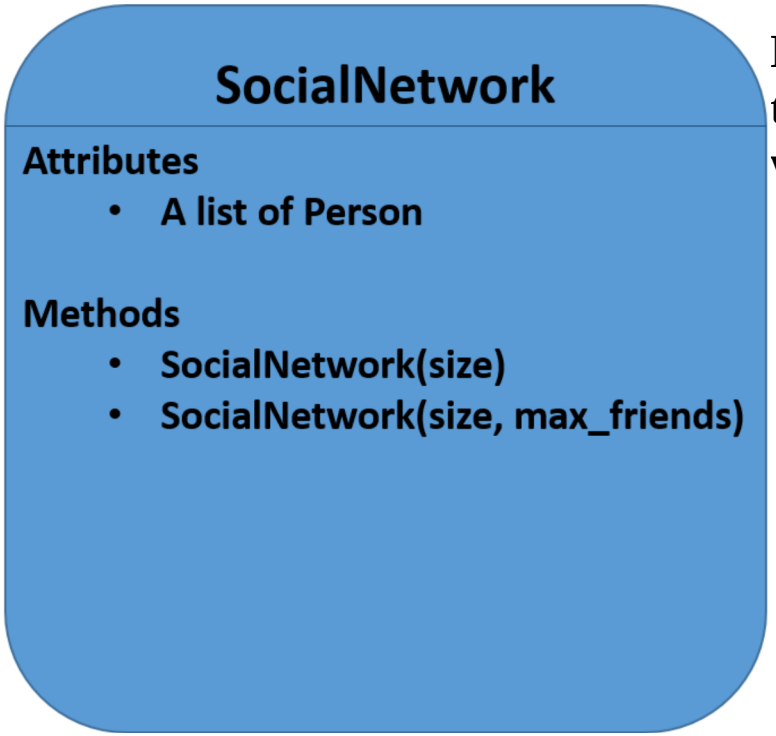


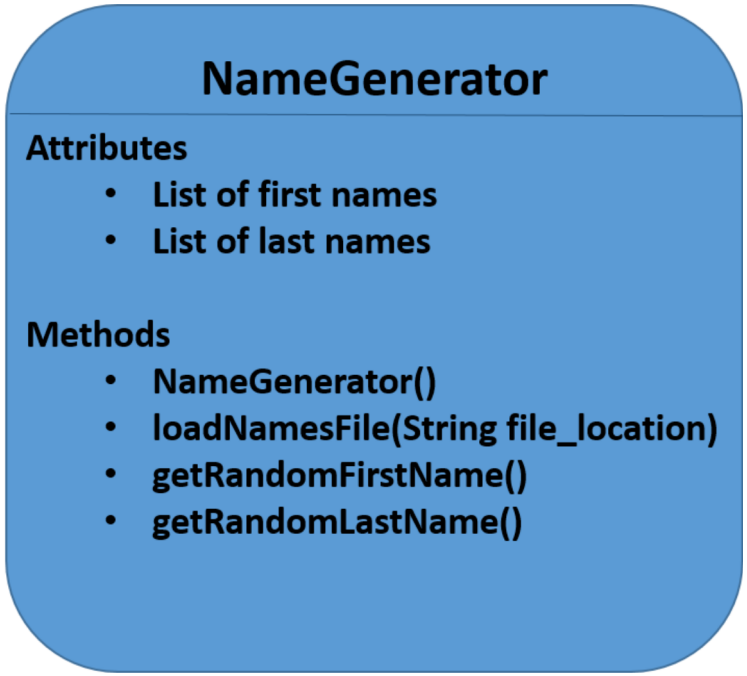


Now you want to test your software with fake data

You want to test your software with randomly generated people

To do this, you would like to generate a social network with randomly generated `Person` objects, each one with randomly assigned firends

- When constructing a `SocialNetwork` you would decide on the size of the network and the maximum number of friends
- Take a look at the NameGenerator class
- We want to add two methods: getRandomFirstName, and getRandomLastName



Now that you have a simulated social network, you are ready for pitching your idea

You want to generate silly statistics that would attract investors to your new startup

- Find the person with the largest number of friends
- Find the 2nd person with the largest number of friends
- Find the N-th person with the largest number of friends
- Find the total number of connections in your social network
- Find if you have isolated groups in your social network (see a4)
- Find the maximum **degree of separation**

Resources

- Classes and Objects:
  http://docs.oracle.com/javase/tutorial/java/javaOO/
- The Shoelace Algorithm:
  http://en.wikipedia.org/wiki/Shoelace_formula
- Suggested reading:
  How to think like a Computer Scientist, Chapter 11