

1 Exercises

For the following exercises, pair up with someone else in the class and create a project for each exercise. In your comment section at the top of each of the programs make sure that both of your names are listed in the Author line in the comments at the top of each program.

For each of the following create a new project with an appropriate name and then write a program that solves the given problem.

Remember:

- Shift+Ctrl+F to format the program, or Shift+Command+F on the Mac.
- The standard comments of at the top,
 - Authors
 - Date
 - Description

For each program, you will be submitting the java code file through MyClasses, as you did before. I also want either a Microsoft Word docx file, LibreOffice Writer odt, or a text file (which you can create with NotePad++) which contains the following. This docx, odt, or text file is to be uploaded to MyClasses as well. You can copy and paste output from the Eclipse console area to the word or text program. Only one of you will need to submit the files.

- The answers to the three main questions:
 1. What do I want as the final result of the program? (WANT)
 2. What is the calculation I will need to do? (HOW)
 3. What do I need to complete this calculation? (NEED)
- The answers above reformatted into an algorithm.
- Output of at least three runs of each program on different data inputs.

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1. Given two points on the xy -plane (x_1, y_1) and (x_2, y_2) the slope of the line between these two points is

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

the distance between the two points is

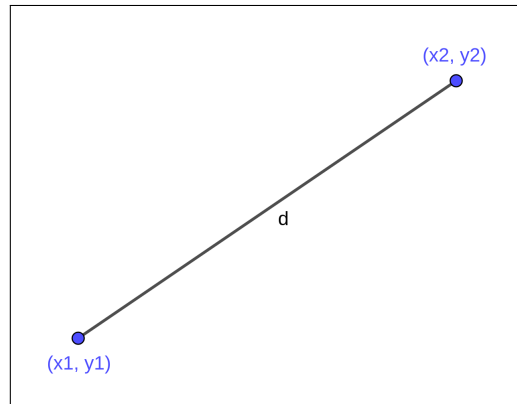
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

and the equation of the line between the two points is

$$y = m \cdot x + b$$

where m is the slope and $b = y_1 - m \cdot x_1$.

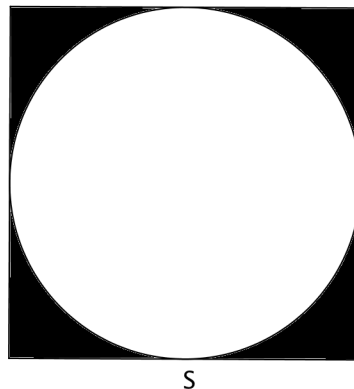
Write a program that takes in the two points (x_1, y_1) and (x_2, y_2) as input and outputs the slope of the line, the distance between the two points, and the equation of the line between the two points. A sample run is below.



```
Input x1: 2
Input y1: 4
Input x2: 6
Input y2: 1
```

```
The slope is -0.75
The distance between the points is 5.0
The equation of the line is  $y = -0.75 x + 5.5$ 
```

2. Write a program that will calculate the area of the shaded region in the image below. It is a square with side length S and there is a circle cut out of it. A sample run is below.



```
Input side length S: 7
Shaded Area = 10.515489993525037
```