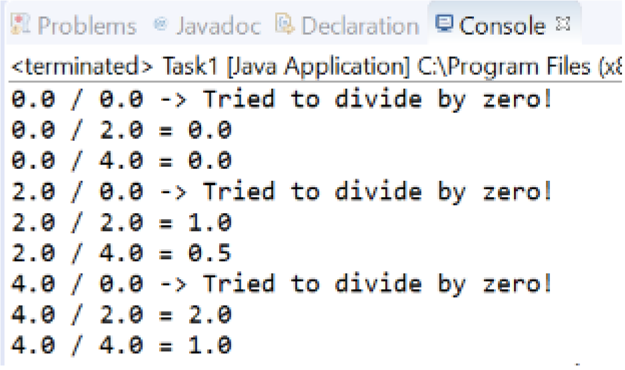
OPMS 2018 - Exercise 4

Task 1 (Exceptions)

1. Create a new project called “Exercise4” and create a new class called `MathFunctions` which has a main()-method.
2. Create a static function `division`, which takes two double arguments and returns the division.
3. As you might have already noticed, not all input arguments will return a valid result. Since a division by 0 is impossible, this case has to be handled by throwing an exception. Implement a new class `DivisionByZeroException` which extends Exception.
4. Throw the DivisionByZeroException in your `division` function if the second argument is 0.
5. Test your implementation by calling your function from the main()-method. Use a try-catch block to print the result of the division, if the parameters are valid and else print an error message. See Picture 1 for a possible output.

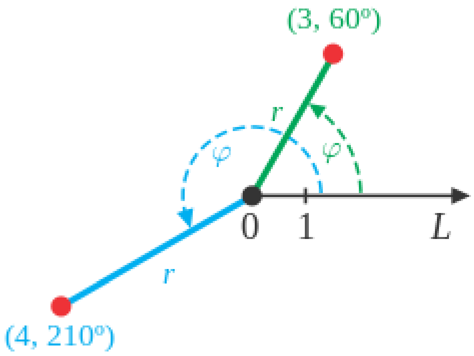


```
<terminated> Task1 [Java Application] C:\Program Files (x8
0.0 / 0.0 -> Tried to divide by zero!
0.0 / 2.0 = 0.0
0.0 / 4.0 = 0.0
2.0 / 0.0 -> Tried to divide by zero!
2.0 / 2.0 = 1.0
2.0 / 4.0 = 0.5
4.0 / 0.0 -> Tried to divide by zero!
4.0 / 2.0 = 2.0
4.0 / 4.0 = 1.0
```

Picture 1: Possible output from testing the division function with different parameters

Task 2 (Exceptions)

The polar coordinate system describes each point in a plane by a distance and an angle.



Picture 2: The arctan function

1. Extend your class `MathFunctions` by a static function `getPolarAngle` which takes the co-ordinates x and y as two double arguments. The function should implement the behavior

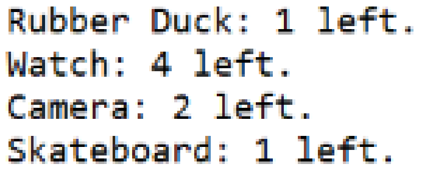
$$\theta = \begin{cases} \arctan(\frac{y}{x}) & \text{if } x > 0 \\ \arctan(\frac{y}{x}) + \pi & \text{if } x < 0 \text{ and } y \geq 0 \\ \arctan(\frac{y}{x}) - \pi & \text{if } x < 0 \text{ and } y < 0 \\ \frac{\pi}{2} & \text{if } x = 0 \text{ and } y > 0 \\ -\frac{\pi}{2} & \text{if } x = 0 \text{ and } y < 0 \\ \text{undefined} & \text{if } x = 0 \text{ and } y = 0 \end{cases}$$

   Picture 3: Calculation of a polar angle from Cartesian coordinates

   Throw an IllegalArgumentException if x and y are both 0. Use `Math.atan` for calculating arctan() and `Math.PI` for π.
2. Provide the IllegalArgumentException with the message String "x and y cannot both be 0 at the same time.". Test your function in the main()-method and print the exception message in the catch block by using the exception’s getMessage()-method.

Task 3 (Data Structures)

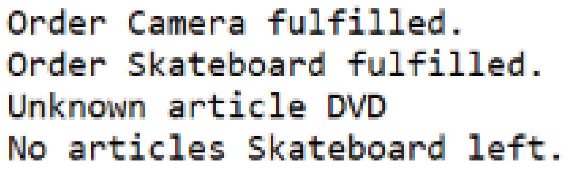
1. Create a new class `Task3` with a main()-method.
2. Instantiate a HashMap called *stock* which maps Strings onto Integers. This map will store articles and the corresponding amount left in stock.
3. Fill the stock with 4 items. Then iterate over the keys with a for-each loop and print the corresponding amount to the console. Use the method keySet() to get the keys of your map. Your output should look similar to Picture 4.



```
Rubber Duck: 1 left.
Watch: 4 left.
Camera: 2 left.
Skateboard: 1 left.
```

Picture 4: Sample output of printing the stock

4. Instantiate a LinkedList called *orders* which will hold Strings. Add 5 orders to the list.
5. Iterate over the *order* list. For each order, check if the requested item is in stock. If it is not, print the message “Unknown article”. Else check if there are any items left in stock and either fulfill or reject the order. Don’t forget to reduce the count of the respective item by 1 after fulfilling an order. Look at Picture 5 for the expected output



```
Order Camera fulfilled.
Order Skateboard fulfilled.
Unknown article DVD
No articles Skateboard left.
```

Picture 5: Sample output of processing the order list