

## Practice Exercise #03: Washers

[http://www.comp.nus.edu.sg/~cs1020/4\\_misc/practice.html](http://www.comp.nus.edu.sg/~cs1020/4_misc/practice.html)

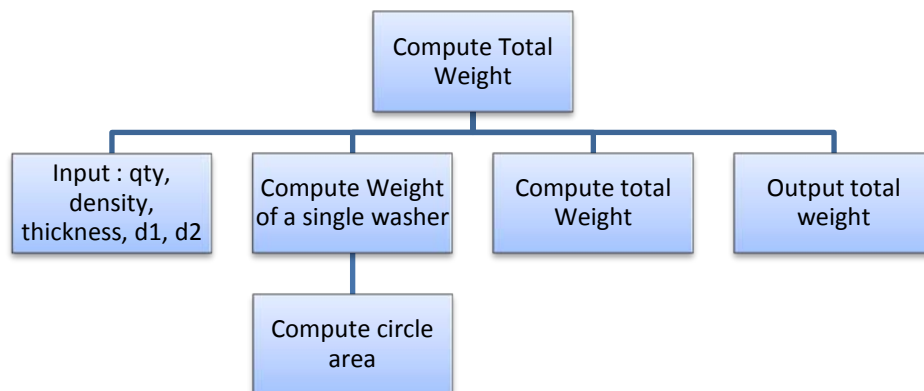
**Reference:** Week 1 Java Basics

### Objectives:

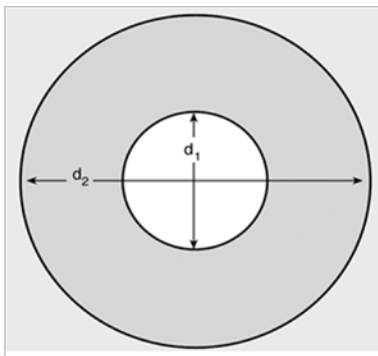
1. Converting a simple C program to Java program
2. Using **Math** class
3. Writing user-defined method

### Task statement:

In CS1010 Week 3 example 3<sup>†</sup>, we calculate the total weight of washers. The structure chart is shown below.



The rim area of a washer is the difference between the area of the outer circle and the area of the inner hole:



$$\text{rim area} = \pi(d_2/2)^2 - \pi(d_1/2)^2$$

The C program is given in the next page.

<sup>†</sup> Lecture slides for CS1010 are available on [http://www.comp.nus.edu.sg/~cs1020/4\\_misc/cs1010\\_lect.html](http://www.comp.nus.edu.sg/~cs1020/4_misc/cs1010_lect.html)

```

// Compute total weight of a batch of washers
#include <stdio.h>
#include <math.h>
#define PI 3.14159

double circle_area(double);

int main(void) {
    double d1,           // hole circle's diameter
           d2,           // big circle's diameter
           thickness,
           density;
    int    qty;

    double unit_weight,  // single washer's weight
           total_weight, // a batch of washers' total weight
           rim_area;     // single washer's rim area

    printf("Inner diameter in cm: ");
    scanf("%lf", &d1);
    printf("Outer diameter in cm: ");
    scanf("%lf", &d2);
    printf("Thickness in cm: ");
    scanf("%lf", &thickness);
    printf("Density in grams per cubic cm: ");
    scanf("%lf", &density);
    printf("Quantity: ");
    scanf("%d", &qty);

    // compute weight of a single washer
    rim_area = circle_area(d2) - circle_area(d1);
    unit_weight = rim_area * thickness * density;

    // compute weight of a batch of washers
    total_weight = unit_weight * qty;

    printf("Total weight of %d washers is %.2f grams.\n",
           qty, total_weight);

    return 0;
}

double circle_area(double diameter) {
    return pow(diameter/2, 2) * PI;
}

```

Convert the program into a Java program **Washers.java**. You are to use appropriate method(s) in the **Math** class, and also include a user-defined method **circleArea()** to compute the area of a circle.

You do not need to define your own constant for  $\pi$ , as the **Math** class already has such a constant for you to use. Check out the API.

**Sample runs:**

```
Inner diameter in cm: 12.3
Outer diameter in cm: 23.4
Thickness in cm: 3.5
Density in grams per cubic cm: 2.4
Quantity: 23
Total weight of 23 washers is 60129.58 grams.
```

```
Inner diameter in cm: 20
Outer diameter in cm: 25
Thickness in cm: 2.1
Density in grams per cubic cm: 3.7
Quantity: 100
Total weight of 100 washers is 137307.23 grams.
```