Worksheet Three

"Ford!", Arthur said, "There's an infinite number of monkeys outside who want to talk to us about this script for Hamlet they've worked out".
Douglas Adams, The Hitch Hikers Guide to the Galaxy 1979

Unit Learning Outcomes Addressed by this worksheet: 1

Place the answers to exercise one in a text file called exerciseOne.txt and the answers to exercise two in a text file called exerciseTwo.txt. The text files should be placed in your P03 directory. The pseudo code for the programming exercises can be handwritten in a notebook or stored electronically in the P03 directory. The Java implementations must be kept in the P03 directory.

Exercise One

(a) For each of the identifiers below:

1. State whether or not it is legal (i.e. will it compile?). If it is not legal than state the reason.
2. State whether or not the name follows the Java naming convention. If it does then state what type of identifier it is (i.e. class, method or variable or constant).

```
NavigationReading, fred.dat, My_int, loop-Counter, 2ndcounter,
Men&Women, -zero, a, noMore , FISH
```

(b) Evaluate the following Java expressions:

```
5 + 7 + 3 * 12 % 2 * 3
3 + 24 / 5 * 2
12 + 5 * 2.0 - 19 % 10 + 2.0
```

What is the problem with the last expression? How would you fix the problem?

(c) Give Java assignment statements for each of the following algebraic formulae (remember you can use built in functions)

$$weirdValue = \frac{(zeroToOne * 39.0) + 1.0}{2.6}$$

$$triangleArea = \sqrt{s(s - side1)(s - side2)(s - side3)}$$

where $s = \frac{(side1 + side2 + side3)}{2.0}$

(d) Why can we be "sure" of integer values and not of real values? Can you think of any examples to illustrate this?

Exercise Two (Another algorithm with sub modules)
Design an algorithm which will:

- Input the cost of a product and the amount the customer has tendered for payment. you may assume that the payment is always > cost. You may also assume that the cost and the amount paid are always in increments of 5 cents.
- The algorithm should:
    - Calculate the amount of change required.
    - Determine the notes and coins to be given to the customer.
    - Output both to the user.

A good strategy is to calculate and output the dollar amounts required and then do the same for the cents amounts. The simplest and easiest way to design this algorithm is to make good use of integer division and remainder. Algorithms which do not make use of this are MUCH more difficult. Also make good use of sub modules and think carefully about your algorithm as it seems straight forward but can be a bit tricky. This one will need to be developed carefully. Use an example to work out how you would decide the change as a human and then use that knowledge to attempt your solution.

Exercise Three (Another Java implementation)
Convert your pseudo code design into a complete Java application.

Exercise Four (Another algorithm with sub modules)
Design an algorithm which will:

- Input the cost of a product.
- Inputs a discount as a percentage.
- Both the price and the discount should be input as real numbers. Also you may assume the input is valid.
- The algorithm should:
    - Calculate the discounted price and
    - Round the discounted price to two decimal places
    - Output the discounted price to the user.

Think about the data type issues. Your solution at one point should involve converting a value from real to integer and back again. Note this is not as simple as truncating the discounted price to an integer. You will need to think carefully.

Exercise Five (Another Java implementation)
Convert your pseudo code design into a complete Java application.