Computer Programming

Unit 1 Handout Rounding Numbers

There are many, many times where a decimal answer needs to get rounded in a program. This handout covers how you can round decimal numbers. Please read the two examples and explore . It is crucial that you understand how to round decimals to specific digits.

Rounding to the Nearest Positive Integer

Process: Add 0.5 and cast into an integer.

Reasoning: Think of it this way…

1) Numbers that contain a decimal below 0.5 will round down. If you add 0.5 to a decimal that is less than half, the number will still round down.

```
Example:          double a = 7.4;          // a = 7.4
                  a += 0.5;                // a = a + 0.5, so a = 7.9
                  int b = (int)a;          // b = 7

More Efficient:   double a = 7.4;          // initialize a
                  int b = (int)(a+0.5);    // cast to an integer = 7

Warning!!!        double a = 7.4;          // DOES NOT WORK!!!
                  a = (int)(a+0.5);        // a is a double … will be 7.0
```

2) Numbers that contain a decimal that is 0.5 or greater round up. If you add 0.5 to a decimal that is one-half or more, the number will be rounded up.

```
Example:          double a = 53.8;         // a = 53.8
                  a += 0.5;                // a = a + 0.5, so a = 54.3
                  int b = (int)a;          // b = 54

More Efficient:   double a = 53.8;         // initialize a
                  int b = (int)(a+0.5);    // cast to an integer = 54
```

Rounding to One Decimal Place

Process: Multiply by 10, add 0.05, cast into an integer, and then divide by 10.

Reasoning: Very similar to rounding an integer, the decimal just needs to be shifted back-and-forth so that the problem works the same.

Example #1:

```
double a = 7.43;          // a = 7.43
a += 0.05;                // a = a + 0.05, so a = 7.48
a *= 10;                  // a = 7.48 * 10, so a = 74.8
int b = (int)a;           // b = 74
a = b/10.0;               // a = 7.4
```

More Efficient:

```
double a = 7.43;          // initialize a
int b = (int)(10*(a+0.05)); // (int)(10*7.48) = 74
a = b/10.0;               // a = 7.4
```

Example #2:

```
double a = 53.87;         // a = 53.87
a += 0.05;                // a = a + 0.5, so a = 53.92
a *= 10;                  // a = 53.92 * 10 = 539.2
int b = (int)a;           // b = 539
a = b/10.0;               // a = 53.9
```

More Efficient:

```
double a = 53.87;         // initialize a
int b = (int)(10*(a+0.05)); // (int)(10*53.92) = 539
a = b/10.0;               // a = 53.9
```