**Student Activity Guide: Round-off Errors Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Unit 3 Lesson 4

Directions:

Enter and run the following short JavaScript code segments. Record your answers in the space provided.

1. Enter the following code. Run the program. Record the output: x = \_\_\_\_\_\_\_\_\_\_\_ and 100 times x = \_\_\_\_\_\_\_\_\_\_\_

var x;

var y;

x = 4.36;

y = 100 \* x;

(Modify the following line of code intended to output the answer according to the script editor being used.)

document.getElementById("demo").innerHTML= "Is it correct? " + x + " " + y;

Change 4.36 to 4.35.

Run the program. Record the output: x = \_\_\_\_\_\_\_\_\_\_\_ and 100 times x = \_\_\_\_\_\_\_\_\_\_\_

Is this the correct answer? \_\_\_\_\_\_\_\_\_\_\_\_\_

What other values for x generate a similar error? List three examples: \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_

1. Try the following code:

document.getElementById("demo").innerHTML="0.9200000000000001 " + 0.9200000000000001 + " 0.9200000000000002 " + 0.9200000000000002 ;

Describe what happens.

1. Find a value of x for which (0.1 \* x) is different from (x / 10). \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Try 3/7 on a calculator. What answer do you get? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Try this code on the computer:

document.getElementById("demo").innerHTML= 3/7 ;

What do you get? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**So, why is this happening?**

All of these are examples of round-off errors.

In Unit 1, you learned how to store an integer in binary. When a computer stores decimal values it also uses powers of two:

1 1 1 etc.

2 4 8

In computer architecture, not EVERY decimal number can be represented precisely in base-2 numbers.

Rounding errors have created serious real-world problems. Summarize what happened in each of these two situations because of round-off errors.

1. Vancouver Stock Exchange
2. Patriot Missile Defense System
3. How does the potential for round-off errors impact how computer scientists must test program code?
4. What responsibility does a programmer have to making sure their code works as intended?