GENERAL
MATH TOOLKIT
Significant Digits and Rounding

BLM G-39

> **Goal** • Practise estimating and rounding off digits in measurements.

Introduction

Scientists frequently work with many numbers. Sometimes, such as in the distance to the Sun, they are extremely large numbers. Sometimes, such as in the size of a microbe, they are extremely small numbers. In order to help them easily read and compare many numbers, scientists use significant digits.

When scientists measure an object, they record as accurate a number as possible. This number will consist of known (or certain) digits and one or more estimated digits. Scientists refer to accurately measurable numbers as significant digits. This master will help you learn to work with significant digits.

What to Do

• As a class, discuss the importance of using significant digits.

• Use the guidelines before each question to help you answer it.

Questions

Guidelines for Counting Significant Digits

Look at any zeros.

• Zeros placed before other digits are not significant. For example, 0.0000067 has only two significant digits. What are they? _____

• Zeros placed between digits are important. For example, how many significant digits will 2001 have? _____

• Zeros placed after other digits and behind a decimal are significant. For example, in 3.60, every number is significant. How many significant digits does 3.60 have? _____

1. Determine the number of significant digits in the following measurements:

(a) 4.357 L _____	(b) 0.005 g _____
(c) 4.0 mm _____	(d) 0.0050 N _____
(e) 4.3570 m _____	(f) 0.0501 W _____
(g) 0.0037 L _____	(h) 200 303 cm _____
(i) 4.3 kg _____	(j) 303 s _____

Guidelines for Rounding Off Using Significant Digits

Choose the number of significant digits. Usually this is provided in the question.

• When rounding to two significant digits, keep the two most important numerals.

• When rounding to three significant digits, keep the three most important numerals.

If a numeral has to be dropped, round it off using the next numeral. For example, consider rounding off 3.6 ___ to two significant digits. The value of the two significant digits depends on what is in the blank.

- If the first digit to be dropped is 4 or less, the preceding   e.g., 3.64 becomes 3.6
  digit is not changed.

- If the first digit to be dropped is 6 or more, the preceding   e.g., 3.66 becomes 3.7
  digit is raised.

- If the digit to be dropped is a 5 followed by digits other than 0,   e.g., 3.25179 becomes 3.3
  then the preceding digit is raised by one.

- If the digit to be dropped is a 5, or a 5 followed by 0's, the   e.g., 3.65 becomes 3.6
  preceding digit is not changed if it is even, and is raised   e.g., 2.75 becomes 2.8
  by 1 if it is odd.

2. Round off each of the following measurements to 3 significant digits:

(a) 3.752   _____   (b) 14.25   _____

(c) 0.04542   _____   (d) 2.051   _____

(e) 76.23   _____   (f) 13.1801   _____

(g) 6.722   _____   (h) 3.215   _____

(i) 0.01512   _____   (j) 3.753   _____

(k) 14.45   _____   (l) 0.04552   _____