SCIENTIFIC NOTATION

Explain – Tell students that scientific notation is used to reduce the number of zeros in a number. Numbers are expressed as simple numbers multiplied by a power of 10. Explain to students that the first fact of scientific notation is that when you multiply 10 by itself some number of times, your answer is 1 with that many zeros. For example:

$10^4 = 10000$
$10^3 = 1000$
$10^2 = 100$
$10^1 = 10$
$10^0 = 1$
$10^{-1} = 0.1$
$10^{-2} = 0.01$
$10^{-3} = 0.001$
$10^{-4} = 0.0001$

For 10^4 we say "10 raised to the 4^{th} power," or "10 to the 4^{th} power" or just "10 to the 4^{th}."
The next fact is that if you multiply a number by 1 with some number of zeros, you move the decimal point to the right that many places. For example:
5.6 x 1000 =
 |____
 |
5 6000.
The scientific notation for 56000 is 5.6×10^4.

To write 56000 in scientific notation you move the decimal point to the left until there is only one digit to the left of it. That number is between 1 and 10. Then count the places you moved the decimal point and that number becomes the exponent (the number above the line after the 10).

Here's what you do if you have a number that is less than one. For example:

$$0.0056 = \frac{56}{1000} = 56 \times 10^{-4}$$

We can write 0.0056 as 56×10^{-4}, but in true scientific notation the first number is always between 1 and 10. Therefore, you have to move the decimal point one place to the left, which means adding 1 to the exponent.
$0.0056 = 5.6 \times 10^{-3}$

The rule is: If you move the decimal point left to get one non-zero digit to the left of the decimal point, you count the places and use a positive exponent. If you move the decimal point right to get one non-zero digit to the left of the decimal point, you count the places and use a negative exponent.

Overall Rules:
1. Move the decimal point, left or right, until there is one non-zero digit to the left of the new decimal point. Count the places you moved it.
2. Multiply the number by 10 raised to this power. Make the power positive if you moved the decimal point to the left, and negative if you moved the decimal point to the right.

Examples:

a. $3270 = 3.27 \times 10^3$
3 270.
 ___| 3 places left
 |
3.270

b. $0.000507 = 5.07 \times 10^{-4}$
0.0005 07
 |____ 4 places right
  |
  5.07

Have students practice by writing the following measurements in scientific notation:
a. 900 000 000 m 9.0×10^8m

b.	0.000 45 m	4.5×10^{-4}m
c.	3 001 000 km	3.001×10^{6} km
d.	82 300 L	8.23×10^{4}L
e.	0.0058 kg	5.8×10^{-3}kg
f.	0.000 000 000 07 kg	7.0×10^{-11} kg