Scientific Notation

<u>Scientific Notation</u> is used when writing a very large number or a number with lots of decimal places, using powers of 10.
Example: $34{,}000{,}000{,}000 = 3.4 \times 10^{10}$.

Converting Standard Form to Scientific Notation

1) Move the decimal point in the original number to the right ➡ (or left ⬅) so that the new number is between 1 & 10.
2) Count the number of places you moved the decimal.
   a. If moved to the right ➡ the exponent of the 10 is negative (-).
   b. If moved to the left ⬅ the exponent of the 10 is positive (+).
3) Write the new number & double check.

1) 4700   Have to move the decimal 3 places to the left, so that the new number has a value between 1 and 10.
⬅

Since we moved the decimal 3 places, and the original number was > 10, our count is positive 3.

$4700 = 4.7 \times 10^3$

2) 0.00047   Have to move the decimal 4 places to the right, so that the new number has a value between 1 and 10.
➡

Since we moved the decimal 4 places, and the original number was < 1, our count is negative 4.

$0.00047 = 4.7 \times 10^{-4}$

Converting Scientific Notation to Standard Form

1) Move the decimal point the number of places in the exponent.

   a. If it is positive, move to the right →

   b. If it is negative, move to the left ←

1) 5.2738×10^3

Since the exponent is a positive 3, we move the decimal 3 places to the right.

$5.2738 \times 10^3 = 5273.8$

2) 6.45×10^{-5}

Since the exponent is a negative 5, we move the decimal 5 places to the left.

$00006.45 \times 10^{-5} = 0.0000645$

Operations with Scientific Notation

Multiplying and dividing with numbers written in scientific notation involves using properties of exponents.

Perform the following operations.

1) $(7.3 \times 10^{-2})(8.1 \times 10^5) = (7.3 \cdot 8.1) \times (10^{-2} \cdot 10^5)$
$$= 59.13 \times 10^3$$
$$= 59{,}130$$

2) $\dfrac{1.2 \times 10^4}{4 \times 10^9} = \dfrac{1.2}{4} \times \dfrac{10^4}{10^9} = 0.3 \times 10^{-5} = 0.000003$