

EXPONENTIAL (SCIENTIFIC) NOTATION EXPLAINED

(in small steps)

A. POWERS OF TEN: (Note: * is frequently used to show multiplication)

10^5	$= 10 \times 10 \times 10 \times 10 \times 10$	$= 100,000$	$= 10^5$	
10^4	$= 10 \times 10 \times 10 \times 10$	$= 10,000$	$= 10^4$	
10^3	$= 10 \times 10 \times 10$	$= 1000$	$= 10^3$	
10^2	$= 10 \times 10$	$= 100$	$= 10^2$	
10^1	$= 10$	$= 10$	$= 10^1$	
10^0	$= 1$	$= 1$	$= 10^0$	
10^{-1}	$= (.1)$	$= .1$	$= 10^{-1}$	$= 1 / 10$
10^{-2}	$= (.1)(.1)$	$= .01$	$= 10^{-2}$	$= 1 / 100$
10^{-3}	$= (.1)(.1)(.1)$	$= .001$	$= 10^{-3}$	$= 1 / 1000$
10^{-4}	$= (.1)(.1)(.1)(.1)$	$= .0001$	$= 10^{-4}$	$= 1 / 10,000$
10^{-5}	$= (.1)(.1)(.1)(.1)(.1)$	$= .00001$	$= 10^{-5}$	$= 1 / 100,000$

B. CONVERTING EXPONENTIAL NOTATION TO DECIMAL NOTATION:

Method 1: Convert powers of ten using above table, then multiply

Examples: $5.41 * 10^3 = 5.41 * 1000 = 5410$.

$1.38 * 10^{-4} = 1.38 * .0001 = .000138$

Method 2: Use positive exponent to move decimal point to the right that many places, or

Use negative exponent to move decimal point to the left that many places

Examples: $5.41 * 10^3 = 5.41$ with decimal moved 3 places to right = 5410.

$1.38 * 10^{-4} = 1.38$ with decimal moved 4 places to left = .000138

HINT: Remember that negative exponents are always for numbers less than 1;
zero or positive exponents are always for numbers greater than 1. **Always check this!**

C. CONVERTING DECIMAL NOTATION INTO EXPONENTIAL NOTATION:

Step 1: Copy the digits without the decimal point.

Step 2: Put a decimal point after the first nonzero digit.

Step 3: Determine how many places, and in what direction, this NEW decimal point must move to reach the position of the ORIGINAL decimal point
(BE CAREFUL not to do it the opposite way!)

Step 4: Write "times ten to the" and then insert a positive exponent if you need to move to the right and a negative exponent if you need to move to the left.

Examples: 15046. steps 1+2: 1.5046

step 3: move 4 places to the right to convert 1.5046 to 15046.

step 4: answer is $1.5046 * 10^4$

.0000275 steps 1+2: 2.75

step 3: move 5 places to the left to convert 2.75 to .0000275

step 4: answer is $2.75 * 10^{-5}$

HINT: Check any answer by converting it back to decimal, using method 1 or 2 in **B**, above.