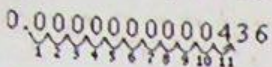


[1-9B] Scientific Notation and Standard Form (Decimal Notation) Notes

- By using exponents, we can reformat numbers. For very large or very small numbers, it is sometimes simpler to use "scientific notation" (so called, because scientists often deal with very large and very small numbers).
- The format for writing a number in scientific notation is fairly simple: (first digit of the number) followed by (the decimal point) and then (all the rest of the digits of the number), times (10 to an appropriate power). The conversion is fairly simple.

- Write 0.000 000 000 043 6 in scientific notation.

In scientific notation, the number part (as opposed to the ten-to-a-power part) will be "4.36". So I will count how many places the decimal point has to move to get from where it is now to where it needs to be:



Then the power on 10 has to be -11 : "eleven", because that's how many places the decimal point needs to be moved, and "negative", because I'm dealing with a SMALL number. So, in scientific notation, the number is written as 4.36×10^{-11}

- Convert 4.2×10^{-7} to decimal notation.

Since the exponent on 10 is negative, I am looking for a small number. Since the exponent is a seven, I will be moving the decimal point seven places. Since I need to move the point to get a *small* number, I'll be moving it to the left. The answer is 0.000 000 42

- Convert 0.000 000 005 78 to scientific notation.

This is a small number, so the exponent on 10 will be negative. The first "interesting" digit in this number is the 5, so that's where the decimal point will need to go. To get from where it is to right after the 5, the decimal point will need to move nine places to the right. Then the power on 10 will be a negative 9, and the answer is 5.78×10^{-9}

Just remember: However many spaces you moved the decimal, that's the power on 10. If you have a small number (smaller than 1, in absolute value), then the power is negative; if it's a large number (bigger than 1, in absolute value), then the exponent is positive.

Warning: A negative on an exponent and a negative on a number mean two very different things! For instance:

$$-0.00036 = -3.6 \times 10^{-4}$$

$$0.00036 = 3.6 \times 10^{-4}$$

$$36,000 = 3.6 \times 10^4$$

$$-36,000 = -3.6 \times 10^4$$

Don't confuse these!

Part 1) Write in standard form.

- 1) 4.82×10^{-5} 0.0000482 2) 2.6×10^{-6} 0.00000026 3) 1.79×10^{-4} 0.000179
 4) -5.28×10^5 -528,000 5) 7×10^8 700,000,000 6) -6.12×10^{-6} -0.00000612

Write each number in scientific notation.

- 7) 0.000 000 000 52 5.2×10^{-10} 8) 0.000 000 041 4.1×10^{-8} 9) 0.000 000 398 3.98×10^{-7}
 10) 578,000,000 5.78×10^8 11) 38,000,000,000 3.8×10^{10} 12) 219,000 2.19×10^5

Use your calculator to evaluate the following. Write the answer in scientific notation and standard form.

	Scientific notation (3 significant digits)	Standard form
$\frac{1}{5^{11}}$ 13) 5^{-11}	2×10^{-8}	$0.000\ 000\ 02$ (10)
14) 9^{-12}	3.54×10^{-12}	$0.000\ 000\ 000\ 000\ 354$ (13)
15) 8^{-15}	2.84×10^{-14}	$0.000\ 000\ 000\ 000\ 000\ 284$ (11)
16) 5^{20}	9.54×10^{13}	$95,400,000,000,000$
17) 9^{11}	3.14×10^{10}	$31,400,000,000$
18) 10^{12}	1.0×10^{12}	$1,000,000,000,000$

Part 3) Scientific Notation
Write in standard form.

- 1) 1.91×10^{-5} _____ 2) 3.1×10^7 _____ 3) 8.46×10^8 _____
 4) 9.182×10^5 _____ 5) 7.2×10^{-8} _____ 6) 1.97×10^{-6} _____

Write each number in scientific notation.

- 7) 0.000 000 027 _____ 8) 79,000,000,000 _____ 9) 0.000 000 398 _____
 10) 123,100,000 _____ 11) 0.000 000 05 _____ 12) 0.000 000 018 _____

Use your calculator to evaluate the following. Write the answer in scientific notation and standard form.

	Scientific notation	Standard form
13) 7^{-11}	_____	_____
14) 8^{12}	_____	_____
15) 5^{-15}	_____	_____
16) 6^{-10}	_____	_____
17) 7^{14}	_____	_____
18) 12^{-8}	_____	_____