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:

  0.00000000000436
  1 2 3 4 5 6 7 8 9 10 11

  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 $\mathbf{4.36 \times 10^{-11}}$

- **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 $\mathbf{5.78 \times 10^{-9}}$

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!

Write in standard form.

1) 4.82×10^{-5} 0.0000482 2) 2.6×10^{-7} .000000026 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} 6,120,000

Write each number in scientific notation.

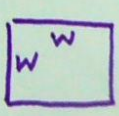
7) 0.000 000 000 52 5.2×10^{-10} 8) 0.000 000 041 4.1×10^{-8} 9) 0.000 000 398 $3.98 \times 10^{-}$

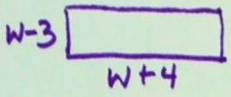
10) 578,000,000 5.78×10^{8} 11) 38,000,000,000 3.8×10^{10} 12) 219,000 2.19×10^{5}

Area Problems; #4

Example:

A house has two rooms of equal area. One room is square and the other is 4 ft longer and 3 ft narrower than the square room. Find the area of the square room.





$w \cdot w = (w+4)(w-3)$

$w^2 = w^2 + -3w + 4w + -12$

$12 = w$

$12 \cdot 12 = 144 ft^2$ ← Area

Problem for practice:

A zoo has two rectangular cages of equal area. One cage is square and the other is 10 ft longer and 6 ft narrower than the square cage. Find the area of the square cage.

Area Problems: #5