Percent: The decimal number times 100 .

Ex: $0.25 = 25\%$, $7.431 = 743.1\%$, $629.73\% = 6.2973$, $0.1\% = 0.001$.

Negative Integer Exponents: Any number written with a **negative exponent** means the reciprocal of that number to the positive exponent.

Ex: $17^{-31} = \dfrac{1}{17^{31}}$.

Scientific Notation: Any decimal number can always be written as a non-zero integer followed by a decimal point followed by the rest of the number, all multiplied by some power of 10.

Ex: $4{,}723.5 = 4.7235 \times 10^{3}$, $0.001496 = 1.496 \times 10^{-3}$, $0.00000007214 = 7.214 \times 10^{-8}$, $5{,}120{,}000 = 5.12 \times 10^{6}$.

This is an easy way to write very large or very small numbers. The only tricky part is to figure out the correct power of 10. **The magnitude of the power of 10 equals the number of places the decimal point is moved.** The sign of the power of 10 is determined by whether the magnitude of the original number is larger than 1 or smaller than 1 (remember that $10^{-anything} < 1$ while $10^{+anything} > 1$ for $(anything) > 0$).

The real value of scientific notation lies in the use of the rules of exponents to manipulate numbers.

Ex:

$$\sqrt{400{,}000{,}000} \bullet (0.000000027)^{1/3} = \left(4 \times 10^{8}\right)^{1/2} \bullet \left(27 \times 10^{-9}\right)^{1/3} = \left(2 \times 10^{4}\right)\left(3 \times 10^{-3}\right) = 2 \bullet 3 \times 10^{4-3} = 6 \times 10 = 60$$

.

Prime Decomposition: Every integer can be written as a product of prime numbers. There is only one way that this can be done.

Ex: $342 = 2 \bullet 171 = 2 \bullet 9 \bullet 19 = 2 \bullet 3^{2} \bullet 19$, which is the prime decomposition of 342 .

Testing For Primes: When trying to determine if some number, call it N, is a prime you only have to check for prime factors up to $\sqrt{N}$.

Ex: Is 119 prime?

Soln: Since $11 \bullet 11 = 121$ you only have to check for prime factors less than 11.
2 and 5 are not factors by inspection.
Adding the digits gives 11 so 3 is not a factor.
The only prime left less than 11 is 7. 119/7 = 17 so the answer is NO.

Relative Primes: Two numbers which have no prime factors in common are **relatively prime**.

Ex: Which of the three pairs of numbers are relatively prime: (342,195), (95,114), (990,323) ?

Soln: $3 + 4 + 2 = 9$, $1 + 9 + 5 = 15$ and both sums are divisible by 3, so 3 must be a common factor of the first pair, so 342 and 195 are NOT relatively prime.

$95 = 5 \bullet 19$, and 5 is not a factor of 114 , so try 19. 114/19 = 6 , so 19 is a common factor of the second pair, so 95 and 114 are NOT relatively prime.

$990 = 10 \bullet 99 = 10 \bullet 9 \bullet 11 = 2 \bullet 3^{2} \bullet 5 \bullet 11$, so see if these primes are factors of 323. Not 2 or 5, adding digits gives 8 so not 3, $3 - 2 + 3 = 4$ so not 11. None of the factors of 990 is a factor of 323, so 990 and 323 ARE relatively prime. (Notice that since $323 = 17 \bullet 19$ neither 990 nor 323 are prime numbers.)

Numbers 3 Homework Problems

(NO CALCULATORS)

a) Express $62\frac{1}{2}\%$ as a common fraction in lowest terms.

b) Express $16\frac{2}{3}\%$ as a common fraction in lowest terms.

c) Write the decimal equivalent to $\frac{3}{5}\%$.

d) Write the common fraction equivalent to $20\frac{5}{6}\%$.

e) Write $62\frac{2}{3}\%$ as a common fraction.

f) Write $22\frac{1}{2}\%$ as a common fraction.

g) Express $6\frac{1}{4}\%$ as a common fraction.

h) Write the common fraction equivalent to $71\frac{3}{7}\%$.

i) 24 is what percent of 73 ? Express your answer to the nearest tenth of a percent.

j) Find the absolute value of the difference between the two largest of the following numbers. Express your answer as a decimal. (a) $\frac{3}{8}$, (b) 0.3, (c) 35%, (d) $\frac{1}{3}$.

k) What is $(0.00000003)(1,700,000,000)$?

l) What is $\dfrac{(80,000,000)^2(0.000003)}{(600,000)(0.0002)^4}$?

m) Which pair(s) are relatively prime: (a) (23,115) , (b) (72,35) , (c) (256,27) , (d) (990,637)