NOTES

In 1996, Larry Page and Sergey Brin started a search engine that we all use today. Larry's office was shared with several other graduate students, including Sean Anderson. In 1997, Larry and Sean were in their office, using the whiteboard, trying to think up a good name - something that related to the indexing of an immense amount of data. Sean verbally suggested the word "googolplex," and Larry responded verbally with the shortened form, "googol" (both words refer to specific large numbers).

Sean was seated at his computer terminal, so he executed a search of the Internet domain name registry database to see if the newly suggested name was still available for registration and use. Sean is not an infallible speller, and he made the mistake of searching for the name spelled as "google.com," which he found to be available. Larry liked the name, and within hours he took the step of registering the name "google.com" for himself and Sergey (the domain name registration record dates from September 15, 1997).

A googol is a 1 with 100 zeros

10000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000

We use exponents to help us write very large numbers like this. A googol can be written as 10^{100}.

Exponents indicate repeated multiplication. 10^{100} means find the product of 100 tens.

bases and exponents: 3^5 ← Exponent

Base number

$2^4 = 16$	$3^4 = 81$	$10^4 = 10,000$
$2^3 = 8$	$3^3 = 27$	$10^3 = 1,000$
$2^2 = 4$	$3^2 = 9$	$10^2 = 100$

1 as an exponent: Any base number to the power of 1 is equal to the base number itself.

Examples: $2^1 = 2$, $10^1 = 10$

0 as an exponent: Any base number to the power of 0 is equal to 1.

Examples: $5^0 = 1$, $8^0 = 1$

Negative exponents: Any base number to a negative power equals its reciprocal to the positive power.

Examples:

$$2^{-1} = \left(\frac{1}{2}\right)^1 = \frac{1}{2} \qquad 3^{-2} = \left(\frac{1}{3}\right)^2 = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$$

Simplify each of the following expressions.

$$1{,}333^1$$

$$19^0$$

$$5^{-2}$$

$$(-2)^4$$

$$-2^4$$

$$-2^{-3}$$

This dust mite has been magnified 1.5×10^5 times its actual size. The picture of the dust mite is how many times larger than the actual mite?

What is the value of this expression?

$$(1-4)^3 - 3 \cdot 8 \div 6$$