

Computing Expressions with Exponents Without a Calculator

Quick Review	
The Division Property	$\frac{a^n}{a^m} = a^{n-m}$
The Power Property	$(a^n)^m = a^{nm}$
The Distributive Property	$(ab)^n = a^n b^n$
The Zero Power Property	$a^0 = 1$ for any quantity $a \neq 0$
Caution! Remember that $(a + b)^2 \neq a^2 + b^2$.	

Problems

1. Without a calculator, compute the exact value of each of the following

a. 8^2

b. $\left(\frac{3}{4}\right)^3$

c. $\frac{(20)^3 (20)^2 (20)^5}{20^{15}}$

d. $\frac{16^{18}}{16^{17}}$

e. $\left(\frac{2^{23}}{2^{20}}\right)^2$

f. $2^6 + 4^3 - 8^2$

g. $\frac{9^6}{27^4}$

h. $\frac{25^3}{5^5}$

i. $(-8)^4 \left(\frac{1}{4}\right)^4$

2. Simplify each of the following expressions as much as possible.

a. $\left(\frac{12^{-3}}{12^{-1}}\right)^{-1}$

b. $(25^{-3})^2 (25^3)^{-2} (25^4)^3$

c. $(12^3)(12^{-2})$

d. $(1^4 + 2^5 + 3^6 + 4^7 + 5^8)^0$

e. $(3^2 - 2^3)^4$

f. $\left(\frac{144^3}{441^4}\right)^{(3^3 - 3^2 - 2^4 - 2^1)}$