Exponential Laws #1

1) Please write the following as a single power using the exponent laws.

a) $2^8 \times 2^2$

$= 2^{8+2}$

$= 2^{10}$

b) $\dfrac{(-1)^9}{(-1)^2} = (-1)^{9-2}$

$= (-1)^7$

c) $\left(8^2\right)^6$

$= 8^{2 \cdot 6}$

$= 8^{12}$

d) $3^{10} \div 3^8$

$= 3^{10-8}$

$= 3^2$

e) $1^{10} \times 1^4$

$= 1^{10+4}$

$= 1^{14}$

f) $\left(\dfrac{5^5}{5^2}\right)^{10} = \left(5^{5-2}\right)^{10}$

$= \left(5^3\right)^{10}$

$= 5^{3 \cdot 10}$

$= 5^{30}$

g) $x^5 x^4$

$= x^{5+4}$

$= x^9$

h) $\dfrac{a^8}{a^5} = a^{8-5}$

$= a^3$

i) $(y^3)^5 = y^{3 \cdot 5}$

$= y^{15}$

2) Write the following in expanded form and then evaluate.

a) $3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$

$= 243$

b) $\left(\dfrac{1}{7}\right)^6 = \left(\dfrac{1}{7}\right)\left(\dfrac{1}{7}\right)\left(\dfrac{1}{7}\right)\left(\dfrac{1}{7}\right)\left(\dfrac{1}{7}\right)$

$= \dfrac{1}{117649}$

c) $(-3)^4 = (-3)(-3)(-3)(-3)$

$= 81$

d) $-3^4 = -3 \cdot 3 \cdot 3 \cdot 3$

$= -81$

e) $\left(\dfrac{3}{5}\right)^4 = \left(\dfrac{3}{5}\right)\left(\dfrac{3}{5}\right)\left(\dfrac{3}{5}\right)\left(\dfrac{3}{5}\right)$

$= \dfrac{81}{125}$

f) $(-5)^1 = -5$

g) $(2^2)^3 = (2^2)(2^2)(2^2)$

$= (4)(4)(4)$

$= 64$

h) $\left(\dfrac{3}{4}\right)^2 = \left(\dfrac{3}{4}\right)\left(\dfrac{3}{4}\right)$

$= \dfrac{9}{16}$

Exponential Laws #2

1) Please write the following as a single power using the exponent laws, remember to NOT leave any negative exponents or decimals. Do **NOT** evaluate.

a) $7^{-2} \times 7^{-5}$ $= 7^{(-2)+(-5)}$
$= 7^{-7}$
$= \frac{1}{7^7}$

b) $\dfrac{3^{-9}}{3^{-2}}$ $= 3^{-9-(-2)}$
$= 3^{-9+2}$
$= 3^{-7}$
$= \frac{1}{3^7}$

c) $\left(5^{-4}\right)^{-2} = 5^{(-4)\cdot(-2)}$
$= 5^8$

d) $6^5 \div 6^8$ $= 6^{5-8}$
$= 6^{-3}$
$= \frac{1}{6^3}$

e) $5^{10} \times 5^{10}$ $= 5^{10+10}$
$= 5^{20}$

f) $\left(\dfrac{10^{-2}}{10^{-4}}\right)^{-3} = \left[10^{-2-(-4)}\right]^{-3}$
$= \left(10^{-2+4}\right)^{-3}$
$= \left(10^2\right)^{-3}$
$= 10^{-6}$

g) $x^{-5}x^4x^{-3} = x^{-5+4+(-3)}$
$= x^{-4}$
$= \frac{1}{x^4}$

h) $\dfrac{a^8}{a^{-5}}$ $= a^{8-(-5)}$
$= a^{8+5}$
$= a^{13}$

i) $(y^{-3})^{15}$
$= y^{-3\cdot15}$
$= y^{-45}$

2) Evaluate the following, do NOT leave decimals answers, leave them in fraction form.

a) 3^{-3} $= \dfrac{1}{3^3}$
$= \dfrac{1}{27}$

b) $\left(\dfrac{1}{7}\right)^{-6}$ $= \left(7\right)^6$
$= 117649$

c) $(-1)^{12}$ $= 1$

d) -1^{12} $= -1$

e) $\left[\left(\dfrac{4}{3}\right)^{-2}\right]^3 = \left[\left(\dfrac{3}{4}\right)^2\right]^3$
$= \left(\dfrac{3}{4}\right)^6 = \left(\dfrac{3}{4}\right)\left(\dfrac{3}{4}\right)\left(\dfrac{3}{4}\right)\left(\dfrac{3}{4}\right)\left(\dfrac{3}{4}\right)\left(\dfrac{3}{4}\right)$
$= \dfrac{729}{4096}$

f) 2000^0 $= 1$

g) $-(2^{-2})^{-2}$
$= -(2^{-2\cdot-2})$
$= -(2^4)$
$= -(16)$
$= -16$

h) $\left(\dfrac{3}{4}\right)^{-2}$ $= \left(\dfrac{4}{3}\right)^2$
$= \dfrac{4}{3}\cdot\dfrac{4}{3}$
$= \dfrac{16}{9}$

Exponential Laws #3

1) Please write the following as a single power using the exponent laws, remember to NOT leave any negative exponents or decimals. Do **NOT** evaluate.

a) $7^{-2} \div 7^{-5} = 7^{-2-(-5)}$
$= 7^{-2+5}$
$= 7^{3}$

b) $(3)(3)(3)^{-4} = 3^{1+1-4}$
$= 3^{-2}$
$= \frac{1}{3^{2}} =$

c) $(4^{3})^{-2} = 4^{3 \cdot -2}$
$= 4^{-6}$
$= \frac{1}{4^{6}}$

d) $7^{-5} \times 7^{8} = 7^{-5+8}$
$= 7^{3}$

e) $5^{10} \times 5^{10} \times 5^{-20}$
$= 5^{10+10-20}$
$= 5^{0}$
$= 1$

f) $\left(\dfrac{2^{-2}}{2^{7}}\right)^{3} = \left(2^{-2-7}\right)^{3}$
$= \left(2^{-9}\right)^{3}$
$= 2^{-27}$

g) $\dfrac{x^{-5}x^{3}x^{-3}}{x^{10}} = \dfrac{x^{-5+3-3}}{x^{10}} = \dfrac{x^{-5}}{x^{10}}$
$= x^{-5-10}$
$= x^{-15}$

h) $\dfrac{bb^{8}}{b^{-5}} = \dfrac{b^{1+8}}{b^{-5}} = \dfrac{b^{9}}{b^{-5}}$
$= b^{9-(-5)}$
$= b^{14}$

i) $(y^{-3})^{-5} = y^{(-3)(-5)}$
$= y^{15}$

2) Evaluate the following, do **NOT** leave decimals answers, leave them in fraction form.

a) $(-3)^{3} = (-3)(-3)(-3)$
$= -27$

b) $\left(\dfrac{3}{5}\right)^{-2} = \left(\dfrac{5}{3}\right)^{2} = \left(\dfrac{5}{3}\right)\left(\dfrac{5}{3}\right) = \dfrac{25}{9}$

c) $(-1)^{99} = -1$

d) $-1^{100} = -1$

e) $\left[\left(\dfrac{1}{5}\right)^{2}\right]^{-3} = \left(\dfrac{1}{5}\right)^{-6} = 5^{6} = 15625$

f) $343.248^{0} = 1$

g) $(5)^{-2} = \dfrac{1}{5^{2}} = \dfrac{1}{25}$

h) $\left(\dfrac{5}{4}\right)^{-1} = \dfrac{4}{5}$