1. $(-3)^5 =$

2. $-3^4 =$

3. $(2x^3y^6)^4 =$

4. $\dfrac{(-5a^3)(2a^2)^3}{(2a^3)^2} =$

5. $4w^0 =$

6. $5^{-2} =$

7. $\dfrac{2^{-1}}{3} =$

8. $(2^3 - 3^2)^{10} =$

9. $5^8 \times (5^3)^{12} \div 5^8 \times (5^7)^2 =$

$5^8 \times 5^{36} \div 5^8 \times 5^{14}$

$5^{8+36-8+14}$

$= 5^{50}$

We can use the exponent laws to simplify expressions that contain rational number bases. It is a convention to write a simplified power with a positive exponent.

Example 1 Simplifying Numerical Expressions with Rational Number Bases

Simplify by writing as a single power. Explain the reasoning.

a) $0.3^{-3} \cdot 0.3^{5}$

$= 0.3^{2}$

b) $\left[\left(-\frac{3}{2}\right)^{-4}\right]^{2} \cdot \left[\left(-\frac{3}{2}\right)^{2}\right]^{3}$

c) $\frac{(1.4^{3})(1.4^{4})}{1.4^{-2}}$

$\frac{(1.4)^{7}}{(1.4)^{-2}}$

$(1.4)^{9}$

d) $\left(\frac{7^{\frac{2}{3}}}{7^{\frac{1}{3}} \cdot 7^{\frac{5}{3}}}\right)^{6}$

d) $\left(\dfrac{7^{\frac{2}{3}}}{7^{\frac{1}{3}} \cdot 7^{\frac{5}{3}}}\right)^6$

$$\left(\frac{7^{2/3}}{7^{6/3}}\right)^6 \qquad -\frac{4}{3}\cdot\frac{6}{1}$$

$$\left(7^{-4/3}\right)^{\frac{6}{1}}$$

$$= 7^{-\frac{24}{3}}$$

$$= 7^{-8}$$

$$= \frac{1}{7^8}$$

$$\frac{7^4}{7^2 \cdot 7^{10}}$$

$$= \frac{7^4}{7^{12}}$$

$$= 7^{-8} = \frac{1}{7^8}$$

b) $\left[\left(-\frac{3}{2}\right)^{-4}\right]^{2} \cdot \left[\left(-\frac{3}{2}\right)^{2}\right]^{3}$

$$\left(-\frac{3}{2}\right)^{-8} \cdot \left(-\frac{3}{2}\right)^{6}$$

$$\left(-\frac{3}{2}\right)^{-2}$$

$$\left(-\frac{2}{3}\right)^{2} = \left(\frac{2}{3}\right)^{2}$$

Another important skill is writing expressions to a new base...let's take a look

$2^{?}=8$

$2^3=8$

$3^{?}=81$

3^4

$\left(\frac{1}{16}\right)=2^{?}$

$\frac{1}{2^4}=2^{-4}$

$4^3=2^{?}$

$(2^2)^3$

2^6

$\left(\frac{1}{64}\right)^2=4^{?}$

$\left(\frac{1}{4^3}\right)^2$

$\frac{1}{4^6}$

4^{-6}

$125^x=5^{?}$

$(5^3)^x$

$5^{3x}=5^{?}$

$7^{25}=7^{?}$

$5^{3x}=5^1$

$3x=1$

$x=\frac{1}{3}$

$32^{3x+1}=2^{?}$

$(2^5)^{3x+1}$

2^{15x+5}

Which is the largest?

A/ 16^{300}

$(2^4)^{300}$

2^{1200}

B/ 4^{555}

$(2^2)^{555}$

2^{1110}

C/ 8^{312}

$(2^3)^{312}=2^{936}$

D/ 32^{210}

$(2^5)^{210}$

2^{1050}

Should also be comfortable solving equations involving Rational Exponents...

$a)\ x^{\frac{5}{2}} = 32$

$\left(x^{\frac{5}{2}}\right)^{2/5} = 32^{2/5}$

$x = 4$

$b)\ \left(a^{\frac{2}{3}}\right)^{3/2} = 49^{3/2}$

$a = 7^3$

$\underline{a = 343}$

$c)\ \dfrac{2a^{-\frac{3}{2}}}{2} = \dfrac{128}{2}$

$\left(a^{-3/2}\right)^{-2/3} = 64^{-2/3}$

$a^1 = \dfrac{1}{64^{2/3}}$

$a = \dfrac{1}{\left(\sqrt[3]{64}\right)^2}$

$= \dfrac{1}{16}$

Simplify...

$a)\ -27^{-\frac{2}{3}}$

$b)\ a^{\frac{4}{5}} = 16$ (Find *a*)

$c)\ \dfrac{3^{\frac{7}{12}}}{3^{\frac{1}{4}} \cdot 3^{\frac{1}{3}}}$

$d)\left(\dfrac{2a}{b}\right)^{-3}\left(2ab^{2}\right)^{2}$