Warm Up Questions:

Express as a radical:

a) $8^{1/4}$ b) $25^{0.5}$ c) $100^{3/4}$

$\sqrt[4]{8}$ $\sqrt{25}$ $\left(\sqrt[4]{100}\right)^3$

Express as a power:

a) $\sqrt{67}$ b) $\left(\sqrt[3]{40}\right)^2$ c) $\left(\sqrt[4]{16}\right)^3$

$67^{1/2}$ $40^{2/3}$ $16^{3/4}$

Evaluate without the use of a calculator :

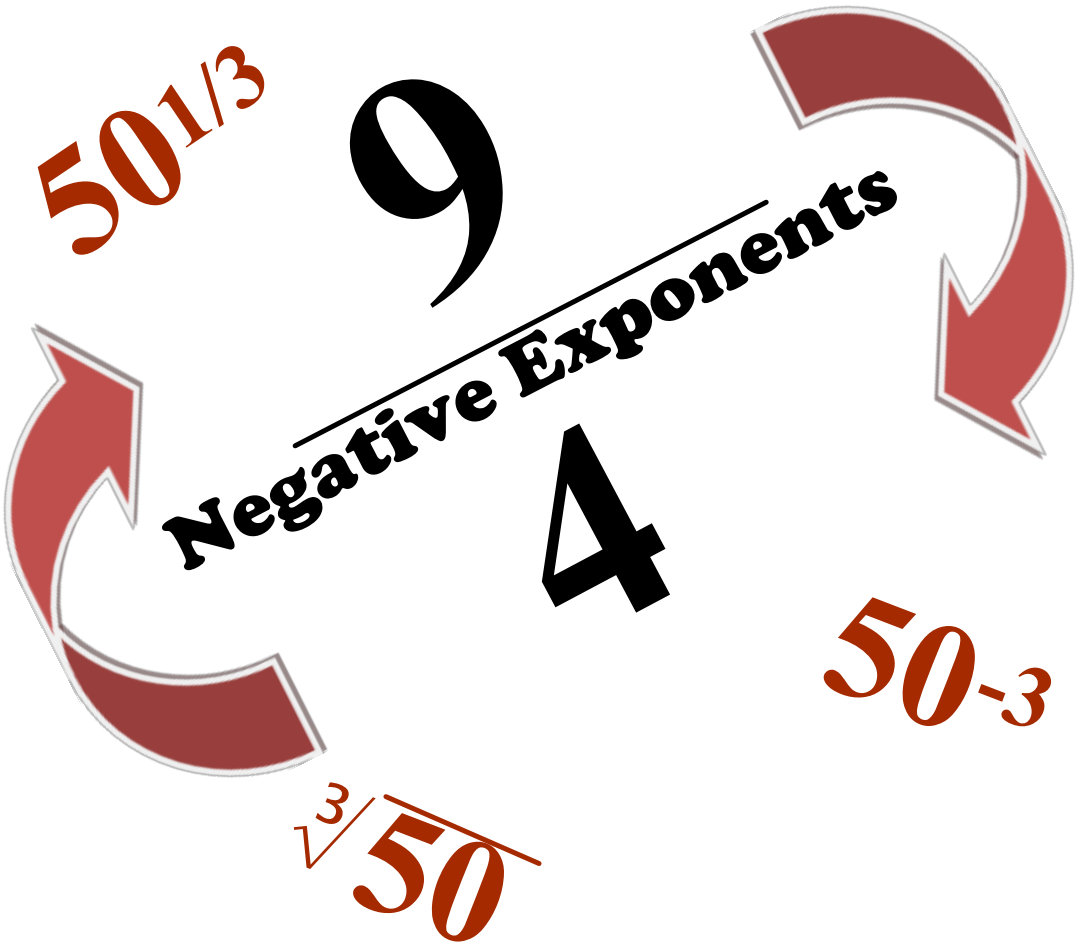
a) $25^{3/2}$ b) $100^{0.5} = 100^{1/2}$

$=\left(\sqrt{25}\right)^3$ $=\sqrt{100}$

$=(5)^3$ $=10$

$=5\times5\times5$

$=125$


$50^{1/3}$
9
Negative Exponents
4
50^{-3}
$\sqrt[3]{50}$

What do negative exponents represent??

$\frac{8^5}{8^3}$

$\frac{8\,8\,8\,8\,8}{8\,8\,8}$

8^2

or $\frac{8^5}{8^3}$

$= 8^{5-3}$

$= 8^2$

$= 64$

$\frac{8^3}{8^5}$

$\frac{8\,8\,8}{8\,8\,8\,8\,8}$

8^{-2}

or $\frac{8^3}{8^5}$

$= 8^{3-5}$

$= 8^{-2}$

$= \left(\frac{1}{8}\right)^2$

take the reciprocal of base make exponent positive

$= \frac{1^2}{8^2}$

$= \frac{1 \times 1}{8 \times 8}$

$= \frac{1}{64}$

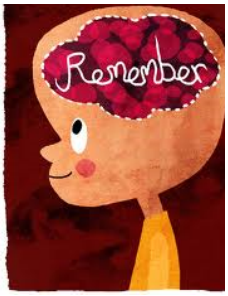
reciprocals

ex: ① $\frac{1}{4} = \frac{4}{1}$

② $\frac{2}{3} = \frac{3}{2}$

③ $\frac{-3}{1} = -\frac{1}{3}$

When dividing powers, subtract the exponents.



a) $\frac{15^{11}}{15^{9}}$

$= 15^{11-9}$

$= 15^{2}$

b) $\frac{9^{15}}{9^{20}}$

$= 9^{15-20}$

$= 9^{-5}$

$= \left(\frac{1}{9}\right)^{5}$

$= \frac{1}{9^{5}}$

c) $26^{15} \div 26^{32}$

$= 26^{15-32}$

$= 26^{-17}$

$= \left(\frac{1}{26}\right)^{17}$

$= \frac{1}{26^{17}}$

$\frac{15x^{-5}}{y^{-4}}$

$\frac{15y^{4}}{x^{5}}$

Express with positive exponents:

$\frac{25n^{4}m^{-7}p^{-1}}{z^{-6}}$

$\frac{25n^{4}z^{6}}{m^{7}p^{1}}$

Express with positive exponents:

$12a^{-2}b^{5}c^{-7}$

$\frac{12b^{5}}{a^{2}c^{7}}$

$$\left(\frac{4}{9}\right)^{-2}$$

$$= \left(\frac{9}{4}\right)^{2}$$

$$= \frac{9^2}{4^2}$$

$$= \frac{9 \cdot 9}{4 \cdot 4}$$

$$= \frac{81}{16}$$

or

$$\frac{4^{-2}}{9^{-2}}$$

$$= \frac{9^2}{4^2}$$

$$= \frac{9 \cdot 9}{4 \cdot 4}$$

$$= \frac{81}{16}$$

Let's Give it a Try!

Evaluate:

a) $(3)^{-2}$

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

$= \frac{1^2}{3^2}$

$= \frac{1}{9}$

b) $(4/5)^{-2}$

$= \left(\frac{5}{4}\right)^2$

$= \frac{25}{16}$

c) $(1/2)^{-2}$

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

$= \frac{4}{1}$

$= 4$

Express with positive exponents:

d) $(-5)^{-3}$

$= \left(\frac{1}{-5}\right)^{3}$

$= \frac{(1)^3}{(-5)^3}$

$= \frac{1}{-125}$

$= \left(-\frac{1}{125}\right)$

e) $\left(\frac{8}{1}\right)^{-2/3}$

$= \left(\frac{1}{8}\right)^{2/3}$

$= \frac{(1)^{2/3}}{(8)^{2/3}}$

$= \frac{(\sqrt[3]{1})^2}{(\sqrt[3]{8})^2}$

$= \frac{(1)^2}{(2)^2}$

$= \left(\frac{1}{4}\right)$

f) $(1/9)^{-3/2}$

$= \left(\frac{9}{1}\right)^{3/2}$

$= 9^{3/2}$

$= \left(\sqrt{9}\right)^3$

$= (3)^3$

$= 3 \times 3 \times 3$

$= (27)$

$\sqrt[3]{8}$

$= \sqrt[3]{2 \times 2 \times 2}$

$= 2$

Evaluate:

g) $(8/27)^{-2/3}$

$= \left(\frac{27}{8}\right)^{2/3}$

$= \frac{(27)^{2/3}}{(8)^{2/3}}$

$= \frac{\left(\sqrt[3]{27}\right)^2}{\left(\sqrt[3]{8}\right)^2}$

$= \frac{\left(\sqrt[3]{3\times3\times3}\right)^2}{\left(\sqrt[3]{2\times2\times2}\right)^2}$

$= \frac{3^2}{2^2}$

$= \frac{9}{4}$

h) $(-125)^{-1/3}$

$= \left(\frac{1}{-125}\right)^{1/3}$

$= \frac{(1)^{1/3}}{(-125)^{1/3}}$

$= \frac{\sqrt[3]{1}}{\sqrt[3]{-125}}$

$= \frac{1}{\sqrt[3]{-5\times-5\times-5}}$

$= \frac{1}{-5}$

$= -\frac{1}{5}$

i) $(-14/5)^0$

$= 1$

a) $144^{-1/2}$ b) $(9/64)^{-1/2}$ c) $81^{-3/2}$

a) $(-64)^{-1/3}$ b) $(100/49)^{-3/2}$ c) $0.36^{1/2}$

a) $144^{-1/2}$

$= 1/144^{1/2}$
$= 1/\sqrt{144}$

$= 1/12$

b) $(9/64)^{-1/2}$

$= (64/9)^{1/2}$
$= \sqrt{64} / \sqrt{9}$

$= 8/3$

c) $81^{-3/2}$

$= 1/81^{3/2}$
$= 1/ (\sqrt{81})^3$
$= 1/ 9^3$

$= 1/729$

a) $(-64)^{-1/3}$

$= (1/-64)^{1/3}$
$= (\sqrt[3]{1} / \sqrt[3]{-64}$

$= 1 / -4$

b) $(100/49)^{3/2}$

$= (49/100)^{3/2}$
$= (\sqrt{49})^3 / (\sqrt{100})^3$
$= 7^3 / 10^3$

$= 343/1000$

c) $0.36^{1/2}$

$= 1/0.36^{1/2}$
$= 1/\sqrt{0.36}$

$= 1/ 0.6$

Check out page 233

Questions: 6, 7, 8, 9b,d,f,h, 12

⑨ b) $\frac{1}{0.3} = \frac{10}{3}$ (×10 on numerator, ×10 on denominator)

Powers with Negative Exponents

$x^{-n} = 1/x^n$ AND $1/x^n = x^{-n}$ $x \neq 0$

Flip It and Turn the Exponent Positive

Warm Up Questions

1. Arrange these numbers in order from least to greatest. Describe your strategy.

$$\sqrt[3]{4},\ 4^{\frac{3}{2}},\ 4^{2},\ \left(\frac{1}{4}\right)^{\frac{3}{2}}$$

2. Evaluate.

i) $16^{1.5}$ **ii)** $81^{0.75}$

iii) $(-32)^{0.8}$ **iv)** $36^{0.5}$

v) $1.21^{1.5}$

1. Arrange these numbers in order from least to greatest. Describe your strategy.

$\sqrt[3]{4}, 4^{\frac{3}{2}}, 4^2, \left(\frac{1}{4}\right)^{\frac{3}{2}}$

$4^{1/3}$, $4^{3/2}$, 4^2 , $4^{-3/2}$

Least to Greatest

$4^{-3/2}$, $4^{1/3}$, $4^{3/2}$, 4^2

Evaluate.

i) $16^{1.5}$ ii) $81^{0.75}$

iii) $(-32)^{0.8}$ iv) $36^{0.5}$

v) $1.21^{1.5}$

i) $16^{3/2}$
$= (\sqrt{16})^3$
$= 4^3$
$= 64$

ii) $81^{3/4}$
$= (\sqrt[4]{81})^3$
$= 3^3$
$= 27$

iii) $(-32)^{4/5}$
$= (\sqrt[5]{-32})^4$
$= (-2)^4$
$= 16$

iv) $36^{1/2}$
$= \sqrt{36}$
$= 6$

v) $1.21^{3/2}$
$= (\sqrt{1.21})^3$
$= 1.1^3$
$= 1.331$