

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) $1.21^{1.5}$

$$\begin{aligned} \text{i) } 16^{3/2} &= (\sqrt{16})^3 \\ &= 4^3 \\ &= 64 \end{aligned}$$

$$\begin{aligned} \text{ii) } 81^{3/4} &= (\sqrt[4]{81})^3 \\ &= 3^3 \\ &= 27 \end{aligned}$$

$$\begin{aligned} \text{iii) } (-32)^{4/5} &= (\sqrt[5]{-32})^4 \\ &= (-2)^4 \\ &= 16 \end{aligned}$$

$$\begin{aligned} \text{iv) } 36^{1/2} &= \sqrt{36} \\ &= 6 \end{aligned}$$

$$\begin{aligned} \text{v) } 1.21^{3/2} &= (\sqrt{1.21})^3 \\ &= 1.1^3 \\ &= 1.331 \end{aligned}$$



What do negative exponents represent??

$$\frac{8^5}{8^3} = 8^2$$

LOOK

$$\frac{8^3}{8^5} = 8^{-2}$$

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

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

$$8^2$$

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

Express with positive exponents:

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



Express with positive exponents:

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



Express with positive exponents:

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



$$\left(\frac{4}{9}\right)^{-2}$$
$$\left(\frac{9}{4}\right)^2$$
$$\frac{9^2}{4^2}$$
$$= \frac{81}{16}$$

Powers with Negative Exponents

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

Flip It and Turn the Exponent Positive

NEVER
EVER
FLIP THE
EXPONENT!



Let's Give it a Try!

a) 3^{-2}

$$\frac{1}{3^2}$$
$$\frac{1}{9}$$

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

$$\left(\frac{5}{4}\right)^2$$
$$\frac{5^2}{4^2}$$
$$= \frac{25}{16}$$

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

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

$$\begin{aligned}
 \text{d) } & \frac{(-5)^{-3}}{1} \\
 & = \frac{1}{(-5)^3} \\
 & = \frac{1}{-125}
 \end{aligned}$$

$$\begin{aligned}
 \text{e) } & \frac{8^{-2/3}}{1} \\
 & = \frac{1}{8^{2/3}} \quad \begin{array}{l} \swarrow \text{EXP} \\ \searrow \text{root} \end{array} \\
 & = \frac{1}{(\sqrt[3]{8})^2} \\
 & = \frac{1}{2^2} \\
 & = \frac{1}{4}
 \end{aligned}$$

$$\begin{aligned}
 \text{f) } & \frac{(1/9)^{-3/2}}{1} \\
 & = \frac{9^{3/2}}{1} \quad \begin{array}{l} \swarrow \text{EXP} \\ \searrow \text{root} \end{array} \\
 & = (\sqrt{9})^3 \\
 & = 3^3 \\
 & = 27
 \end{aligned}$$

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

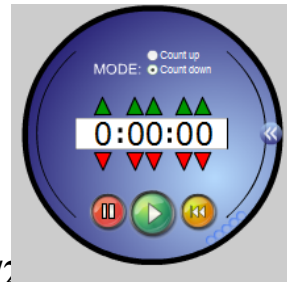
$$\begin{aligned} & \left(\frac{27}{8}\right)^{2/3} \\ & \begin{array}{l} \text{2/3} \leftarrow \text{exp} \\ \text{3} \leftarrow \text{root} \end{array} \\ & \frac{27}{8^{2/3}} \\ & \frac{(\sqrt[3]{27})^2}{(\sqrt[3]{8})^2} \\ & \frac{3^2}{2^2} \\ & = \frac{9}{4} \end{aligned}$$

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

$$\begin{aligned} & \frac{1}{(-125)^{1/3}} \\ & \frac{1}{\sqrt[3]{-125}} \\ & \frac{1}{-5} \end{aligned} = 1$$

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

Try These !!



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

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

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

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

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

c) $0.36^{-1/2}$

Try These !!

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

$$\begin{aligned} &= 1/144^{1/2} \\ &= 1/\sqrt{144} \\ &= 1/12 \end{aligned}$$

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

$$\begin{aligned} &= (64/9)^{1/2} \\ &= \sqrt{64} / \sqrt{9} \\ &= 8/3 \end{aligned}$$

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

$$\begin{aligned} &= 1/81^{3/2} \\ &= 1/(\sqrt{81})^3 \\ &= 1/9^3 \\ &= 1/729 \end{aligned}$$

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

$$\begin{aligned} &= (1/-64)^{1/3} \\ &= (1 / -64)^{1/3} \\ &= 1 / -4 \end{aligned}$$

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

$$\begin{aligned} &= (49/100)^{3/2} \\ &= (\sqrt{49})^3 / (\sqrt{100})^3 \\ &= 7^3 / 10^3 \\ &= 343/1000 \end{aligned}$$

c) $0.36^{-1/2}$

$$\begin{aligned} &= 1/0.36^{1/2} \\ &= 1/\sqrt{0.36} \\ &= 1/0.6 \end{aligned}$$

Pg. 233
#9, 13