



Warm Up

$$1. 4\sqrt{3} + 2\sqrt{3}$$

$$2. -3\sqrt{n} - \sqrt{n}$$

$$3. 2\sqrt{80} + \sqrt{20}$$

$$4. \sqrt{48p} + 3\sqrt{18p} - 2\sqrt{27p}$$

ANSWERS:

$$1. 6\sqrt{3}$$

$$2. -4\sqrt{2}$$

$$3. 10\sqrt{5}$$

$$4. -2\sqrt{3p} + 9\sqrt{2p}$$

P3C Rational Exponents

- Understand and use rational exponents

Definition of $a^{\frac{1}{n}}$ n is the index of the root.

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

$$a^{-\frac{1}{n}} = \frac{1}{a^{\frac{1}{n}}} = \frac{1}{\sqrt[n]{a}}$$

Example 10

$$64^{\frac{1}{2}} = \sqrt{64}$$

$$= 8$$

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

$$= 5$$

$$-16^{\frac{1}{4}} = -\sqrt[4]{16}$$

$$= -2$$

$$(-27)^{\frac{1}{3}} = \sqrt[3]{-27}$$

$$= -3$$

$$64^{-\frac{1}{3}} = \frac{1}{\sqrt[3]{64}}$$

$$= \frac{1}{4}$$

Definition of $a^{\frac{m}{n}}$ n is the index of the root while m is the power of the base.

$$a^{\frac{m}{n}} = \sqrt[n]{a^m} \text{ or } (\sqrt[n]{a})^m$$

$$a^{-\frac{m}{n}} = \frac{1}{a^{\frac{m}{n}}}$$

Example 11

$$\begin{aligned} 27^{\frac{2}{3}} &= (\sqrt[3]{27})^2 \\ &= 3^2 \\ &= 9 \end{aligned}$$

$$\begin{aligned} 9^{\frac{3}{2}} &= (\sqrt{9})^3 \\ &= 3^3 \\ &= 27 \end{aligned}$$

$$\begin{aligned} 81^{-\frac{3}{4}} &= \frac{1}{81^{\frac{3}{4}}} \\ &= \frac{1}{3^3} \\ &= \frac{1}{27} \end{aligned}$$

Example 12:

$$(5x^{\frac{1}{2}})(7x^{\frac{3}{4}})$$

$$= 35x^{\frac{1}{2} + \frac{3}{4}}$$

$$= 35x^{\frac{5}{4}}$$

$$\frac{32x^{\frac{5}{3}}}{16x^{\frac{3}{4}}} = \left(\frac{32}{16}\right) \left(\frac{x^{\frac{5}{3}}}{x^{\frac{3}{4}}}\right)$$

$$= 2x^{\frac{5}{3} - \frac{3}{4}}$$

$$= 2x^{\frac{11}{12}}$$

Example 13:

$$\sqrt[9]{x^3} = x^{\frac{3}{9}}$$

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

$$= \sqrt[3]{x}$$