SC Algebra 1
8.5 Simplifying Radical Expressions

1 4 9

Warm Up:

Complete the list of perfect squares:

4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225,

256, 289, 324, 361, 400

How can I meet today's standards?

*I can **simplify radical expressions with and without variables**.*

Radical Vocabulary Review

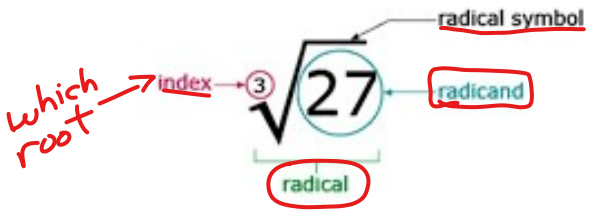
$3^2 = 9$

$\sqrt{9} = 3$

$\sqrt[3]{27} = x^3 = 27$

$\sqrt[3]{27} = 3$ 9 (3)

(3)(3)



Example 1: Simplify Square Roots

Simplify. Perfect Square

$\sqrt{27}$ → $\sqrt{9}\cdot\sqrt{3}$ → $3\sqrt{3}$

$\sqrt{72}$ → $\sqrt{36}\cdot\sqrt{2}$ → $6\sqrt{2}$

$\sqrt{90}$ → $\sqrt{9}\cdot\sqrt{10}$ → $3\sqrt{10}$

9 → 9, 10 → 2, 5

$\sqrt{200}$ → $\sqrt{100}\cdot\sqrt{2}$ → $10\sqrt{2}$

$\sqrt{27}$ → $\sqrt{9}\cdot\sqrt{3}$ → $3\sqrt{3}$

$\sqrt{32}$ → $\sqrt{16}\sqrt{2}$ → $4\sqrt{2}$

Example 2: Multiply and Dividing Square Roots

Simplify.

$\sqrt{5} * \sqrt{48}$ → $\sqrt{5}\ \sqrt{16}\ \sqrt{3}$ → $\sqrt{5}\cdot 4\sqrt{3}$ → $4\sqrt{15}$

$\sqrt{12} * \sqrt{44}$ → $\sqrt{4}\ \sqrt{3}\sqrt{4}\sqrt{11}$ → $2\sqrt{3}\cdot 2\sqrt{11}$ → $4\sqrt{33}$

$\sqrt{18} * \sqrt{5}$ → $\sqrt{9}\sqrt{2}\ \sqrt{5}$ → $3\sqrt{2}\cdot\sqrt{5}$ → $3\sqrt{10}$

$\sqrt{90}$ → $\sqrt{9}\ \sqrt{10}$ → $3\sqrt{10}$

$\sqrt{\frac{24}{27}} = \left(\frac{24}{27}\right)^{1/2} = \left(\frac{4\cdot 6}{9\cdot 3}\right)^{1/2}$ → $\frac{2\sqrt{6}}{3\sqrt{3}} = \frac{2}{3}\sqrt{2}$

1/2

$\sqrt{\frac{81}{4}} = \frac{9}{2}$

$\sqrt{\frac{32}{8}} = \frac{\sqrt{16}\cdot\sqrt{2}}{\sqrt{4}\cdot\sqrt{2}}$ → $\sqrt{4} = 2$ → $\frac{4\sqrt{2}}{2\sqrt{2}} = 2$

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Example 3: Simplify Square Roots with Variables

Simplify.

$\sqrt{g^4h^6j^2}$

$\sqrt{g^4}\cdot\sqrt{h^6}\cdot\sqrt{j^2}$

$(g^4)^{\frac{1}{2}}\,(h^6)^{\frac{1}{2}}\,(j^2)^{\frac{1}{2}}$

g^2h^3j

perfect squares

* even exponent on a variable in the $\sqrt{\ }$ would have the exponent divided by 2.

$x^2 = x\cdot x$

$x^4 = x^2\cdot x^2$

$x^6 = x^3\cdot x^3$

$\sqrt{16x^5}$

$4\sqrt{x^5}$

$4\sqrt{x^4}\sqrt{x}$

$4x^2\sqrt{x}$

$\sqrt{63x^3y^4}$

$\sqrt{9}\cdot\sqrt{7}\sqrt{x^2}\cdot\sqrt{x}\,\sqrt{y^4}$

$3\sqrt{7}\times\sqrt{x}\,y^2$

$3xy^2\sqrt{7x}$

$\sqrt{12x^2y^4}$

$\sqrt{4}\cdot\sqrt{3}\cdot x^2\cdot y^4$

$2x\,y^2\cdot\sqrt{3}$

$\sqrt{525x^4y^5z^5}$

$\sqrt{25}\,\sqrt{21}\,\sqrt{y^4}\cdot\sqrt{y}\,\sqrt{z^4}\cdot\sqrt{z}$

$5\sqrt{21}\cdot x^2y^2\sqrt{y}\,z^2\sqrt{z}$

$5x^2y^2z^2\sqrt{21yz}$

$\sqrt{147x^3y^4z^5}$

$\sqrt{49}\,\sqrt{3}\,\sqrt{x^2}\cdot x\,\sqrt{y^4}\,\sqrt{z^4}\cdot\sqrt{z}$

$7\sqrt{3}\,x\,x\,y^2\,z^2\sqrt{z}$

$7xy^2z^2\sqrt{3xz}$

$\sqrt{45p^2}$

$\sqrt{9}\cdot\sqrt{5}\cdot\sqrt{p^2}$

$3p\sqrt{5}$

$\sqrt{125n}$

$\sqrt{25}\cdot\sqrt{5}\,\sqrt{n}$

$5\sqrt{5n}$

$\sqrt{512k^2}$

$\sqrt{256}\,\sqrt{2}\,\sqrt{k^2}$

$16k\sqrt{2}$

$\sqrt{80p^3}$

$\sqrt{16}\,\sqrt{5}\,\sqrt{p^2}\sqrt{p}$

$4\sqrt{5}\,p\sqrt{p}$

$4p\sqrt{5p}$

$\sqrt{200m^4n}$

$\sqrt{100}\,\sqrt{2}\,\sqrt{m^4}\,\sqrt{n}$

$10\sqrt{2}\,m^2\sqrt{n}$

$10m^2\sqrt{2n}$

$\sqrt{75x^2y}$

$\sqrt{25}\cdot\sqrt{3}\,\sqrt{x^2}\,\sqrt{y}$

$5\sqrt{3}\times\sqrt{y}$

$5x\sqrt{3y}$