Simplify:

1. $\sqrt{40}$
2. $\sqrt{288}$
3. $5\sqrt{98}$

$\sqrt{40}$

$\sqrt{4 \cdot 10}$

$\sqrt{4}\ \sqrt{10}$

$2\sqrt{10}$

$\sqrt{288}$

$\sqrt{144 \cdot 2}$

$\sqrt{144}\ \sqrt{2}$

$12\sqrt{2}$

$5\sqrt{98}$

$5 \cdot \sqrt{49 \cdot 2}$

$5 \cdot \sqrt{4}\, 9\sqrt{2}$

$5 \cdot 7\sqrt{2}$

$35\sqrt{2}$

$\sqrt{40}$

$\sqrt{4 \cdot 10}$

$\sqrt{4}\ \sqrt{10}$

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

$\sqrt[3]{54}$

$\sqrt[3]{27 \cdot 2}$

$\sqrt[3]{27}\ \sqrt[3]{2}$

$\sqrt[3]{3^3}\ \sqrt[3]{2}$

$3 \cdot \sqrt[3]{2}$

11-10

How do I find roots of numbers & expressions? (5.5)

$\sqrt{\ }$ (2) → square root

Ex. $\sqrt{49} = 7$

$7 \cdot 7 = 49$

$7^2 = 49$

Ex. $\sqrt[3]{8}$ is 2 bc $2 \cdot 2 \cdot 2 = 8$

OR $2^3 = 8$.

Ex. $\sqrt[4]{625} = 5$ bc $5 \cdot 5 \cdot 5 \cdot 5 = 625$.

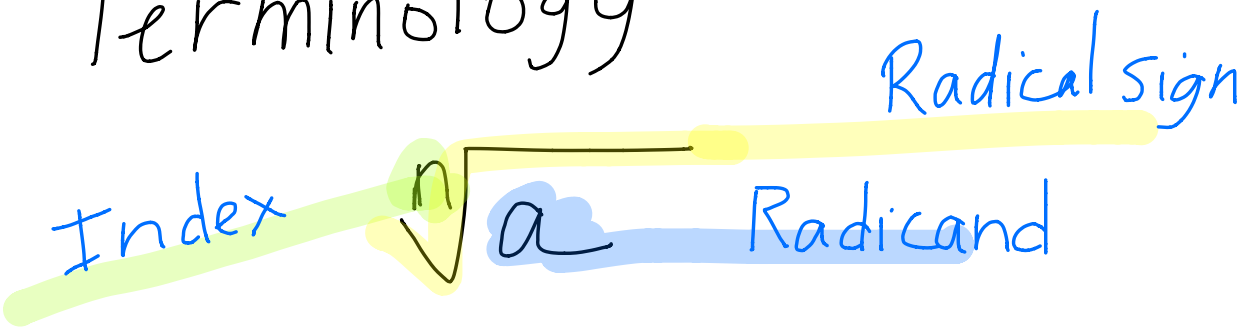
or $5^4 = 625$.

Definition of n^{th} root:

If $a^n = b$, then a is an n^{th} root of b.

Ex. $3^5 = 243$, so 3 is a fifth root of 243.

Terminology



Principal Root

$\sqrt{16}$ means 4.

$\sqrt[4]{625}$ means 5.

$-\sqrt{36}$ means $-1 \cdot 6 = -6$.

Ex. Simplify

$\pm\sqrt{16x^6}$

$\pm\sqrt{4^2(x^3)^2}$

$\pm 4x^3$

Check:

Is $4x^3 \cdot 4x^3 = 16x^6$?

Ex. $-\sqrt[4]{(x^2+9)^{12}}$

$-\sqrt[4]{[(x^2+9)^3]^4}$

$-(x^2+9)^3$

Ex: $\sqrt[5]{32x^{20}y^{25}}$

Rewrite Radicand as powers of 5.

$\sqrt[5]{2^5(x^4)^5(y^5)^5}$

$2x^4y^5$

even Radicand → positive

Ex. $\sqrt[4]{-81}$ not a real number

on calc → $\sqrt[4]{81} = 3$

4 MATH: 5 81 =

$\sqrt[4]{81}$ $\sqrt[5]{32}$

Ex. $\sqrt[8]{x^8} = |x|$

guarantees positive radicand

$$\sqrt[8]{(-3)^8} = |-3| = 3$$

p. 248: 17–61 odd

$\sqrt{40}$

$\sqrt{4 \cdot 10}$

$\sqrt{4}\sqrt{10}$

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

$2\sqrt{10}$

$\sqrt{288}$

$\sqrt{144 \cdot 2}$

$\sqrt{144}\ \sqrt{2}$

$\sqrt{12^2}\sqrt{2}$

$12\sqrt{2}$

$5\sqrt{98}$

$5 \cdot \sqrt{49 \cdot 2}$

$5 \cdot \sqrt{49}\sqrt{2}$

$5 \cdot 7\sqrt{2}$

$35\sqrt{2}$

$\sqrt{288}$

$\sqrt{16}\sqrt{18}$

$4\sqrt{18}$

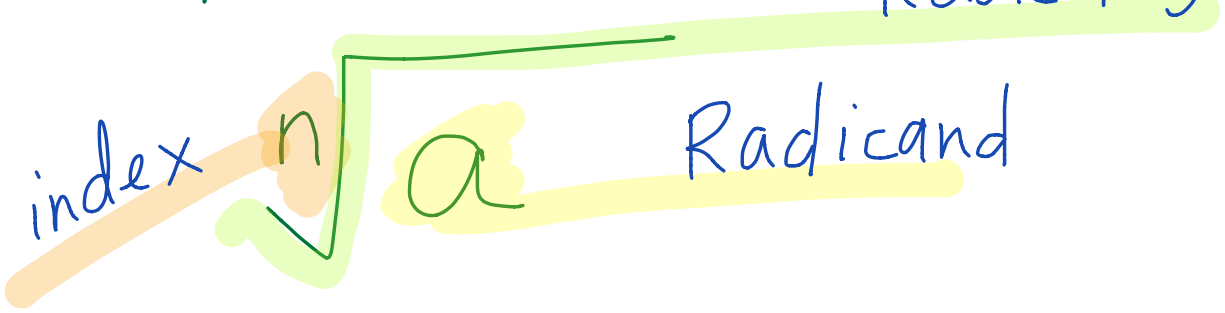
$4\sqrt{9}\sqrt{2}$

$4 \cdot 3\sqrt{2}$

$12\sqrt{2}$

$\frac{100}{200} = \frac{10}{20} = \frac{1}{2}$

11-10 How do I find Real roots of numberst expressions?



Definition of n^{th} root:

If $a^n = b$, then a is an n^{th} root of b.

Ex. $2^5 = 32$ This means 2 is a fifth root of 32.

$$\sqrt[5]{32} = 2$$

TI-83/84: 5 Math: OPT 5 = 32 =

$\sqrt[x]{y}$

$\sqrt[2]{25} = 5$

$\sqrt[4]{16} = 2$

$\sqrt[6]{729} = 3$

} Principal Root

Ex. $-\sqrt[4]{625} = -1 \cdot \sqrt[4]{625}$

$= -1.5$

$= -5$

Calculators give principal value.

Ex. Simplify

$\sqrt[2]{16x^4}$

$\sqrt[2]{4^2(x^2)^2}$

$4x^2$

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

$16x^4$

Ex. $\sqrt[3]{8x^{12}}$

Look for cubes

$\sqrt[3]{2^3(x^4)^3}$

$2x^4$

Ex. Simplify $\sqrt[5]{243x^{15}y^{20}}$

$\sqrt[5]{3^5(x^3)^5(y^4)^5}$

$3x^3y^4$

Check $(3^1x^3y^4)^5 = 3^5x^{15}y^{20}$ ✓

even $\sqrt{\square}$ → Radicand must be positive

Ex. $\sqrt[4]{x^4} = |x|$

$\sqrt[4]{(-3)^4} = |-3| = 3$

p. 248: 17 - 61 odd

Check as you go.