Using the $\sqrt[x]{\ }$ Feature of a Calculator

Use the following procedure to determine $\sqrt[4]{10\,000}$ on a calculator.

shift or 2nd.

1. Press 4 . **2.** Press MATH . **3.** Choose 5: $\sqrt[x]{\ }$.

4. Press 10 000 . **5.** Press ENTER . The answer will be 10.

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Use a calculator to evaluate.

a) $\sqrt[5]{1\,024}$ = 4 **b)** $\sqrt[7]{-2\,187}$ = −3 **c)** $-3\sqrt[4]{50\,625}$ = −45 **d)** $\sqrt[3]{\frac{216}{125}} = \frac{\sqrt[3]{216}}{\sqrt[3]{125}} = \frac{6}{5}$

Evaluate to the nearest hundredth.

a) $\sqrt[5]{125}$ ≈ 2.63 **b)** $\sqrt[6]{0.5}$ ≈ 0.89 **c)** $\frac{2}{3}\sqrt[4]{1\,000}$ ≈ 3.75

Radicals

Numbers like $\sqrt{30}$, $\sqrt[3]{125}$, $\sqrt[4]{15}$, $\sqrt[6]{1\,000\,000}$ etc. are examples of **radicals**.

In fact, any expression of the form $\sqrt[n]{x}$, where $n \in N$, is called a radical.
n is called the **index**. In a number like $\sqrt{30}$ the index is 2.
x is called the **radicand** and $\sqrt{\ }$ is called the **radical sign**.
If the index in a radical is even, then the radicand must be positive.

- When the index is not written in the radical, as in square root, it is assumed to be 2.
- The index is the number of times the radical must be multiplied by itself to equal the radicand.

Identify the index and the radicand in each of the following.

a) $\sqrt[5]{75}$ index: 5 radicand: 75

b) $\sqrt{50}$ index: 2 radicand: 50

c) $5\sqrt[3]{-\frac{1}{10}}$ index: 3 radicand: $-\frac{1}{10}$

Review

Recall the following results from Lesson #1, Assignment Question #10.

* index must be the same

$\sqrt{9} \times \sqrt{4}$ is equal to $\sqrt{9 \times 4}$

$\sqrt{9} + \sqrt{4}$ is **not** equal to $\sqrt{9+4}$

$\sqrt{9} \div \sqrt{4}$ is equal to $\sqrt{9 \div 4}$

$\sqrt{9} - \sqrt{4}$ is **not** equal to $\sqrt{9-4}$

The calculations above are examples of some general rules involving radicals.

i) **The product(quotient) of the roots of two numbers is equal to the root of the product(quotient) of the two numbers.**

ii) **The sum (difference) of the roots of two numbers is NOT equal to the root of the sum (difference) of the two numbers.**

In general $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ where $a, b \geq 0$ and $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$ where $a \geq 0,\ b > 0$.

State whether each statement is true or false.

a) $\sqrt{3} \times \sqrt{6} = \sqrt{18}$ ✓

b) $\frac{\sqrt{20}}{\sqrt{10}} = \sqrt{2}$ ✓

c) $\sqrt{16+9} = \sqrt{16} + \sqrt{9}$ $\sqrt{25} = \sqrt{16}+\sqrt{9}$ $5 \neq 4+3$ ✗

Write the following as a single radical in the form $\sqrt{x}$.

a) $\sqrt{8} \times \sqrt{3}$ $= \sqrt{24}$

b) $\sqrt{7} \times 3$ $= \sqrt{21}$

c) $\frac{\sqrt{50}}{\sqrt{10}}$ $= \sqrt{5}$

d) $\frac{\sqrt{\sqrt{100}}}{\sqrt{2}}$ $= \frac{\sqrt{10}}{\sqrt{2}}$ $= \sqrt{5}$

Express as a product of radicals.

a) $\sqrt{77}$ $\sqrt{7} \cdot \sqrt{11}$

b) $\sqrt{27}$ $\sqrt{9} \cdot \sqrt{3}$ $3\sqrt{3}$

c) $\sqrt{40}$ $\sqrt{4} \cdot \sqrt{10}$ $2\sqrt{10}$

Complete Assignment Questions #3 - #13

Assignment #1-10

1. Mentally evaluate, where possible, using the real number system.

a) $\sqrt{81}$ **b)** $\sqrt[4]{81}$ **c)** $5\sqrt[3]{27}$ **d)** $\sqrt[5]{100\,000}$

e) $\sqrt{\frac{16}{25}}$ **f)** $\sqrt[4]{\frac{1}{16}}$ **g)** $4\sqrt{\frac{1}{16}}$ **h)** $-\sqrt{1}$

i) $\sqrt{-1}$ **j)** $\sqrt[5]{-1}$ **k)** $7\sqrt[3]{-125}$ **l)** $\sqrt[4]{-\frac{1}{16}}$

m) $3\sqrt{144}$ **n)** $\frac{1}{2}\sqrt[5]{32}$ **o)** $-\sqrt[11]{-1}$ **p)** $\sqrt[3]{-\frac{8}{27}}$

2. State whether the following are true or false.

a) The square roots of 25 are ± 5.

b) $\sqrt{25} = \pm 5$

c) If $x^2 = 25, x \in R$, then $x = \pm 5$.

3. Use a calculator to evaluate.

a) $\sqrt[4]{4\,096}$ **b)** $\sqrt[5]{-243}$ **c)** $-\sqrt[4]{2401}$

d) $-\sqrt[3]{729}$ **e)** $\sqrt[3]{-729}$ **f)** $-8\sqrt[4]{\frac{1}{256}}$

g) $4\sqrt[6]{0.015\,625}$ **h)** $\sqrt[4]{-6\,561}$ **i)** $\frac{3}{2}\sqrt[4]{\frac{16}{81}}$

4. Evaluate to the nearest hundredth.

a) $\sqrt{10}$ **b)** $\sqrt[8]{29}$ **c)** $-\frac{3}{2}\sqrt[9]{-527}$

5. Evaluate to the nearest tenth.

a) $\sqrt[5]{-25}$ **b)** $-5\sqrt[4]{169}$ **c)** $\frac{1}{2}\sqrt[3]{-81}$