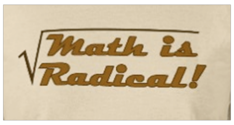
Section 4.1
Mixed and Entire Radicals

Goal: *Compare and express numerical radicals in equivalent forms.*



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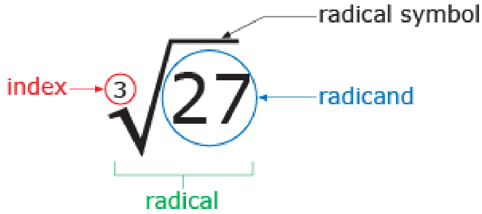
Parts of a Radical



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Entire Radicals:	$\sqrt{24}$	$\sqrt{50}$
	$\updownarrow$	$\updownarrow$
Mixed Radicals:	$2\sqrt{6}$	$5\sqrt{2}$

When converting Entire radicals to Mixed Radicals, use perfect squares:

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$$\sqrt{80}$$
$$\sqrt{16 \cdot 5}$$
$$\sqrt{16} \cdot \sqrt{5}$$
$$4\sqrt{5}$$

$$\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5}$$
$$\sqrt{2^4 \cdot 5}$$
$$\sqrt{2^4} \cdot \sqrt{5}$$
$$2^2\sqrt{5}$$
$$4\sqrt{5}$$

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2^{nd} + (mem)

Stat : Edit (Lists)

L_1 $\quad$ $80 \div L_2$ $\quad$ $\sqrt{80}$

$\downarrow$

1-20 $\quad$ $\sqrt{16 \cdot 5}$

$L_2 \rightarrow$ 4 $\quad$ L_2: 16 $\quad$ L_3: 5 $\quad$ $4\sqrt{5}$

L_1^2

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$\sqrt{675}$

$\sqrt{225 \cdot 3}$

$\boxed{\sqrt{225} \cdot \sqrt{3}}$

$15\sqrt{3}$

$\sqrt{2527}$

$\sqrt{361 \cdot 7}$

$19\sqrt{7}$

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$\sqrt[3]{5488}$

$\sqrt[3]{2744 \cdot 2}$

$14\sqrt[3]{2}$

$L_1 \wedge 3$

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$\sqrt[4]{103680}$

$\sqrt[4]{20736 \cdot 5}$

$12\sqrt[4]{5}$

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Simplify $\sqrt{48}$

1. Find the ***largest*** perfect square that will divide evenly into the number under your radical sign.
   (Perfect Squares: 1, 4, 9, 16, 25, 36, 49, ...)
2. Write the number under the radical as a product of the perfect square and its corresponding number.
3. Separate each number with its own radical sign.
4. Simplify.

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Simplify $\sqrt{48}$

$\sqrt{48}$ ← Entire Radical

$= \sqrt{16 \bullet 3}$

$= \sqrt{16} \bullet \sqrt{3}$

$= 4 \bullet \sqrt{3}$

$= 4\sqrt{3}$ ← Mixed Radical

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Note:

- If you cannot find a perfect square that divides evenly then it is already in simplest form.
- If you do not choose the ***largest*** perfect square, you will need to repeat the process.

Simplify $\sqrt{48}$

$\sqrt{48}$

$= \sqrt{4 \bullet 12}$

$= \sqrt{4} \bullet \sqrt{12}$

$= 2\sqrt{12}$ ← Not as Simple as Possible

$= 2\sqrt{4 \bullet 3}$

$= 2\sqrt{4} \bullet \sqrt{3}$

$= 2 \bullet 2\sqrt{3}$

$= 4\sqrt{3}$

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or:
Write the radicand as a product of its prime factors.
Group the factors in multiples of the index number.
Simplify.

$\sqrt{48} = \sqrt{2 \bullet 2 \bullet 2 \bullet 2 \bullet 3}$

$= \sqrt{2^4 \bullet 3}$

$= 2^2\sqrt{3}$

$= 4\sqrt{3}$

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$3\sqrt{7}$

$= \sqrt{3^2 \cdot 7}$

$= \sqrt{9 \cdot 7}$

$= \sqrt{63}$

$4\sqrt{5}$

$\sqrt{4^2 \cdot 5}$

$\sqrt{16 \cdot 5}$

$= \sqrt{80}$

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$5\sqrt[3]{2}$ *

$\sqrt[3]{5^3 \cdot 2}$

$\sqrt[3]{125 \cdot 2}$

$\sqrt[3]{250}$ *

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$3\sqrt[4]{11}$ $= 3 * 4$ MATH 5: 11

$= \sqrt[4]{3^4 \cdot 11}$

$= \sqrt[4]{81 \cdot 11}$

$= \sqrt[4]{891}$

$3(4 \sqrt[x]{\ } 11)$

$3(4)$

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Writing Radicals in Simplest Form

Simplify each radical.

1. $\sqrt{50}$ $\qquad \sqrt{50} = \sqrt{25 \bullet 2} = 5\sqrt{2}$

2. $\sqrt{98}$ $\qquad \sqrt{98} = \sqrt{49 \bullet 2} = 7\sqrt{2}$

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Writing Mixed Radicals as Entire Radicals

Write each mixed radical as an entire radical.

a) $4\sqrt{3}$ $\quad 4\sqrt{3}=\sqrt{4^2\bullet 3}=\sqrt{16\bullet 3}=\sqrt{48}$

b) $2\sqrt[5]{2}$ $\quad 2\sqrt[5]{2}=\sqrt[5]{2^5\bullet 2}=\sqrt[5]{32\bullet 2}=\sqrt[5]{64}$

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Write the following as a mixed or entire radical.

$\sqrt[3]{54}$

$\sqrt[3]{2\times3\times3\times3}$

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

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

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

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

$4\sqrt[3]{2}$

$\sqrt[3]{4^3\cdot 2}$

$=\sqrt[3]{128}$

$3\sqrt[5]{2}$

$=\sqrt[5]{3^5\cdot 2}$

$=\sqrt[5]{486}$

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Which is larger?

$3\sqrt{5}$ *or* $4\sqrt{3}$

$=\sqrt{9\cdot 5}$ $\quad \sqrt{16\cdot 3}$

$=\sqrt{45}$ $\quad \sqrt{48}$

To compare like radicals, rewrite the radicals in equivalent forms.

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Which is larger?

$2\sqrt{6}$ *or* $4\sqrt{3}$

$\sqrt{2^2\cdot 6}$ $\quad \sqrt{4^2\cdot 3}$

$\sqrt{24}$ $\quad \sqrt{48}$

To compare like radicals, rewrite the radicals in equivalent forms.

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Arrange the following from least to greatest.

$$2\sqrt{5},\quad \sqrt{59},\quad 4\sqrt[3]{2},\quad \sqrt[4]{48}$$

To compare unlike radicals, you can write the radicals as decimals and compare.

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Order the following numbers from least to greatest:
$5,\ 3\sqrt{3},\ 2\sqrt{6},\ \sqrt{23}$

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Every positive number has two roots.

Ex. The square root of 49 = 7 or -7

$\sqrt{49} = 7$ is called the **principal square root.**

$-\sqrt{49} = -7$ is called the **secondary square root.**

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The ***principal*** (***positive***) ***square root*** is noted as

$$\sqrt{a}$$

The ***negative square root*** is noted as

$$-\sqrt{a}$$

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In what situations would it make sense only to use the principal square root?

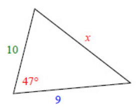
$\text{leg}^2 + \text{leg}^2 = \text{hypotenuse}^2$

$5^2 + 7^2 = x^2$

$25 + 49 = x^2$

$74 = x^2$

$\sqrt{74} = x$



$c^2 = a^2 + b^2 - 2ab\cos C$

$x^2 = 10^2 + 9^2 - 2(10)(9)\cos(47°)$

$x^2 = 100 + 81 - 180\cos(47°)$

$x^2 = 181 - 180(.6819)$

$x^2 = 58.2403$

$x \approx 7.632$

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The domain of a square root function is limited to values for which the function has meaning.

Complete the following chart and state any restrictions on the function.

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x	$\sqrt{x}$	$\frac{1}{x}$	$\frac{1}{\sqrt{x}}$		$\sqrt{x-1}$	$\sqrt{x+1}$	$\frac{1}{\sqrt{x-1}}$	$\frac{1}{\sqrt{x+1}}$
-3								
-2								
-1								
0								
1								
2								
3								

- What values of x are undefined?
- Is the restriction different if the radical expression is in the denominator?

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Why is the domian of $\sqrt{2x-5},\ x \geq \frac{5}{2},$

while the domain of $\frac{1}{\sqrt{2x-5}}$ *is* $x > \frac{5}{2}$?

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4.1 Assignment: Nelson Foundations of Mathematics 11, Sec 4.1, pg, 182-183

Questions: 1-12, 15, 17

Jun 22-8:44 AM

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