

Name Key

Date \_\_\_\_\_

8A; Algebra 1

Period \_\_\_\_\_

Rationalizing Denominators with Radicals

I. A fractional radicand is considered simplified, or **rationalized**, when there is no radical in the denominator.

II. To simplify a fraction that has a radical in the denominator (To rationalize) multiply the numerator and the denominator by the radical you want to eliminate. Then simplify the numerator and fraction as needed.

\*\* You can only simplify "like terms" (constant or  $\sqrt{\quad}$ )

For example:

$$1) \frac{3}{\sqrt{7}} = \frac{3}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{3\sqrt{7}}{\sqrt{49}} = \frac{3\sqrt{7}}{7}$$

$$2) \frac{7}{3\sqrt{2}} = \frac{7}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{7\sqrt{2}}{3\sqrt{4}} = \frac{7\sqrt{2}}{3 \cdot 2} = \frac{7\sqrt{2}}{6}$$

Now you try!!! *→ same as multiplying by 2, so it doesn't change the original value*

<p>1) <math>\frac{7}{\sqrt{11}} \cdot \frac{\sqrt{11}}{\sqrt{11}} = \frac{7\sqrt{11}}{\sqrt{121}}</math></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">NUM <math>7\sqrt{11}</math></td> <td style="border-right: 1px solid black; padding: 5px;">DENOM <math>\sqrt{121}</math> ↓ 11</td> <td style="padding: 5px;"><math>\frac{7\sqrt{11}}{11}</math></td> </tr> </table>	NUM $7\sqrt{11}$	DENOM $\sqrt{121}$ ↓ 11	$\frac{7\sqrt{11}}{11}$	<p>2) <math>\frac{5}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{5\sqrt{3}}{2\sqrt{9}}</math></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">NUM <math>5\sqrt{3}</math></td> <td style="border-right: 1px solid black; padding: 5px;">DENOM <math>2\sqrt{9}</math> (↓) 2 · 3 6</td> <td style="padding: 5px;"><math>\frac{5\sqrt{3}}{6}</math></td> </tr> </table>	NUM $5\sqrt{3}$	DENOM $2\sqrt{9}$ (↓) 2 · 3 6	$\frac{5\sqrt{3}}{6}$	<p>3) <math>\frac{-7}{4\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{-7\sqrt{2}}{4\sqrt{4}}</math></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">NUM <math>-7\sqrt{2}</math></td> <td style="border-right: 1px solid black; padding: 5px;">DENOM 4√4 (↓) 4 · 2 8</td> <td style="padding: 5px;"><math>\frac{-7\sqrt{2}}{8}</math></td> </tr> </table>	NUM $-7\sqrt{2}$	DENOM 4√4 (↓) 4 · 2 8	$\frac{-7\sqrt{2}}{8}$
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<p>4) <math>\frac{5}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} = \frac{5\sqrt{10}}{\sqrt{100}}</math></p> <p>Num: <math>5\sqrt{10}</math>   Denom: <math>\sqrt{100}</math>   <math>\frac{5\sqrt{10}}{10} = \frac{\sqrt{10}}{2}</math></p>	<p>5) <math>\frac{15}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{15\sqrt{6}}{\sqrt{36}}</math></p> <p>Num: <math>15\sqrt{6}</math>   Denom: <math>\sqrt{36}</math>   <math>\frac{15\sqrt{6}}{6} = \frac{5\sqrt{6}}{2}</math></p>	<p>6) <math>\frac{20}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{20\sqrt{5}}{\sqrt{25}}</math></p> <p>Num: <math>20\sqrt{5}</math>   Denom: <math>\sqrt{25}</math>   <math>\frac{20\sqrt{5}}{5} = 4\sqrt{5}</math></p>
<p>7) <math>\frac{-4}{\sqrt{14}} \cdot \frac{\sqrt{14}}{\sqrt{14}} = \frac{-4\sqrt{14}}{\sqrt{196}}</math></p> <p>Num: <math>-4\sqrt{14}</math>   Denom: <math>\sqrt{196}</math>   <math>\frac{-4\sqrt{14}}{14} = \frac{-2\sqrt{14}}{7}</math></p>	<p>8) <math>\frac{19}{\sqrt{19}} \cdot \frac{\sqrt{19}}{\sqrt{19}} = \frac{19\sqrt{19}}{\sqrt{361}}</math></p> <p>Num: <math>19\sqrt{19}</math>   Denom: <math>\sqrt{361}</math>   <math>\frac{19\sqrt{19}}{19} = \sqrt{19}</math></p>	<p>9) <math>\frac{6}{\sqrt{18}} \cdot \frac{\sqrt{18}}{\sqrt{18}} = \frac{6\sqrt{18}}{\sqrt{324}}</math></p> <p>Num: <math>6\sqrt{18}</math>   Denom: <math>\sqrt{324}</math>   <math>\frac{6\sqrt{18}}{18} = \frac{\sqrt{2}}{3}</math></p>
<p>10) <math>\frac{7}{\sqrt{45}} \cdot \frac{\sqrt{45}}{\sqrt{45}} = \frac{7\sqrt{45}}{\sqrt{2025}}</math></p> <p>Num: <math>7\sqrt{45}</math>   Denom: <math>\sqrt{2025}</math>   <math>\frac{7\sqrt{45}}{45} = \frac{7\sqrt{5}}{15}</math></p>	<p>11) <math>\frac{5\sqrt{2}}{\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{5\sqrt{16}}{\sqrt{64}}</math></p> <p>Num: <math>5\sqrt{16}</math>   Denom: <math>\sqrt{64}</math>   <math>\frac{5\sqrt{16}}{8} = \frac{5 \cdot 2}{2} = 5</math></p>	<p>12) <math>\frac{5\sqrt{5}}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{10}}{3\sqrt{4}}</math></p> <p>Num: <math>5\sqrt{10}</math>   Denom: <math>3\sqrt{4}</math>   <math>\frac{5\sqrt{10}}{6}</math></p>
<p>13) <math>\frac{4\sqrt{6}}{2\sqrt{27}} \cdot \frac{\sqrt{27}}{\sqrt{27}} = \frac{4\sqrt{162}}{2\sqrt{729}}</math></p> <p>Num: <math>4\sqrt{162}</math>   Denom: <math>2\sqrt{729}</math>   <math>\frac{4\sqrt{162}}{54} = \frac{2\sqrt{2}}{3}</math></p>	<p>14) <math>\frac{3\sqrt{15}}{2\sqrt{80}} \cdot \frac{\sqrt{80}}{\sqrt{80}} = \frac{3\sqrt{1200}}{2\sqrt{6400}}</math></p> <p>Num: <math>3\sqrt{1200}</math>   Denom: <math>2\sqrt{6400}</math>   <math>\frac{3\sqrt{1200}}{160} = \frac{3\sqrt{3}}{8}</math></p>	<p>15) <math>\frac{5\sqrt{2}}{\sqrt{32}} \cdot \frac{\sqrt{32}}{\sqrt{32}} = \frac{5\sqrt{64}}{\sqrt{1024}}</math></p> <p>Num: <math>5\sqrt{64}</math>   Denom: <math>\sqrt{1024}</math>   <math>\frac{40}{32} = \frac{5}{4} = \frac{1}{\frac{4}{5}}</math></p>

<p>16) <math>\frac{3\sqrt{20}}{3\sqrt{12}} \cdot \frac{\sqrt{12}}{\sqrt{12}} = \frac{3\sqrt{240}}{3\sqrt{144}}</math></p> <table border="0"> <tr> <td>Num</td> <td>Denom</td> <td></td> </tr> <tr> <td><math>\frac{3\sqrt{240}}{3\sqrt{144}}</math></td> <td><math>\frac{3\sqrt{144}}{3\sqrt{144}}</math></td> <td><math>\frac{12\sqrt{15}}{36} = \frac{\sqrt{15}}{3}</math></td> </tr> <tr> <td><math>3 \cdot \sqrt{16} \cdot \sqrt{15}</math></td> <td><math>3 \cdot 12</math></td> <td></td> </tr> <tr> <td><math>3 \cdot 4\sqrt{15}</math></td> <td><math>36</math></td> <td></td> </tr> <tr> <td><math>12\sqrt{15}</math></td> <td></td> <td></td> </tr> </table>	Num	Denom		$\frac{3\sqrt{240}}{3\sqrt{144}}$	$\frac{3\sqrt{144}}{3\sqrt{144}}$	$\frac{12\sqrt{15}}{36} = \frac{\sqrt{15}}{3}$	$3 \cdot \sqrt{16} \cdot \sqrt{15}$	$3 \cdot 12$		$3 \cdot 4\sqrt{15}$	$36$		$12\sqrt{15}$			<p>17) <math>\frac{5\sqrt{4}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{5\sqrt{12}}{\sqrt{9}}</math></p> <table border="0"> <tr> <td>Num</td> <td>Denom</td> <td></td> </tr> <tr> <td><math>\frac{5\sqrt{12}}{\sqrt{9}}</math></td> <td><math>\frac{\sqrt{9}}{\sqrt{9}}</math></td> <td><math>\frac{10\sqrt{3}}{3}</math></td> </tr> <tr> <td><math>5 \cdot \sqrt{4} \cdot \sqrt{3}</math></td> <td><math>3</math></td> <td></td> </tr> <tr> <td><math>5 \cdot 2\sqrt{3}</math></td> <td></td> <td></td> </tr> <tr> <td><math>10\sqrt{3}</math></td> <td></td> <td></td> </tr> </table>	Num	Denom		$\frac{5\sqrt{12}}{\sqrt{9}}$	$\frac{\sqrt{9}}{\sqrt{9}}$	$\frac{10\sqrt{3}}{3}$	$5 \cdot \sqrt{4} \cdot \sqrt{3}$	$3$		$5 \cdot 2\sqrt{3}$			$10\sqrt{3}$			<p>18) <math>\frac{6\sqrt{2}}{2\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{6\sqrt{14}}{2\sqrt{49}}</math></p> <table border="0"> <tr> <td>Num</td> <td>Denom</td> <td></td> </tr> <tr> <td><math>\frac{6\sqrt{14}}{2\sqrt{49}}</math></td> <td><math>\frac{2\sqrt{49}}{2\sqrt{49}}</math></td> <td><math>\frac{3\sqrt{14}}{14} = \frac{3\sqrt{14}}{7}</math></td> </tr> <tr> <td><math>6 \cdot \sqrt{14}</math></td> <td><math>2 \cdot 7</math></td> <td></td> </tr> <tr> <td><math>14</math></td> <td></td> <td></td> </tr> </table>	Num	Denom		$\frac{6\sqrt{14}}{2\sqrt{49}}$	$\frac{2\sqrt{49}}{2\sqrt{49}}$	$\frac{3\sqrt{14}}{14} = \frac{3\sqrt{14}}{7}$	$6 \cdot \sqrt{14}$	$2 \cdot 7$		$14$		
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