

Name Key

Date \_\_\_\_\_

8A: Algebra 1

Period \_\_\_\_\_

Multiplying & Dividing Radicals

Multiplying Radicals

I. Steps:

- 1) Multiply the coefficients & write as a new coefficient
- 2) Multiply the radicals & write as a new radical
- 3) Express your answer in simplest radical form.

\*numbers outside the radical can't be multiplied by numbers inside the radical

II. Examples: Express the product in simplest radical form

<p>1) <math>\sqrt{5} \cdot \sqrt{10}</math></p> $\begin{array}{c} \sqrt{50} \\ \wedge \\ \sqrt{25} \cdot \sqrt{2} \\ \boxed{5\sqrt{2}} \end{array}$	<p>2) <math>\sqrt{8} \cdot \sqrt{5}</math></p> $\begin{array}{c} \sqrt{40} \\ \wedge \\ \sqrt{4} \cdot \sqrt{10} \\ \boxed{2\sqrt{10}} \end{array}$	<p>3) <math>\sqrt{6} \cdot \sqrt{3}</math></p> $\begin{array}{c} \sqrt{18} \\ \wedge \\ \sqrt{9} \cdot \sqrt{2} \\ \boxed{3\sqrt{2}} \end{array}$
<p>4) <math>7\sqrt{3} \cdot \sqrt{12}</math></p> $\begin{array}{c} 7\sqrt{36} \\ \downarrow \\ 7 \cdot 6 \\ \boxed{42} \end{array}$	<p>5) <math>4\sqrt{2} \cdot 5\sqrt{3}</math></p> $\boxed{20\sqrt{6}}$	<p>6) <math>\frac{2}{3}\sqrt{24} \cdot 9\sqrt{3}</math></p> $\begin{array}{c} 6\sqrt{72} \\ \wedge \\ 6 \cdot \sqrt{36} \cdot 2 \\ 6 \cdot 6 \cdot 2 \\ \boxed{36\sqrt{2}} \end{array}$
<p>7) <math>(5\sqrt{8})(7\sqrt{3})</math></p> $\begin{array}{c} 35\sqrt{24} \\ \wedge \\ 35 \cdot \sqrt{4} \cdot \sqrt{6} \\ 35 \cdot 2 \cdot \sqrt{6} \\ \boxed{70\sqrt{6}} \end{array}$	<p>8) <math>(\sqrt{5})^2 \rightarrow</math> write twice 1<sup>st</sup></p> $\begin{array}{c} (\sqrt{5})(\sqrt{5}) \\ \downarrow \\ \sqrt{25} \\ \boxed{5} \end{array}$	<p>9) <math>(2\sqrt{3})^2 \rightarrow</math> write twice 1<sup>st</sup></p> $\begin{array}{c} (2\sqrt{3})(2\sqrt{3}) \\ \downarrow \\ 4\sqrt{9} \\ 4 \cdot 3 \\ \boxed{12} \end{array}$
<p>10) <math>2\sqrt{2y^3} \cdot 5\sqrt{32y}</math> <i>add exponents</i></p> $\begin{array}{c} 10\sqrt{64y^4} \\ 10 \cdot \sqrt{64} \cdot \sqrt{y^4} \\ 10 \cdot 8 \cdot y^2 \\ \boxed{80y^2} \end{array}$	<p>11) <math>-\frac{1}{10}\sqrt{3x^5} \cdot 70\sqrt{6x^2}</math> <i>add exponents</i></p> $\begin{array}{c} -7\sqrt{18x^7} \\ \downarrow \\ -7 \cdot \sqrt{9} \cdot \sqrt{2} \cdot \sqrt{x^6} \cdot \sqrt{x} \\ -7 \cdot 3 \cdot \sqrt{2} \cdot x^3 \cdot \sqrt{x} \\ \boxed{-21x^3\sqrt{2x}} \end{array}$	<p>12) <math>\frac{4}{7}\sqrt{28z^3} \cdot 21\sqrt{7z^2}</math> <i>add exponents</i></p> $\begin{array}{c} 12\sqrt{196z^5} \\ 12 \cdot \sqrt{196} \cdot \sqrt{z^5} \\ \downarrow \\ 12 \cdot 14 \cdot \sqrt{z^4} \cdot \sqrt{z} \\ \boxed{168z^2\sqrt{z}} \end{array}$

## Dividing Radicals

### III. Steps:

- 1) Divide the coefficients & write as a new coefficient
- 2) Divide the radicands & write as a new radicand
- 3) Express your answer in simplest radical form.

\*numbers outside the radical can't be divided by numbers inside the radical

\*\*If the division is not rational, simplify then divide

### IV. Examples: Express the product in simplest radical form

<p>1) <math>\sqrt{27} \div \sqrt{3}</math></p> $\frac{\sqrt{27}}{\sqrt{3}} = \sqrt{9}$ $\downarrow$ $\boxed{3}$	<p>2) <math>\sqrt{125} \div \sqrt{5}</math></p> $\frac{\sqrt{125}}{\sqrt{5}} = \sqrt{25}$ $\downarrow$ $\boxed{5}$	<p>3) <math>\sqrt{24} \div \sqrt{2}</math></p> $\frac{\sqrt{24}}{\sqrt{2}} = \sqrt{12}$ $\downarrow$ $\sqrt{4 \cdot 3}$ $\boxed{2\sqrt{3}}$									
<p>4) <math>\frac{20\sqrt{50}}{5\sqrt{2}}</math></p> $4\sqrt{25}$ $\downarrow$ $4 \cdot 5$ $\boxed{20}$	<p>5) <math>\frac{2\sqrt{40}}{\sqrt{5}}</math></p> $2\sqrt{8}$ $\downarrow$ $2 \cdot \sqrt{4 \cdot 2}$ $2 \cdot 2\sqrt{2}$ $\boxed{4\sqrt{2}}$	<p>6) <math>\frac{35\sqrt{54}}{5\sqrt{3}}</math></p> $7\sqrt{18}$ $\downarrow$ $7 \cdot \sqrt{9 \cdot 2}$ $7 \cdot 3\sqrt{2}$ $\boxed{21\sqrt{2}}$									
<p>** 7) <math>\frac{6\sqrt{24}}{\sqrt{32}}</math></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;"> <math display="block">\frac{\text{Num}}{\text{Denom}}</math> <math display="block">\frac{6\sqrt{24}}{\sqrt{32}}</math> <math display="block">6 \cdot \sqrt{4 \cdot 6}</math> <math display="block">6 \cdot 2\sqrt{6}</math> <math display="block">\boxed{12\sqrt{6}}</math> </td> <td style="border-right: 1px solid black; padding: 5px;"> <math display="block">\frac{\text{Denom}}{\sqrt{32}}</math> <math display="block">\sqrt{16 \cdot 2}</math> <math display="block">4\sqrt{2}</math> </td> <td style="padding: 5px;"> <math display="block">\frac{12\sqrt{6}}{4\sqrt{2}} =</math> <math display="block">3\sqrt{3}</math> </td> </tr> </table>	$\frac{\text{Num}}{\text{Denom}}$ $\frac{6\sqrt{24}}{\sqrt{32}}$ $6 \cdot \sqrt{4 \cdot 6}$ $6 \cdot 2\sqrt{6}$ $\boxed{12\sqrt{6}}$	$\frac{\text{Denom}}{\sqrt{32}}$ $\sqrt{16 \cdot 2}$ $4\sqrt{2}$	$\frac{12\sqrt{6}}{4\sqrt{2}} =$ $3\sqrt{3}$	<p>** 8) <math>\frac{2\sqrt{63}}{\sqrt{28}}</math></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;"> <math display="block">\frac{\text{Num}}{2\sqrt{63}}</math> <math display="block">2 \cdot \sqrt{9 \cdot 7}</math> <math display="block">2 \cdot 3\sqrt{7}</math> <math display="block">\boxed{6\sqrt{7}}</math> </td> <td style="border-right: 1px solid black; padding: 5px;"> <math display="block">\frac{\text{Denom}}{\sqrt{28}}</math> <math display="block">\sqrt{4 \cdot 7}</math> <math display="block">2\sqrt{7}</math> </td> <td style="padding: 5px;"> <math display="block">\frac{6\sqrt{7}}{2\sqrt{7}}</math> <math display="block">3\sqrt{1}</math> <math display="block">3 \cdot 1</math> <math display="block">\boxed{3}</math> </td> </tr> </table>	$\frac{\text{Num}}{2\sqrt{63}}$ $2 \cdot \sqrt{9 \cdot 7}$ $2 \cdot 3\sqrt{7}$ $\boxed{6\sqrt{7}}$	$\frac{\text{Denom}}{\sqrt{28}}$ $\sqrt{4 \cdot 7}$ $2\sqrt{7}$	$\frac{6\sqrt{7}}{2\sqrt{7}}$ $3\sqrt{1}$ $3 \cdot 1$ $\boxed{3}$	<p>** 9) <math>\frac{3\sqrt{80}}{\sqrt{45}}</math></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;"> <math display="block">\frac{\text{Num}}{3\sqrt{80}}</math> <math display="block">3 \cdot \sqrt{16 \cdot 5}</math> <math display="block">3 \cdot 4\sqrt{5}</math> <math display="block">\boxed{12\sqrt{5}}</math> </td> <td style="border-right: 1px solid black; padding: 5px;"> <math display="block">\frac{\text{Denom}}{\sqrt{45}}</math> <math display="block">\sqrt{9 \cdot 5}</math> <math display="block">3\sqrt{5}</math> </td> <td style="padding: 5px;"> <math display="block">\frac{12\sqrt{5}}{3\sqrt{5}}</math> <math display="block">4\sqrt{1}</math> <math display="block">4 \cdot 1</math> <math display="block">\boxed{4}</math> </td> </tr> </table>	$\frac{\text{Num}}{3\sqrt{80}}$ $3 \cdot \sqrt{16 \cdot 5}$ $3 \cdot 4\sqrt{5}$ $\boxed{12\sqrt{5}}$	$\frac{\text{Denom}}{\sqrt{45}}$ $\sqrt{9 \cdot 5}$ $3\sqrt{5}$	$\frac{12\sqrt{5}}{3\sqrt{5}}$ $4\sqrt{1}$ $4 \cdot 1$ $\boxed{4}$
$\frac{\text{Num}}{\text{Denom}}$ $\frac{6\sqrt{24}}{\sqrt{32}}$ $6 \cdot \sqrt{4 \cdot 6}$ $6 \cdot 2\sqrt{6}$ $\boxed{12\sqrt{6}}$	$\frac{\text{Denom}}{\sqrt{32}}$ $\sqrt{16 \cdot 2}$ $4\sqrt{2}$	$\frac{12\sqrt{6}}{4\sqrt{2}} =$ $3\sqrt{3}$									
$\frac{\text{Num}}{2\sqrt{63}}$ $2 \cdot \sqrt{9 \cdot 7}$ $2 \cdot 3\sqrt{7}$ $\boxed{6\sqrt{7}}$	$\frac{\text{Denom}}{\sqrt{28}}$ $\sqrt{4 \cdot 7}$ $2\sqrt{7}$	$\frac{6\sqrt{7}}{2\sqrt{7}}$ $3\sqrt{1}$ $3 \cdot 1$ $\boxed{3}$									
$\frac{\text{Num}}{3\sqrt{80}}$ $3 \cdot \sqrt{16 \cdot 5}$ $3 \cdot 4\sqrt{5}$ $\boxed{12\sqrt{5}}$	$\frac{\text{Denom}}{\sqrt{45}}$ $\sqrt{9 \cdot 5}$ $3\sqrt{5}$	$\frac{12\sqrt{5}}{3\sqrt{5}}$ $4\sqrt{1}$ $4 \cdot 1$ $\boxed{4}$									
<p>10) <math>\sqrt{45x^7} \div \sqrt{5x^4}</math> *Subtract exponents</p> $\sqrt{9x^3}$ $\downarrow$ $\textcircled{3} \sqrt{x^3}$ $\textcircled{3} \sqrt{x^3}$ $\boxed{3\sqrt{x^3}}$	<p>11) <math>-2\sqrt{\frac{80x^5y^{10}}{10x^3y^6}}</math> *Subtract exponents</p> $-2\sqrt{8x^2y^4}$ $-2 \cdot \sqrt{8} \cdot \sqrt{x^2} \cdot \sqrt{y^4}$ $-2 \cdot \sqrt{4 \cdot 2} \cdot x \cdot y^2$ $-2 \cdot 2\sqrt{2} \cdot x \cdot y^2$ $\boxed{-4xy^2\sqrt{2}}$	<p>12) <math>6\sqrt{\frac{300x^6y^8}{100x^4y^2}}</math> *Subtract exponents</p> $6\sqrt{3x^2y^6}$ $6 \cdot \sqrt{3} \cdot \sqrt{x^2} \cdot \sqrt{y^6}$ $6 \cdot \sqrt{3} \cdot x \cdot y^3$ $\boxed{6xy^3\sqrt{3}}$									