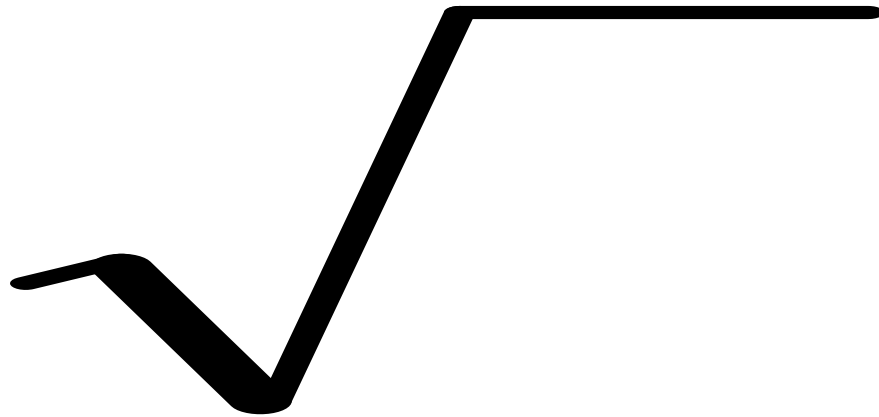




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# Simplifying Radicals





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# Perfect Squares

1	64	225
4	81	256
9	100	289
16	121	324
25	144	400
36	169	
49	196	625



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# Simplify

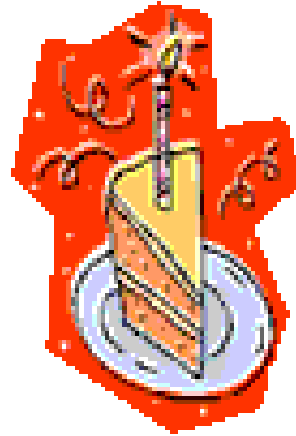
$$\sqrt{4} = 2$$

$$\sqrt{16} = 4$$

$$\sqrt{25} = 5$$

$$\sqrt{100} = 10$$

$$\sqrt{144} = 12$$



*This is a piece of cake!*



**Simplify**

Perfect Square Factor \* Other Factor

$$\sqrt{8} = \sqrt{4 * 2} = 2\sqrt{2}$$

$$\sqrt{20} = \sqrt{4 * 5} = 2\sqrt{5}$$

$$\sqrt{32} = \sqrt{16 * 2} = 4\sqrt{2}$$

$$\sqrt{75} = \sqrt{25 * 3} = 5\sqrt{3}$$

$$\sqrt{40} = \sqrt{4 * 10} = 2\sqrt{10}$$

LEAVE IN RADICAL FORM



**Simplify**

Perfect Square Factor \* Other Factor

$$\sqrt{48} = \sqrt{16 * 3} = 4\sqrt{3}$$

$$\sqrt{80} = \sqrt{16 * 5} = 4\sqrt{5}$$

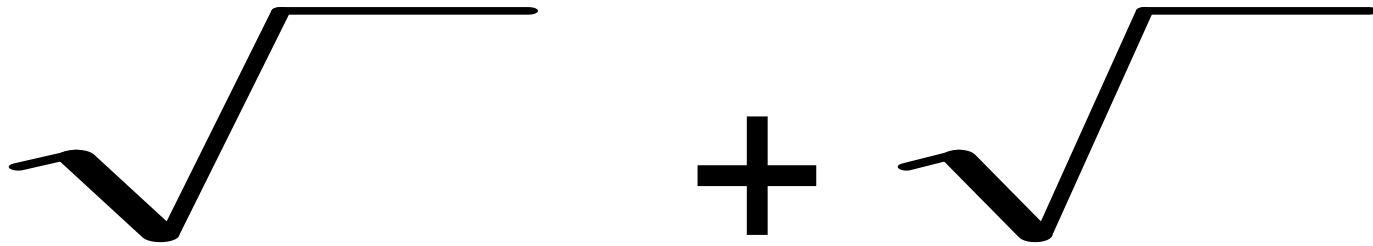
$$\sqrt{50} = \sqrt{25 * 2} = 25\sqrt{2}$$

$$\sqrt{125} = \sqrt{25 * 5} = 5\sqrt{5}$$

$$\sqrt{450} = \sqrt{225 * 2} = 15\sqrt{2}$$

LEAVE IN RADICAL FORM

# Combining Radicals



To combine radicals: combine the coefficients of like radicals



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Simplify each expression

$$6\sqrt{7} + 5\sqrt{7} - 3\sqrt{7} = 8\sqrt{7}$$

$$5\sqrt{6} + 3\sqrt{7} + 4\sqrt{7} - 2\sqrt{6} = 3\sqrt{6} + 7\sqrt{7}$$

Simplify each expression: Simplify each radical first and then combine.

$$\begin{aligned}2\sqrt{50} - 3\sqrt{32} &= 2\sqrt{25*2} - 3\sqrt{16*2} = \\ &2*5\sqrt{2} - 3*4\sqrt{2} = \\ &10\sqrt{2} - 12\sqrt{2} = \\ &-2\sqrt{2}\end{aligned}$$



Simplify each expression: Simplify each radical first and then combine.

$$\begin{aligned} 3\sqrt{27} + 5\sqrt{48} &= 3\sqrt{9*3} + 5\sqrt{16*3} = \\ &3*3\sqrt{3} + 5*4\sqrt{3} = \\ &9\sqrt{2} + 20\sqrt{2} = \\ &29\sqrt{2} \end{aligned}$$



# Simplify

Perfect Square Factor \* Other Factor



LEAVE IN RADICAL FORM

$\sqrt{18}$

=

=

$\sqrt{288}$

=

=

$\sqrt{75}$

=

=

$\sqrt{24}$

=

=

$\sqrt{72}$

=

=



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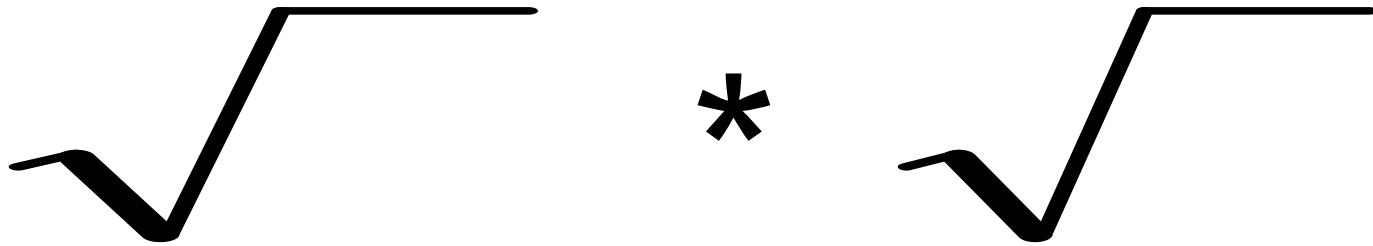
Simplify each expression

$$6\sqrt{5} + 5\sqrt{6} - 3\sqrt{6} =$$

$$3\sqrt{24} + 7\sqrt{54} =$$

$$2\sqrt{8} - 7\sqrt{32} =$$

# Multiplying Radicals



To multiply radicals: multiply the coefficients and then multiply the radicands and then simplify the remaining radicals.



## Multiply and then simplify

$$\sqrt{5} * \sqrt{35} = \sqrt{175} = \sqrt{25*7} = 5\sqrt{7}$$

$$2\sqrt{8} * 3\sqrt{7} = 6\sqrt{56} = 6\sqrt{4*14} =$$

$$6 * 2\sqrt{14} = 12\sqrt{14}$$

$$2\sqrt{5} * 4\sqrt{20} = 20\sqrt{100} = 20*10 = 200$$



$$(\sqrt{5})^2 = \sqrt{5} * \sqrt{5} = \sqrt{25} = 5$$

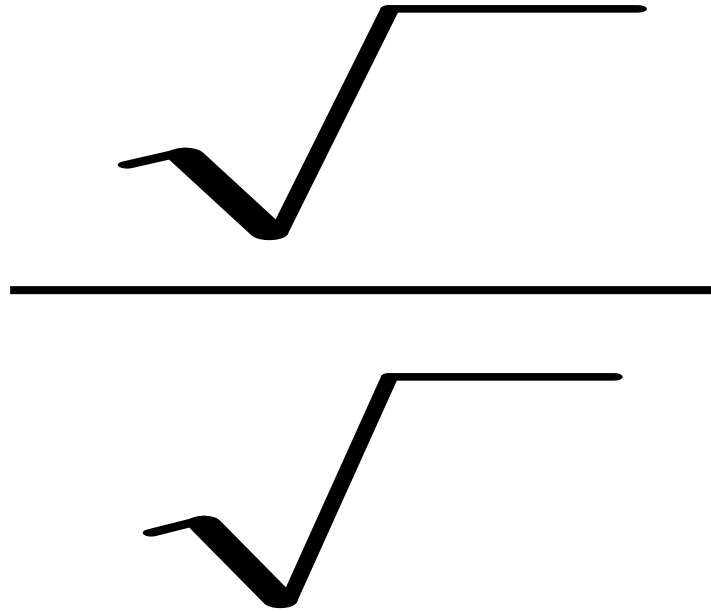
$$(\sqrt{7})^2 = \sqrt{7} * \sqrt{7} = \sqrt{49} = 7$$

$$(\sqrt{8})^2 = \sqrt{8} * \sqrt{8} = \sqrt{64} = 8$$

$$(\sqrt{x})^2 = \sqrt{x} * \sqrt{x} = \sqrt{x^2} = x$$



# Dividing Radicals



To divide radicals:  
divide the  
coefficients, divide  
the radicands if  
possible, and  
rationalize the  
denominator so that  
no radical remains in  
the denominator



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$$\frac{\sqrt{56}}{\sqrt{7}} = \sqrt{8} = \sqrt{4*2} = 2\sqrt{2}$$

**That was easy!**





This cannot be divided which leaves the radical in the denominator. We do not leave radicals in the denominator. So we need to rationalize by multiplying the fraction by something so we can eliminate the radical in the denominator.

$$\frac{\sqrt{6}}{\sqrt{7}} = \frac{\sqrt{6}}{\sqrt{7}} * \frac{\sqrt{7}}{\sqrt{7}} =$$

$$\frac{\sqrt{42}}{\sqrt{49}} = \frac{\sqrt{42}}{7}$$

42 cannot be simplified, so we are finished.



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This can be divided which leaves the radical in the denominator. We do not leave radicals in the denominator. So we need to rationalize by multiplying the fraction by something so we can eliminate the radical in the denominator.

$$\frac{\sqrt{5}}{\sqrt{10}} = \frac{\sqrt{1}}{\sqrt{2}} * \frac{\sqrt{2}}{\sqrt{2}} =$$
$$\frac{\sqrt{2}}{10}$$



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This cannot be divided which leaves the radical in the denominator. We do not leave radicals in the denominator. So we need to rationalize by multiplying the fraction by something so we can eliminate the radical in the denominator.

$$\frac{3}{\sqrt{12}} = \frac{3}{\sqrt{12}} * \frac{\sqrt{3}}{\sqrt{3}} =$$

$$\frac{3\sqrt{3}}{\sqrt{36}} =$$

Reduce the fraction.

$$\frac{\cancel{3}\sqrt{3}}{\cancel{6}} = \frac{\sqrt{3}}{6}$$



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# Simplify

$$\sqrt{X^2} = X$$

$$\sqrt{Y^6} = Y^3$$

$$\sqrt{P^4 X^6 Y^2} = P^2 X^3 Y$$

$$\sqrt{4X^4 Y^2} = 2X^2 Y$$

$$\sqrt{25C^8 D^{10}} = 5C^4 D^5$$





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**Simplify**

$$\sqrt{X^3}$$

$$= \sqrt{X^2 * X}$$

$$= X \sqrt{X}$$

$$\sqrt{Y^5}$$

$$= \sqrt{Y^4 Y}$$

$$= Y^2 \sqrt{Y}$$



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$$\begin{aligned}\sqrt{PX^3Y^3} &= \sqrt{X^2Y^2 * PXY} \\ &= XY\sqrt{PXY}\end{aligned}$$

$$\begin{aligned}\sqrt{12X^7Y^2} &= \sqrt{Y^5} \\ \sqrt{25C^8D^9} &= \sqrt{Y^5}\end{aligned}$$