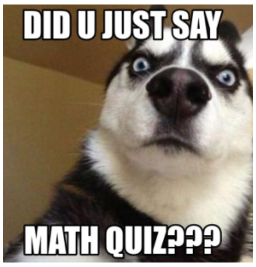

You will need:

-Agenda

-Pencil

-Spiral/comp notebook

Exponent Rule	Examples
$x^a \cdot x^b = x^{a+b}$	$c^3 \cdot c^5 = c^8$ $\quad 3^5 \cdot 3^8 = 3^{13}$ $5(5^n) = 5^1(5^n) = 5^{n+1}$
$a^x \cdot b^x = (ab)^x$	$2^4 \cdot 3^4 = 6^4$ $\quad 12^5 = 2^{10} \cdot 3^5$
$\dfrac{x^a}{x^b} = x^{(a-b)}$	$\dfrac{2^5}{2^{11}} = \dfrac{1}{2^6} = 2^{-6}$ $\quad \dfrac{x^{10}}{x^3} = x^7$
$\left(\dfrac{a}{b}\right)^x = \dfrac{a^x}{b^x}$	$\left(\dfrac{10}{2}\right)^6 = \dfrac{10^6}{2^6} = 5^6$ $\quad \dfrac{3^5}{9^5} = \left(\dfrac{3}{9}\right)^5 = \left(\dfrac{1}{3}\right)^5$
$(a^x)^y = a^{xy} = (a^y)^x$	$(3^2)^4 = 3^{2\cdot4} = 3^8 = 3^{4\cdot2} = (3^4)^2$
$x^{-a} = \dfrac{1}{x^a}$	$\left(\dfrac{3}{2}\right)^{-2} = \left(\dfrac{2}{3}\right)^2 = \dfrac{4}{9}$ $\quad 2x^{-4} = \dfrac{2}{x^4}$

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Simplifying Radicals

A radical expression is simplified if the following statements are true.

- The radicand has no perfect-square factors other than 1.
- The radicand contains no fractions.
- No radicals appear in the denominator of a fraction.

Simplified

$3\sqrt{5}$ $\quad 9\sqrt{x}$ $\quad \dfrac{\sqrt{2}}{4}$

Not Simplified

$3\sqrt{12}$ $\quad \sqrt{\dfrac{x}{2}}$ $\quad \dfrac{5}{\sqrt{7}}$

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take note

Property **Multiplication Property of Square Roots**

Algebra

For $a \geq 0$ and $b \geq 0$, $\boxed{\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}.}$

Example

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

You can use the Multiplication Property of Square Roots to simplify radicals by removing perfect-square factors from the radicand.

$\sqrt{1} = 1$	$\sqrt{36} = 6$	$\sqrt{121} = 11$
$\sqrt{4} = 2$	$\sqrt{49} = 7$	$\sqrt{144} = 12$
$\sqrt{9} = 3$	$\sqrt{64} = 8$	$\sqrt{169} = 13$
$\sqrt{16} = 4$	$\sqrt{81} = 9$	$\sqrt{196} = 14$
$\sqrt{25} = 5$	$\sqrt{100} = 10$	$\sqrt{225} = 15$

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Prime vs. Composite Numbers

Prime	Composite
have only 2 factors: (1 and itself)	have more than 2 factors
2,3,5,7,11	4,6,8,9,12,14

0 and 1 are neither

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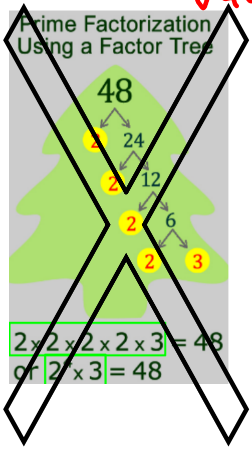
psf

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

$\sqrt{4}\sqrt{12}$

$2\sqrt{12}$

$\sqrt{4}\sqrt{3}$



Prime factorization using Upside-Down-Division (UDD) (aka Division by Primes)

Prime #

$$\begin{array}{r|l} 2 & 48 \\ 2 & 24 \\ 2 & 12 \\ 2 & 6 \\ 3 & 3 \\ & 1 \end{array}$$

one your done

$$\sqrt{48} = \underbrace{\sqrt{2}\cdot\sqrt{2}}\cdot\underbrace{\sqrt{2}\cdot\sqrt{2}}\cdot\sqrt{3}$$

$$\sqrt{4}\cdot\sqrt{4}\cdot\sqrt{3}$$

$$2\cdot 2\cdot\sqrt{3}$$

$$4\sqrt{3}$$

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Problem 1 Removing Perfect-Square Factors

What is the simplified form of $\sqrt{160}$?

What strategy can you use to find the factor to remove?
You can *solve a simpler problem* by first just listing the factors of the radicand. Then choose the greatest perfect square on the list.

$\sqrt{1}$
$\sqrt{4}$
$\sqrt{9}$
$\sqrt{16}$
$\sqrt{25}$
$\sqrt{36}$
$\sqrt{49}$
$\sqrt{64}$
$\sqrt{81}$
$\sqrt{100}$

$$\sqrt{160} = \sqrt{16}\sqrt{10}$$

$$\boxed{4\sqrt{10}}$$

$$\begin{array}{r|l} 2 & 10 \\ 5 & 5 \\ & 1 \end{array}$$

Prime factorization using Upside-Down-Division (UDD) (aka Division by Primes)

$$\begin{array}{r|l} 2 & 160 \\ 2 & 80 \\ 2 & 40 \\ 2 & 20 \\ 2 & 10 \\ 5 & 5 \\ & 1 \end{array}$$

$$\sqrt{160} = \sqrt{2}\sqrt{2}\sqrt{2}\sqrt{2}\sqrt{2}\sqrt{5}$$

$$\sqrt{4}\cdot\sqrt{4}\cdot\sqrt{10}$$

$$2\cdot 2\cdot\sqrt{10}$$

*Look for pairs

$$4\sqrt{10}$$

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What is the simplified form of $\sqrt{72}$?

What strategy can you use to find the factor to remove?
You can *solve a simpler problem* by first just listing the factors of the radicand. Then choose the greatest perfect square on the list.

$\sqrt{1}$
$\sqrt{4}$
$\sqrt{9}$
$\sqrt{16}$
$\sqrt{25}$
$\sqrt{36}$
$\sqrt{49}$
$\sqrt{64}$
$\sqrt{81}$
$\sqrt{100}$

$\sqrt{72} = \sqrt{36} \cdot \sqrt{2}$

$\boxed{6\sqrt{2}}$

$\sqrt{72} = \sqrt{9}\sqrt{8}$

$3\sqrt{8}$

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

$3 \cdot 2\sqrt{2}$

$6\sqrt{2}$

Prime factorization using Upside-Down-Division (UDD) (aka Division by Primes)

$\sqrt{72} = \sqrt{2}\sqrt{2}\sqrt{2}\sqrt{3}\sqrt{3}$

$\sqrt{4} \cdot \sqrt{2} \cdot \sqrt{9}$

$2 \cdot \sqrt{2} \cdot 3$

$6\sqrt{2}$

2 | 72
2 | 36
2 | 18
3 | 9
3 | 3
1

*Look for pairs

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$-3\sqrt{175}$

$-3 \cdot \sqrt{25}\sqrt{7}$

$-3 \cdot 5 \cdot \sqrt{7}$

$-15\sqrt{7}$

$-3\sqrt{175}$

$-3 \cdot \sqrt{5} \cdot \sqrt{5} \cdot \sqrt{7}$

$-3 \cdot \sqrt{25} \cdot \sqrt{7}$

$-3 \cdot 5 \cdot \sqrt{7}$

$-15\sqrt{7}$

5 | 175
5 | 35
7 | 7
1

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