Parts of a radical:

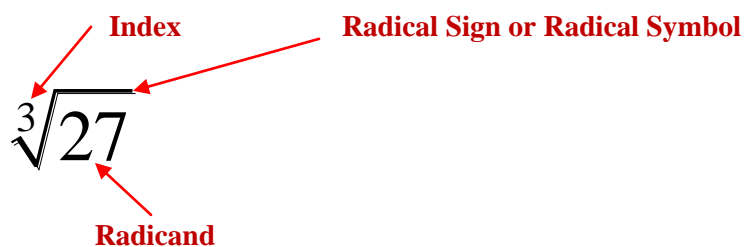**Index**   **Radical Sign or Radical Symbol**

$$\sqrt[3]{27}$$

Radicand

Steps to Simplify a Radical of a Number
1. Write original problem.
2. Go off to the side and factor the radicand using a factor tree.
3. Once all factors are prime, rewrite the factors in order.
4. Note the **index** of the radical [Note: If there is no explicit index, then the index is understood to be "2" or a square root.
5. Rewrite any of the common factors as a base to the exponent that is the index.
6. Put all factors back in main problem under a radical. Put the factors with exponents first.
7. Use the **Root of a Product of Rule** and put each factor with an exponent under a separate radical and put the rest of the factors under a radical.
8. Simplify each radical.
9. Multiply factors in front of radical together and multiply factors under radical together.

Example: Simplify $\sqrt{980}$

<table>
<tr><th colspan="2">Main Problem</th></tr>
<tr><th>Comments</th><th>Math Steps</th></tr>
<tr><td>Write original problem.</td><td>$\sqrt{980}$</td></tr>
<tr><td>Put factors back in main problem. Insert factors with exponents first under radical.. [Note: We will show multiplication with ( ) and not x.]</td><td>$= \sqrt{(2)^2 (7)^2 (5)}$</td></tr>
<tr><td>Use Product of Radicals which allows us to take a radical of each factor.</td><td>$= \sqrt{(2)^2} \sqrt{(7)^2} \sqrt{(5)}$</td></tr>
<tr><td>Simplify each radical.</td><td>$= (2)(7)\sqrt{5}$</td></tr>
<tr><td>Multiply numbers in front of radical together and numbers underneath radicals together.</td><td>$= 14\sqrt{5}$</td></tr>
</table>

<table>
<tr><th colspan="2">Side of Problem</th></tr>
<tr><th>Comments</th><th>Math Steps</th></tr>
<tr><td>*Factor 980 completely.*</td><td>980
98 x 10
2 x 49 x 2 x 5
2 x 7 x 7 x 2 x 5</td></tr>
<tr><td>*Put factors in order*.</td><td>*2 x 2 x 5 x 7 x 7*</td></tr>
<tr><td>*Write common factors with a base and an exponent of "2".*</td><td>$2^2 \, x \, 5 \, x \, 7^2$</td></tr>
</table>