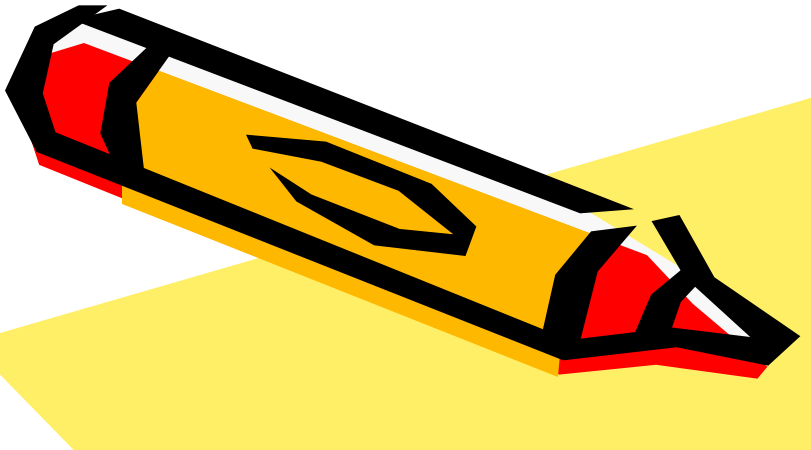
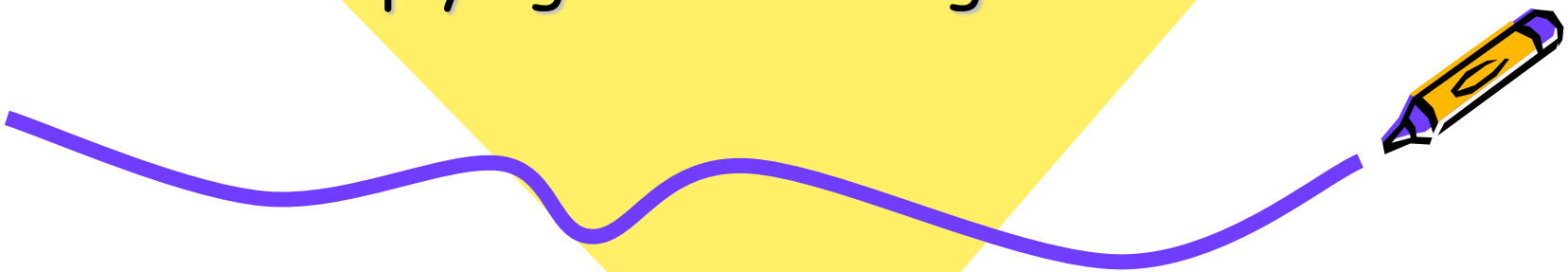


# Geometry

## Multiplying and Dividing Radicals



# Multiplying Radicals

Numbers outside the radical get worked together.
Numbers inside the radical get worked together.

| | | |
|---|---|---|
| $\sqrt{3} * \sqrt{6}$ | $4\sqrt{3} * 3\sqrt{6}$ | $-\sqrt{12} * 2\sqrt{6}$ |
| $\sqrt{18}$ | $12\sqrt{18}$ | $-2\sqrt{72}$ |
| $3\sqrt{2}$ | $36\sqrt{2}$ | $-12\sqrt{2}$ |

# Multiplying Radicals

Depending on the numbers, you may choose to simplify each factor before multiplying, but be sure your final answer is simplified.

$$\sqrt{18} * \sqrt{54}$$

$$3\sqrt{2} * 3\sqrt{6}$$

$$9\sqrt{12}$$

$$18\sqrt{3}$$

or

$$\sqrt{18} * \sqrt{54}$$

$$\sqrt{972}$$

$$18\sqrt{3}$$

# Simplifying Radicals

Simplify each radical expression:

1) $\sqrt{10} * \sqrt{20}$

2) $\sqrt{3} * \sqrt{8}$

3) $-3\sqrt{6} * \sqrt{10}$

4) $5\sqrt{50} * -2\sqrt{12}$

# Dividing Radicals

Numbers outside the radical get worked together.

Numbers inside the radical get worked together.

If a fraction is contained in the radical, split the numerator and denominator, and work them out separately.

$$\frac{\sqrt{8}}{\sqrt{9}} = \frac{2\sqrt{2}}{3}$$

$$\sqrt{\frac{8}{9}} = \frac{\sqrt{8}}{\sqrt{9}} = \frac{2\sqrt{2}}{3}$$

# Dividing Radicals

Numbers outside the radical get worked together.

Numbers inside the radical get worked together.

If a fraction is contained in the radical, split the numerator and denominator, and work them out separately.

$$\sqrt{\frac{12}{4}} = \frac{\sqrt{12}}{\sqrt{4}} = \frac{2\sqrt{3}}{2} = \sqrt{3}$$

Note the 2 's reduced

We also could have reduced the original fraction first and be left with $\sqrt{3}$

# Dividing Radicals

In many cases we are left with a radical in the denominator, which then must be rationalized.

$$\sqrt{\frac{12}{5}} = \frac{2\sqrt{3}}{\sqrt{5}} * \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{15}}{5}$$

Note that the 15 and the 5 cannot reduce since one is inside and one is outside

The denominator must be rationalized.

We rationalize, by multiplying both the top and bottom by the radical in the denominator ( in this example, $\sqrt{5}$ ).

# Simplifying Radicals

Simplify each radical. Be sure to rationalize the denominator if needed, and check that the final answer is completely simplified.

1) $\sqrt{\frac{5}{3}}$

2) $\sqrt{\frac{8}{5}}$

3) $\sqrt{\frac{24}{10}}$

4) $\frac{\sqrt{80}}{\sqrt{12}}$

# Simplifying Radicals

Simplify each radical. Be sure to rationalize the denominator if needed, and check that the final answer is completely simplified.

5) $\dfrac{4\sqrt{8}}{\sqrt{10}}$

6) $\dfrac{2\sqrt{18}}{\sqrt{2}}$

7) $\dfrac{-15\sqrt{15}}{\sqrt{50}}$

8) $\dfrac{7\sqrt{12}}{\sqrt{3}}$