Simplifying Radical Expressions – Squares, Distributive Property and FOIL

Because squaring is the inverse operation of square rooting, they "undo" each other and the result is the radicand. Therefore, you don't have to go through all that work when you see a problem that is squaring a square root. All you have to do is remember:

A square root squared is the radicand!

This example shows all the steps to simplify.

1) $\left(\sqrt{7}\right)^2$

$\left(\sqrt{7}\right)\left(\sqrt{7}\right)$

$\sqrt{7 \bullet 7}$

$\sqrt{(7)^2}$

$\boxed{7}$

However, you should have known that the answer was going to be 7 without doing all those steps.

You should not have to use your calculator or do any work to figure out the following:

2) $\left(\sqrt{13}\right)^2$

$\boxed{13}$

3) $\left(\sqrt{48}\right)^2$

$\boxed{48}$

4) $\left(\sqrt{2649}\right)^2$

$\boxed{2649}$

5) $\left(3\sqrt{11}\right)^2$

$3^2\left(\sqrt{11}\right)^2$ Recall the power to a power rule. $(xy)^m = x^m y^m$ So, square both terms.

$9 \bullet 11$ Simplify. (This is a "MUST SEE STEP"!)

$\boxed{99}$

6) $\left(4\sqrt{25}\right)^2$

$4^2\left(\sqrt{25}\right)^2$ Square both terms

$16 \bullet 25$ Simplify. (This is a "MUST SEE STEP"!)

$\boxed{400}$

7) $\sqrt{5}\left(\sqrt{11} + \sqrt{3}\right)$

$\sqrt{5} \bullet \sqrt{11} + \sqrt{5} \bullet \sqrt{3}$ Use the Distributive Property.

$\boxed{\sqrt{55} + \sqrt{15}}$ Simplify.

8) $3\sqrt{6}\left(\sqrt{2} + 8\sqrt{5}\right)$

$3\sqrt{6} \bullet \sqrt{2} + 3\sqrt{6} \bullet 8\sqrt{5}$ — Use the Distributive Property.

$3\sqrt{6 \bullet 2} + 3 \bullet 8\sqrt{6 \bullet 5}$

$3\sqrt{3 \bullet 2 \bullet 2} + 24\sqrt{30}$ — Since the 6 in the first radical can be factored into 3 and 2 and you already have a two, you need to factor so you can simplify. However, in the second radical, if you broke the 6 up into 3 and 2, it won't matter because the other number is a 5. So we just multiply them together.

$3\sqrt{(2)^2 \bullet 3} + 24\sqrt{30}$

$\boxed{6\sqrt{3} + 24\sqrt{30}}$ — Since you can not simplify the radicals anymore and the radicands are not the same, this is the final answer.

7) $\left(3\sqrt{5} - \sqrt{8}\right)\left(\sqrt{5} + \sqrt{8}\right)$

$\left(3\sqrt{5}\right)\left(\sqrt{5}\right) + \left(3\sqrt{5}\right)\left(\sqrt{8}\right) + \left(\sqrt{5}\right)\left(\sqrt{8}\right) + \left(\sqrt{8}\right)\left(\sqrt{8}\right)$ — Use FOIL

$3\left(\sqrt{5}\right)^2 + 3\sqrt{5 \bullet 8} + \sqrt{5 \bullet 8} + \left(\sqrt{8}\right)^2$ — Rewrite so you can simplify.

$3 \bullet 5 + 3\sqrt{5 \bullet 2 \bullet (2)^2} + \sqrt{5 \bullet 2 \bullet (2)^2} + 8$ — Simplify. Look back at examples 1-4.

$15 + 6\sqrt{10} + 2\sqrt{10} + 8$ — Simplify.

$\boxed{23 + 8\sqrt{10}}$ — Simplify by combining like terms and like radicals.

Remember: $(x + y)^2 = (x + y)(x + y)$