Properties of Radicals

Property		Example
$\sqrt[a]{x^b} = \left(\sqrt[a]{x}\right)^b$		$\sqrt[3]{8^2} = \left(\sqrt[3]{8}\right)^2 = (2)^2 = 4$
$a\sqrt{x} + b\sqrt{x} = (a+b)\sqrt{x}$	***Both index and radicand must match***	$3\sqrt{5} + 6\sqrt{5} = 9\sqrt{5}$
$\sqrt{x} \cdot \sqrt{y} = \sqrt{xy}$	***To multiply radicals with different radicands, the index must match. However, if the radicands are the same you can multiply if the indexes are different. Refer to your notes.***	$\sqrt{2} \cdot \sqrt{3} = \sqrt{6}$
$a\sqrt{x} \cdot b\sqrt{y} = ab\sqrt{xy}$		$2\sqrt{3} \cdot 3\sqrt{5} = 6\sqrt{15}$
$\sqrt[a]{\frac{x}{y}} = \frac{\sqrt[a]{x}}{\sqrt[a]{y}}$	***Must be able to use this property backwards and forwards.***	$\sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$
$\sqrt[a]{\sqrt[b]{x}} = \sqrt[ab]{x}$	***If you have a radical inside another radical you multiply the indexes to simplify.***	$\sqrt[4]{\sqrt[3]{17}} = \sqrt[12]{17}$
$\sqrt[a]{(xy)^a} = xy$	***If and only if a is odd.***	$\sqrt[5]{(5x)^5} = 5x$ *or* $\sqrt[3]{(-12)^3} = -12$
$\sqrt[a]{(xy)^a} = \lvert xy \rvert$	***If and only if a is even. Remember, when you take the square root of numbers, you are taking the absolute root, so absolute value symbols only need to be used with variables or an expression containing variables when writing your answer. The actual number would come out of the symbols..***	$\sqrt[4]{(3xy)^4} = 3\lvert xy \rvert$ *or* $\sqrt[4]{(x-6)^4} = \lvert x-6 \rvert$