(*) when multiplying or dividing radicals, you multiply or divide the roots and coefficients (numbers in front) separately.

Ex 1 Simplify

a) $-3\sqrt{6x} \cdot 5\sqrt{3x} = -15\sqrt{18x^2} = -15 \cdot 3x\sqrt{2}$

$18 = 2 \cdot 9$, $9 = 3 \cdot 3$

$= \boxed{-45x\sqrt{2}}$

b) $(2\sqrt{3} - 3\sqrt{2})(4\sqrt{3} + \sqrt{2}) = 8\sqrt{9} + 2\sqrt{6} - 12\sqrt{6} - 3\sqrt{4}$

$= 24 - 10\sqrt{6} - 6$

$= 18 - 10\sqrt{6}$

$\boxed{\sqrt[n]{a^m} = a^{\frac{m}{n}}}$

c) $\dfrac{\sqrt[2]{x^5}}{\sqrt[3]{x^2}} = \dfrac{x^{5/2}}{x^{2/3}}$

$= x^{5/2 - \frac{2}{3}} = x^{\frac{15}{6} - \frac{4}{6}} = x^{\frac{11}{6}} = \sqrt[6]{x^{11}} = \boxed{x\sqrt[6]{x^5}}$

NB: when we have roots with different indices, we need to convert to exponential form to simplify

Rationalizing the Denominator

← bottom of fraction

Rational number => fractions NOT roots

"Get rid of roots in the denominator"

a) $\sqrt{\frac{2}{7}} = \frac{\sqrt{2}}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{14}}{\sqrt{49}} = \boxed{\frac{\sqrt{14}}{7}}$

$\frac{5}{2} \cdot \frac{3}{3} = \frac{15}{6}$

Like changing denominators for fractions

b) $\sqrt[3]{\frac{2}{x}} = \frac{\sqrt[3]{2}}{\sqrt[3]{x}} \cdot \frac{\sqrt[3]{x^2}}{\sqrt[3]{x^2}} = \frac{\sqrt[3]{2x^2}}{\sqrt[3]{x^3}} = \frac{\sqrt[3]{2x^2}}{x}$

not always the same, we need perfect cube we need perfect cube

c) $\frac{3}{2-\sqrt{3}} \cdot \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{6+3\sqrt{3}}{4-\cancel{2\sqrt{3}}+\cancel{2\sqrt{3}}-3} = \boxed{6+3\sqrt{3}}$

Diff of Sq

$(x-y)(x+y) = x^2-y^2$

conjugate

"The conjugate of

$2-\sqrt{3}$ is $2+\sqrt{3}$"

d) $\frac{\sqrt{x}-1}{\sqrt{x}+2} \cdot \frac{\sqrt{x}-2}{\sqrt{x}-2} = \frac{x-\sqrt{x}-2\sqrt{x}+2}{x-4}$

$= \boxed{\frac{x-3\sqrt{x}+2}{x-4}}$