

5.2 – MULTIPLYING AND DIVIDING RADICAL EXPRESSIONS
MULTIPLICATION AND DIVISION RULES :
Examples :

$$1) 3\sqrt{2} \times 5\sqrt{5} = 15\sqrt{10}$$

$$2) 2\sqrt{7x} \times 4\sqrt{75x^3} = 2\sqrt{7x} \times 4\sqrt{25x^2 \times 3x} = 2\sqrt{7x} \times 20x\sqrt{3x} = 40x\sqrt{21x^2} = 40x^2\sqrt{21}$$

$$3) 7\sqrt{3}(5\sqrt{5} - 6\sqrt{3}) = 35\sqrt{15} - 42 \times 3 = 35\sqrt{15} - 126$$

$$4) (8\sqrt{2} - 5)(4 - 3\sqrt{2}) = 32\sqrt{2} - 24 \times 2 - 20 + 15\sqrt{2} = 47\sqrt{2} - 68$$

$$5) 9^3\sqrt{2x}(\sqrt[3]{8x^2} - 3) = 9^3\sqrt{2x}(2^3\sqrt{x^2} - 3) = 18^3\sqrt{2x^3} - 27^3\sqrt{2x} = 18x^3\sqrt{2} - 27^3\sqrt{2x}$$

$$6) (3\sqrt{5} - 2)^2 = 9 \times 5 - 12\sqrt{5} + 4 = 49 - 12\sqrt{5}$$

$$7) (3\sqrt{5} + 1)(3\sqrt{5} - 1) = 9 \times 5 - 1 = 44$$

$$8) \frac{4\sqrt{6}}{12\sqrt{3}} = \frac{4}{12} \sqrt{\frac{6}{3}} = \frac{1}{3} \sqrt{2}$$

You always need to simplify your result...

Simplest form of a radical:

Definition: A radical is in simplest form if:

- There is no square root on the denominator and vice versa.
- no perfect power can be removed from the radicand.

Examples: $\sqrt{\frac{3}{5}}$; $\frac{2}{3\sqrt{5}}$; $\sqrt{50}$ aren't in simplest form...

We have learned in 5.1 how to remove perfect powers from radicands. Now we're going to learn how to deal with denominator issues.

That is called **rationalizing the denominator.**

The method depends on the number of terms on the denominator...

RATIONALIZING THE DENOMINATOR :**Case # 1 : If there is only 1 term on the denominator**Examples :

$$1) \frac{5}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{5\sqrt{3}}{2 \times 3} = \frac{5\sqrt{3}}{6}$$

$$2) \frac{\sqrt{2}-3}{5\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{2-3\sqrt{2}}{5 \times 2} = \frac{2-3\sqrt{2}}{10}$$

$$3) \frac{3}{5\sqrt[3]{2}} \times \frac{\sqrt[3]{2^2}}{\sqrt[3]{2^2}} = \frac{3\sqrt[3]{4}}{5 \times 2} = \frac{3\sqrt[3]{4}}{10}$$

Case # 2 : If there are 2 terms on the denominator.

Example : $\frac{3}{5-\sqrt{2}}$

Definition: Two expressions are called **conjugate expressions** if their product is a difference of squares.

Reminder: $(a + b)(a - b) = a^2 - b^2$

For example : $5 - \sqrt{2}$ et $5 + \sqrt{2}$ are conjugates. Et on a : $(5 - \sqrt{2})(5 + \sqrt{2}) = 25 - 2 = 23$

Examples of applications :

$$1) \frac{2}{5-\sqrt{3}} \times \frac{5+\sqrt{3}}{5+\sqrt{3}} = \frac{10+2\sqrt{3}}{25-3} = \frac{10+2\sqrt{3}}{22} = \frac{5+\sqrt{3}}{11}$$

$$2) \frac{5\sqrt{3}}{4-2\sqrt{3}} \times \frac{4+2\sqrt{3}}{4+2\sqrt{3}} = \frac{20\sqrt{3}+10 \times 3}{16-4 \times 3} = \frac{20\sqrt{3}+30}{4} = \frac{10\sqrt{3}+15}{2}$$

$$3) \frac{2\sqrt{3}+1}{2\sqrt{3}-1} \times \frac{2\sqrt{3}+1}{2\sqrt{3}+1} = \frac{4 \times 3 + 4\sqrt{3} + 1}{4 \times 3 - 1} = \frac{13+4\sqrt{3}}{11}$$

Hwk : p 289 # 1 - 14, 16 - 20, 22 - 25