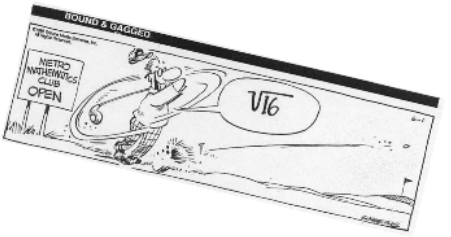
Section 4.1

CHAPTER 4

Radicals



Recall from Grade 10:

Perfect Square → 1, 4, 9, 16, 25, 36, 49, 64, 81, 100

Perfect Cube → 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000

→

Section 4.1

Square Root ⟶ the number that multiplies by itself to give the number

« the inverse operation to squaring

$\sqrt{25} = 5$ because _____

Cube root ⟶ determining the number that multiplied by itself 3 times to give the number

« the inverse operation to cubing

$\sqrt[3]{8} = 2$ because _____

Notation: $\sqrt[index]{radicand} = radical$

Summary:

$$\sqrt[3]{8} = 2$$

The 3 is called the **index.**

This entire thing is called a **radical**.

The 8 is called the **radicand**.

Think About:

$7^2 = 49$ and $(-7)^2 = 49$

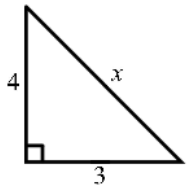
The square root of a positive number has two answers!

The positive square root is called the _____

The negative square root is called the _____

In certain situations, (finding the length of a side) it makes sense to only take the principal square root.

Example: How to determine the length of x:



Section 4.1

Entire and Mixed Radicals

Examples of Entire Radicals

$\sqrt{40}$

$\sqrt{75}$

only have the number 1 in front of the radical

Examples of Mixed Radicals

$2\sqrt[3]{5}$

$3\sqrt{5}$

has a number other than 1 in front of the radical

Simplifying Entire Radicals as Mixed Radicals

two methods

Method 1 ★
Use the largest perfect square or perfect cube, etc, as a factor

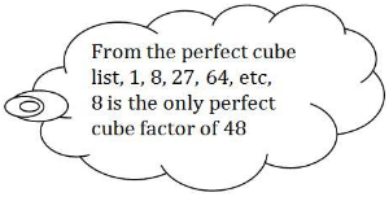
work with method 1 first

Method 2
Use prime factorization

Example 1: Rewrite $\sqrt{12}$ as a mixed radical.

We wouldn't use $\sqrt{6 \cdot 2}$ because 6 or 2 are not perfect squares.

Example 2: Rewrite $\sqrt[3]{48}$ as a mixed radical.



*** Be careful! We used a perfect cube factor this time because we were given a cube root.

Your Turn

Example 3: Express each radical in simplest form:

a) $\sqrt{40}$

b) $\sqrt{75}$

c) $\sqrt[3]{320}$

d) $\sqrt{288}$

e) $\sqrt{80}$

f) $\sqrt[3]{-144}$

Example: Use prime factorization to simplify the radical:

a) $\sqrt{12}$

b) $\sqrt[3]{48}$

Your Choice

Example: Express each radical in simplest form:

a) $\sqrt{40}$

b) $\sqrt[3]{108}$

Example: Simplify as a mixed radical using a method of your choice.

c) $\sqrt{3600}$

d) $\sqrt{288}$

e) $\sqrt[3]{-432}$

Note: *Sometimes mixed radicals are not in simplest radical form*. This means they can be simplified further.

Example: Express each mixed radical in ***simplest radical form***.

a) $4\sqrt{18}$

b) $-2\sqrt[3]{54}$

Assign: p. 182 # 4, 5, 7, 15, 18

Section 4.1

Writing Mixed Radicals as Entire Radicals

Example: Express each mixed radical as an entire radical.

$a) \ 3\sqrt{5}$ $b) -16\sqrt{2}$

$c) \ 5\sqrt[3]{4}$ $d) -2\sqrt[3]{10}$

Example : Order the following from least to greatest:

$$2\sqrt{5} \ , \ \sqrt{59} \ , \ 3\sqrt{6} \ , \ 2\sqrt[3]{3}$$

Entire Radical	Decimal

Assign: p. 182 #2, 3, 11, 12