Examples
Irrational and Real Numbers

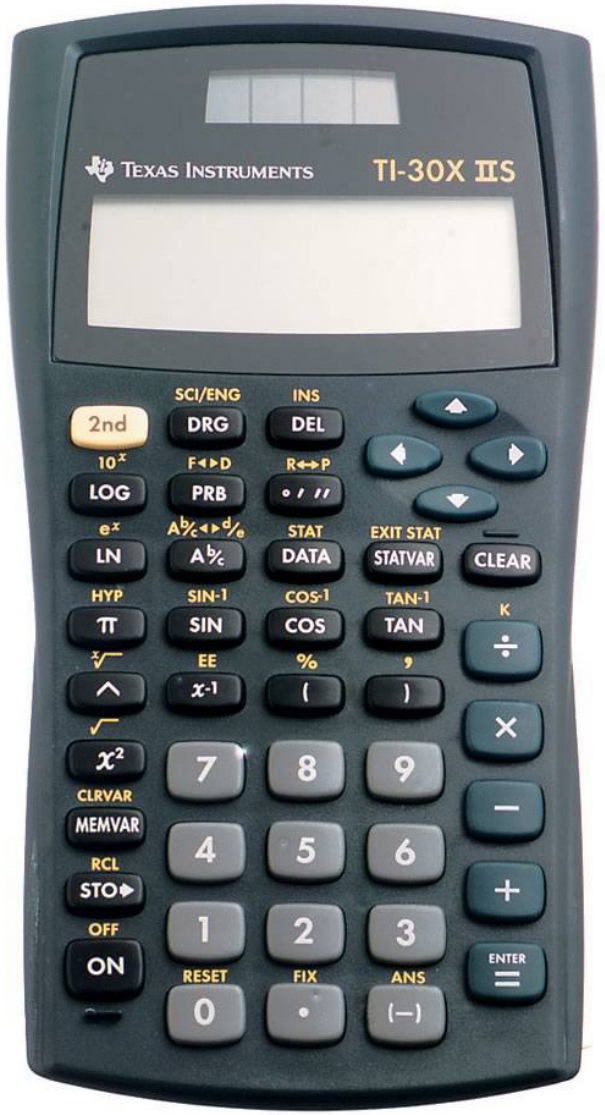
Based on power point presentations by Pearson Education, Inc.
Revised by Ingrid Stewart, Ph.D.

Learning Objectives

1. Define irrational numbers.
2. Evaluate irrational numbers derived from radicals.
3. Evaluate irrational numbers derived from logarithms.
4. Evaluate irrational numbers derived from nature.
5. Define real numbers and recognize their subsets.

NOTE: This lesson contains some examples. You can find more examples in the "Examples" document also located in the appropriate MOM Learning Materials folder.

Example 1: Evaluate Radicals



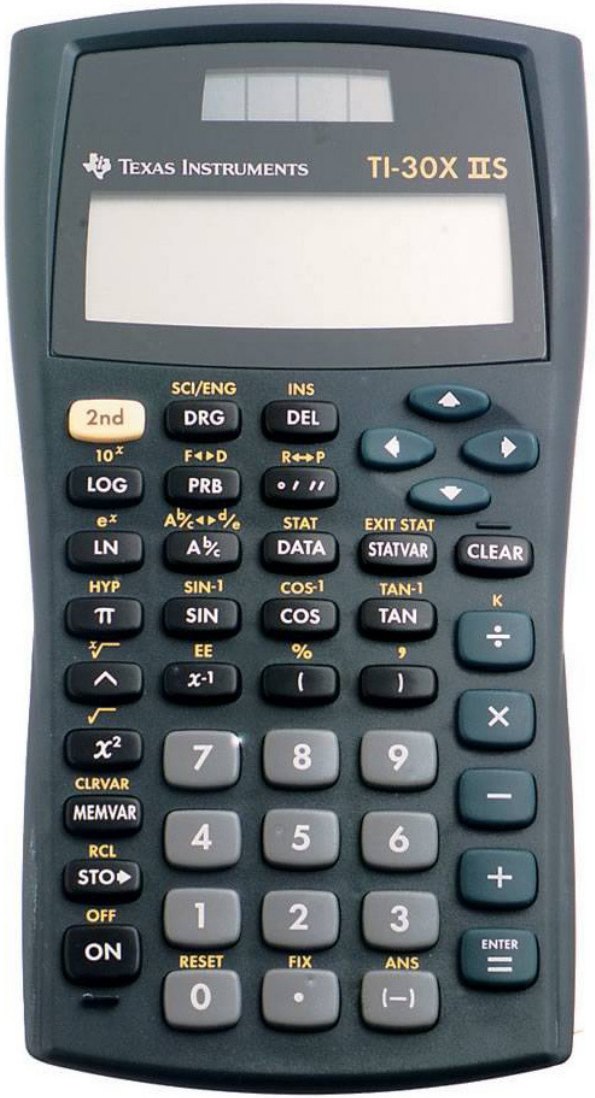
Evaluate $\sqrt{10}$ with a calculator.

We will use the TI-30X IIS.

- Press the 2nd button. Then the x^2 button. We will see $\sqrt{(}$.
- Type **10** and press the right parenthesis **)** button to close the set.
- Press the ENTER button.

The answer is **3.16227766 …** which has infinitely many decimal places. This makes it an irrational number.

Example 2: Evaluate Radicals



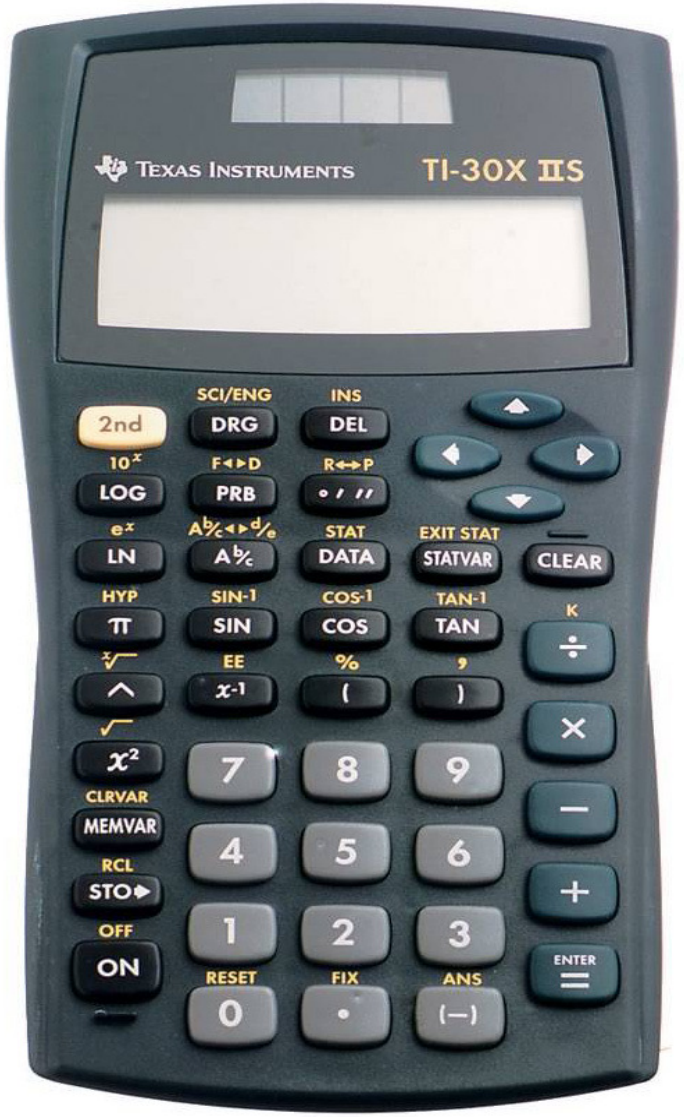
Evaluate $\sqrt[3]{40}$ on the calculator.

We will use the TI-30X IIS.

- Type the index **3**.
- Press the 2nd button. Then the caret ^ button. We will see 3 $\sqrt[x]{\ }$.
- Type **40**.
- Press the ENTER button.

The answer is **3.419951893 …** which has infinitely many decimal places. This makes it an irrational number.

Example 3: Evaluate a Logarithmic Expression



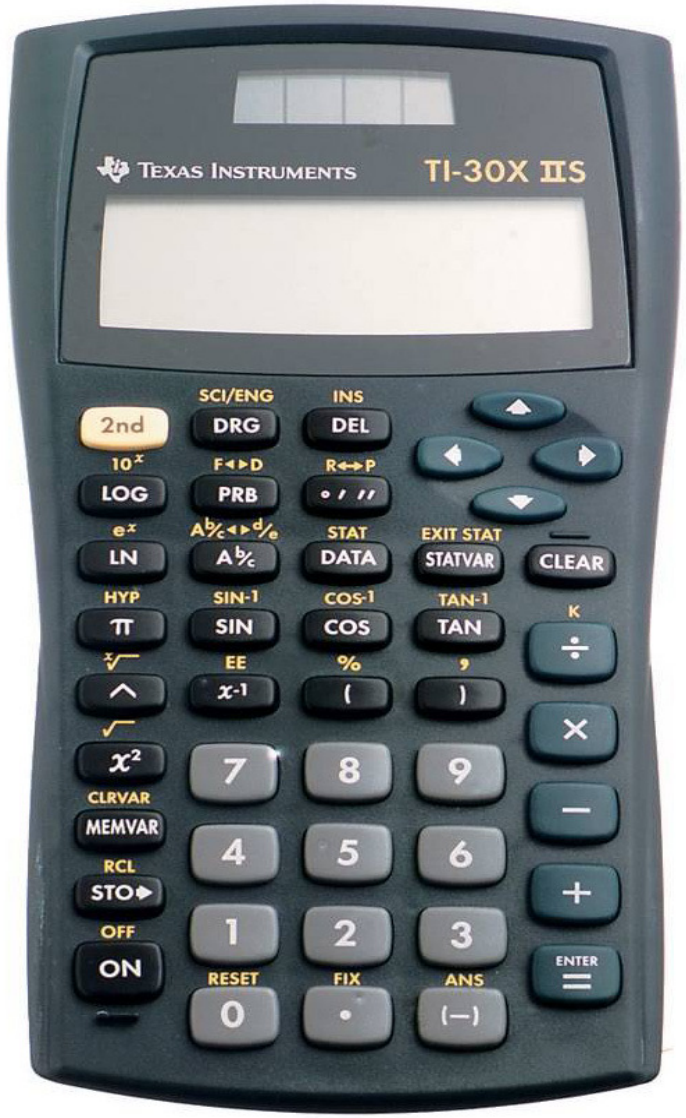
Evaluate **log 99** with a calculator.

We will use the TI-30X IIS.

- Press the LOG button because we are dealing with a log base 10. You will see **log (**.
- Type **99**.
- Press the right parenthesis button **)** to "close" the set.
- Press the ENTER button.

The answer is **1.995635195 …** which has infinitely many decimal places. This makes it an irrational number.

Example 4: Evaluate a Logarithmic Expression



Evaluate **ln 2** with a calculator.

We will use the TI-30X IIS.

- Press the LN button because we are dealing with a log base ***e***. You will see **ln (**.
- Type **2**.
- Press the right parenthesis button **)** to “close” the set.
- Press the ENTER button.

The answer is **0.693147181 …** which has infinitely many decimal places. This makes it an irrational number.

Example 5: Evaluate Expressions Containing π and e

a. Evaluate $\frac{3}{\pi} + 4$ using the calculator. Round to 2 decimal places. Use the π button on the calculator and not 3.14! ÷

We find that $\frac{3}{\pi} + 4$ is approximately equal to ***4.95***.

Calculator Input:

3	÷	π	+	4	ENTER

b. Evaluate $e^2 - 1$ using the calculator. Round to 3 decimal places. Use the ***e*** function on the calculator and not 2.72!

We find that $e^2 - 1$ is approximately equal to ***6.389.***

Calculator Input:

2nd	LN	2	)	−	1	ENTER

Example 6: Evaluate Expressions Containing *e* and Logarithms

Evaluate $\ln\left(\frac{1}{e^3}\right)$ using the calculator. Round to 2 decimal places.

Use the ***e*** function on the calculator and not 2.72!

We find that $\ln\left(\frac{1}{e^3}\right)$ is exactly equal to **– *3***.

Calculator Input:

LN	1	÷	2nd	LN	3	)	)	ENTER

Example 7: Recognize Subsets of the Real Numbers

Consider the following set of numbers:

$$\left\{-9, -1.3, 0, 0.\overline{3}, \pi, 9, 10\right\}$$

List the numbers in the set that are natural numbers:

The natural numbers in the set are 9 and 10.

List the numbers in the set that are whole numbers:

The whole numbers in the set are 0, 9, and 10.

Example 8: Recognize Subsets of the Real Numbers

Consider the following set of numbers.

$$\left\{-9, -1.3, 0, 0.\overline{3}, \pi, 9, 10\right\}$$

List the numbers in the set that are integers:

The numbers in the set that are integers are – 9, 0, 9, and 10.

List the numbers in the set that are rational numbers:

The numbers in the set that are rational numbers are

$$-9,\ -1.3,\ 0,\ 0.\overline{3} = \frac{1}{3},\ 9,\ \text{and } 10.$$

Example 9: Recognize Subsets of the Real Numbers

Consider the following set of numbers.

$$\left\{-9, -1.3, 0, 0.\overline{3}, \pi, 9, 10\right\}$$

List the numbers in the set that are irrational numbers.

The numbers in the set that are irrational numbers is π (Pi) .