Gabriela Calderon 25-Jan-21

/\*\* CPS201

\* Spring 2021

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package babylonia;

import java.util.Scanner;

import java.text.NumberFormat;

import java.util.regex.Matcher;

import java.util.regex.Pattern;

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\* File name: BabyloniaCalderon.java

\* <p>

\* Description: Program that estimates the square root of several inputs

\* given by the user. Solves programming project 1, Walter

\* Savitch, <i>Absolute Java, 6th ed.</i>, Chapter 3, page 168.

\* <p>

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\* @version 25-Jan-2021

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public class BabyloniaCalderon

{

public static double obtainValidRadicand()

{

Scanner keyboard = new Scanner(System.in);

String radicandString = "";

System.out.print("Enter the radicand: ");

radicandString = keyboard.nextLine();

while (!isValidNumber(radicandString,"")

|| radicandString.contains("-"))

{

System.out.print("Enter the radicand: ");

radicandString = keyboard.nextLine();

}

return Double.parseDouble(radicandString);

} // end public static double obtainValidRadicand

public static double estimateSquareRoot(double radicand)

{

int guessCounter = 1;

double oldEstimate = radicand;

double newEstimate = radicand / 2;

// loop

while (((oldEstimate - newEstimate) / oldEstimate) > 0.001)

{

oldEstimate = newEstimate;

newEstimate = (oldEstimate + (radicand / oldEstimate)) / 2;

System.out.print(String.format("Guess %d = %,-7.4f \n", guessCounter, newEstimate));

guessCounter += 1;

}

return newEstimate;

}

public static boolean isValidNumber(String numberString, String type)

{

String regex;

if (type.equalsIgnoreCase("natural"))

regex = "[0-9]+"; //Match unsigned ints only

else

regex = "^[-+]?" //Match opt. sign in the set

+ "[0-9]" //Match digits

+ ".?[0-9]+" //Match opt. dot and digits

+ "([eE][-+]?[0-9]+)?$"; //Match scientific

Pattern p = Pattern.compile(regex);

Matcher m = p.matcher(numberString);

boolean isValid = m.matches();

return isValid;

}

public static void main(String[] args)

{

double radicand = 0.0;

double squareRoot = 0.0;

// program header

System.out.println("\n\t\tCOMPUTE A SQUARE ROOT\n\n"

+ "Gabriela Calderon\n"

+ "January 25, 2021\n");

System.out.println("This program estimates square roots using"

+ " the Babylonian algorithm.\n");

// prompt users for input

radicand = obtainValidRadicand();

if (radicand == 0)

squareRoot = 0;

else if (radicand == 1)

squareRoot = 1;

else

squareRoot = estimateSquareRoot(radicand);

//display root

System.out.print(String.format("The estimated square root of %,.2f is %,.4f", radicand, squareRoot));

System.out.println();

}

}