Connecting Mathematics & Coding: TI Codes Ten Minutes a Week

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Slides & handouts available at http://bit.ly/2018camtfisher

Programming?

https://www.youtube.com/watch?v=qQGgaI-BcI4

Why “Coding”?

- Computer programming **jobs are growing** at 2x the national average.
- Computing occupations are among the **highest-paying** jobs for new graduates.
- **2.4%** of college students graduate with a degree in computer science.
- Only **12%** of CS degrees are earned by women.

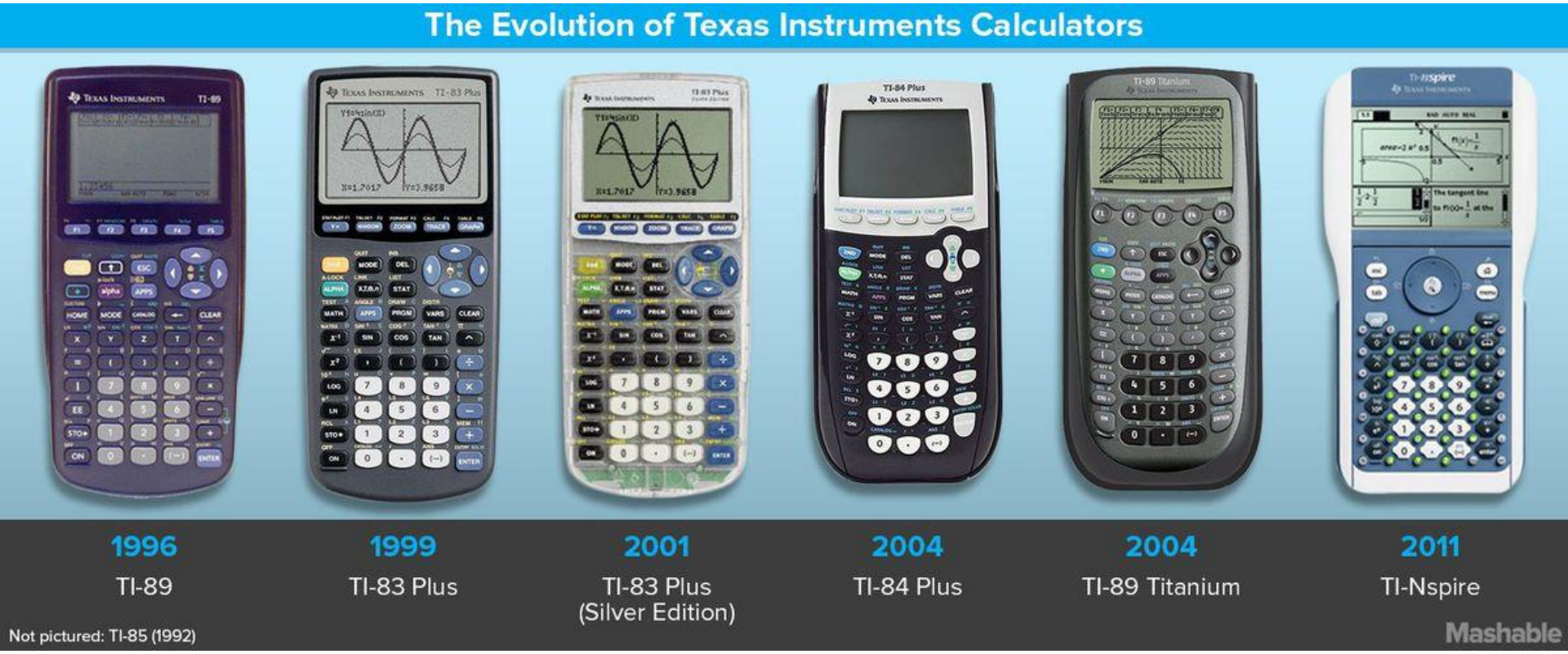
http://csedweek.org/resource_kit/blurbs

Why Coding in Math or Science Class?

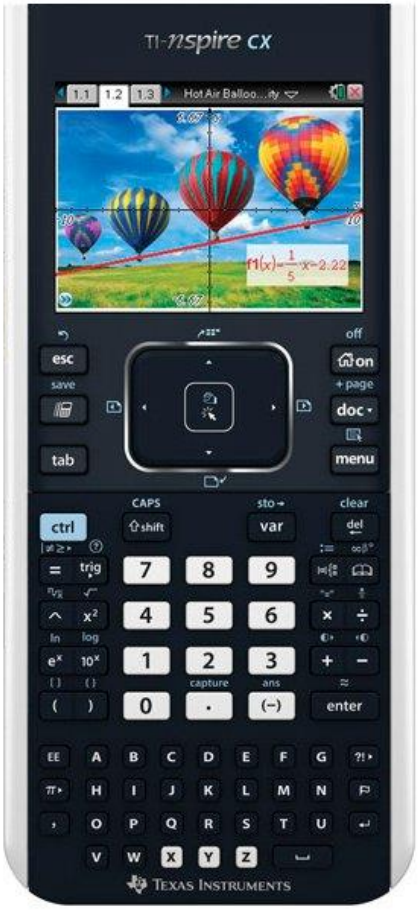
- Strengthens math and science concepts
- Promotes creativity
- Easy-to-learn coding on all TI graphing devices
- Sparks an interest in coding
- Introductory experience builds a foundation in coding

Evolution of the Calculator

Evolution of Texas Instruments Graphing Handhelds



TI Graphing Handhelds Today



TI-Nspire

TI-84 Plus CE

Texas Instruments

TI Handhelds - Calculator or Computer?

- A Calculator is a usually electronic device for performing mathematical calculations.
- A Computer is a programmable usually electronic device that can store, retrieve, and process data.

From https://www.merriam-webster.com

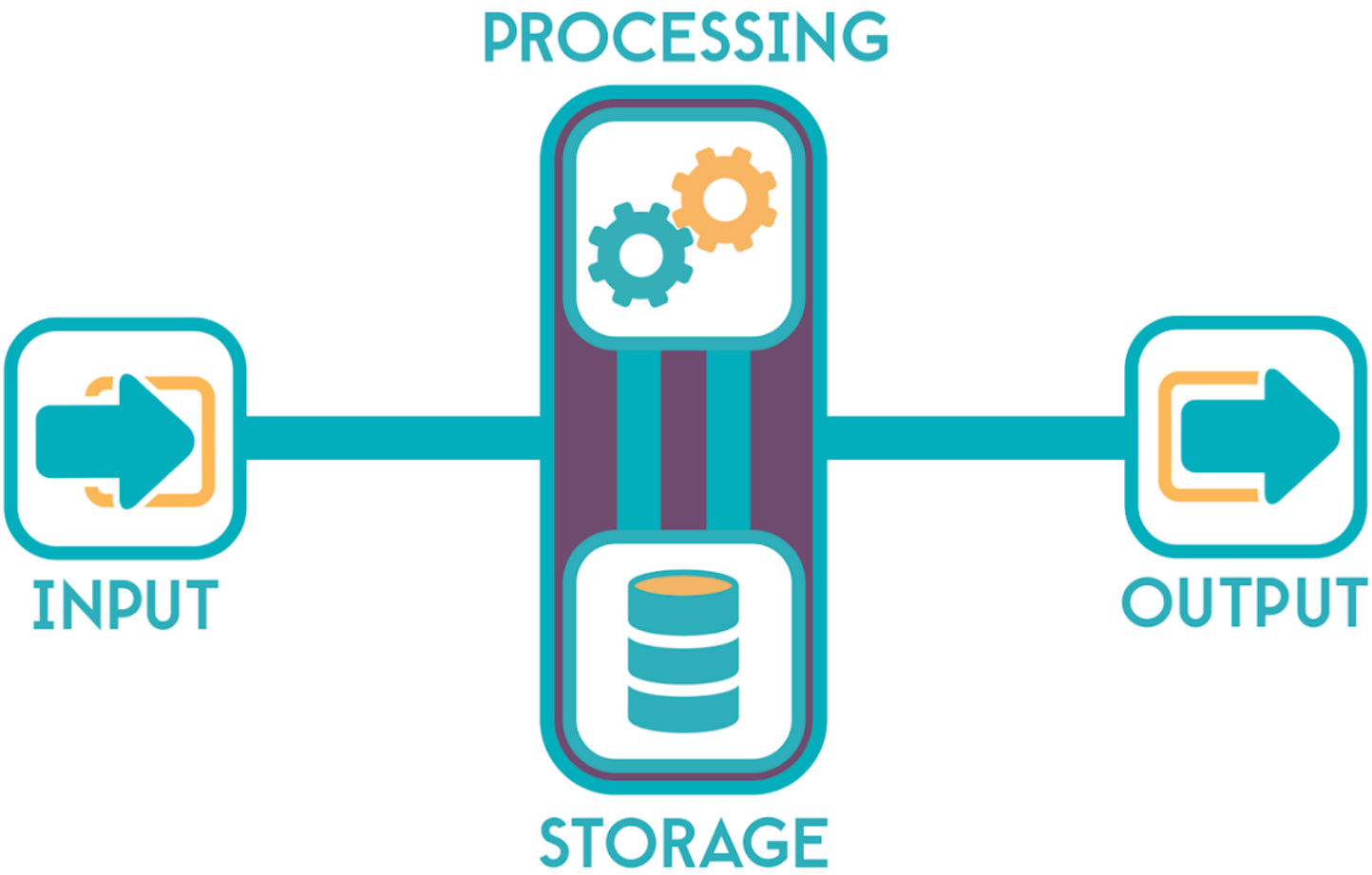
TI Handhelds - Calculator or Computer?

YES!

Video

https://www.youtube.com/watch?v=mCq8-xTH7jA&feature=youtu.be

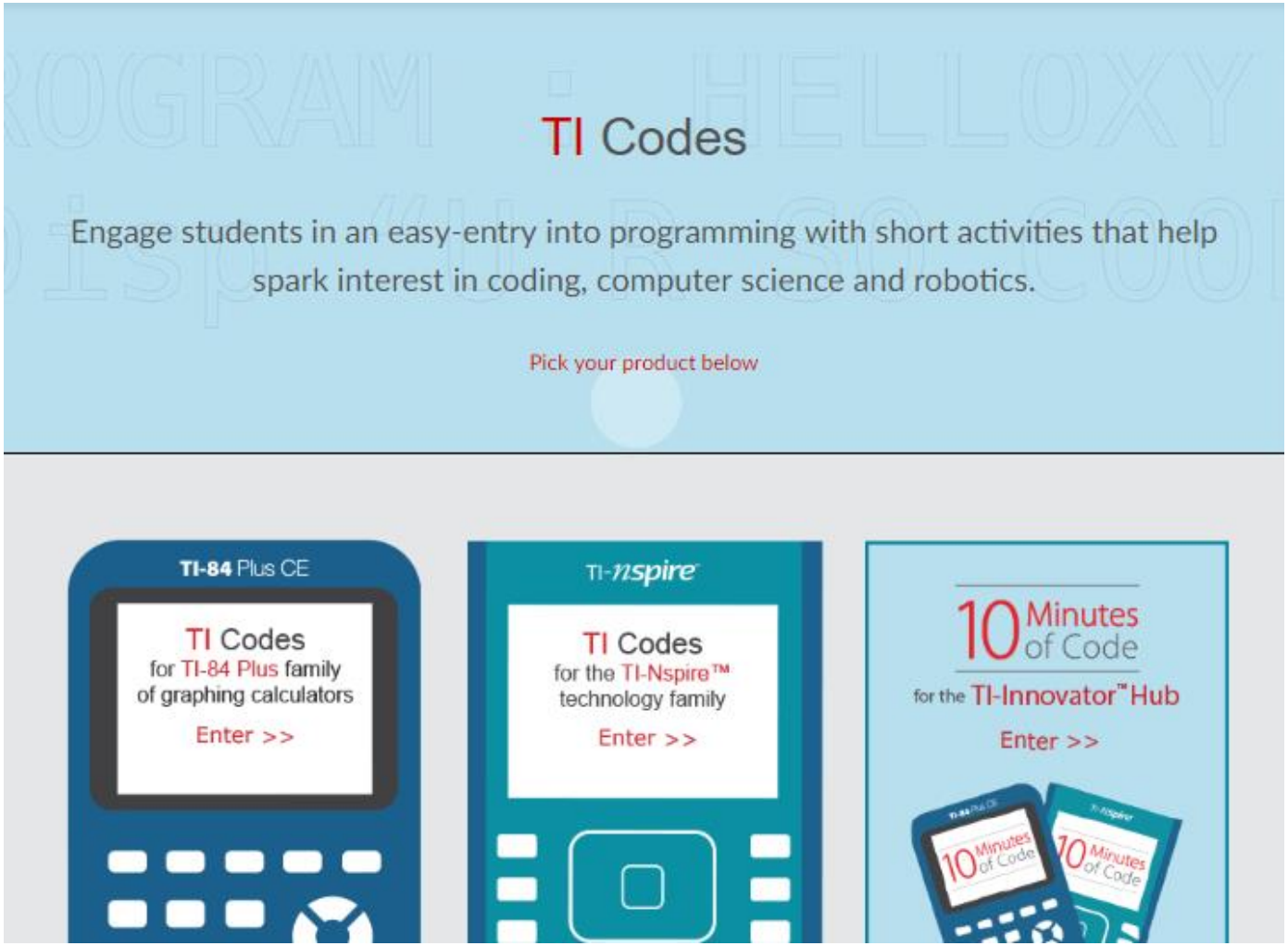
What Makes a Computer a Computer?



How would you rank yourself in programming experience?

How would you rank yourself with TI-84 or TI-Nspire Graphing Technology?

TI Codes: Lots of Resources



https://education.ti.com/en/us/activities/ti-codes

TI Codes

Introduce students to the basics of coding, a critical skill for 21st century careers, using the TI technology they carry in their backpacks every day.

Engage students with programming through the eyes of a mathematician to help spark their interest in computer science.

https://education.ti.com/en/us/activities/ti-codes

“10 Minutes of Code”

- Short, 10-minute activities
- Easily fits into your class
- You don’t need to know how to code to get started – Student Activities and Teacher Notes are provided
- 5 Units
  - 3 Skill-Builder Lessons
  - 1 Application Lesson (programming project)

Algorithms

Algorithms are precise sequences of instructions for processes that can be executed by a computer and are implemented using programming languages.

In other words, an algorithm is a step-by-step procedure for solving a problem.

Building Blocks of Algorithms

- Sequencing
- Selection
- Iteration

In Both Platforms

Description	TI-Nspire	TI-84
Input and Output	I/O	I/O
Selection(conditional statements) and Iteration (looping	Control	CTL
Storage/Memory	sto-> := Define Variables	sto->

Let's Get Started

TI-Nspire:

- New Document
- 9: Add Program Editor
- 1: New…
- Name:
- Once in editor, press menu to get started!

TI-84:

- prgm
- Arrow over to NEW
- 1: Create New
- Name=
- Once in editor, press prgm to get started!

New Data Type: Strings

- Items in quotes are called strings. A string is a sequence of characters.
  - Example: “Hello world” is a string

Output

TI-Nspire:

- Disp
  - Expression or string
  - Can have more than one argument – separated by commas
- DispAt
  - First argument is line number
  - Then expression or string

TI-84:

- Disp (
  - Expression or string
- Output(
  - *(row_num, col_num, exp/string)*
- ClrHome

Program #1

- Write a program that displays the statement → Hello world!
- Extension: Write a program that asks for the name of the user, then displays a greeting that includes the user's name.

Input and Variables

TI-Nspire:

- Data can be passed into the program through parameters
- Request *
  - Includes message
  - expression
- RequestStr *
  - Includes message
  - string

TI-84:

- Prompt *
  - Variable(s)
- Input *
  - Only ask user for one input
  - Can include message to tell user what input to enter

* Allows user to enter values into program WHILE program is running

Variables: “Gets” vs. Equals

TI-Nspire:

- := OR sto->
- Variables can be a single letter of multiple letters.
- Letters are NOT initially defined and assigned values.

TI-84:

- sto->
- 27 variables to store numeric values – A through Z and theta.
- If a value is not assigned then the default value is zero.

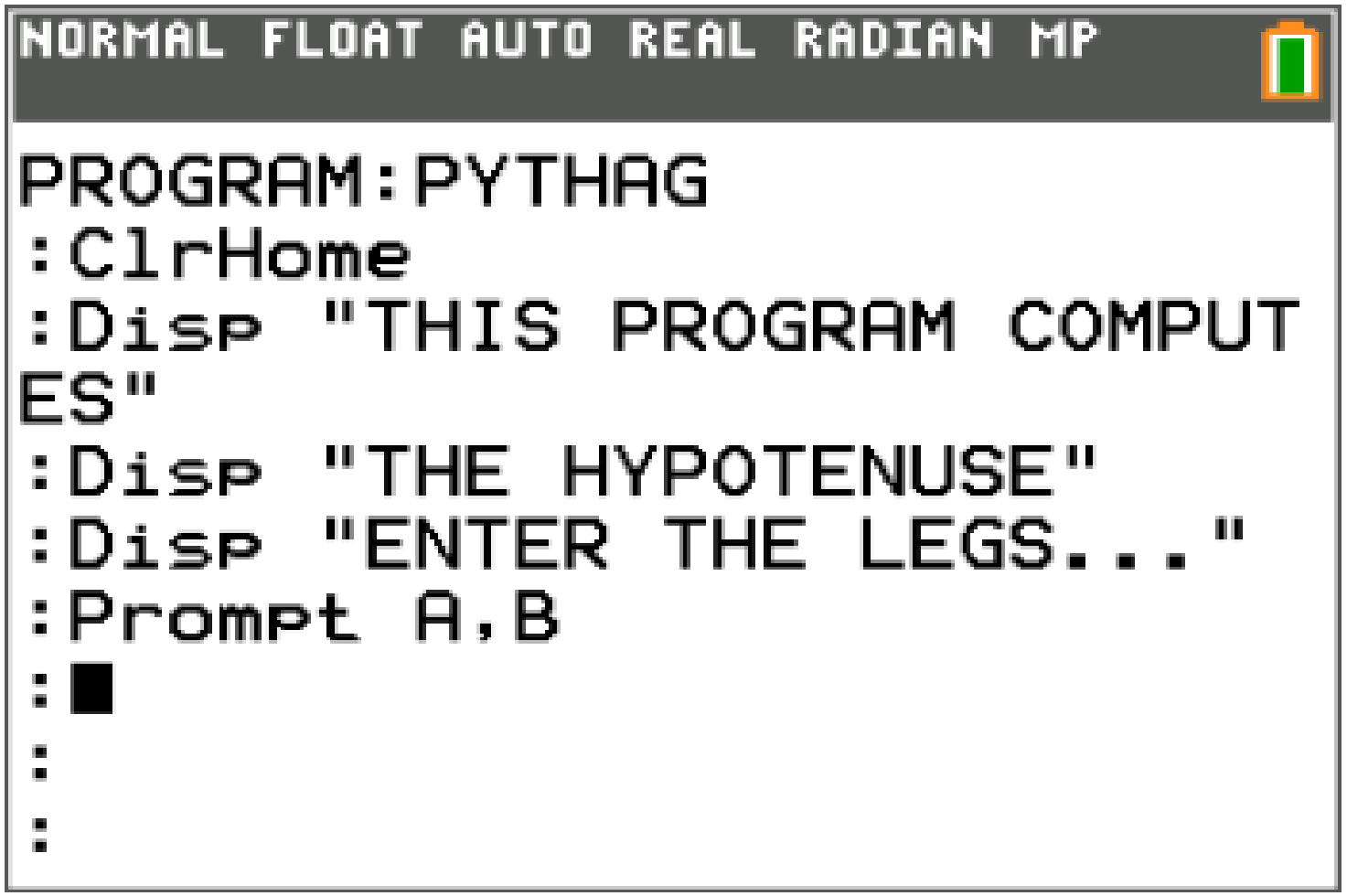
TI-Nspire:

Define hypotenuse(a,b)=…

» Arguments are also called ‘parameters’. The letters a and b in the code are called ‘formal parameters’. They are place holders used to perform computations within the program. When the program runs, it will receive the ‘actual parameters’ from the command line.

» Example: hypotenuse(3,4)

TI-84


NORMAL FLOAT AUTO REAL RADIAN MP
PROGRAM:PYTHAG
:ClrHome
:Disp "THIS PROGRAM COMPUT
ES"
:Disp "THE HYPOTENUSE"
:Disp "ENTER THE LEGS..."
:Prompt A,B
:
:
:

Program #2

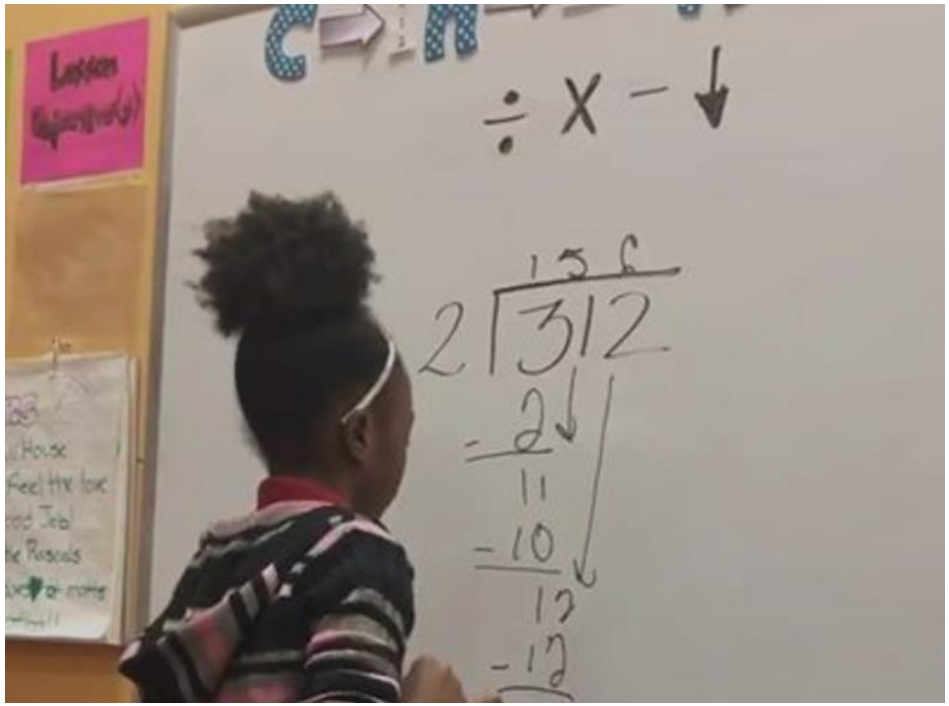
- Write a program that computes and then displays the hypotenuse of a right triangle given the lengths of the two legs of the triangle.

Extension: Write a program that computes and displays the distance of the leg given the lengths of the hypotenuse and other leg of a right triangle.

Algorithms

Which algorithms are you already familiar with?

Example:



http://mashable.com/2016/12/14/students-long-division-song/#uAf2YCtapaqF

Algorithms

Which algorithms are you interested in coding?

What other tools may we need to implement these algorithms?

Possible algorithms to program

- Area of a geometric shape (triangle, circle, trapezoid,...)
- Volume of a solid (cube, square pyramid)
- Simple or Compound Interest
- Heron's Formula

Possible algorithms to program

- Quadratic formula
- “Pass” or “Fail” based on 3 test scores
- Displaying arithmetic or geometric sequences
- TI-84: Drawing multiple circles in a pattern
- Finding the nth element in the Fibonacci sequence

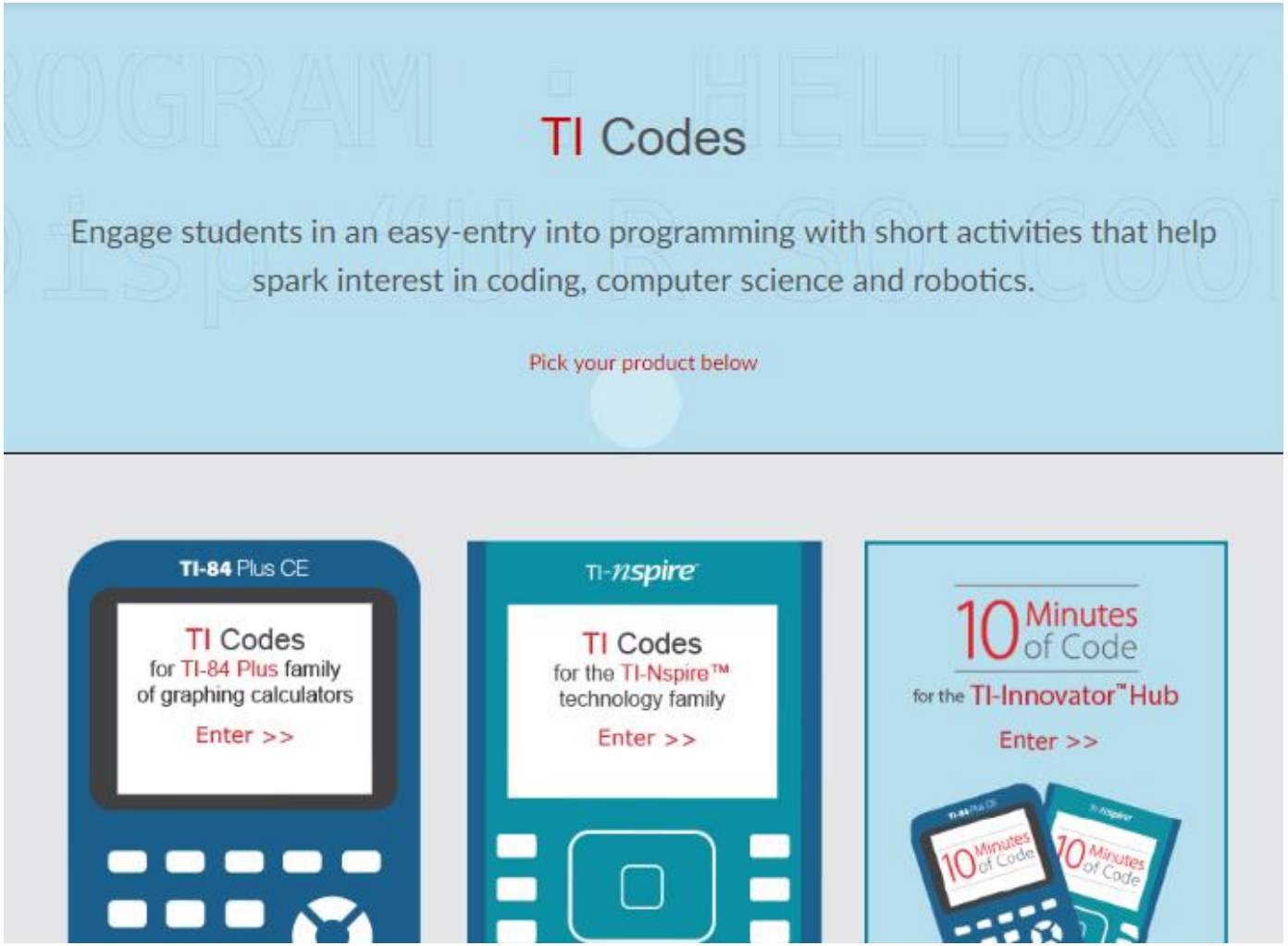
We Need Coding in Schools, but Where are the Teachers?

"If we really want to bring coding to our schools, we need to focus on the teachers first.

We need to look for teachers who are lifelong learners, teachers who are ready to learn to code, the teachers who can become the 'coding' teachers for our schools."

https://www.edsurge.com/news/2013-12-09-opinion-we-need-coding-in-schools-but-where-are-the-teachers

TI Codes: Explore and Enjoy!



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Texas Instruments