Calculate

Answers + Teacher Notes

7 8 9 10 11 12

TI-Nspire™ Coding Student 20 min

Introduction

Programs can be used to complete single or multiple calculations.

It is assumed that you have completed **Unit 1 Programming Basics - Skill Builder 2**
You may return to the Skill Builder exercise at any time to review the instructions.

Display

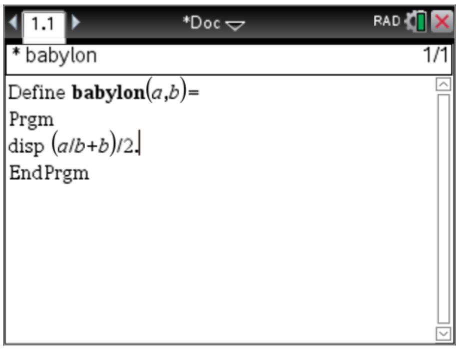
Start a new document and create a program titled:

Babylon

Use *a* and *b* as the variables and enter the line of code shown opposite, make sure a decimal point (.) follows the 2.

When you have finished use Ctrl + B to compile and save the program. Insert a calculator application and run your program.

Babylon(95,10)



Question: 1.

Write down the output of the program when 95 and 10 are entered as the values.

Answer: babylon(95,10) = 9.75

Question: 2.

Run the program again as: Babylon(95,#) where # represents the value calculated in Question 1.

Answer: babylon(95,9.75) = 9.7467948718

The previous answer contains a lot of decimal places. You can copy (Ctrl + C) and paste (Ctrl + V) the entire answer into the appropriate section.

Question: 3.

Run the program again as: Babylon(95, #) where # represents the value calculated in Question 2.

Answer: babylon(95, 9.7467948718) = 9.74679434481

Question: 4.

What do you notice about the answers to Question 2 and Question 3?

The answers to Question 2 and 3 are very similar ≈ 9.746784

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Question: 5.

Repeat the process one more time: Babylon(95, #) where # is the answer to Question 3.

Answer: babylon(95, 9.74679434481) = 9.74679434481

Question: 6.

Square the answer to Question 5. What is this algorithm doing?

Answer: $9.74679434481^2 \approx 95$

The algorithm is providing progressively closer approximations to the square root of a number.
Note: This is called the Babylonian technique for computing the square-root of a number. The first number entered in the program is the number to be square-rooted. The second number is a reasonable estimate for the square-root.

Question: 7.

Repeat the above process for Babylon(200,15). After 4 or 5 steps, square your answer. Does this confirm your response to Question 6?

Answer:

Step 1: babylon(200, 15) = 14.1666666667

Step 2: babylon(200, 14.1666666667) = 14.1421568627

Step 3: babylon(200, 14.1421568627) = 14.1421356237

Step 4: babylon(200, 14.1421356237) = 14.1421356237

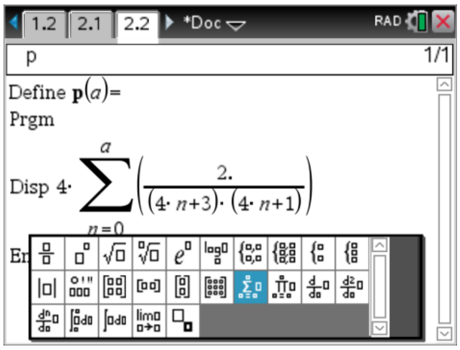
$14.1421356237^2 \approx 200$

The algorithm / program provided progressively closer approximations for the square-root of 200.

Insert a new Problem and create a new program called: p

This program requires only a single value. The program computes the sum of a series of numbers, the quantity of terms is determined by the value of '*a*'. The summation command is available from the 'maths' tools menu obtained by pressing: . (As shown opposite)

Make sure the decimal place is included after the 2 in the numerator.



Question: 8.

Run the program from a calculator application and determine the result when n = 10.

Answer: 3.09616152646 (At this stage this number is unlikely to raise any 'interest').

Question: 9.

Run the program from a calculator application and determine the result when n = 100.

Answer: 3.13664218887 (Rounding at second decimal place: 3.14 may arouse suspicion $\approx \pi$).

Question: 10.

Run the program from a calculator application and determine the result when n = 500. What value do you think this computation is approximating?

Answer: 3.14059464985 (Approximation now much closer: $\pi \approx 3.14159$) Given the first three digits, students should now start to recognise this value as approaching: π.

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