AP Physics 1 Programs for TI-84 Plus CE Calculators

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This guide will show you how to install AP Physics 1 programs on your TI-84 Plus CE calculator and will explain the intended use case of each file along with its naming conventions.

The programs are unmodifiable in the calculator, so nothing gets accidentally deleted. You can modify it on your computer if you wish to do so.

Here is what you will need:

- A **TI-84 Plus CE** calculator (the programs may not work as intended on other Texas Instruments calculators).
- TI-84 Plus CE charging cable.
- A device with MacOS or Windows with TI Connect CE app.

Step 1: Go to the GitHub page where all the programs are stored.

Step 2: Click on the green "Code" button. You should see a drop-down menu.

Step 3: Click on "Download ZIP." Save the file to your desired location.

Step 4: Download the TI Connect CE app. You can download it here.

Step 5: Once you download the app, open it and follow the instructions to install it.

Step 6: Plug in your calculator to your computer (Make sure your calculator is on).

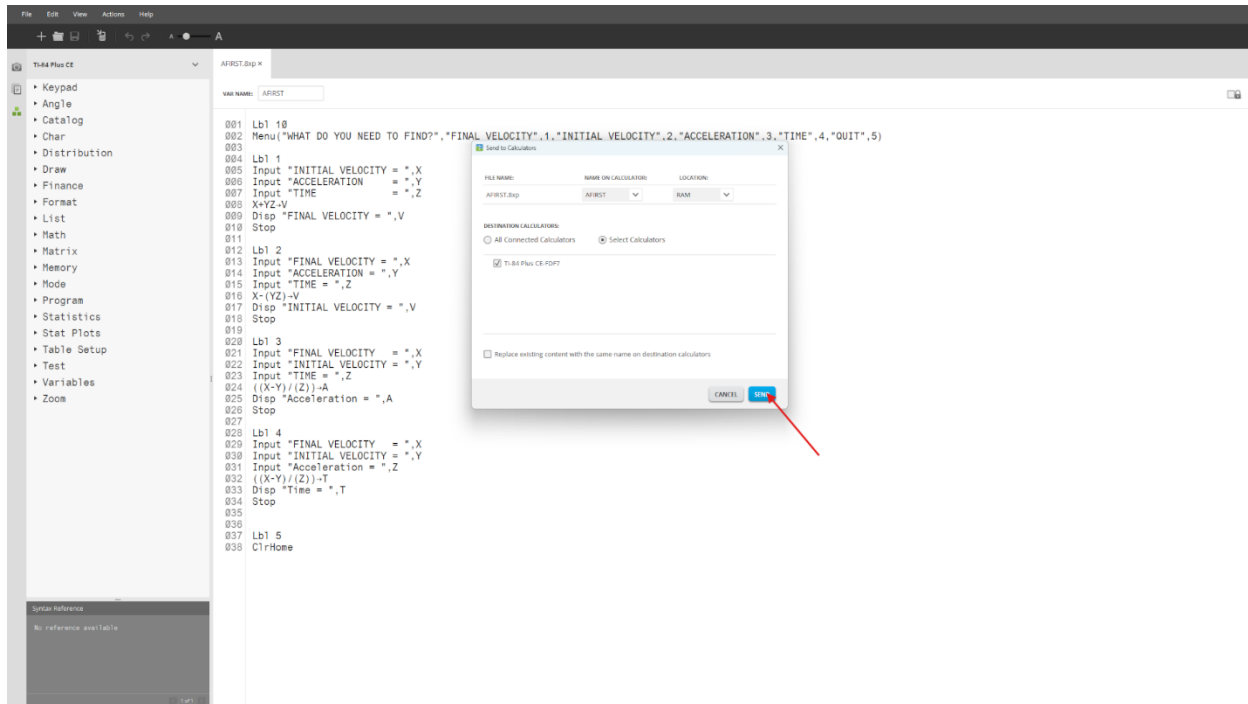Step 7: Once the program is launched, click the icon with three green boxes and then click "Open Program"
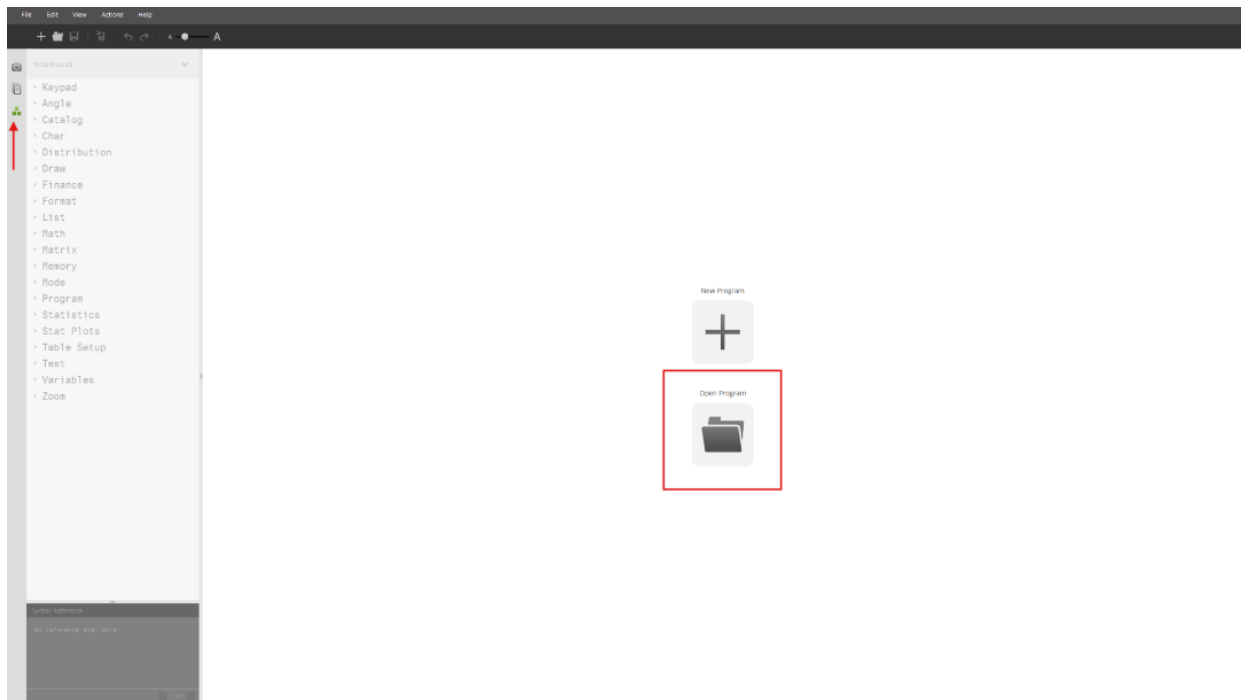
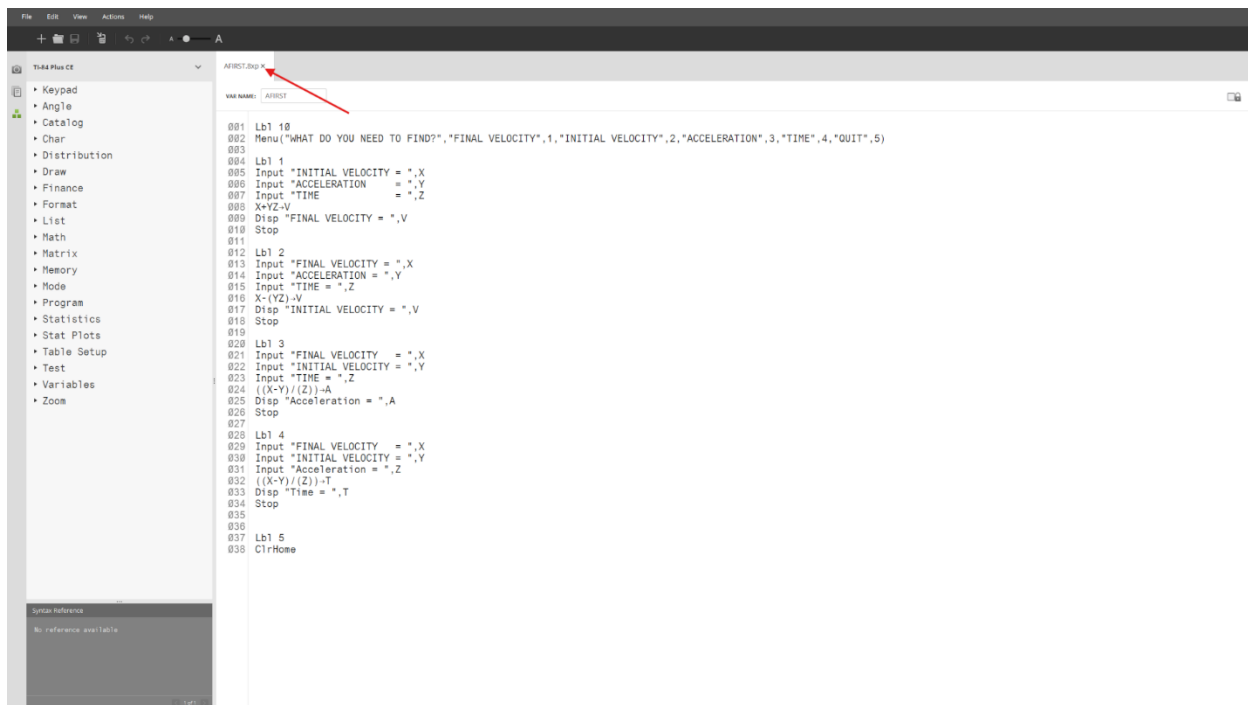Step 4: Navigate to "AFIRST.8xp" and click open

Step 5: Click the icon with calculator and arrow.

Step 6: Click Send

Step 7: Close the tab

Step 8: Repeat this with all other programs

How to execute programs in your calculator?

Click the "prgm" button

Navigate your programs with up and down arrow keys.

Click "enter" to execute. You can also click the number of the program to execute it.

What is "AFIRST"?

There are 3 main equations you will use in AP Physics 1:

- $V_f = V_o + at$
  - Final Velocity (m/s) = Initial Velocity (m/s) + Acceleration (m/s^2) * Time(s).
- $X_f = X_o + V_o t + \frac{1}{2}at^2$
  - Final Position (m) = Initial Position (m) + Initial Velocity (m/s) * time (s) + ½* Acceleration (m/s^2) * time^2 (s).
- $V_f^2 = V_o^2 + 2a(X_f - X_o)$
  - Final Velocity^2 (m/s) = Initial Velocity^2 (m/s) + 2*Acceleration (m/s^2) *(Final Position (m) – Initial Position (m)).

AFIRST lets you solve the first main equation once you know all but one variable.

Naming Convention Explained:

AFIRST is named this way instead of "FIRST" because the calculator organizes programs in alphabetical order. AFIRST ensures that the program will be the first option. It makes sense for the first main equation to be the first option. Most programs are named this way so they can be in order. BSECOND and CTHIRD helps you solve the second and third main equations.

What is "DFALLROL"?

This program helps you find the following:

- Free Fall:
    - final velocity of a dropped object given height
    - height of a dropped object given final velocity
- Rolling Without Slipping:
    - final velocity or height of dropped object that is rolling without slipping for the following shapes:
        - Solid Cylinder
        - Hollow Cylinder
        - Solid Sphere
        - Hollow Sphere

What is "Fluids"?

This Program helps you find one missing variable for the given equations:

- $F_B = \rho V g$
    - Buoyant Force (N) = Density (kg/m^3) * Volume (m^3) * gravitational acceleration (m/s^2).
- $A_1 v_1 = A_2 v_2$
    - Area$_1$ (m^2) * velocity$_1$ (m/s) = area$_2$ (m^2) * velocity$_2$ (m/s).
- $P_1 + \rho g h_1 + \frac{1}{2}\rho v_1^2 = P_2 + \rho g h_2 + \frac{1}{2}\rho v_2^2$
    - Pressure$_1$ (Pa) + Density (kg/m^3) * gravitational acceleration (m/s^2) * height$_1$ (m) + ½ * Density (kg/m^3) * velocity$_1$ (m/s) = Pressure$_2$ (Pa) + Density (kg/m^3) * gravitational acceleration (m/s^2) * height$_2$ (m) + ½ * Density (kg/m^3) * velocity$_2$ (m/s).

What is "OSCILTR"?

Short for oscillator, this program can find the period and frequency of pendulums and springs.

Selecting the pendulum option can let you solve the following:

- Period
- Frequency
- Length
- Gravitational Acceleration

Selecting the spring option lets you solve the following:

- Period
- Frequency
- Mass
- Spring Constant
- Displacement at specific time
- Maximum velocity
- Maximum displacement given maximum velocity
- Spring Constant given maximum velocity

What is "PYTHTHM"?

Short for Pythagorean Theorem, this program can help you find any one side if you know two other sides of the right triangle.

What is "SCOLSION"?

This lets you solve for the three main collisions: elastic (Masses start separated and end up separated), inelastic (Masses start separate and end up together), and explosion (Mass starts together and ends up separated). This program can help you find the mass or velocity of an object after a collision.

What is "SGRAVITY"?

This lets you solve for one variable given all others for the following equation: $F = G \frac{m_1 m_2}{r^2}$

If you want to find the gravitational force between two planets, you can use this.

You can also find the distance between the planets given the gravitational force along with masses.

The uppercase G is not a variable for gravitational acceleration, it is a variable for the Universal Gravitational Constant, which is $6.67*10^{-11}$ m³/(kg * s²) or $6.67*10^{-11}$ N*m²/(kg²).

Lowercase g is a variable for gravitational acceleration. On Earth it is 9.8 m/s² or 9.8N/kg.

What is "TCONVERT"?

This program helps you convert the following units:

- rad/s to rev/min
- rev/min to rad/s
- rad/s to deg/s
- deg/s to rad/s
- deg/s to rev/min
- rev/min to deg/s

Maintaining the programs:

- Be sure to check the GitHub page for any program updates
- Update your calculator's firmware
- Doing this once every 2-3 months should be fine. Make sure to do this right before the AP Physics 1 test.

Potential issues you may face:

- Program may display an error because it tried to divide by 0:
  - press 1 and go to home screen. If you press 2, press 2nd + mode. After this, execute the program again and ensure that you enter your values correctly.
- Program displays imaginary numbers:
  - execute the program again and ensure that you enter your values correctly.

- Program displays more than one answer:
  - This happens because the quadratic formula often returns two answers due to the plus-minus symbol in $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ or when using the square root in equations ($x^2 = 49 \rightarrow x = \pm 7$). Choose the most appropriate answer to your problem.
- Wrong Answer:
  - If you are sure that the program returned the wrong answer, please report the bug. Be as detailed as possible. Include program name and instructions on how to replicate the bug. Thank you.

For any questions, comments, concerns, or bug reports, please contact me at kimjongun1984@tutamail.com.

The programs are meant for you to solve equations faster. This is only one step in getting a higher score. You still need to understand the equations and know when to apply them to ace the AP Physics 1 test. Good luck.