

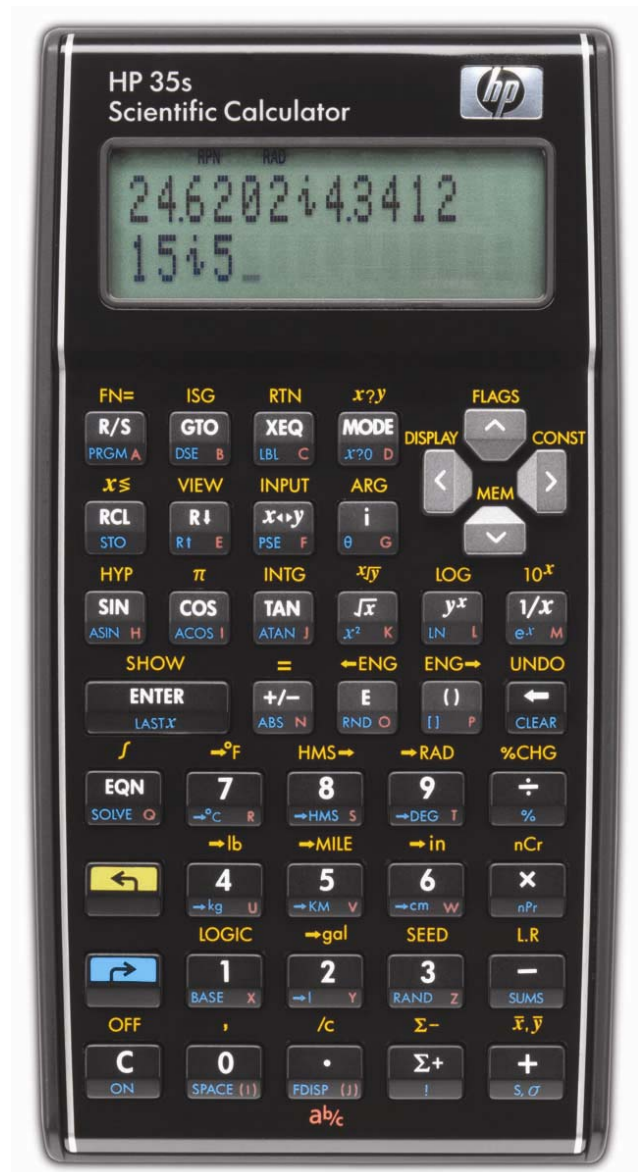


hp calculators

HP 35s Using the built-in constants

The built-in constants

Practice using the built-in constants



## hp calculators

### HP 35S Using the built-in constants





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#### The built-in constants

The HP 35s includes 41 physics constants built into the  **CONST** menu. These constants remove the need to keep a table of frequently used constants handy or to look them up in a reference manual. These constants can be used when doing calculations in run mode, within a program, or within an equation. The 41 constants included are:

Speed of light in vacuum	Bohr magneton
Standard acceleration of gravity	Nuclear magneton
Newtonian constant of gravitation	Proton magnetic moment
Molar volume of ideal gas	Electron magnetic moment
Avogadro constant	Neutron magnetic moment
Rydberg constant	Muon magnetic moment
Elementary charge	Classical electron radius
Electron mass	Characteristic impedance of vacuum
Proton mass	Compton wavelength
Neutron mass	Neutron Compton wavelength
Muon mass	Proton Compton wavelength
Boltzmann constant	Fine structure constant
Planck constant	Stefan–Boltzmann constant
Planck constant over 2 pi	Celsius temperature
Magnetic flux quantum	Standard atmosphere
Bohr radius	Proton gyromagnetic ratio
Electric constant	First radiation constant
Molar gas constant	Second radiation constant
Faraday constant	Conductance quantum
Atomic mass constant	The base number e of natural logarithm
Magnetic constant	

In algebraic mode, the constants are shown as the corresponding symbol. In RPN mode, when doing calculations manually, the constants are shown as their numeric values. In either mode, the constants are shown as their corresponding symbol when in equation mode or within a program.

The HP 35s displays between 4 to 6 constants on the screen, depending on which “page” of the constant menu is being viewed. The first two pages are shown in example 1 below. To move from one page to the next, you can press  to move down a page or  to move up a page. To move across a page, press  to move right and  to move left. Once you are on the page, you can select a constant by pressing the numeric key indicating its position on the page, with 1 selecting the first constant shown, 2 the second, etc.

#### Practice using the built-in constants

**Example 1:** What is the ratio of a proton’s mass to an electron’s mass?

**Solution:** These constants are on the second displayed page of constants. The first page looks like this:



```
c  g  G  Vm  Na  R∞
299,792,458.00
```

Figure 1

## hp calculators

### HP 35S Using the built-in constants

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The second page looks like this. To move from one page to the next, you can press  $\downarrow$  to move down a page or  $\uparrow$  to move up a page.



EV ME MP MN MM  
1.60E-19

Figure 2

In RPN mode, press:  $\leftarrow$  [CONST]  $\downarrow$   $\rightarrow$   $\rightarrow$  [ENTER]  $\leftarrow$  [CONST]  $\downarrow$   $\rightarrow$  [ENTER]



1.67E-27  
9.11E-31

Figure 3

The display is now showing the two mass values. Press  $\div$  to compute the ratio.



0.00  
1,836.15

Figure 4

In algebraic mode, press:  $\leftarrow$  [CONST]  $\downarrow$   $\rightarrow$   $\rightarrow$  [ENTER]  $\div$   $\leftarrow$  [CONST]  $\downarrow$   $\rightarrow$  [ENTER] [ENTER]



MP ÷ ME  
1,836.15

Figure 5

**Answer:** The proton is approximately 1836 times more massive than an electron.

**Example 2:** A space probe is traveling at 50,000 meters per hour. How many times faster would it have to travel to reach 10% of the speed of light?

**Solution:** In RPN mode, press:

$\leftarrow$  [CONST] [ENTER] 1 0  $\div$

Now convert the space probe's speed to meters per second.

5 0 0 0 0 [ENTER] 6 0  $\div$  6 0  $\div$

Now compute the number of times faster the probe would have to travel to reach 10% of the speed of light by dividing the two values.

$\div$

In algebraic mode, press:

( )  $\leftarrow$  [CONST] [ENTER]  $\div$  1 0  $\rightarrow$   $\div$

Now convert the space probe's speed to meters per second.

## hp calculators

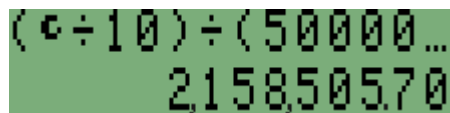
### HP 35S Using the built-in constants

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$(\square) 5 0 0 0 0 \div 6 0 \div 6 0$

Now compute the number of times faster the probe would have to travel to reach 10% of the speed of light by pressing:

$\text{ENTER}$



The calculator display shows the result of the calculation in algebraic mode. The top line displays the expression  $(c \div 10) \div (50000\dots)$  and the bottom line displays the numerical result  $2,158,505.70$ .

Figure 6

Answer: The space probe would have to travel over two million times faster than its present speed to reach 10% of the speed of light. Figure 6 shows the result in algebraic mode.