



hp calculators

HP 33S Percentages and Percentage Changes

Percentages

Practice working problems involving percentages

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percentage changes



Percentages

A percentage is a fraction multiplied by 100. For example, 25 percent is written 25%, and is 0.25 (one quarter) multiplied by 100.

Percentages are used very widely in business, for example to specify bank rate, interest rates, tax rates, or discounts. Percentages and percent changes are also used outside business – scientific or engineering measurements, results, and uncertainties are stated as percentages.

The HP 33S provides a % key for use in calculating percentages, and adding or subtracting percentages. It also provides a percent change key for the calculation of changes as percentages.

Practice working problems involving percentages

Most business calculations are made to the nearest cent or penny, so it is useful to set the display mode of the HP 33S to FIX 2 before doing these practice problems, to have two digits displayed after the decimal point. Press **DISPLAY** **1** **2** to set FIX 2 mode.

Example 1: What is 12% of \$1,235.17?

Solution: In RPN mode, the number 1,235.17 is typed and then **ENTER** is pressed. Then 12 is typed and the **%** key is pressed.

1 **2** **3** **5** **.** **1** **7** **ENTER** **1** **2** **%**



Figure 1

The number 1,235.17 is still displayed in the upper line (it is left in register Y) and the result, 12% of 1,235.17, is displayed in the lower line (in register X). Unlike other RPN commands such as **+** or **x**, the **%** command leaves the number in the Y register unchanged. This makes it possible to continue a calculation, using that number. This will be shown in the next example.

In algebraic mode, 1,235.17 is typed and then **x** is pressed. Then 12 is typed and the **%** key pressed.

1 **2** **3** **5** **.** **1** **7** **x** **1** **2** **%**

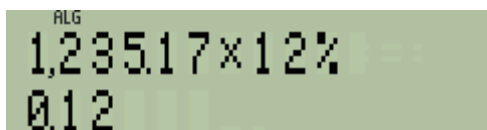


Figure 2

At this stage, the 12% has become the fraction 0.12, as shown in Figure 2.

To complete the calculation, **ENTER** must be pressed. The HP 33S multiplies the previous number by 0.12 to give the result.

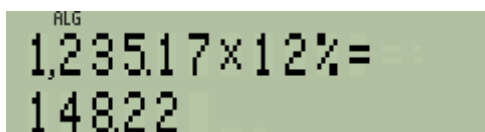


Figure 3

Note that in algebraic mode “n” percent *of* something is obtained by multiplying by the percentage.

Answer: 12% of \$1,235.17 is \$148.22 when written to the nearest cent.

Example 2: What is 12% added to \$1,235.17?

Solution: In RPN mode, the calculation shown in Figure 1 has left the original number in register Y, and 12% of it in register X. Pressing $\boxed{+}$ adds the 12 percent to the original number, giving the answer.



Figure 4

In algebraic mode, the calculation must be repeated, but $\boxed{+}$ is used instead of $\boxed{\times}$. Again, pressing $\boxed{\text{ENTER}}$ completes the calculation.

$\boxed{1} \boxed{2} \boxed{3} \boxed{5} \boxed{\div} \boxed{1} \boxed{7} \boxed{+} \boxed{1} \boxed{2} \boxed{\%} \boxed{\text{ENTER}}$

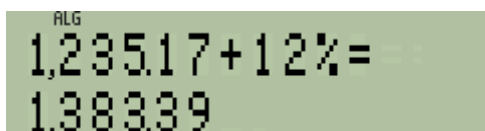


Figure 5

Note that in algebraic mode “n” percent *added to* something is obtained by adding the percentage.

Answer: 12% added to \$1,235.17 is \$1,383.39 to the nearest cent.

Example 3: The local grocery store is offering 8% off all tinned foods this week. What will be the cost of buying 5 tins that normally cost \$1.85 each?

Solution: In RPN mode, the usual cost of 5 tins is first calculated by multiplying 1.85 by 5. Then 8% is calculated as in Example 1. Finally, the $\boxed{-}$ key is used to subtract the percentage from the original.

$\boxed{1} \boxed{\div} \boxed{8} \boxed{5} \boxed{\text{ENTER}} \boxed{5} \boxed{\times} \boxed{8} \boxed{\%} \boxed{-}$



Figure 6

In algebraic mode, the price of 5 tins is also calculated first, then $\boxed{-}$ must be used to subtract 8%

$\boxed{1} \boxed{\cdot} \boxed{8} \boxed{5} \boxed{\times} \boxed{5} \boxed{-} \boxed{8} \boxed{\%} \boxed{\text{ENTER}}$

ALG
1.85x5-8%=
8.51

Figure 7

Answer: 8% subtracted from 5 times \$1.85 gives a price of \$8.51 for the 5 tins, to the nearest cent.

Example 4: An investor has \$2,804 and \$25,755 in two market-tracking investment portfolios. The market gains 0.7% overnight. What is the new total value of the investor's portfolios?

Solution: In RPN mode, the original total value is first calculated by adding the value of the two investments. Then 0.7% is calculated as in Example 1. Finally, the $\boxed{+}$ key is used to add the percentage increase to the original.

$\boxed{2} \boxed{8} \boxed{0} \boxed{4} \boxed{\text{ENTER}} \boxed{2} \boxed{5} \boxed{7} \boxed{5} \boxed{5} \boxed{+} \boxed{\cdot} \boxed{7} \boxed{\%} \boxed{+}$

RPN
8.51
28,758.91

Figure 8

In algebraic mode, the total value is also calculated first, then $\boxed{+}$ must be used to add 0.7%

$\boxed{2} \boxed{8} \boxed{0} \boxed{4} \boxed{+} \boxed{2} \boxed{5} \boxed{7} \boxed{5} \boxed{5} \boxed{+} \boxed{\cdot} \boxed{7} \boxed{\%} \boxed{\text{ENTER}}$

ALG
2,804+25,755+0.7%
28,758.91

Figure 9

Answer: The investor's portfolios are worth \$28,758.91 this morning.

Note: The HP 33S calculates using "operator precedence". This means that a combination of several $\boxed{+}$ and $\boxed{-}$ operations is calculated from left to right. The example above is therefore treated as $(2,804 + 25,755) + 0.7\%$ as would be expected. However, $\boxed{\times}$ and $\boxed{\div}$ have a higher "precedence" and are carried out before $\boxed{+}$ and $\boxed{-}$, so calculating 0.7% of the total must be done using parentheses. Typing $2804 + 25755 \times 0.7\%$ is calculated as $2,804 + (25,755 \times 0.7\%)$. To get 0.7% of the total in algebraic mode, the following must be typed

$\boxed{\text{F2}} \boxed{)} \boxed{2} \boxed{8} \boxed{0} \boxed{4} \boxed{+} \boxed{2} \boxed{5} \boxed{7} \boxed{5} \boxed{5} \boxed{\text{F2}} \boxed{(} \boxed{\times} \boxed{\cdot} \boxed{7} \boxed{\%} \boxed{\text{ENTER}}$

ALG
(2,804+25,755)x0.7%
199.91

Figure 10

Practice working problems involving percentage changes

The examples so far have shown how percentages are calculated, and how they are added or subtracted, by use of the $\boxed{\%}$ key. Calculating a percent change is carried out using $\boxed{\%CHG}$ above the \boxed{TAN} key.

Example 5: The investor in example 4 finds that when the market closes in the afternoon, the investment is worth \$28,701. By how much did the market change during the day?

Solution: In RPN mode, if the previous value is still displayed, the new value is entered and then the $\boxed{\%CHG}$ key is pressed. If the previous value is not on the stack, it must be entered first.

$\boxed{2} \boxed{8} \boxed{7} \boxed{0} \boxed{1} \boxed{\rightarrow} \boxed{\%CHG}$



Figure 11

As with the $\boxed{\%}$ key, the original value stays in register Y so that it can be used again.

In algebraic mode, again assuming that the previous value is still displayed, $\boxed{\%CHG}$ is pressed first then the new value is typed, and then \boxed{ENTER} is pressed to complete the calculation. Pressing $\boxed{\%CHG}$ begins a new calculation that uses the result of the previous calculation. If the previous value is not displayed, it must be typed again, or recovered with $\boxed{\leftarrow} \boxed{LASTx}$.

$\boxed{\rightarrow} \boxed{\%CHG} \boxed{2} \boxed{8} \boxed{7} \boxed{0} \boxed{1} \boxed{ENTER}$

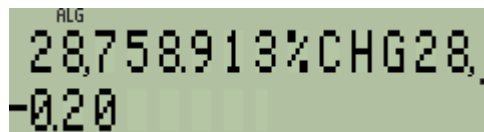


Figure 12

Answer: The market changed by -0.20 during the day, in other words it fell by 0.2%.

Note: It is important to remember that the change is calculated as a percentage of the *first* number. If you have 100 apples and give 20 to your neighbor, then you have 80 apples left and the percentage change is $-20/100$ or -20% . If you have 80 apples and your neighbor gives you 20 then you have 100 again, but this time the change is $20/80$ or $+25\%$. This means that a percent change down, followed by exactly the same percent change up, does not bring you back to the original number.

Finally, if FIX 2 mode was set before these practice problems were done, it may be useful to set a different mode now they are finished.

Press: $\boxed{DISPLAY} \boxed{4}$ to set "All" mode.