

This is stolen from Mark J. Perry's web page. Thanks Mark!

## **CALCULATOR KEYSTROKES FOR THE HP-10B and the HP-10BII**

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**NOTE:** The HP calculators come from the factory with the PMTS/YR set to 12. Change this setting to 1 PMT/YR by going to #6 below. Change this setting before you do any of the time value of money problems!!!! You only have to change the PMT/YR setting one time!

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**GENERAL:** Note that every HP-10B calculator key has two functions, the main one in WHITE LETTERS and a second function in either YELLOW (ORANGE) or GREEN letters. To access the second function, you simply enter the YELLOW (ORANGE) or GREEN key first, and then press the key to access the function in YELLOW (ORANGE) or GREEN letters. For the HP-10BII, there is also a purple button, which accesses statistical functions that we will not be using.

In the examples below, the slash symbol: / is used to separate keystrokes. Also, depending on your HP-10B calculator, the main function key that we will be using is either yellow or orange in color. In the discussion below, please note that when I say to use the Yellow Key, it might actually be the Orange Key on your calculator.

For both models, to turn the calculator on: press the "C" button and to turn calculator off:

YELLOW (ORANGE) KEY / C for the HP-10B and

YELLOW (ORANGE) KEY / ON KEY for the HP-10BII.

### **1. SETTING THE NUMBER OF DECIMAL PLACES:**

Yellow Key / = Key (DISP) / Number of desired decimal places

Examples:

Yellow Key / = / 2 (to set display to two places, good for bond prices, e.g. \$975.42)

Yellow Key / = / 4 (to set display to four places, good for ex-rates, e.g. \$1.5074 / £ )

**NOTE:** Setting to two decimal places is not appropriate when calculating answers involving certain percentages or interest rates. For example, suppose your answer is an interest rate: .0851, or 8.51%. If your calculator is set to two decimal places, it will round your answer to .09 or 9%, which is almost .5% away from 8.51%. Be sure in this case that you set your calculator to display three or four decimal places, since 9% would not qualify for full credit when the true answer is 8.51%!! With experience, you will get used to changing the decimal display to the appropriate setting, based on the problem.

## 2. CLEARING THE CALCULATOR

To clear the calculator display (screen) only, use the C key (bottom left corner). This will NOT clear any of the financial registers, memory registers, or statistical registers.

To clear EVERYTHING (all registers), Enter the YELLOW KEY and then INPUT (note that it says "Clear All" above INPUT) for the HP-10B

For the HP-10BII, Enter the Yellow Key and then the C key to access the "C ALL" function.

## 3. PERCENTAGE CHANGE:

General format: A variable goes from X1 to X2, what is the percentage change in X?

First number (X1) / INPUT / Second Number (X2) / Yellow Key / % Key (to access %CHG)

Example: Find the inflation rate if the CPI goes from 114 to 120:

Solution: 114 / INPUT / 120 / Yellow Key / % (Answer: 5.26%)

Example: Real GDP goes from \$8800B to \$9200B, what is the growth rate of real output?

Solution: 8800 / Input / 9200 / Yellow Key / % (Answer: 4.55%)

Example: If the \$/£ rate goes from \$1.50 to \$1.60, what is the percentage change in the UK pound?

Solution: 1.5 / Input / 1.6 / Yellow Key / % (Answer: 6.667%)

## 4. PERCENTAGE INCREASE OR DECREASE:

General format: Variable X increases (decreases) by Y%.

Example: A stock is \$62 and increases by 5%.

62 / + / 5 / % / = (Answer is \$65.10)

Example: Sales in 1999 are \$7m and fall by 2% in 2000.

7 / - / 2 / % / = (Answer: \$6.86m)

Example: The current ex-rate is \$1.40 / £. The pound is expected to appreciate over the next year and is selling at a one year forward premium of 4%. What is the forward rate for the British pound?

1.4 / + / 4 / % / = (Answer: \$1.456 / £)

## 5. TO CHANGE THE SIGN OF A NUMBER

The +/- key will change the sign of a number.

Example: To enter \$950 as a negative number for PV:

1000 / +/- / PV

## 6. TO SET PAYMENTS PER YEAR

The factory default setting is 12 PMTS / YR. You should change this setting to 1 PMT per Year for this class, using the P/YR key (in yellow above the PMT key for the HP-10B, below the PMT key for the HP-10BII)!

Example: 1 / Yellow Key / PMT Key. (Sets Payments/YR to 1)

Most of the problems in this class will be 1 PMT/YR.

## 7. BEG/END OF PERIODS

The BEG/END key (in yellow above 0 for HP-10B, below the MAR key for the HP-10BII) will change PMTS/CFS from End-of-Period to Beginning-of-Period

To set to BEG of period: a) Yellow Key / 0 (You will now see the word "BEGIN" on your display) for HP-10B.

b) Yellow Key / MAR key for the HP-10BII.

The normal assumption is that CFs and PMTS typically occur at the END OF PERIOD. Some payments do occur at the beginning of the period (Rent/lease/lottery) but that is the NON-NORMAL situation, which is why the word BEGIN is displayed, to remind you that you are in the NON-NORMAL mode.

To set to END of Period: Yellow Key / 0 (The word BEGIN will now disappear)

(Yellow Key / MAR for the HP-10BII)

## 8. EXPONENTS:

Solution for  $Yx$ :

Number (Y) / Yellow Key / X Key (with  $yx$  above in yellow for the HP-10B, below for the HP-10BII) / Exponent Value

Example: Solve for  $(1.01)^{12}$

1.01/ Yellow Key / X / 12 / = (Answer: 1.1268)

Example: Find the square root of 125

125 / Yellow Key / X / .5 / = (Answer: 11.1803)

Or you can use the Square Root function on the minus (-) key.

## 9. TIME VALUE OF MONEY:

Example: What is the future value (FV) in 10 years (N) of \$1000 invested today (PV) at an interest rate of 12% (I)?

10 / N

12 / I

1000 / PV

0 / PMT (we are not really using this key, but want to be sure it is set to 0)

FV (Answer: \$3105.85)

(Hint: set decimals to two places for this problem)

Example: What is the Present Value (PV) of \$1000 to be received (FV) in 5 years (N) at an interest rate of 8% (I)?

5 / N

8 / I

0 / PMT

1000 / FV

PV (\$680.58)

Example: If you invest \$700 today (PV) and receive \$850 in two years (FV), what is your rate of return or yield on your investment (I)?

2 / N

700 / +/- Key / PV (makes the price or original investment a NEGATIVE CF)

0 / PMT

850 / FV

I (Answer: 10.19%)

NOTE: If you enter both \$700 for PV as a positive number AND \$850 for FV as a positive number, you will get this message: NO SOLUTION. You must make one number negative to solve for I. To calculate a rate of return (I), or a yield on investment, the calculator needs to know that \$700 (PV) is a NEGATIVE CF, or CASH OUT or your INITIAL INVESTMENT and the \$850 (FV) is a POSITIVE CF, or CASH IN. Intuition: To get a return on investment, you must first purchase a security (CASH OUT) and then later get something back (CASH IN).

Example: What is the yield (YTM) on a 20 year bond (N), with a face value (FV) of \$1000, a price of \$925 (PV) and a coupon rate of 8% (PMT = \$80 or 8% of the face value of \$1000), coupon payments are annual?

20 / N

925 / +/- Key / PV (make the price (PV) negative)

80 / PMT

1000 / FV

Solve for I (Answer: 8.81%)

SEMI-ANNUAL PAYMENT BOND: What is the price of a 10-year bond with semi-annual coupon payments if the coupon rate is 8%, the current interest rate is 6% and the face value is \$1000?

20 / N (# semi-annual periods is 20, or 10 years x 2 periods per year)

3 / I (semi-annual interest rate is  $6\% / 2 = 3\%$ )

40 / PMT (semi-annual payments are =  $\$1000 \times 8\% = \$80 / 2 = \$40$ )

1000 / FV

Solve for Price (PV) = \$1148.77

## 10. CASH FLOWS NOTE: The PMT key is reserved exclusively for a CONSTANT CF.

Suppose there is a series of NON-CONSTANT CFs, such as:

YR 1: \$100

YR 2: \$150

YR 3: \$200

What is the PV of the above CFs if the interest rate is 10%? (Note: We cannot use the PMT key, because the CFs are not constant, we use the CF<sub>j</sub> key).

0 CF<sub>j</sub> (to set the first CF to 0)

100 / CFj

150 / CFj

200 / CFj

10 / I

Yellow Key / PRC Key (to access NPV in yellow on PRC key) (Answer: \$365.14)

### 11. IRR/NPV

Suppose you have the CFs above, but an initial investment of \$325.

a. What is your annual rate of return on the investment (IRR)?

(325) CFj (make this CF negative, it is your initial investment)

100 / CFj

150 / CFj

200 / CFj

Yellow Key / CST Key (to access IRR/YR in yellow on CST key) (Answer: 16.14%)

b. What is the Net Present Value (\$) of your investment if the appropriate discount rate (hurdle rate, cost of capital) is 10%?

(325) CFj (make this CF negative, it is your initial investment)

100 / CFj

150 / CFj

200 / CFj

10 / I/YR

Yellow Key / PRC Key (to access NPV in yellow on PRC key) (Answer: \$40.14)