HP-80
APPLICATION NOTES
PUBLISHED AS A SERVICE FOR USERS OF THE HP-80 FINANCIAL POCKET CALCULATOR

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# ANNUITY DUE CALCULATIONS FOR SAVINGS FUNDS

## GENERAL

Data entry sequences for the HP-80 top row keys ( n i PMT PV FV ) were designed to be simplest for calculations involving ordinary annuities. The most common definition of ***ordinary annuity*** (sometimes called "payments in arrears") assumes that payment amounts are equal, that payment periods are equally spaced in time, and that these payments are made ***at the end*** of each period. However, by slightly modifying the standard key sequences, the HP-80 can be used for ***annuity due*** calculations (sometimes called "payments in advance") where equal payments are made ***at the beginning*** of equally spaced periods.

This issue of the HP-80 APPLICATION NOTES will be of assistance to the HP-80 user wishing to solve for ***Future value***, ***payment amount***, number of ***payment periods***, and ***interest rate*** in annuity due calculations.

The symbolic values listed below will be used to demonstrate the various keystroke sequences that follow.

A = number of payment periods in a year
B = number of years
C = annual interest rate
D = payment amount
F = future value of the series of payments at the end of the last payment period

## FIND THE FUTURE VALUE OF A SERIES OF PAYMENTS

*Keystrokes:*

1. A STO SAVE↑ B × n
2. C RCL ÷ STO i
3. D RCL % + PMT
4. FV → F

*Example:*

Deposits of $75 a month for 6 years will be paid into a savings account starting tomorrow. The savings plan compounds monthly using a 5% nominal interest rate. How much money will be in the account at the end of 6 years?

*Procedure:*

12 STO SAVE↑ 6 × n 5 RCL ÷ STO i 75 RCL % + PMT FV → 6308.494583

(This series of payments will be worth $6,308.49)

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**Note:**

When solved using ordinary annuity assumptions the future value of these payments would be $6,282.32.

## FIND THE PAYMENT AMOUNT REQUIRED TO ACHIEVE SOME FUTURE VALUE

***Keystrokes:***

1. A [STO] [SAVE ↑] B [×] [n]
2. C [RCL] [÷] [STO] [i]
3. 1 [RCL] [%] [+] F [x⇄y] [÷] [FV]
4. [PMT] ⟶ D

***Example:***

It has been determined that $10,000 will be required 15 years from now to send a son to college. A savings plan paying 7% (compounded monthly) is available. What equal monthly payments should be made in order to accrue the required amount ?

***Procedure:***

12 [STO] [SAVE ↑] 15 [×] [n] 7 [RCL] [÷] [STO] [i] 1 [RCL] [%]
[+] 10000 [x⇄y] [÷] [FV] [PMT] ⟶ 31.366525
($31.37 per month)

## FIND THE NUMBER OF PERIODS WHEN PMT FV AND i ARE KNOWN

***Keystrokes:***

1. C [SAVE ↑] A [÷] [STO] [i]
2. D [RCL] [%] [+] [PMT]
3. F [FV]
4. [n] ⟶ AxB

***Example:***

The same $10,000 amount is desired as in the previous example and a 7% interest also applies. Now however, the individual will be placing $40 per month in his account. How long will it be before the desired sum is available?

***Procedure:***

7 [SAVE ↑] 12 [÷] [STO] [i] 40 [RCL] [%] [+] [PMT] 10000 [FV] [n] ⟶ 154.053987
(154 months)

12 [÷] ⟶ 12.837832
(almost 13 years)

## FIND THE ANNUAL INTEREST RATE

***Keystrokes:***

1. A [SAVE ↑] B [×] 1 [+] [n]
2. D [SAVE ↑] [PMT]
3. F [+] [FV]
4. [i] A [×] ⟶ C

***Example:***

Suppose the individual in our second example was only able to pay $20 per month but still wanted to accumulate $10,000 in 15 years. What interest rate must a savings plan offer in order to accomplish this?

***Procedure:***

12 [SAVE ↑] 15 [×] 1 [+] [n] 20 [SAVE ↑] [PMT] 10000 [+] [FV] [i] 12 [×] ⟶ 11.904768
(an 11.90% interest rate is required)