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

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)

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 `xʒy` `÷` `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 `xʒy` `÷` `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)