2200 General Library
Finance/Utilities/Games
GLBR 22B

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INTRODUCTION

Programs of varying complexity and from different fields have been included in this library to provide a sample of the usefulness and versatility of the 2200 series calculators. Programs have been selected bearing in mind their use and possible application. Each one contains a set of instructions which is easy to follow; at least one example per program has been given to facilitate checking and enhance comprehension.

In loading the program tapes advantage may be taken of SKIP and BACKSPACE features. These two features and their use are explained on a following page.

Programs are designed to display all output on the CRT. However, they may be adapted for printing the output on either the 2201 (typewriter) or the 2221 (Hi-Speed Printer).
Note: All operating instructions assume you are at the beginning of the block you desire.

If you wish to load programs that are separated by other blocks, you may use one of two methods.

(1) LOAD each block until you reach the desired block. This would require the repetition of 4 keystrokes for each block between your current position and your desired position. The 4 keystrokes would be:

CLEAR, CR/LF, LOAD, CR/LF

This method would require you to REWIND the tape if you desire a block which you have passed.

(2) Using the SKIP feature will allow you to go from one block to another with less work, and the BACKSPACE feature will allow you to "back-up" to a block that you have passed.

a) SKIP – Subtract from the Block # corresponding to where you wish to be, the Block # corresponding to your current location then subtract 1. This is the # of files to skip to place you at the beginning of the desired block.

For Example,

The last block loaded was 4; you wish to load block 12.

12 - 4 - 1 = 7

Key S, K, L, P, 7, F, CR/LF

b) BACKSPACE – Subtract from the block # corresponding to your present location, the block # corresponding to your desired location then add 1. This is the # of files to backspace to place you at the beginning of the desired block.

For Example,

The last block loaded was 12; you wish to load block 4,

12 - 4 + 1 = 9

To change output device from 2216 (CRT display) to 2201 (typewriter) or 2221 (Hi-Speed Printer) the following procedure is used:

1. Choose what output is to be displayed or typed.

2. Insert a statement with the following information:
   For CRT display
   Statement # SELECT PRINT 005
   For Typewriter (2201)
   Statement # SELECT PRINT 211
   For Hi-Speed Printer (2221)
   Statement # SELECT PRINT 215

It may be advisable to change print to the CRT at the end of the program.
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<tr>
<td>22</td>
<td>AVERAGE GROWTH RATE &amp; PROJECTED SALES</td>
<td></td>
</tr>
</tbody>
</table>
**WANG 2200 SERIES PROGRAM**

NUMBER OF SEMI-ANNUAL PERIODS BETWEEN TWO DATES (360 DAYS)

**TITLE**

PF.02-2200.01A-00F1-1-0  6/1/73

**NUMBER**  **DATE**

2200A-01, 2215, 2216/2217  **EQUIPMENT**

**PROGRAM ABSTRACT**

Calculates the number of semi-annual periods between two dates (360 day-year)

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
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</table>

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PROGRAM DESCRIPTION

Calculates the number of semi-annual periods between 2 dates, based on a 360-day year.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE


1. Key **RESET**  **CLEAR**  **CR/LF**
   **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **MONTH**  **DAY**  **YEAR**  **CR/LF**

5. **INSTRUCTION**

6. Key **MONTH**  **DAY**  **YEAR**  **CR/LF**

7. Read:

8. **INSTRUCTION**

   **SEMI-ANNUAL PERIODS = 22**

   **MORE INPUT? (1 = YES, 0 = NO)**

   If you have more input Key **1**  **CR/LF** and go to Step 3. Otherwise, Key **0**  **CR/LF** and go to Step 10.

9. Key **0**  **CR/LF**

   or

   Key **1**  **CR/LF**

10. **END PROGRAM**
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# WANG

## 2200 SERIES

### PROGRAM

**BOND DOLLAR PRICE**

**TITLE**

PF. 02-2200. 01A-00F1-2-0  
6/1/73  
**NUMBER**  
2200A-01, 2215, 2216/2217  
**DATE**  
**EQUIPMENT**

### PROGRAM ABSTRACT

Calculates the dollar price of a bond whose maturity is ≥ 6 months.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
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</table>

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PROGRAM DESCRIPTION

This program calculates a dollar price for a bond whose maturity is ≥ 6 months.

The program requests an increment value, the inputted yield is decreased by a value 5 times the increment value and the dollar price for 11 yields, ranging from (yield - 5* increment) to (yield + 5*increment) in increments of the increment value, is calculated.

I. Dollar Price (for maturities between 6 months and 40 yrs., 3 mos.)

\[
\text{price} = \frac{C(T-1)}{2} + \frac{R + \frac{100C}{Y} \left[ \left( \frac{Y}{200} + 1 \right)^{N+1} - 1 \right]}{\left( \frac{Y}{200} + 1 \right)^{N+T}}
\]

where  
C = Coupon  
Y = Yield  
R = redemption value (100 unless otherwise stated, ((Call Price)) )  
N = number of whole semi-annual periods.  
T = fractional number of semi-annual periods (omitting odd days)

The dollar price is calculated at the two months bracketing the time to maturity; then the interpolation for the odd number of days is applied.

EXAMPLE:

Settlement Date: 5/3/70 = 5(30) + 3 + 70(360) = 25353  
Maturity Date: 2/21/89 = 2(30) + 21 + 89 (360) = 32121  

\[
D_{SM}: \text{Number of days between settlement date and maturity date} = 6768
\]

\[
\frac{6768}{30} = 225.6 \text{ (months) (fractional portion of a month used for interpolation)}
\]

\[
\frac{225}{6} = 37.5 \text{ (semi-annual periods)}
\]

where  
N = 37 (whole semi-annual periods)  
and  
T = .5 (fractional number of semi-annual periods)
PROGRAM DESCRIPTION (Cont)

To find dollar price:

1. Solve equation where $N + T = 37.5$

2. Solve equation where $N + T = 37.66666666$
   (add 1 month $\left(\frac{1}{6}\right)$ to 37.5)

3. Interpolate for the .6 month remaining – round off the answer three places after decimal point.

when $N + T = 37.5$ the dollar price is 81.973(A)

$N + T = 37.66666666$ the dollar price is 81.933 (B)

then $B = A = -.04; (.6) (-.04) = -.024$

Dollar Price = $A + (-.024) = 81.949$

NOTE: If $C = Y$ (coupon = yield), then the dollar price for all non-callable bonds is stated as 100 (par).

II. Dollar Price for Long-Term Bonds

This is calculated in the same manner as a dollar price for bonds with maturities between 6 months and 40 years 3 months except that the interpolation is between semi-annual periods (instead of months). Instead of adding $1/6$ to $N+T$ before solving the equation a second time, add 1 to $N+T$.

EXAMPLE

Settlement Date: 5/3/70 = 5 (30) + 3 + 70 (360) = 25353
Maturity Date: 2/28/11 = 2 (30) + 28 + 11 (360) = 4048

$$D_{SM} = \text{Number of days between settlement date and maturity date} = 4048 - 25353$$
$$= -21305 \text{ (since this is a negative value, add 36000 . . 14695 days)}$$

$$\frac{14695}{180} = 81.6388888888 \text{ (semi-annual periods)}$$

where $N + T = 81$
PROGRAM DESCRIPTION (Cont)

To find dollar price:

1. Solve equation where \(N + T = 81\)

2. Solve equation where \(N + T = 82\)
   (add 1 semi-annual period to 81)

3. Interpolate for the odd days remaining (.6388888888) - round off the answer
   three places after the decimal point.

when \(n + t = 81\) the dollar price is 101.725 \((A)\)

\(n + t = 82\) the dollar price is 101.730 \((B)\)

then \(B - A = .005; (.6388888888) (.005) = .003194444444\)

Dollar Price = \(A + (.003194444444) = 101.728\)

NOTE

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devices. When such instructions occur the word INSTRUCTION will appear on the left
hand side of the operating instructions and what is displayed or typed will appear on the
right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET**  **CLEAR**  **CR/LF**
   **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **SETTLEMENT DATE**  **CR/LF**

5. **INSTRUCTION**

6. Key **COUPON (%)**  **CR/LF**

7. **INSTRUCTION**

8. Key **MATURITY DATE**  **CR/LF**

9. **INSTRUCTION**

10. Key **YIELD (%)**  **CR/LF**

11. **INSTRUCTION**

12. Key **INCREMENT VALUE**  **CR/LF**

EXAMPLE

Find the dollar price for a bond given the following data:

Settlement date = 1/1/72
Maturity date = 1/1/92
Coupon (%) = 7
Yield = 5
Increment of .5

4. Key 1 0 1 7 2  **CR/LF**

6. Key 7  **CR/LF**

8. Key 1 0 1 9 2  **CR/LF**

10. Key 5  **CR/LF**

12. Key .5  **CR/LF**

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13. Read:

<table>
<thead>
<tr>
<th>YIELD TO MATURITY</th>
<th>$ PRICE TO MATURITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2.500</td>
<td>170.485</td>
</tr>
<tr>
<td>2 3.000</td>
<td>159.831</td>
</tr>
<tr>
<td>3 3.500</td>
<td>150.039</td>
</tr>
<tr>
<td>4 4.000</td>
<td>141.033</td>
</tr>
<tr>
<td>5 4.500</td>
<td>132.741</td>
</tr>
<tr>
<td>6 5.000</td>
<td>125.102</td>
</tr>
<tr>
<td>7 5.500</td>
<td>118.058</td>
</tr>
<tr>
<td>8 6.000</td>
<td>111.557</td>
</tr>
<tr>
<td>9 6.500</td>
<td>105.552</td>
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<td>10 7.000</td>
<td>100.000</td>
</tr>
<tr>
<td>STOP 11 7.500</td>
<td>94.862</td>
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</table>
WANG
2200
SERIES
PROGRAM

BOND YIELD (BASIS)

TITLE

PF. 02-2200. 01A-00F1-3-0 6/1/73
NUMBER DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Calculates the basis of a bond whose maturity \( \geq 6 \) months.

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<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
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<td></td>
<td>1818</td>
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</table>
PROGRAM DESCRIPTION

Calculates the yield (basis) of a bond whose maturity ≥ 6 months.

The program requests an increment value, the inputed $ Price being decreased by a value 5 times the increment value and the yield for 11 dollar prices, ranging from ($ price - 5 * increment) to ($ price + 5 * increment) in increments of the increment value, is calculated.

The yield is calculated by the Newton-Rhapson Method:

\[ B = A - \frac{F(x)}{F'(x)} \]

where \( F(x) = \) $ price formula - Price

\( F'(x) = \) 1st derivative of $ price formula - Price

For information on interpolation see Bond Dollar Price Program.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET**  **CLEAR**  **CR/LF**
    **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **SETTLEMENT DATE**  **CR/LF**

5. **INSTRUCTION**

6. Key **COUPON (%)**  **CR/LF**

7. **INSTRUCTION**

8. Key **MATURE DATE**  **CR/LF**

9. **INSTRUCTION**

10. Key **$ PRICE**  **CR/LF**

11. **INSTRUCTION**

12. Key **INCREMENT VALUE**  **CR/LF**

EXAMPLE

Find the yield for the following data:

- **Settlement Date**  = 6/15/72
- **Maturity Date**  = 6/15/92
- **Coupon (%)**  = 7
- **Dollar Price**  = 125.102
- **Increment Value**  = .7

4. Key 6 1 5 7 2  **CR/LF**

ENTER SETTLEMENT DATE IN THE FORM MMDDYY

6. Key 7  **CR/LF**

ENTER COUPON (%)

8. Key 6 1 5 9 2  **CR/LF**

ENTER MATURITY DATE IN THE FORM MMDDYY

10. Key 1 2 5 . 1 0 2  **CR/LF**

ENTER $ PRICE

12. Key . 7  **CR/LF**

ENTER INCREMENT VALUE

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13. Read:

<table>
<thead>
<tr>
<th>YIELD TO MATURITY</th>
<th>$ PRICE TO MATURITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  5.243</td>
<td>121.602</td>
</tr>
<tr>
<td>2  5.194</td>
<td>122.302</td>
</tr>
<tr>
<td>3  5.145</td>
<td>123.002</td>
</tr>
<tr>
<td>4  5.096</td>
<td>123.702</td>
</tr>
<tr>
<td>5  5.048</td>
<td>124.402</td>
</tr>
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<td>6  5.000</td>
<td>125.102</td>
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<td>7  4.952</td>
<td>125.802</td>
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<td>126.502</td>
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<td>10 4.812</td>
<td>127.902</td>
</tr>
<tr>
<td>11 4.766</td>
<td>128.602</td>
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WANG
2200
 SERIES
PROGRAM

DISCOUNT & PRICE ON DISCOUNT COMMERCIAL PAPER
TITLE

PF-02-2200.01A-00FI-4-0  6/1/73
NUMBER       DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Calculates the discount and net cost on discount commercial paper.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
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<tbody>
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<td></td>
<td>304</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Calculates the discount and net cost on discount commercial paper.

\[
\text{Discount} = P \left( \frac{R}{100} \right) \left( \frac{M}{360} \right)
\]

\[
\text{Cost} = P - \text{Discount}
\]

where:

\[
P = \text{principal}
\]

\[
R = \text{discount rate}
\]

\[
M = \text{days to maturity}
\]

NOTE: Calculations made on an actual no. of days/360-day year basis.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right.
OPERATING INSTRUCTIONS

1. Key **RESET**  **CLEAR**  **CR/LF**  **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **PRINCIPAL**  **CR/LF**

5. **INSTRUCTION**

6. Key **DISCOUNT RATE (%)**  **CR/LF**

7. **INSTRUCTION**

8. Key **DAYS TO MATURITY**  **CR/LF**

9. Read:

10. **INSTRUCTION**

11. Key **0**  **CR/LF**
    
or
    Key **1**  **CR/LF**

If you have more input, go to Step 3. Otherwise, go to Step 12.

12. **END PROGRAM**

EXAMPLE

Find the discount and cost of $450,000 commercial paper due in 40 days, purchased at 5.25%.

4. Key **4 5 0 0 0 0**  **CR/LF**

DISCOUNT RATE (%)

6. Key **5 - 2 5**  **CR/LF**

DAYS TO MATURITY?

8. Key **4 0**  **CR/LF**

DISCOUNT = 2625

COST = 447375

MORE INPUT? (1 = YES, 0 = NO)

11. Key **0**  **CR/LF**
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WANG
2200
SERIES
PROGRAM

INTEREST BEARING COMMERCIAL PAPER
TITLE

PF.02-2200.01A-00F1-5-0  6/1/73
NUMBER DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Calculates the interest rate and accrued interest at maturity on interest bearing commercial paper.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>334</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Calculates the interest rate and accrued interest at maturity on interest bearing commercial paper.

Interest Rate, \( I = \text{Discount} \times \frac{360}{M \times \text{PRICE}} \)

Accrued Interest = \( P \times I \times \frac{M}{360} \)

where:

Discount = \( P \times \frac{R}{100} \times \frac{M}{360} \)

Price = \( P - \text{Discount} \)

\( P = \text{principal} \)

\( R = \text{discount rate} \)

\( M = \text{days to maturity} \).

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET** **CLEAR** **CR/LF**
   **LOAD** **CR/LF**

2. Key **RUN** **CR/LF**

3. **INSTRUCTION**

4. Key **PRINCIPAL** **CR/LF**

5. **INSTRUCTION**

6. Key **DISCOUNT RATE (%)** **CR/LF**

7. **INSTRUCTION**

8. Key **DAYS TO MATURITY** **CR/LF**

9. Read:

   **PRINCIPAL?**

4. Key 2 5 0 0 0 0 **CR/LF**

   **DISCOUNT RATE?**

6. Key 5 5 **CR/LF**

   **DAYS TO MATURITY?**

8. Key 3 0 **CR/LF**

   INTEREST RATE = 5.525324403514

   ACCRUED INTEREST = $1151.109250733

   MORE INPUT? (1 = YES, 0 = NO)

11. Key 0 **CR/LF**

   or

   Key 1 **CR/LF**

   If you have more input, go to Step 3. Otherwise, go to Step 12.

12. **END PROGRAM**

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NUMBER OF DAYS BETWEEN TWO DATES

TITLE

PF.02-2200.01A-00F1-6-0  6/1/73

NUMBER      DATE
2200A-01, 2215, 2216/2217

EQUIPMENT

PROGRAM ABSTRACT

Calculates the actual number of days between two dates.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td></td>
<td>738</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Calculates the actual number of days between two dates.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

Determine the number of days between January 1, 1960 and January 1, 1970.

1. Key [RESET] [CLEAR] [CR/LF]
   [LOAD] [CR/LF]

2. Key [RUN] [CR/LF]

3. [INSTRUCTION]

   [CR/LF]

5. [INSTRUCTION]

   [CR/LF]

7. Read

8. [INSTRUCTION]

9. Key 0  [CR/LF]
   or
   Key 1  [CR/LF]

   If you have more input, go to Step 3. Otherwise, go to Step 10.

10. END PROGRAM

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MORTGAGE PAYMENT

TITLE

PF.05-2200.01A-00F1-1-0  6/1/73
NUMBER
2200A-01, 2215, 2216/2217
DATE
EQUIPMENT

PROGRAM ABSTRACT

Computes the monthly payment and total interest on a loan.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td></td>
<td>712</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Computes the monthly payment and total interest on a loan.

\[ M = \frac{P \times \frac{I}{1200}}{1 - (1+I)^{-N}} \]

\[ T = N \times M - P \]

where:

- \( M \) = monthly payment
- \( T \) = total interest
- \( P \) = principal
- \( I \) = annual interest rate (\%)
- \( N \) = no. of payments

If requested, a mortgage table listing principal outstanding, interest and principal repayment for each month in the life of the loan will be printed out.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET**  **CLEAR**  **CR/LF**  **LOAD**  **CR/LF**
2. Key **RUN**  **CR/LF**
3. **INSTRUCTION**
4. Key **PRINCIPAL**  **CR/LF**
5. **INSTRUCTION**
6. Key **ANNUAL INTEREST RATE (%)**  **CR/LF**
7. **INSTRUCTION**
8. Key **YEARS * MONTHS**  **CR/LF**
9. Read
10. **INSTRUCTION**
11. Key **0**  **CR/LF**
or
   Key **1**  **CR/LF**

If you do not want table, go to Step 14.

EXAMPLE

Principal = $20,000
Annual Interest Rate (%) = 5.5
Term = 20 yrs. 3 mos.

4. Key **2 0 0 0 0**  **CR/LF**
6. Key **5 - 5**  **CR/LF**
8. Key **2 0 - 3**  **CR/LF**

PRINCIPAL?

ANNUAL INTEREST RATE (%)

LOAN PERIOD (YEARS, MONTHS)?

MONTHLY PAYMENT = $136.65
TOTAL INTEREST = $13205.95

DO YOU WANT MORTGAGE TABLE?
(1 = YES, 0 = NO)

11. Key **1**  **CR/LF**
12. 

<table>
<thead>
<tr>
<th>MONTH</th>
<th>PRINCIPAL OUTSTANDING</th>
<th>INTEREST</th>
<th>PRINCIPAL REPAYMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20000</td>
<td>91.67</td>
<td>44.00</td>
</tr>
<tr>
<td>2</td>
<td>19955.02</td>
<td>91.46</td>
<td>45.19</td>
</tr>
<tr>
<td>3</td>
<td>19909.83</td>
<td>91.25</td>
<td>45.40</td>
</tr>
<tr>
<td>4</td>
<td>19864.43</td>
<td>91.05</td>
<td>45.60</td>
</tr>
<tr>
<td>5</td>
<td>19819.83</td>
<td>90.84</td>
<td>45.81</td>
</tr>
<tr>
<td>6</td>
<td>19773.02</td>
<td>90.63</td>
<td>46.02</td>
</tr>
<tr>
<td>7</td>
<td>19727</td>
<td>90.42</td>
<td>46.23</td>
</tr>
<tr>
<td>8</td>
<td>19680.77</td>
<td>90.20</td>
<td>46.45</td>
</tr>
<tr>
<td>9</td>
<td>19634.32</td>
<td>89.99</td>
<td>46.66</td>
</tr>
<tr>
<td>10</td>
<td>19587.66</td>
<td>89.78</td>
<td>46.87</td>
</tr>
<tr>
<td>11</td>
<td>19540.79</td>
<td>89.56</td>
<td>47.09</td>
</tr>
<tr>
<td>12</td>
<td>19493.7</td>
<td>89.35</td>
<td>47.33</td>
</tr>
</tbody>
</table>

13. After each 12 months are displayed the program will stop. To continue, Key **CONTINUE**, **CR/LF**.

14. END PROGRAM
# WANG 2200 SERIES PROGRAM

**DAY OF YEAR**

**TITLE**

PF.02-2200.01A-00FI-7-0  6/1/73

**NUMBER**

2200A-01, 2215, 2216/2217

**DATE**

**EQUIPMENT**

---

**PROGRAM ABSTRACT**

Computes the day of the week that a given date falls on.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td></td>
<td>635</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Computes the day of the week that a given date falls on.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE
Determine what day of the week did August 25, 1949 and December 12, 1951 fall on.

1. Key **RESET**  **CLEAR**  **CR/LF**
   **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **MONTH** ,  **DAY** ,  **YEAR**
   **CR/LF**

5. Read

6. **INSTRUCTION**

If you wish to determine more data, continue as in Step 4. Otherwise, Key **0** ,  **0** ,  **0**  **CR/LF** and go to Step 7.

Key **1** ,  **2** ,  **1** ,  **2** ,  **1** ,  **9** ,  **5** ,  **1**  **CR/LF**

WEDNESDAY

ENTER MONTH, DAY, YEAR

Key **0** ,  **0** ,  **0**  **CR/LF**

END PROGRAM

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35
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WANG 2200 SERIES PROGRAM

ANNUITY

TITLE

PF.06-2200A-00F1-1-0  6/1/73
NUMBER  DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Calculates the accumulated amount of an annuity.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td></td>
<td>308</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Calculates the accumulated amount of an annuity by:

\[ \text{Amount} = R \times S_{n|i} \]

where:

\( R \) = amount of each payment

\[ S_{n|i} = \frac{(1+i)^n - 1}{i} \]

\( i \) = interest rate/period

\( n \) = term of annuity (time from beginning of 1st payment to the end of the last)
OPERATING INSTRUCTIONS

EXAMPLE

R = $1000
i = 4-1/2%
n = 14 years

1. Key RESET CLEAR CR/LF
   LOAD CR/LF
2. Key RUN CR/LF
3. INSTRUCTION
4. Key R CR/LF
5. INSTRUCTION
6. Key i CR/LF
7. INSTRUCTION
8. Key n CR/LF
9. Read:
10. INSTRUCTION
11. Key 0 CR/LF
    or
    Key 1 CR/LF

If you have more input, go to Step 3. Otherwise, go to Step 12.

12. END PROGRAM
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WANG
2200
SERIES
PROGRAM

ANNUAL DEBT PAYMENT

TITLE

PF.06-2200.01A-00FI-2-0  6/1/73
NUMBER       DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Calculates the annual debt payment.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td>458</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Calculates the annual debt payment by:

\[ CR = (P-L) \left( \frac{i (1+i)^N}{(1+i)^N - 1} \right) + Li \]

where:

\[ \begin{align*}
CR &= \text{annual debt payment} \\
i &= \text{annual interest rate} \\
N &= \text{life of study period (yrs.)} \\
L &= \text{prospective net salvage value at end of N yrs.} \\
P &= \text{price or first cost}
\end{align*} \]

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET**  **CLEAR**  **CR/LF**
   **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **PRICE OR FIRST COST**  **CR/LF**

5. **INSTRUCTION**

6. Key **ANNUAL INTEREST RATE**  **CR/LF**

7. **INSTRUCTION**

8. Key **LIFE**  **CR/LF**

9. **INSTRUCTION**

10. Key **SALVAGE VALUE**  **CR/LF**

11. Read:

12. **INSTRUCTION**

13. Key 0  **CR/LF**
    or
    Key 1  **CR/LF**

   **EXAMPLE**

   What would the annual debt payment be on a $25,000 computer with a salvage value of $2000 after 15 years if the cost of money was 6.8%/yr?

   **PRICE**

   4. Key 2 5 0 0 0  **CR/LF**

   **ANNUAL INTEREST RATE (%)**

   6. Key 6 8  **CR/LF**

   **LIFE OF STUDY PERIOD (YRS)**

   8. Key 1 5  **CR/LF**

   **PROSPECTIVE NET SALVAGE VALUE AT END OF STUDY PERIOD**

   10. Key 2 0 0 0  **CR/LF**

   **ANNUAL DEBT PAYMENT = $2629.47**

   **MORE INPUT (1 = YES, 0 = NO)**

   13. Key 0  **CR/LF**

   If you have more inputs, go to Step 3. Otherwise, go to Step 14.

14. **END PROGRAM**

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PROGRAM ABSTRACT

Finds the present amount necessary to provide a sum $S$ after $N$ years.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td></td>
<td>402</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Finds the present amount necessary to provide a sum $S$ after $N$ years.

$$P = \frac{S}{\left(1 + \frac{i}{M}\right)^{NM}}$$

where:

$P =$ present amount  
$S =$ sum after $N$ years  
$M =$ no. of compounding periods/yr.  
$N =$ total years of investment  
i =$ yearly interest rate

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key \textbf{RESET \ CLEAR \ CR/LF} \\
   \textbf{LOAD \ CR/LF}
2. Key \textbf{RUN \ CR/LF}
3. \textbf{INSTRUCTION}
4. Key \textbf{DESIGNED SUM \ CR/LF}
5. \textbf{INSTRUCTION}
6. Key \textbf{NO. OF COMPOUNDING PERIODS/YR \ CR/LF}
7. \textbf{INSTRUCTION}
8. Key \textbf{ANNUAL INTEREST RATE (\% \ CR/LF}
9. \textbf{INSTRUCTION}
10. Key \textbf{LIFE OF INVESTMENT \ CR/LF}
11. Read
12. \textbf{INSTRUCTION}
13. Key 0 \textbf{ \ CR/LF} \\
   or \textbf{Key 1 \ CR/LF}

If you have more input, go to Step 3. Otherwise, go to Step 14.

14. \textbf{END PROGRAM}

EXAMPLE

How much would you need to invest at 5.85% compounded quarterly to yield $12,000 at the end of 17 years?

SUM AFTER N YRS.

4. Key 1 \ 2 \ 0 \ 0 \ 0 \ \textbf{CR/LF}

NO. OF COMPOUNDING PERIODS/YR.?

6. Key 4 \ \textbf{CR/LF}

ANNUAL INTEREST RATE (%)

8. Key 5 \ 8 \ 5 \ \textbf{CR/LF}

NO. OF YRS. OF INVESTMENT

10. Key 1 \ 7 \ \textbf{CR/LF}

PRESENT AMOUNT = $4470.99

MORE INPUT (1 = YES, 0 = NO)

13. Key 0 \ \textbf{CR/LF}

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WANG
2200
SERIES
PROGRAM

NOMINAL INTEREST RATE

TITLE

PF.13-2200.01A-00FI-1-0  6/1/73
NUMBER  DATE
2200A-01, 2215, 2216/2217  EQUIPMENT

PROGRAM ABSTRACT

Finds the nominal interest rate for a given principal invested for N years compounded M times/year amounting to sum S.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td></td>
<td>354</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Finds the nominal (stated) interest rate for a given principal invested for N years compounded M times/year amounting to sum S.

\[ i = M(S/P)^{NM} - M \]

where:

\[ i = \text{nominal interest rate} \]
\[ M = \text{no. of compounding periods/year} \]
\[ P = \text{principal} \]
\[ S = \text{sum at end of N years} \]
\[ N = \text{no. of years}. \]

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

If you invested $1000 for 2 years and got back $1116, what would be the nominal interest rate if it was compounded monthly?

1. Key [RESET] [CLEAR] [CR/LF]
   [LOAD] [CR/LF]
2. Key [RUN] [CR/LF]
3. [INSTRUCTION]
4. Key [PRINCIPAL] [CR/LF]
5. [INSTRUCTION]
6. Key [NO. OF COMPOUNDING PERIODS/]
   [YR] [CR/LF]
7. [INSTRUCTION]
8. Key [SUM AFTER N YEARS]
   [CR/LF]
9. [INSTRUCTION]
10. Key [N] [CR/LF]
11. Read:
12. [INSTRUCTION]
13. Key [0] [CR/LF]
   or
   Key [1] [CR/LF]

If you have more input, go to Step 3. Otherwise, go to Step 14.

14. [END PROGRAM]
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WANG 2200 SERIES PROGRAM

EFFECTIVE INTEREST RATE

TITLE

PF.13-2200.01A-00FI-2-0  6/1/73

NUMBER
2200A-01, 2215, 2216/2217

DATE

EQUIPMENT

PROGRAM ABSTRACT

Finds the effective interest rate for a principal invested for N years amounting to sum S.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td></td>
<td>288</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Finds the effective (actual) interest rate for a principal invested for N years amounting to sum S.

\[ i = \left( \frac{S}{P} \right)^{1/N} - 1 \]

where:

i = effective annual interest rate

P = principal

S = sum at end of N years

N = no. of years

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

If you invested $1000 for 2 years and got back $1,116, what would be the effective interest rate?

1. Key **RESET**  **CLEAR**  **CR/LF**
   **LOAD**  **CR/LF**
2. Key **RUN**  **CR/LF**
3. **INSTRUCTION**
4. Key **PRINCIPAL**  **CR/LF**
5. **INSTRUCTION**
6. Key **SUM AFTER N YEARS**  **CR/LF**
7. **INSTRUCTION**
8. Key **N**  **CR/LF**
9. Read:
10. **INSTRUCTION**
11. Key **0**  **CR/LF**
    or
    Key **1**  **CR/LF**

If you have more input, go to Step 3. Otherwise, go to Step 12.

12. **END PROGRAM**
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INVESTMENT WITHDRAWAL

TITLE

PF.06-2200.01A-00F1-4-0       6/1/73
NUMBER                        DATE
2200A-01, 2215, 2216/2217     EQUIPMENT

PROGRAM ABSTRACT

Finds the amount that can be withdrawn from an initial investment M times/year for N years, leaving nothing at end, if the interest rate is 1.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td></td>
<td>430</td>
</tr>
</tbody>
</table>

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Printed in U.S.A.
PROGRAM DESCRIPTION

Finds the amount that can be withdrawn from an initial investment $M$ times/year for $N$ years, leaving nothing at the end, if the interest rate is $i$.

$$R = P \left[ \frac{i/M}{(1 + i/M)^{NM} - 1} + \frac{i}{M} \right]$$

where:

$\begin{align*}
R &= \text{amount of withdrawal} \\
P &= \text{initial investment} \\
i &= \text{nominal annual interest rate} \\
M &= \text{no. of withdrawals/year} \\
N &= \text{no. of years}.
\end{align*}$

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET**  **CLEAR**  **CR/LF**
   **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **INITIAL INVESTMENT**  **CR/LF**

5. **INSTRUCTION**

6. Key **A.I.R. (%)**  **CR/LF**

7. **INSTRUCTION**

8. Key **NO. OF WITHDRAWALS/YR.**  **CR/LF**

9. **INSTRUCTION**

10. Key **NO. OF YEARS**  **CR/LF**

11. Read

12. **INSTRUCTION**

13. Key **0**  **CR/LF**
   or
   Key **1**  **CR/LF**

   If you have more input, go to Step 3. Otherwise, go to Step 19.

14. **END PROGRAM**

---

EXAMPLE

How much could you withdraw each month for 4 years from a $12,000 investment leaving nothing at end if it were invested at 5.5%?

4. Key **1 2 0 0 0**  **CR/LF**

ANNUAL INTEREST RATE IN THE FORM X.XX?

6. Key **5 . 5**  **CR/LF**

NO. OF WITHDRAWLS? YR.?

8. Key **1 2**  **CR/LF**

NO. OF YRS.?

10. Key **4**  **CR/LF**

AMOUNT OF WITHDRAWAL = $279.08

MORE INPUT (1 = YES, 0 = NO)

13. Key **0**  **CR/LF**
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INITIAL INVESTMENT

PF.05-2200.01A-00Fl-5-0  6/1/73
NUMBER  DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT
Finds the investment necessary to enable one to withdraw a given amount, \( m \) times/year for \( N \) years.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
<td>416</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Finds the investment necessary to enable one to withdraw a given amount, m times/year for N years.

\[ P = R \left[ \frac{(1 + \frac{i}{M})^{NM} - 1}{\frac{i}{M} (1 + \frac{i}{M})^{NM}} \right] \]

where:

- \( P \) = initial investment
- \( R \) = amount of withdrawal
- \( i \) = nominal annual interest
- \( M \) = no. of withdrawal periods/year
- \( N \) = no. of years

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

How much would you need to invest at 5.5% so that you could withdraw $250, 9 times/yr. for 4 years leaving nothing at the end?

1. Key RESET CLEAR CR/LF
   LOAD CR/LF
2. Key RUN CR/LF
3. INSTRUCTION
4. Key AMT OF WITHDRAWAL CR/LF
5. INSTRUCTION
6. Key A.I.R. (%) CR/LF
7. INSTRUCTION
8. Key NO. OF WITHDRAWALS/yr. CR/LF
9. INSTRUCTION
10. Key NO. OF YEARS CR/LF
11. Read:
12. INSTRUCTION
13. Key 0 CR/LF
    or
    Key 1 CR/LF

   If you have more input, go to Step 3. Otherwise, go to Step 14.

14. END PROGRAM

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WANG
2200
SERIES
PROGRAM

SUM TOTAL FROM A SINGLE INVESTMENT

TITLE

PF.06-2200.01A-00F1-6-0 6/1/73

NUMBER
2200A-01, 2215, 2216/2217

DATE

EQUIPMENT

PROGRAM ABSTRACT

Finds the sum total from a single investment

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td></td>
<td>382</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Finds the sum total from a single investment by:

\[ S = P (1 + i/M)^{NM} \]

where:

- \( S \) = sum at end of \( N \) years
- \( P \) = principal
- \( i \) = annual interest rate
- \( M \) = no. of compounding periods/yr.
- \( N \) = no. of years.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word **INSTRUCTION** will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

If you invested $3001.82 at 5.85% compounded quarterly, what would be the sum after 17 years?

1. Key RESET  CLEAR  CR/LF
   LOAD  CR/LF
2. Key RUN  CR/LF
3. INSTRUCTION
4. Key INVESTMENT  CR/LF
5. INSTRUCTION
6. Key A.I.R. (%)  CR/LF
7. INSTRUCTION
8. Key NO. OF COMPOUNDING PERIODS/YR  CR/LF
9. INSTRUCTION
10. Key NO. OF YRS. INVESTED  CR/LF
11. Read:
12. INSTRUCTION
13. Key 0  CR/LF
     or
     Key 1  CR/LF

If you have more input, go to Step 3. Otherwise, go to Step 14.

END PROGRAM

INVESTMENT?

4. Key 3 0 0 1 . 8 2  CR/LF
ANNUAL INTEREST RATE IN THE FORM X.XX?

6. Key 5 . 8 5  CR/LF
NO. OF COMPOUNDING PERIODS/YR.?

8. Key 4  CR/LF
NO. OF YRS. INVESTED?

10. Key 1 7  CR/LF
SUM = $8056.80
MORE INPUT (1 = YES, 0 = NO)?

13. Key 0  CR/LF
This page intentionally left blank
WANG
2200
SERIES
PROGRAM

PERIODIC INVESTMENT

TITLE

PF.06-2200.01A-00F1-7-0  6/1/73
NUMBER  DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Finds the periodic investment $R$ required to yield sum $S$.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td></td>
<td>393</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Finds the periodic investment $R$ required to yield sum $S$ if $R$ is invested at interest rate $i$, $M$ times/year for $N$ years.

\[
R = S \left[ \frac{i/M}{(1 + i/M)^{NM} - 1} \right]
\]

where:

- $R$ = end of period investment
- $S$ = sum after $N$ years
- $i$ = nominal annual interest rate
- $M$ = no. of investments/year
- $N$ = no. of years

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word **INSTRUCTION** will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

How much would you need to invest monthly at 5.5% to yield $12,000 after 17 years?

1. Key **RESET**  **CLEAR**  **CR/LF**
   **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **SUM AFTER N YRS.**  **CR/LF**

5. **INSTRUCTION**

6. Key **A.I.R. (%)**  **CR/LF**

7. **INSTRUCTION**

8. Key **NO. OF INVESTMENTS/YR.**  **CR/LF**

9. **INSTRUCTIONS**

10. Key **NO. OF YRS.**  **CR/LF**

11. Read:

12. **INSTRUCTION**

13. Key **0**  **CR/LF**
    or
    Key **1**  **CR/LF**


If you have more input, go to Step 3. Otherwise, go to Step 14.

14. **END PROGRAM**
WANG
2200
SERIES
PROGRAM

SUM FROM PERIODIC INVESTMENT

TITLE

PF.06-2200.01A-00F1-8-0       6/1/73
NUMBER                      DATE
2200A-01, 2215, 2216/2217    EQUIPMENT

PROGRAM ABSTRACT

Finds the sum resulting from an amount invested at a given interest rate, m times/year for N years.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td></td>
<td>393</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Finds the sum resulting from an amount invested at a given interest rate, M times/year for N years.

\[ S = R \left[ \frac{(1 + i/M)^{NM} - 1}{i/M} \right] \]

where:

\( S = \) sum after N years

\( R = \) end of period investment

\( i = \) nominal annual interest rate

\( M = \) no. of investments/year

\( N = \) no. of years

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key RESET CLEAR CR/LF
    LOAD CR/LF
2. Key RUN CR/LF
3. INSTRUCTION
4. Key AMT OF PERIODIC INVESTMENT CR/LF
5. INSTRUCTION
6. Key A.I.R. (%) CR/LF
7. INSTRUCTION
8. Key NO. OF INVESTMENTS/YR. CR/LF
9. INSTRUCTION
10. Key NO. OF YRS. CR/LF
11. Read:
12. INSTRUCTION
13. Key 0 CR/LF
    or
Key 1 CR/LF

If you have more input, go to Step 3. Otherwise, go to Step 14.

END PROGRAM

EXAMPLE

If you invested $23.95 monthly at 5.5%, how much would you have after 17 years?

AMOUNT OF PERIODIC INVESTMENT?
4. Key 2 3 9 5 CR/LF

ANNUAL INTEREST RATE IN THE FORM X.XX?
6. Key 5 5 CR/LF

NO. OF INVESTMENTS/YR?
8. Key 1 2 CR/LF

NO. OF YRS.
10. Key 1 7 CR/LF

SUM = $8056.49

MORE INPUT (1 = YES, 0 = NO)?
13. Key 0 CR/LF

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DEPRECIATION CHARGE (DECLINING BALANCE)

TITLE

PF.05-2200.01A-00FI-2-0  6/1/73
NUMBER                   DATE
2200A-01, 2215, 2216/2217 EQUIPMENT

PROGRAM ABSTRACT

Finds the depreciation charge in a given year for a given declining balance depreciation rate.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td></td>
<td>346</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Finds the depreciation charge in a given year for a given declining balance depreciation rate.

\[ C = Pf (1 - f)^{Y-1} \]

where:

\[ C = \text{depreciation charge} \]

\[ P = \text{price or first cost} \]

\[ f = \text{declining balance depreciation rate} \]

\[ Y = \text{age in years at the end of year to be considered} \]

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET**  **CLEAR**  **CR/LF**
   **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **PRICE**  **CR/LF**

5. **INSTRUCTION**

6. Key **DEPRECIATION RATE (%)**  **CR/LF**
   6. Key 5  0  0  0  **CR/LF**

7. **INSTRUCTION**

8. Key **YEAR**  **CR/LF**

9. Read

10. **INSTRUCTION**

11. Key 0  **CR/LF**
    or
    Key 1  **CR/LF**

   If you have more input, go to Step 3. Otherwise, go to Step 12.

12. **END PROGRAM**

EXAMPLE

What is the depreciation write off in the 9th year for a $25,000 computer if the declining balance depreciation rate is 15.497%?

PRICE?

Key 2 5 0 0 0  **CR/LF**

DEPRECIATION RATE (%)?

AGE AT END OF YEAR TO BE CONSIDERED?

Key 1 5 4 9 7  **CR/LF**

DEPRECIATION CHARGE = $1007.31

MORE INPUT (1 = YES, 0 = NO)?

Key 0  **CR/LF**

Key 0  **CR/LF**
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WANG 2200 SERIES PROGRAM

DECLINING BALANCE DEPRECIATION RATE

PF.05-2200.01A-00F1-3-0 6/1/73

NUMBER DATE

2200A-01, 2215, 2216/2217 EQUIPMENT

PROGRAM ABSTRACT

Finds the declining balance depreciation rate.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td></td>
<td>308</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Finds the declining balance depreciation rate such that the book (listed) value of an item equals the estimated salvage value at the end of an N year life.

\[ f = 1 - (L/P)^{1/N} \]

where:

- \( f \) = declining balance depreciation rate
- \( N \) = life of study period (years)
- \( L \) = prospective net salvage value after \( N \) years
- \( P \) = price or first cost

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

What declining balance depreciation rate would make the book value of a $25,000 computer exactly equal to the prospective salvage value ($2,000) at end of 15 years?

1. Key **RESET** **CLEAR** **CR/LF**
   **LOAD** **CR/LF**
2. Key **RUN** **CR/LF**
3. **INSTRUCTION**
4. Key **PRICE** **CR/LF**
5. **INSTRUCTION**
6. Key **SALVAGE VALUE** **CR/LF**
7. **INSTRUCTION**
8. Key **LIFE (YRS)** **CR/LF**
9. Read:
10. **INSTRUCTION**
11. Key 0 **CR/LF**
    or
   Key 1 **CR/LF**

   If you have more input, go to Step 3. Otherwise, go to Step 12.

12. **END PROGRAM**
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WANG
2200
SERIES
PROGRAM

SALVAGE VALUE

TITLE

PF.05-2200.01A-00FI-4-0 6/1/73
NUMBER DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Finds the book salvage value at the end of N years given the declining balance depreciation rate.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td></td>
<td>278</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Finds the book salvage value at the end of N years given the declining balance depreciation rate.

\[ L = P \ (1 - f)^N \]

where:

\[ L \] = book salvage value

\[ P \] = price or first cost

\[ f \] = declining balance depreciation rate

\[ N \] = age of item (years)

NOTE

Many operating instructions are presented via the CRT 'display' or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET**  **CLEAR**  **CR/LF**
   **LOAD**  **CR/LF**

2. Key **RUN**  **CR/LF**

3. **INSTRUCTION**

4. Key **PRICE**  **CR/LF**

5. **INSTRUCTION**

6. Key **DEPRECIATION RATE (%)**  **CR/LF**

7. **INSTRUCTION**

8. Key **AGE (YRS.)**  **CR/LF**

9. Read

10. **INSTRUCTION**

11. Key 0  **CR/LF**
    or
    Key 1  **CR/LF**

   **EXAMPLE**

   What is the salvage value of a 9 year old $25,000 computer if the declining balance depreciation rate is 15.497%.

   4. Key 2 5 0 0 0  **CR/LF**

   6. Key 1 5 4 9 7  **CR/LF**

   8. Key 9  **CR/LF**

   SALVAGE VALUE = $5492.74

   MORE INPUT (1 = YES, 0 = NO)?

   11. Key 0  **CR/LF**

   If you have more input, go to Step 3. Otherwise, go to Step 12.

12. **END PROGRAM**

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WANG
2200
SERIES
PROGRAM

AVERAGE GROWTH RATE & PROJECTED SALES

TITLE

PS.05-2200.01A-00FI-5-0  6/1/73
NUMBER
2200A-01, 2215, 2216/2217
DATE

EQUIPMENT

PROGRAM ABSTRACT

Computes the "average" growth rate in sales, earnings, etc. of a company over N years.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td></td>
<td>1101</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Computes the "average" growth rate in sales, earnings, etc. of a company over N years. Given the total sales $S_0, S_1, \ldots, S_n$ of a company for each year over a period of N years, we perform a linear regression to determine the "average" growth rate, G. Using G we can project what the sales of the company should be in the mth year by:

$$S_n = S_0 (1 + G)^m$$

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales in $100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>10</td>
</tr>
<tr>
<td>1961</td>
<td>11</td>
</tr>
<tr>
<td>1962</td>
<td>15</td>
</tr>
<tr>
<td>1963</td>
<td>18</td>
</tr>
<tr>
<td>1964</td>
<td>21</td>
</tr>
<tr>
<td>1965</td>
<td>20</td>
</tr>
<tr>
<td>1966</td>
<td>25</td>
</tr>
</tbody>
</table>

For the above data, compute the average growth rate, and projected sales for years 1968, 1970 and 1972.

1. Key **RESET**  **CLEAR**  **CR/LF**
2. Key **LOAD**  **CR/LF**
3. **INSTRUCTION**
4. Key **FIRST YEAR**  **CR/LF**
5. **INSTRUCTION**
6. Key **LAST YEAR**  **CR/LF**
7. **INSTRUCTION**
8. Key 1st YEAR'S SALES  **CR/LF**

The program will ask for all sales figures in the same manner as Step 7, 8. After all figures have been entered, go to Step 9.
9. Read 'AVE.' GROWTH RATE = 16.5200896494 PERCENT

10. INSTRUCTION YEAR OF INTEREST (FOR PROJECTED SALES)

11. Key YEAR CR/LF

12. Read 11. Key 1 9 6 8 CR/LF

PROJECTED SALES FOR YEAR 1968
= 35.10952

If you wish to calculate more projected sales, go to Step 10. Otherwise, Key 0 CR/LF.
PLOT ROUTINES

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>PROGRAM TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>PLOT</td>
</tr>
<tr>
<td>24</td>
<td>MULTI- PLOT</td>
</tr>
<tr>
<td>25</td>
<td>POLAR PLOT</td>
</tr>
<tr>
<td>26</td>
<td>T- PLOT</td>
</tr>
<tr>
<td>27</td>
<td>HISTOGRAM</td>
</tr>
</tbody>
</table>

UTILITY SUBROUTINES

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>PROGRAM TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>UTILITY</td>
</tr>
</tbody>
</table>
This page intentionally left blank
WANG
2200
SERIES
PROGRAM

PLOT

TITLE

PMi.07-2200.01A-00FI-1-0  6/1/73
NUMBER  DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Plots a function of X, f(x) on a set of coordinate axes.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td></td>
<td>1061</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Plots a function of X, f(x), on a set of coordinate axes. The user must supply the following information:

1. Function to be plotted.
2. Lower limit of X (X_1).
3. Upper limit of X (X_2).
4. Increment by which X is to be increased between each plotted point.
5. Lower limit of Y (Y_1).
6. Upper limit of Y (Y_2).
7. Increment by which Y is to be increased.

The X-axis runs vertically. If Y = 0 is in the specified range of Y and is actually attained when incrementing from Y_1 to Y_2, then the true X-axis is printed. Otherwise, the X-axis is the line Y = Y_1. The Y-axis runs horizontally. The true Y-axis is printed if X = 0 is in the range of X and is actually attained. Otherwise, the Y-axis is the line X = X.

For typewriter output, insert the following two statements in program:

47 SELECT PRINT 211
900 SELECT PRINT 005

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

Plot Y = sin(2X)

1. Key [RESET] [CLEAR] [CR/LF] [LOAD] [CR/LF]

Enter the function in line 1 of the program as follows:

1 DEF FNC(X) = function of X.

For example, the function f(x) = \(x^2 \cos(X)\) would be entered as follows:

1 DEF FNC(X) = X \(2^*\cos(X)\)

2. Key 1 [DEFFN] C ( X ) = f(x) [CR/LF]

2. Key 1 [DEFFN] C ( X ) = SIN( 2 * X ) [CR/LF]

3. Key [RUN] [CR/LF]

4. INSTRUCTION


5. Key \(-2\) . \(2\) . \(2\) . \(2\) [CR/LF]

RIGHT X-END POINT .

X-INCREMENT, [CR/LF]

6. INSTRUCTION

LOWER Y-END POINT, UPPER Y-END POINT, Y-INCREMENT?


7. Key \(-2\) . \(2\) . \(2\) . \(1\) [CR/LF]

UPPER Y-END POINT .

Y-INCREMENT [CR/LF]
8. Read Output

X-AXIS IS THE LINE: Y = 0
Y-AXIS IS THE LINE: X = 0

END PROGRAM
MULTI- PLOT

TITLE

PMi. 07-2200.01A-00F1-2-0 6/1/73
NUMBER DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Plots from 1 to 9 functions of X on the same set of coordinate axes.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td></td>
<td>1392</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Plots from 1 to 9 functions of X on the same set of coordinate axes. The user must supply the following information:

1. Number of functions being plotted.
2. Each function to be plotted.
3. Lower limit of X(X₁).
4. Upper limit of X(X₂).
5. Increment by which X is to be increased between each plotted point.
6. Lower limit of Y(Y₁).
7. Upper limit of Y(Y₂).
8. Increment by which Y is to be increased.

The X-axis will run vertically and be the line Y = Y₁. The Y-axis will run horizontally and be the line X = X₁; the number of steps in the Y-axis must be ≤ 70.

The first function will be represented by the character "1", the second by "2", etc. If more than 1 function is to be plotted at the same location, an asterisk is printed. Values of the function outside the specified range of Y are ignored.

For typewriter output, insert the following two statements in the program:

205 SELECT PRINT 211
555 SELECT PRINT 005

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key [RESET]  [CLEAR]  [CR/LF]
   [LOAD]  [CR/LF]

Enter the number of functions to be plotted (n) in line 10 of the program as follows:

10 DATA n

Enter the functions to be plotted on lines 15–90 of the program as follows:

15 Y(1) = first function of X.
20 Y(2) = second function of X.
.
.
.

2. Key 1 0  [DATA]  n  [CR/LF]

3. Key 1 5  Y ( 1 ) =  ...  [CR/LF]
   Key 2 0  Y ( 2 ) =  ...  [CR/LF]
   .
   .

2. Key 1 0  [DATA]  4  [CR/LF]

3. Key 1 5  Y ( 1 ) = X * X / 4 - X,  [CR/LF]
   Key 2 0  Y ( 2 ) = 1 / EXP( X )  [CR/LF]
   Key 2 5  Y ( 3 ) = SIN( 2 * X )  [CR/LF]
   Key 3 0  Y ( 4 ) = COS( 2 * X )  [CR/LF]

4. Key [RUN]  [CR/LF]
OPERATING INSTRUCTIONS (Cont)

5. **INSTRUCTION**

6. Key **LEFT X-ENDPOINT**, **RIGHT X-ENDPOINT**, **X-INCREMENT**
6. Key  \[0 \quad 4 \quad . \quad . \quad 1\] **CR/LF**

7. **INSTRUCTION**

8. Key **LOWER Y-ENDPOINT**, **UPPER Y-ENDPOINT**, **Y-INCREMENT**
8. Key  \[-1 \quad 1 \quad . \quad . \quad 0 \quad 5\] **CR/LF**
9. Read Output

X-AXIS IS THE LINE: Y = -1
Y-AXIS IS THE LINE: X = 0

+ 1 3 2 4
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+ 1 3 2 4
+ 1 3 2 4
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Polar Plot

Title

PMI.07-2200.01A-00FL-3-0  6/1/73
Number
2200A-01, 2215, 2216/2217
Equipment

Program Abstract

Plots a function f(θ) in polar coordinates.

<table>
<thead>
<tr>
<th>Block</th>
<th>Save &quot;Name&quot;</th>
<th>Bytes Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td></td>
<td>2636</td>
</tr>
</tbody>
</table>

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Printed in U.S.A.
PROGRAM DESCRIPTION

Plots a function f(θ) in polar coordinates. The X-axis (0 = zero degrees) runs horizontally; the Y-axis runs vertically. Each axis is 6 inches long. The user must specify the value of the positive end of the X-axis.

For typewriter output, insert the following two statements in the program:

2 SELECT PRINT 211
205 SELECT PRINT 005

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

Plot \( f(x) = 2 \cdot (1 - 2 \cdot \sin(x)) \)

max. value of positive X-axis is 7.

1. Key \( \text{RESET} \) \( \text{CLEAR} \) \( \text{CR/LF} \)
   \( \text{LOAD} \) \( \text{CR/LF} \)

   Enter the function, \( f(\theta) \), in line 5 of the program as follows:

   \[ 5 \text{ DEF FNC(T) = "function"} \]

   For example, the function \( f(\theta) = 4 \sin(2\theta) \) would be entered as follows:

   \[ 5 \text{ DEF FNC(T) = } 4 \cdot \sin(2 \cdot T) \]

   NOTE: The letter \( T \) replaces \( \theta \).

2. Key 5 \( \text{DEFFN} \) \( \text{C} \) \( T \) \( = \) \( f(T) \)

3. Key \( \text{RUN} \) \( \text{CR/LF} \)

4. INSTRUCTION

5. Key POS. ENDPOINT OF X-AXIS

5. Key 7 \( \text{CR/LF} \)
6. Read

INCREMENT IN X IS: .2333333
INCREMENT IN Y IS: .3688889

**

+++++++

----------

**

*   ****   *

**

*   +   *

*   +   *

*   ** + **

**

*   ****

*   +

*   +

*   +

*   +

*   *

**

*   +   *

**

*   *** ** *

*   +   **

*   +

*   +

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T-Plot

Title

Pmi.07-2200.01A-00FI-4-0  6/1/73
Number   Date
2200A-01, 2215, 2216/2217

Program Abstract

Plots a set of (X, Y) data points on a set of coordinate axes.

<table>
<thead>
<tr>
<th>Block</th>
<th>Save &quot;Name&quot;</th>
<th>Bytes Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td></td>
<td>3188</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Plots a set of \((X, Y)\) data points on a set of coordinate axes. The user must supply the following information:

- \(X_1\) – the lower \(X\)-endpoint
- \(X_2\) – the upper \(X\)-endpoint
- \(\Delta X\) – the \(X\)-increment
- \(Y_1\) – the lower \(Y\)-endpoint
- \(Y_2\) – the upper \(Y\)-endpoint
- \(\Delta Y\) – the \(Y\)-increment
- \(N\) – the number of data points to be plotted

\(\left( X_1, Y_1, \ldots, X_N, Y_N \right)\) – the data points

The \(X\)-axis runs vertically. The \(Y\)-axis runs horizontally and may have no more than 60 steps in it.

For typewriter output, insert the following two statements in program.

\[
125 \text{SELECT PRINT 211; Fill hex \(0E\)}
\]

\[
465 \text{SELECT PRINT 005 (4)}
\]

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

Plot the following points:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>2.3</td>
</tr>
<tr>
<td>15</td>
<td>7.8</td>
</tr>
<tr>
<td>15</td>
<td>8.1</td>
</tr>
<tr>
<td>5.5</td>
<td>2.9</td>
</tr>
<tr>
<td>10</td>
<td>4.1</td>
</tr>
<tr>
<td>10</td>
<td>7.3</td>
</tr>
<tr>
<td>9</td>
<td>3.5</td>
</tr>
<tr>
<td>10</td>
<td>5.6</td>
</tr>
<tr>
<td>14</td>
<td>7.5</td>
</tr>
<tr>
<td>13</td>
<td>6.8</td>
</tr>
<tr>
<td>13</td>
<td>4.5</td>
</tr>
<tr>
<td>11</td>
<td>2.4</td>
</tr>
<tr>
<td>7</td>
<td>4.1</td>
</tr>
<tr>
<td>8</td>
<td>3.8</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

1. Key \texttt{RESET} \texttt{CLEAR} CR/LF
   \texttt{LOAD} CR/LF
2. Key \texttt{RUN} CR/LF
3. INSTRUCTION
4. Key \texttt{LOWER X-ENDPOINT} CR/LF
   \texttt{UPPER X-ENDPOINT} CR/LF
   \texttt{X-INCREMENT} CR/LF
5. INSTRUCTION
6. Key \texttt{LOWER Y-ENDPOINT} CR/LF
   \texttt{UPPER Y-ENDPOINT} CR/LF
   \texttt{Y-INCREMENT} CR/LF

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OPERATING INSTRUCTIONS (Cont)

7. **INSTRUCTION**

8. Key # of Points [CR/LF]

9. **INSTRUCTION**

10. Key $X_1 \cdot Y_1$ [CR/LF]
    
    Key $X_2 \cdot Y_2$ [CR/LF]
    
    ...  
    
    Key $X_N \cdot Y_N$ [CR/LF]

11. Read Output

**NO. OF POINTS TO BE PLOTTED?**

?  

8. Key 1 7 [CR/LF]

**ENTER POINTS**

10. Key 1 8 9 [CR/LF]
    
    Key 3 1 [CR/LF]
    
    ...  
    
    Key 1 2 4 [CR/LF]
PROGRAM ABSTRACT

Prints a histogram of a set of numbers.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td></td>
<td>2764</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Prints a histogram of a set of numbers. Allows up to 255 data points.

The interval size is input by the user. For the complete histogram to be displayed in its entirety, the user should input the interval in such a manner that the distance between the lowest and highest data point can be handled by 12 intervals.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

Create a histogram of the following (20) test results:

Scores

0, 1, 5, 4, 7, 8
5, 3, 12.67, 8, 4
13, 18.9, 6, 20, 12
16, 1, 2, 3

Interval size = 3

1. Key **RESET** **CLEAR** CR/LF

2. Key **RUN** CR/LF

3. **INSTRUCTION**

ENTER THE INTERVAL SIZE?

4. Key INTERVAL SIZE CR/LF

4. Key 3 CR/LF

ENTER THE TOTAL NUMBER OF ENTRIES

5. **INSTRUCTION**

6. Key NO. OF ENTRIES CR/LF

6. Key 2 0 CR/LF

A(1)?

Program will ask for entries, one at a time.

7. **INSTRUCTION**

8. Key ENTRY CR/LF

8. Key 0 CR/LF

9. Continue as above until all entries have been made.
10. Read

<table>
<thead>
<tr>
<th>ENTRIES</th>
<th>HISTOGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>*******</td>
</tr>
<tr>
<td>3</td>
<td>**********</td>
</tr>
<tr>
<td>6</td>
<td>******</td>
</tr>
<tr>
<td>9</td>
<td>*</td>
</tr>
<tr>
<td>12</td>
<td>***</td>
</tr>
<tr>
<td>15</td>
<td>*</td>
</tr>
<tr>
<td>18</td>
<td>**</td>
</tr>
</tbody>
</table>
WANG
2200
SERIES
PROGRAM

UTILITY

TITLE

PMi.07-2200.01A-00FI-6-0 6/1/73
NUMBER
2200A-01, 2215, 2216/2217
DATE
EQUIPMENT

PROGRAM ABSTRACT

Program contains 6 subroutines for the user.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td></td>
<td>1467</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

This program is made up of 6 subroutines to do:

- Sort numeric arrays
- Sort alpha-numeric arrays
- Pack numeric arrays
- Unpack numeric arrays

These subroutines must be used as a part of a main program written by the user. All numeric arrays are X( ) and the alpha array is A$( ), N is the number of items in the array, and C is a value 1 or 0 denoting Hi to Lo or Lo to Hi.

There are two sets of pack and unpack subroutines. The first set will handle positive integers of 6 digits. The second set uses the natural log and exponentiation. Accuracy is lost when you use the last set.

To use these subroutines, the user must "call" them by using the GOSUB' verb.
## GAMES

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>PROGRAM TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>ARTILLERY</td>
</tr>
<tr>
<td>30</td>
<td>CRAPS</td>
</tr>
<tr>
<td>31</td>
<td>TIC-TAC-TOE</td>
</tr>
<tr>
<td>32</td>
<td>ONE ARMED BANDIT</td>
</tr>
<tr>
<td>33</td>
<td>BLACKJACK</td>
</tr>
</tbody>
</table>
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WANG 2200 SERIES PROGRAM

ARTILLERY

TITLE

PMI.04-2200.01A-00FI-1-0  6/1/73
NUMBER   DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Game to determine your rank in the army artillery.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td></td>
<td>1653</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Pretend you are in the artillery branch of the army and are about to take a test to determine your rank. This rank will be based on how many times you must fire your gun to zero in on and destroy a one foot target which has been placed at any distance in miles that you specify. You will be asked to enter the following information:

\[ D = \text{distance in miles that you want the target placed} \]
\[ A = \text{angle in degrees of your gun barrel} \]
\[ V = \text{velocity in ft/sec. of the projectile} \]

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET** **CLEAR** **CR/LF**
   **LOAD** **CR/LF**

2. Key **RUN** **CR/LF**

3. **INSTRUCTION**
   **ENTER DISTANCE, ANGLE, VELOCITY**

4. Key **DISTANCE** **ANGLE** **VELOCITY** **CR/LF**

5. Read

   Various remarks will be displayed, depending upon your accuracy of firing. The over or under shot distance will be displayed.

6. **INSTRUCTION**
   **YOUR NEW ANGLE AND VELOCITY ARE?**

7. Key **ANGLE** **VELOCITY** **CR/LF**

   The cycle will repeat itself until you either blow yourself up or destroy the target. Afterwards go to Step 8.

8. **INSTRUCTION**
   **DO YOU WISH TO PLAY AGAIN?**
   1 = YES, 0 = NO

9. Key 1 or 0 **CR/LF**

10. If you keyed 1, go to Step 3.
    Otherwise, program ends.

EXAMPLE

Determine your rank in the army artillery.
This page intentionally left blank
CRAPS

TITLE

P.04-2200.01A-00FI-2-0  6/1/73
NUMBER  DATE
2200A-01, 2215, 2216/2217  EQUIPMENT

PROGRAM ABSTRACT

Simulates the game of craps.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
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<td>941</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Simulates the game of craps.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET** **CLEAR** **CR/LF**
   **LOAD** **CR/LF**

2. Key **RUN** **CR/LF**

3. **INSTRUCTION**

   ***CRAPS***

   **RULES:**
   1. **IF 7 OR 11 ROLLED ON FIRST ROLL, YOU WIN.**
   2. **IF 2, 3, or 12 ROLLED ON FIRST ROLL, YOU LOSE.**
   3. **IF ANOTHER NUMBER ROLLED, THIS NUMBER IS YOUR 'POINT'. KEEP ROLLING UNTIL YOUR 'POINT' TURNS UP (YOU WIN) OR A 7 IS ROLLED (YOU LOSE).**
   4. **HOUSE LIMIT: $1000.**

4. **INSTRUCTION**

5. Key **BET** **CR/LF**

6. Read

   The program will go to Step 4. If you do not wish to play any more, key **RESET** and go to the next program of interest.
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WANG
2200
SERIES
PROGRAM

TIC-TAC-TOE

TITLE

PMi.04-2200.01A-00F1-3-0  6/1/73
NUMBER
2200A-01, 2215, 2216/2217
EQUIPMENT

DATE

PROGRAM ABSTRACT

Plays Tic-Tac-Toe with user.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td>1141</td>
</tr>
</tbody>
</table>

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Printed in U.S.A.
PROGRAM DESCRIPTION

Plays Tic-Tac-Toe with user.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET** **CLEAR** **CR/LF**
   **LOAD** **CR/LF**

2. Key **RUN** **CR/LF**

3. INSTRUCTION

   ***TIC-TAC-TOE***
   MACHINE MOVES DESIGNATED BY '0',
   YOUR MOVES DESIGNATED BY '11',
   AVAILABLE SPACES DESIGNATED BY A
   DIGIT FROM 1-9. THE MACHINE MOVES
   FIRST. TO ENTER YOUR MOVE, TYPE
   THE DIGIT OF THE SPACE YOU WISH TO
   OCCUPY FOLLOWED BY A CARRIAGE
   RETURN.

   1  2  3
   8  0  4
   7  6  5

4. INSTRUCTION

5. Key **YOUR MOVE** **CR/LF**

   "Computer" will make his move and display the board. It will then go
   to Step 4. Game continues until there is a winner or a draw. Then
   proceed with Step 6.

6. INSTRUCTION

7. TO PLAY AGAIN
   Key 1 **CR/LF**
   Go to Step 4
   Otherwise
   Key 0 **CR/LF**

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ONE ARMED BANDIT

PMi.04-2200.01A-00FI-4-0  6/1/73
NUMBER  DATE
2200A-01, 2215, 2216/2217  EQUIPMENT

PROGRAM ABSTRACT

Simulates a "one-armed-bandit" machine.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td></td>
<td>2404</td>
</tr>
</tbody>
</table>
PROGRAM DESCRIPTION

Simulates a "One-Armed-Bandit" machine.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

Try your luck with the "One-Armed Bandit"

1. Key **RESET** **CLEAR** **CR/LF**
   **LOAD** **CR/LF**
2. Key **RUN** **CR/LF**
3. **INSTRUCTION**

***ONE-ARMED BANDIT***

EACH PLAY YOU CAN PUT ANY AMOUNT OF SILVER DOLLARS INTO THE MACHINE UP TO THE BALANCE YOU HAVE BY TYPING IN THE QUANTITY OF DOLLARS.

YOU 'PULL DOWN THE HANDLE' BY DEPRESSING THE RETURN KEY.

WHEN YOUR BALANCE REACHES ZERO, THE GAME IS OVER... OR ENTER '0' TO QUIT ANY TIME. GOOD LUCK...

YOUR STARTING BALANCE IS $37.

HOW MANY DOLLARS DO YOU WANT TO PUT IN ON YOUR 1ST PLAY?

Your beginning balance is randomly determined.

4. Key **DOLLARS YOU WISH TO PLAY** **CR/LF**

   CRT will display, the arrangement (final) of the "fruit", your winning or loss, and balance.

5. Read

6. **INSTRUCTION** **AMOUNT**?

7. Go to Step 4.
This page intentionally left blank
WANG
2200
SERIES
PROGRAM

BLACK JACK

TITLE

PMi. 04-2200.01A-00F1-5-0  6/1/73
NUMBER  DATE
2200A-01, 2215, 2216/2217
EQUIPMENT

PROGRAM ABSTRACT

Simulates the game of "blackjack".

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td></td>
<td>1867</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Program will simulate the game of "Black Jack". The calculator is the dealer.

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

1. Key **RESET** **CLEAR** **CR/LF**
   **LOAD** **CR/LF**

2. Key **RUN** **CR/LF**

3. **INSTRUCTION**
   ***BLACKJACK***

4. **INSTRUCTION**
   YOUR BET IS?

5. Key **BET** **CR/LF**

6. **INSTRUCTION**
   YOUR CARDS ARE: DEALER SHOWS:

   If one of your cards is an ACE, you will be asked if it is one or
   eleven. Otherwise, go to Step 9.

7. **INSTRUCTION**
   IS YOUR ACE 1 OR 11?

8. Key 1 or 1 **CR/LF**

9. **INSTRUCTION**
   YOU NOW HAVE
   DO YOU WANT A HIT (1=YES, 2=NO)?

10. Key 1 or 2 **CR/LF**
    If you keyed 2 go to Step 4.

11. **INSTRUCTION**
    YOUR CARD IS
    YOU NOW HAVE

    Program will continue until you "bust" or answer no to a "hit".
    Then the results will be displayed and continue with Step 4.
<table>
<thead>
<tr>
<th>BLOCK</th>
<th>PROGRAM TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>MASS OF NITROGEN IN CONTAINMENT SYSTEM</td>
</tr>
<tr>
<td>35</td>
<td>PERCENT ABSORPTION TO CONCENTRATION</td>
</tr>
</tbody>
</table>
MASS OF NITROGEN IN CONTAINMENT SYSTEM

PROGRAM ABSTRACT

This program calculates the mass of nitrogen in the reactor containment system on a periodic basis to provide a measure of the leakage rate.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td></td>
<td>616</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

This program (adapted from a program written by W. Wold, District Manager, San Rafael) calculates the mass of nitrogen (used as an inert fill gas) in the reactor containment system on a periodic basis to provide a measure of the leakage rate. There are 4 drybulb temp. sensors, 2 dewpoint sensors, a manometer for gauge pressure, and a barometer for atmospheric pressure. Mass of nitrogen is calculated by the perfect gas law.

\[
\begin{align*}
P_1 & = \text{Barometric Pressure (In. Hg)} \\
P_2 & = \text{Containment Pressure (In. Water)} \\
T_1, T_2 & = \text{Dewpt. Sensors (Deg. F)} \\
S_1, S_2, S_3, S_4 & = \text{Drybulb Sensors (Deg. F)} \\
M & = \text{Mass of Nitrogen (Lb)} \\
PW & = \text{Partial pressure of water vapor in containment based on TA} \\
TA & = \text{Average dewpoint} \\
PN & = \text{Partial pressure of N in containment} \\
SA & = \text{Average Abs. drybulb temperature} \\
PT & = \text{Containment pressure (PSIA)} \\
PT & = 0.49116*P_1 + 0.036127*P_2 \\
PN & = PT - PW \\
SA & = 459.6 + \left( S_1 + S_2 + S_3 + S_4 \right) / 4 \\
M & = 32637*PN/SA
\end{align*}
\]

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
EXAMPLE

Find the mass of Nitrogen given:

Barometric pressure (In. Hg) = 29.87
Containment pressure (In. H₂O) = 24.19
Dewpoint (Deg F)
Sensor T1 = 85.2
Sensor T2 = 89.3
Drybulb Sensors (Deg F)
Sensor S1 = 139
Sensor S2 = 85
Sensor S3 = 124.5
Sensor S4 = 89.5

Partial pressure of water vapor based on dewpoint of 87.25°F = .64.

1. Key **RESET** **CLEAR** **CR/LF**
   **LOAD** **CR/LF**
2. Key **RUN** **CR/LF**
3. **INSTRUCTION**
4. Key **BAROMETRIC PRESSURE**
   **CR/LF**
5. **INSTRUCTION**
6. Key **CONTAINMENT PRESSURE**
   **CR/LF**
7. **INSTRUCTION**
8. Key **T1** - **T2** **CR/LF**
9. **INSTRUCTION**
10. Key S1 S2 S3 S4 CR/LF

10. Key 1 3 9 8 5 1 2 4 5 CR/LF

11. INSTRUCTION

PARTIAL PRESSURE OF WATER VAPOR
BASED ON DEWPOINT OF 87.25* DEG. F?

The value of 87.25 is a calculated value and will change with different T1 and T2 values.

12. Key PARTIAL PRESSURE CR/LF

12. Key 6 4 CR/LF

13. Read

MASS OF N = 854.7706189197 LB.

END PROGRAM
PERCENT ABSORPTION TO CONCENTRATION

TITLE

PS.05-2200.01A-00F1-2-0 6/1/73
NUMBER DATE
2200A-01, 2215, 2216/2217

EQUIPMENT

PROGRAM ABSTRACT

Computes the concentration of unknowns given the percent absorption read from an atomic absorption spectrophotometer.

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>SAVE &quot;NAME&quot;</th>
<th>BYTES REQUIRED</th>
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</thead>
<tbody>
<tr>
<td>35</td>
<td></td>
<td>502</td>
</tr>
</tbody>
</table>

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PROGRAM DESCRIPTION

Computes the concentration of unknowns given the percent absorption read from an atomic absorption spectrophotometer. Two known samples (standards) are to use only one standard, the second standard may arbitrarily be assigned coordinates of 0 concentration, 0 percent absorption.

NOTE: adapted from a program written by E. R. McGough, Kermac Potash Co.

\[ C = (C_2 - C_1) \left( \frac{\log \frac{100 - A_1}{100 - A}}{\log \frac{100 - A_1}{100 - A_2}} \right) + C_1 \]

where:

- \( C \) = concentration (unknown)
- \( C_1 \) = concentration (low standard)
- \( C_2 \) = concentration (high standard)
- \( A_1 \) = percentage (low standard)
- \( A_2 \) = percentage (high standard)
- \( A \) = percentage (unknown)

NOTE

Many operating instructions are presented via the CRT (display) or one of the output devices. When such instructions occur the word INSTRUCTION will appear on the left hand side of the operating instructions and what is displayed or typed will appear on the right hand side.
OPERATING INSTRUCTIONS

EXAMPLE

Determine the concentration, given the following data:

<table>
<thead>
<tr>
<th>CONCENTRATION</th>
<th>LOW STD.</th>
<th>HIGH STD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERCENTAGE</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

Percentage (unknown) = 6.051797415

1. Key \textbf{RESET} \textbf{CLEAR} \textbf{CR/LF}
   \textbf{LOAD} \textbf{CR/LF}
2. Key \textbf{RUN} \textbf{CR/LF}
3. \textbf{INSTRUCTION}
4. Key \textbf{CONCENTRATION (LOW)} \textbf{CR/LF}
5. \textbf{INSTRUCTION}
6. Key \textbf{CONCENTRATION (HIGH)} \textbf{CR/LF}
7. \textbf{INSTRUCTION}
8. Key \textbf{PERCENTAGE (LOW)} \textbf{CR/LF}
9. \textbf{INSTRUCTION}
10. Key \textbf{PERCENTAGE (HIGH)} \textbf{CR/LF}
11. \textbf{INSTRUCTION}
12. Key \textbf{PERCENTAGE (UNKNOWN)} \textbf{CR/LF}
13. \textbf{INSTRUCTION}
14. \textbf{INSTRUCTION}

If you have more unknowns, go to Step 12. Otherwise Key 0 \textbf{CR/LF}.

Program ends.

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