BASIC Simulation Programs; Volumes V and VI. Social Studies, Teacher Assistance.


National Science Foundation, Washington, D.C.

31 Jan 71

69p.; Developed by the Huntington Computer Project

Digital Equipment Corporation, Educational Marketing (5-2), 146 Main Street, Maynard, Massachusetts 01754 ($3.00)

EDRS Price MF-$0.65 HC Not Available from EDRS.


Five computer programs which teach concepts and processes related to social studies (in the main, economics) are presented. The subjects of the programs are the distinction between balance of trade and balance of payments; installment buying, loan payments, and savings accounts; flow of goods, services, and money between business and the consumer; economic depression and equilibrium; and the stock market. For each lesson the objectives, necessary preliminary preparation, knowledge prerequisites, ways to use the problem, the computer program, and a sample printout are provided. The programs are suitable for use at the high school level. The volume also contains several programs to help the teacher compute and analyze students' grades. These programs average grades, print frequency distributions, and analyze the items missed most frequently. All programs are written in the language BASIC. (JK)
Basic Simulation Programs Volumes V & VI

Social Studies Teacher Assistance

computers are for kids  digital  EduSystems—expandable, economical
HUNTINGTON COMPUTER PROJECT

A TEACHER'S MANUAL
(COMPUTER - RELATED MATERIALS)

Second Edition

January 31, 1971

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Developed by the Huntington Computer Project during the period May, 1968 and September, 1970. This effort was supported by the National Science Foundation under Grant No. J000079.
The enclosed material is a compilation of computer programs developed during the period May, 1968 to September, 1970. These programs were developed by teachers and students in the high schools which participated with us, and by the Project staff.

All of the enclosed programs have been tested on a Digital Equipment Corporation TSS-8 time-shared computer during the summer of 1970. To the best of our ability, we have assured ourselves that the programs actually run. It should be pointed out, however, that we were not able to make an exhaustive exploration of the programs. There may be undiscovered bugs (if there aren't, it may be the first time in the history of computing). We would appreciate hearing of any which emerge in the future.

These programs run in the version of BASIC which existed on the TSS-8 in August, 1970, and should run on most other versions of BASIC. The major potential problem on other machines is the output format (DEC uses 14 columns per print zone, while some other manufacturers use 15; we used the TAB function, which doesn't exist in all BASIC compiles). It may be necessary to make some minor changes in programs to adjust this format. Another possible problem is in the use of the RANDOMIZE command in some programs to start the random-number generator at a random point. If this command is not available, some other means should be devised for randomizing the start.

It is our sincere hope that these programs and their supporting documentation will be helpful to educators who are exploring the uses of computers in education.

We are anxious to hear of any bugs, errors, or improvements in these programs, and are especially anxious to hear of any novel ways of using them.

Ludwig Braun
Marian Visich, Jr.
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Experiment simulation showing the active and passive transport of materials across a membrane.

**NZYM2**
Simulated experiment - Degree of enzyme reactivity varies as environmental conditions are changed.

**NZYM2**
Simulated experiment - Degree of enzyme reactivity varies as environmental conditions are changed.

**PHOSYN**
Simulated experiment - Degree of enzyme reactivity varies as environmental conditions are changed.

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**PI2**
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- Plots the graph of any function.

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- Finds prime factors.

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- Solves for the unknown in a proportion.

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- Finds the real roots of the quadratic equation \( ax^2 + bx + c = 0 \).

**SETS**
- Finds the union and intersection of any two numerical sets.
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<th>Page</th>
</tr>
</thead>
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PHYSICS (con't)

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PRJTL
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Least time principle of light is presented as a challenge involving a game analogy. (Light and Waves)

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VLOCTY
Demonstrates that average velocity (ΔD/ΔT) approaches a limiting value as ΔT→0. A graph of ΔD vs. T is plotted for an acceleration of 1 meter/sec². (Mechanics)

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A simulation of economic depression and equilibrium as effects of consumption.

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Simulates the stock market.
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TEACHER ASSISTANCE

AVERG1
Averages grades, lists value of curve, and adjusts grades.

AVERG2
Sorts and averages grades.

FREQ
Prints a frequency distribution (bar graph) of grades.

GRADE
Prints a table of grades (in percentages), number of questions missed, and number of questions answered correctly.

ITEM1
Counts and prints number of times questions are missed.

ITEM2
Sums item analysis.

STAT
A statistical analysis of laboratory data. (For teachers' use)

STATAL
Calculates the arithmetic mean (average) of a set of numbers.
DESCRIPTION:

This program demonstrates the distinction between "balance of trade" and "balance of payments." Also shown are the components that make up the "balance of payments" account, and their individual impacts.

OBJECTIVES:

A. To emphasize the important distinction between "Balance of Trade," and "Balance of Payments."

B. To demonstrate the impact of any specific foreign expenditure on our "Balance of Payments."

PRELIMINARY PREPARATION:

A. Student must obtain data for components of balance of payments for a given year and country.

B. Discussion of the concepts "balance of trade" and "balance of payments", would be helpful but are not necessary.

DISCUSSION:

A. Student level - average

B. Curriculum location - advanced economics: Unit on U. S. Economy in the world.

C. This program may be used either as a group exercise, or for individual study.
THERE'S A DISTINCTION BETWEEN TRADE BALANCE AND BALANCE OF PAYMENTS.

TRADE BALANCE = EXPORTS - IMPORTS.

BALANCE OF PAYMENTS = ALL OVERSEAS EXCHANGES + ALL OVERSEAS EXPENDITURES.

WHEN INFORMATION IS REQUESTED, INPUT VALUES IN MILLIONS OF DOLLARS (E.G. 6 = 6 MILLION DOLLARS)

A. INPUT A FIGURE FIRST FOR ALL MILITARY AID, THEN FOR ALL OTHER AID TO OTHER NATIONS.
   12,13

B. INPUT A FIGURE FIRST FOR EXPORTS, THEN FOR IMPORTS.
   256,23

C. INPUT A FIGURE FIRST FOR FOREIGNERS TRAVELING IN YOUR COUNTRY, THEN FOR YOUR COUNTRYMEN TRAVELING ABROAD.
   254,6-56

D. INPUT A FIGURE FIRST FOR INCOME FROM FOREIGN INVESTMENTS, THEN FOR FOREIGN INVESTMENT ITSELF.
   259,21

A. FOREIGN AID = 25
B. BALANCE OF TRADE = 233
C. TRAVEL BALANCE = 198
D. INVESTMENT BALANCE = 238

BALANCE OF PAYMENTS = 644

(REMEMBER, IF A MINUS FIGURE APPEARS ABOVE, YOUR COUNTRY HAS A DEFICIT IN ITS BALANCE OF PAYMENTS)

HOPE YOU UNDERSTAND THE DISTINCTION BETWEEN THE BALANCE OF TRADE AND THE BALANCE OF PAYMENTS BETTER NOW.

READY
THERE'S A DISTINCTION BETWEEN TRADE BALANCE AND BALANCE OF PAYMENTS.

TRADE BALANCE = EXPORTS - IMPORTS.

BALANCE OF PAYMENTS = ALL OVERSEAS EXCHANGES + ALL OVERSEAS EXPENDITURES.

WHEN INFORMATION IS REQUESTED, INPUT VALUES IN MILLIONS OF DOLLARS (E.G. 6 = 6 MILLION DOLLARS)

INPUT A FIGURE FIRST FOR MILITARY AID, THEN FOR ALL OTHER AID TO OTHER NATIONS.

INPUT A FIGURE FIRST FOR EXPORTS, THEN FOR IMPORTS.

INPUT A FIGURE FIRST FOR FOREIGNERS TRAVELING IN YOUR COUNTRY, THEN FOR YOUR COUNTRYMEN TRAVELING ABROAD.

INPUT A FIGURE FIRST FOR INCOME FROM FOREIGN INVESTMENTS, THEN FOR FOREIGN INVESTMENT ITSELF.

BALANCE OF PAYMENTS = FOREIGN AID + BALANCE OF TRADE + TRAVEL BALANCE + INVESTMENT BALANCE.

MEMBER, IF A MINUS FIGURE APPEARS ABOVE, YOUR COUNTRY HAS A DEFICIT IN ITS BALANCE OF PAYMENTS.

HOPE YOU UNDERSTAND THE DISTINCTION BETWEEN THE BALANCE OF TRADE AND THE BALANCE OF PAYMENTS BETTER NOW.
DESCRIPTION:

This program solves financial problems concerning installment buying, long-term loans, and savings accounts. The program gives you a choice of these three types of problems, and asks for the information needed to do said problems.

OBJECTIVES:

A. This program aids students in learning the terms used in certain financial problems.

B. Student will hopefully be motivated to learn the mathematical logic behind the solution of these problems.

PRELIMINARY PREPARATION:

A. Student - A review of decimals and fractions would be helpful.

B. Materials - A terminal, and a means by which to display the output to an entire class (e.g. overhead projector, closed circuit TV, etc.)

DISCUSSION:

A type of problem may be demonstrated through the use of the computer, then the mathematical logic behind the solution of the problem may be developed through the use of a flow chart similar to the one that follows. Terminology may be taught when the computer asks for input (see sample run).

Since the execution time of one run is extremely short, many more problems may be demonstrated. Depending upon the ability of the class or student, a variety of relationships may be discovered.
FINANCIAL PROBLEMS

THIS PROGRAM SOLVES THREE TYPES OF PROBLEMS:

1. INTEREST ON INSTALLMENT BUYING
2. PAYMENTS ON LONG TERM LOAN
3. BALANCE OF A SAVINGS ACCOUNT

WHICH PROBLEM WOULD YOU LIKE TO WORK WITH (TYPE 1, 2 OR 3)?

*****

THIS SECTION WILL DETERMINE THE ACTUAL INTEREST YOU PAY
WHEN YOU PURCHASE SOMETHING ON CREDIT.

WHAT IS THE CASH PRICE OF THE ARTICLE ($)?: 88.99
DOWN PAYMENT ($)?: 10
NUMBER OF PAYMENTS EXCLUDING THE DOWN PAYMENT?: 18
NUMBER OF PAYMENTS PER MONTH?: 1
AMOUNT PER PAYMENT ($)?: 4.65

THE RATE OF INTEREST CHARGED WAS 5.69 PERCENT.

*****

WOULD YOU LIKE TO RUN THE PROGRAM AGAIN (1-YES, 0-NO)?

WHICH PROBLEM WOULD YOU LIKE TO WORK WITH (TYPE 1, 2 OR 3)?

*****

THIS SECTION WILL DETERMINE PAYMENTS FOR A LONG TERM LOAN.

WHAT IS THE AMOUNT BORROWED ($)?: 3000
INTEREST CHARGED (%)?: 8
INTEREST DUE ON PAYMENTS (MONTHLY): 1
TERM OF THE LOAN (YEARS): 8

DO YOU WISH TO SEE THE TOTALS ONLY - INSTEAD OF THE ENTIRE TABLE - (1-YES, 0-NO)?

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>OUTSTANDING PRINCIPAL AT BEGINNING</th>
<th>INTEREST DUE AT END OF PERIOD</th>
<th>PRINCIPAL REPAID AT END OF PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3000</td>
<td>20</td>
<td>115.68</td>
</tr>
<tr>
<td>2</td>
<td>2886.32</td>
<td>19.23</td>
<td>116.45</td>
</tr>
<tr>
<td>3</td>
<td>2767.87</td>
<td>19.45</td>
<td>117.23</td>
</tr>
<tr>
<td>4</td>
<td>2650.64</td>
<td>17.67</td>
<td>118.01</td>
</tr>
<tr>
<td>5</td>
<td>2533.63</td>
<td>16.88</td>
<td>118.8</td>
</tr>
<tr>
<td>6</td>
<td>2413.83</td>
<td>16.09</td>
<td>119.59</td>
</tr>
<tr>
<td>7</td>
<td>2294.84</td>
<td>15.29</td>
<td>120.39</td>
</tr>
<tr>
<td>8</td>
<td>2173.85</td>
<td>14.49</td>
<td>121.19</td>
</tr>
<tr>
<td>9</td>
<td>2052.66</td>
<td>13.68</td>
<td>122.0</td>
</tr>
<tr>
<td>10</td>
<td>1930.66</td>
<td>12.87</td>
<td>122.81</td>
</tr>
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<td>11</td>
<td>1807.85</td>
<td>12.05</td>
<td>123.63</td>
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<td>12</td>
<td>1684.82</td>
<td>11.23</td>
<td>124.45</td>
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<tr>
<td>13</td>
<td>1529.77</td>
<td>10.4</td>
<td>125.28</td>
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<tr>
<td>14</td>
<td>1343.49</td>
<td>9.55</td>
<td>126.12</td>
</tr>
<tr>
<td>15</td>
<td>1303.37</td>
<td>8.72</td>
<td>126.96</td>
</tr>
<tr>
<td>16</td>
<td>1181.41</td>
<td>7.88</td>
<td>127.8</td>
</tr>
<tr>
<td>17</td>
<td>1053.61</td>
<td>7.03</td>
<td>128.66</td>
</tr>
<tr>
<td>18</td>
<td>924.95</td>
<td>6.17</td>
<td>129.51</td>
</tr>
<tr>
<td>19</td>
<td>795.44</td>
<td>5.2</td>
<td>130.38</td>
</tr>
<tr>
<td>20</td>
<td>665.06</td>
<td>4.43</td>
<td>131.25</td>
</tr>
<tr>
<td>21</td>
<td>533.81</td>
<td>3.55</td>
<td>132.12</td>
</tr>
<tr>
<td>22</td>
<td>401.69</td>
<td>2.68</td>
<td>133</td>
</tr>
<tr>
<td>23</td>
<td>268.69</td>
<td>1.79</td>
<td>134.89</td>
</tr>
<tr>
<td>24</td>
<td>134.6</td>
<td>1</td>
<td>134.78</td>
</tr>
<tr>
<td>TOTALS</td>
<td></td>
<td>256.34</td>
<td>3000</td>
</tr>
</tbody>
</table>

YOUR MONTHLY PAYMENT IS $ 135.68 AND TOTALS $ 3256.34
WOULD YOU LIKE TO RUN THE PROGRAM AGAIN (1-YES, 0-NO)? 1
WHICH PROBLEM WOULD YOU LIKE TO WORK WITH (TYPE 1, 2 OR 3)? 3

THIS SECTION CALCULATES THE BALANCE OF A SAVINGS ACCOUNT IN WHICH DEPOSITS ARE MADE REGULARLY.

WHAT IS THE AMOUNT DEPOSITED PER INTEREST PERIOD ($)? 10000
HOW OFTEN IS THE INTEREST COMPOUNDED (MONTHS)? 3
WHAT IS THE RATE OF INTEREST PAID (%)? 5
FOR HOW LONG WILL YOU DEPOSIT MONEY (YEARS)? 5

THE BALANCE OF YOUR ACCOUNT AFTER 5 YEARS WILL BE $ 208500

WOULD YOU LIKE TO RUN THE PROGRAM AGAIN (1-YES, 0-NO)? 0

READY
100 REM FINANCIAL PROBLEMS  A. WEBB 10/67
101 REM REVISED 8/25/70 (D. PESSEL)
110 PRINT "FINANCIAL PROBLEMS"
115 REM REVISED BY W. TEPPER, WYANDANCH H.S. 7/10/69
120 PRINT
130 PRINT "THIS PROGRAM SOLVES THREE TYPES OF PROBLEMS!"
132 PRINT
134 PRINT "(1) INTEREST ON INSTALLMENT BUYING"
136 PRINT "(2) PAYMENTS ON LONG TERM LOAN"
138 PRINT "(3) BALANCE OF A SAVINGS ACCOUNT"
140 PRINT
141 PRINT "WHICH PROBLEM WOULD YOU LIKE TO WORK WITH (TYPE 1, 2 OR 3)?"
142 PRINT
143 PRINT "*****"
144 INPUT Q1
146 PRINT
147 PRINT "*****"
150 IF Q1 > 2 THEN 820
155 IF Q1 > 1 THEN 260
160 GO TO 590

250 PRINT "THIS SECTION WILL DETERMINE PAYMENTS FOR A LONG TERM LOAN."
270 PRINT
280 PRINT "WHAT IS THE AMOUNT BORROWED ($)";1
281 INPUT A
285 PRINT "INTEREST CHARGED (%)";1
286 INPUT I
290 PRINT "INTERVAL BETWEEN PAYMENTS (MONTHS)";1
291 INPUT P
295 PRINT "TERM OF THE LOAN (YEARS)";1
296 INPUT Y
298 PRINT
300 PRINT "DO YOU WISH TO SEE THE TOTALS ONLY - INSTEAD OF THE ENTIRE"
361 PRINT "TABLE - (1-YES, 0-NO)"
362 INPUT P5
365 PRINT
370 IF P5 > 0 THEN 430
375 PRINT "OUTSTANDING"
380 PRINT "PRINCIPAL AT"
390 PRINT "BEGINNING" "INTEREST DUE AT" "PRINCIPAL AT"
400 PRINT "END OF PERIOD" "END OF PERIOD"
410 PRINT
420 PRINT
430 LET Z=(Y*12)/P
440 LET K=(1+(P/12))/100
443 LET EM=(1-(1/((1+K)^(12)))*12)
446 LET E=INT(E*100+.5)/100
450 LET C=A
460 LET P=0
461 LET D=0
470 LET TI=0
480 LET TI=TI+1
490 IF TI > Z THEN 554
500 LET B=TI
510 LET C=C-P
520 LET D=1-1
522 LET F=E-D
525 LET C=INT(C*100+.5)/100
530 LET D=INT(D*100+.5)/100
535 LET F=INT(F*100+.5)/100
541 LET D=DI+D
546 IF P5 > 0 THEN 480
550 PRINT B,JTAB(11),C,JTAB(29),D,JTAB(48)
GO TO 480

IF P5<1 THEN 561
PRINT
LET D1=INT(D1*100+.5)/100
PRINT"TOTAL INTEREST PAID = $"D1
PRINT"TOTAL PRINCIPAL REPAID = $"A
GO TO 565
PRINT
PRINT"TOTALS":TAB(29)JDIJTAB(48)JA
LET E5=INT((D1+A)*100+.5)/100
PRINT
LET E6=E5/CCY*12)/p)
LET E6=INTC100*E64..5)/100
PRINT "YOUR MONTHLY PAYMENT = $E6" AND TOTALS = $E5
GO.TO 1060
PRINT"THIS SECTION WILL DETERMINE THE ACTUAL INTEREST YOU PAY"
PRINT"WHEN YOU PURCHASE SOMETHING ON CREDIT."

WHAT IS THE CASH PRICE OF THE ARTICLE (S)"
INPUT C
PRINT"DOWN PAYMENT (S)"
INPUT-D
NUMBER OF PAYMENTS EXCLUDING THE DOWN PAYMENT"
INPUT-N
NUMBER OF PAYMENTS PER MONTH"
INPUT S
AMOUNT PER PAYMENT (S)"
PRINT
INPUT R
LET B*R*N+D
LET ImB..0
LET M*N/(S*12)
LET T*I*100/(8 *M)
PRINT
LET T=INT(100*T+.5)/100
PRINT "THE RATE OF INTEREST CHARGED WAS"T" PERCENT."
GO TO 1060
THE BALANCE OF YOUR ACCOUNT AFTER "T"YEARS WILL BE $F
PRINT
*****
WOULB YOU LIKE TO RUN THE PROGRAM AGAIN (1-YES, 0-NO)
INPUT Q4
IF Q4<>0 THEN 148
END

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DESCRIPTION:

Simulation of the circular flow of goods, services, and money, between business and the consumer in a free enterprise economy without government control.

OBJECTIVES:

A. To explore the effect of personal consumption upon business' demand for productive services from the individual, and upon personal income.

B. To demonstrate that widespread uninvested savings can cause a general drop in income.

C. To demonstrate how credit buying can raise personal income, in general.

PRELIMINARY PREPARATION:

A. Student

1. Terms to define:
   a. propensity to consume
   b. savings
   c. credit
   d. circular flow of goods, services, and money

2. Concepts for explanation or discussion:

   Payment for goods and services

   Payment for productive services: rent, wages, dividends, interest

   CONSUMER

   Productive services

   Goods and services

   BUSINESS

   CIRCULAR FLOW
DISCUSSION:

A. Operational Suggestions
   1. Student level - average to above average ability
   2. Placement in curriculum - Unit: Economic growth and stability
   3. Group size - may be used individually, with small groups, or as a teacher demonstration.

B. Follow-up
   Suggested classroom activities:
   1. Use the circular flow chart to illustrate one or more of the program "run-offs".
   2. Discuss the lack of aggregate demand as a cause for recession; and the rise in aggregate demand as a cause for growth or inflation.
THE FOLLOWING WILL SIMULATE THE EFFECT ON THE CIRCULAR FLOW OF GOODS, SERVICES AND MONEY WHEN ALL THE INDIVIDUALS IN THE ECONOMY SPEND ALL THEIR INCOME. IF THE AVERAGE INCOME IS $2,500 AND EVERY INDIVIDUAL SPENDS 100 PERCENT OF IT, EACH INCOME WILL BE IN EQUILIBRIUM--THEY WILL EARN BACK FROM BUSINESS $2500.

THE FOLLOWING WILL BE A COMPUTATION OF THE VALUES IN THE CIRCULAR FLOW:

AVERAGE INCOME = 2500

PROPENSITY TO CONSUME IS 100 PERCENT

INDIVIDUAL'S PAYMENTS FOR GOODS AND SERVICES = 2500

THE VALUE OF GOODS AND SERVICES = 2500

THE PERCENT OF PRODUCTIVE SERVICES BUSINESS WANTS IS 100 PERCENT.

THE RETURN INCOME TO INDIVIDUAL = 2500.

THE ABOVE REPRESENTS THE AVERAGE OF ALL INDIVIDUAL INCOMES IN THE ECONOMY. SINCE ALL INDIVIDUALS CONSUMED 100 PERCENT OF THEIR INCOME, THEIR RETURN INCOME IS 100 PERCENT OF THEIR PREVIOUS INCOME. THIS HAPPENS BECAUSE BUSINESS NEEDS 100 PERCENT OF THE PREVIOUS PRODUCTIVE SERVICES TO MEET THE DEMAND.

THE RETURN INCOME TO THE INDIVIDUAL FROM BUSINESS DEPENDS TO A LARGE EXTENT ON HOW MUCH ALL INDIVIDUALS SPEND (THEIR PROPENSITY TO CONSUME). COMMON SENSE TELLS US THAT IF AN INDIVIDUAL SAVES PART OF HIS INCOME AND INVESTS IT IN A BANK, HE WILL RAISE HIS INCOME BY MEANS OF THE INTEREST ON HIS SAVINGS. BUT IF ALL OR MANY OF THE INDIVIDUAL CONSUMERS IN THE ECONOMY CUT THEIR CONSUMPTION, THEN THE OVERALL RETURN INCOME TO THOSE INDIVIDUALS WILL PROBABLY DROP.

BY CHANGING THE PERCENTAGE OF YOUR PROPENSITY TO CONSUME YOU CAN CHANGE YOUR INCOME.

A PROPENSITY TO CONSUME OF 100 PERCENT WILL, IN THIS SIMULATION, GIVE YOU A RETURN INCOME EQUAL TO YOUR ORIGINAL INCOME. ANY VALUE MORE OR LESS THAN 100 PERCENT WILL CHANGE YOUR RETURN INCOME.

TYPE IN A VALUE FOR THE PROPENSITY TO CONSUME, A PERCENTAGE MORE OR LESS THAN 100 PERCENT. PUT IT IN DECIMAL FORM (E.G. .75=75 PERCENT).
WHAT IS THE VALUE? .75
BECAUSE YOUR PROPENSITY TO CONSUME IS LESS THAN
YOUR INCOME, YOU ARE SAVING MONEY. WE WILL ASSUME
THAT YOU DIDN'T PUT IT IN A BANK BUT
RATHER STUFFED IT UNDER YOUR MATTRESS, SO
YOU WON'T RAISE YOUR INCOME WITH INTEREST

INDIVIDUAL'S PAYMENTS FOR
GOODS AND SERVICES- 1875

VALUE OF GOODS AND SERVICES
FROM BUSINESS- 1875

PERCENT OF PRODUCTIVE
SERVICES IN DEMAND- .75

RETURN INCOME TO IN-
DIVIDUAL- 1875

YOUR RETURN INCOME
HAS DROPPED THE FOLLOWING
PERCENTAGE POINTS FROM
100 PERCENT- 25
IF YOU WISH TO PUT IN ANOTHER PERCENTAGE VALUE
FOR THE PROPENSITY TO CONSUME, TYPE 0
IF YOU WISH TO STOP THE PROGRAM, TYPE 1
?

READY
THIS PROGRAM BY JAMES DER, NORTHPORT HS, 8/68
REVISED BY C. LOSIK 8/27/70
IT'S DESIGNED TO DEMONSTRATE THE CIRCULAR FLOW OF
GOODS AND SERVICES IN THE U.S. ECONOMY.
THE FOLLOWING ARE DEFINITIONS OF THE SYMBOLS USED:
PER CAPITA INCOME IS I; PROPENSITY TO CONSUME IS C;
PAYMENT FOR GOODS + SERVICES IS P; VALUE OF GOODS IS
PERCENT OF PRODUCTIVE SERVICES IS S;
RETURN INCOME IS R.
THE FOLLOWING WILL SIMULATE THE EFFECT ON THE
CIRCULAR FLOW OF GOODS, SERVICES AND MONEY WHEN
ALL THE INDIVIDUALS IN THE ECONOMY SPEND ALL THEIR
INCOME.
IF THE AVERAGE INCOME IS $2,500 AND
EVERY INDIVIDUAL SPENDS 100 PERCENT OF IT,
EACH INCOME WILL BE IN EQUILIBRIUM--THEY WILL
EARN BACK FROM BUSINESS $2500.
THE FOLLOWING WILL BE A COMPUTATION OF THE
VALUES IN THE CIRCULAR FLOW.
READ I, C.
DATA 2500, 1.2500
PRINT "AVERAGE INCOME = " ; I
PRINT "PROPENSITY TO CONSUME IS " ; C
LET P = C * I
PRINT "INDIVIDUAL'S PAYMENTS FOR GOODS AND SERVICES = " ; P
LET V = P
PRINT "THE VALUE OF GOODS AND SERVICES = " ; V
PRINT "THE PERCENT OF PRODUCTIVE SERVICES BUSINESS WANTS IS 100 PERCENT."
PRINT "THE RETURN INCOME TO THE INDIVIDUAL FROM BUSINESS DEPENDS TO A LARGE EXTENT ON HOW MUCH ALL INDIVIDUALS SPEND THEIR PROPENSITY TO CONSUME. COMMON SENSE TELLS US THAT IF AN INDIVIDUAL SAVES PART OF HIS INCOME AND INVESTS IT IN A BANK, HE WILL RAISE HIS INCOME BY MEANS OF THE INTEREST ON HIS SAVINGS. BUT IF ALL OR MANY OF THE INDIVIDUAL CONSUMERS IN THE ECONOMY CUT THEIR CONSUMPTION, THEN THE OVERALL RETURN INCOME TO THOSE INDIVIDUALS WILL PROBABLY DROP."
"A PROPENSITY TO CONSUME OF 100 PERCENT WILL:" IN THIS SIMULATION, GIVE YOU A RETURN INCOME.
750 PRINT "EQUAL TO YOUR ORIGINAL INCOME. ANY VALUE"
760 PRINT "MORE OR LESS THAN 100 PERCENT WILL CHANGE"
770 PRINT "YOUR RETURN INCOME."
780 PRINT
790 LET N = 1
800 PRINT "TYPE IN A VALUE FOR THE PROPENSITY TO CONSUME,"
810 PRINT "A PERCENTAGE MORE OR LESS THAN 100 PERCENT."
820 PRINT "PUT IT IN IN DECIMAL FORM (.75=75 PERCENT)"
830 PRINT
840 PRINT "WHAT IS THE VALUE?"
850 INPUT CO
860 IF CO < 1 THEN 960
870 IF CO > 1 THEN 1030
890 IF N = 3 THEN 930
900 PRINT "WE'LL GO BACK"
910 LET N = N + 1
920 GOTO 800
930 PRINT "EITHER YOU WERE CARELESS OR YOU WERE BEING"
940 PRINT "WISE. IN EITHER CASE, SUFFER THE CONSEQUENCES."
950 STOP
960 PRINT "BECAUSE YOUR PROPENSITY TO CONSUME IS LESS THAN"
970 PRINT "YOUR INCOME, YOU ARE SAVING MONEY. WE WILL ASSUME"
980 PRINT "THAT YOU DIDN'T PUT IT IN A BANK BUT"
990 PRINT "RATHER STUFFED IT UNDER YOUR MATTRESS, SO"
1000 PRINT "YOU WON'T RAISE YOUR INCOME WITH INTEREST"
1010 GOTO 1070
1020 PRINT "BECAUSE YOUR PROPENSITY TO CONSUME IS GREATER"
1030 PRINT "THAN YOUR INCOME, YOU ARE BUYING ON CREDIT."
1040 PRINT "THAT MEANS YOU ARE BUYING NOW WITH WHAT YOU EXPECT"
1050 PRINT "TO EARN IN THE FUTURE."
1060 LET PO = 10 * CO
1070 PRINT "INDIVIDUAL'S PAYMENTS FOR"
1080 PRINT "GOODS AND SERVICES- " + PO
1090 PRINT "VALUE OF GOODS AND SERVICES"
1100 PRINT "FROM BUSINESS- " + PO
1110 LET VO = PO
1120 PRINT "PERCENT OF PRODUCTIVE"
1130 PRINT "SERVICES IN DEMAND - " + PO
1140 LET SO = CO
1150 PRINT
1160 PRINT "PERCENTAGE POINTS FROM"
1170 PRINT "YOUR RETURN INCOME"
1180 PRINT "HAS DROPPED THE FOLLOWING"
1190 PRINT "PERCENTAGE POINTS FROM"
1200 PRINT "IF YOU WISH TO PUT IN ANOTHER PERCENTAGE VALUE"
1210 PRINT "FOR THE PROPENSITY TO CONSUME, TYPE 0"
1220 PRINT "IF YOU WISH TO STOP THE PROGRAM, TYPE 1"
1230 INPUT W
1240 IF W = 0 THEN 800
1250 IF W = 1 THEN 1320
1260 END
DISCIPLINE_ SOCIAL STUDIES
SUBJECT_ DEPRESSION/EQUILIBRIUM
PROGRAM NAME_ CONSMR

DESCRIPTION:

This program simulates economic depression and equilibrium as effects of consumption.

OBJECTIVES:

A. Depression or recession results when consumption drops below the capacity to produce.

B. Equilibrium results when consumption equals the capacity to produce.

C. One cause for "over-production" is a time-lag in discovering a drop in consumption.

PRELIMINARY PREPARATION:

A. Student - terms to define and explain:
   1. Depression  6. Investment
   2. Recession  7. Savings
   3. Equilibrium  8. GNP
   5. Overproduction

B. Materials - Introduce this program with the Circular Flow model of goods, services and money. (See program CIRFW)

DISCUSSION:

A. Operational Suggestions
   1. Student level - above average
   2. Curriculum location - advanced economics unit on economic growth and stability.

B. Suggested Follow-up
   Discussion topics:
   1. Consider possible causes for a drop in consumption.
   2. With advanced students, discuss the (Keynesian) concept of "equilibrium at less than full employment."

15
THIS PROGRAM SIMULATES THE EFFECTS OF CONSUMPTION ON THE GNP. IT PRINTS OUT THE VALUES FOR THE COMPONENTS OF THE CIRCULAR FLOW MODEL OF GOODS, SERVICES AND MONEY.

ASSUME GNP IS 100 BILLION.
TYPE IN A VALUE FOR PROPENSITY TO CONSUME.
MAKE THE VALUE BETWEEN 0 AND .75
? .75

ORIGINAL GNP= 100

PROPENSITY TO CONSUME= .75

CONSUMPTION= 75

VALUE OF GOODS + SERVICES= 75

SAVINGS= 25

INVEST.= 25

LABOR= .75

RETURN GNP= 100

EQUILIBRIUM.

TO PUT IN ANOTHER CONSUMPTION VALUE, TYPE 0.
TO STOP, TYPE 1
? 0

TYPE IN A VALUE FOR PROPENSITY TO CONSUME.
MAKE THE VALUE BETWEEN 0 AND .75
? .80

READ CAREFULLY; INPUT AGAIN.
? 7-.70

IF STARTING, TYPE 100(GNP); IF NOT STARTING, TYPE VALUE OF RETURN GNP.
? 100

ORIGINAL GNP= 100

PROPENSITY TO CONSUME= .7

CONSUMPTION= 70

VALUE= 70

SAVINGS= 30

INVESTMENT BY PERIODS:
1-3MONTHS 5
4-6MONTHS 4.9375
7-9MONTHS 4.875
10-12MONTHS 4.8125
END OF 12TH MONTH 4.75
TOTAL FOR YEAR 24.375
OVER-INVESTMENT

LABOR:
1-3MONTHS- .15
4-6MONTHS- .1475
7-9MONTHS-.145
10-12MONTHS- .1425
END OF 12MONTH- .14
TOTAL FOR YEAR- .725

GNP:
1-3MONTHS- 15
4-6MONTHS- 14.9875
7-9MONTHS- 14.975
10-12MONTHS- 14.9625
END OF 12 MONTH- 14.95
TOTAL FOR YEAR- 94.375

RECESSION
INVENTORY OVERPRODUCED- 23.125
TYPE DECIMAL VALUE FOR PROPENSITY TO CONSUME
? .65
IF STARTING ,TYPE 100(GNP); IF NOT STARTING, TYPE VALUE OF RETURN GNP. ? 94.375

ORIGINAL GNP- 100
PROPENSITY TO CONSUME- .65
CONSUMPTION- 61.34375
VALUE- 61.34375
SAVINGS- 33.03125

GNP- 63.21875
TYPE DECIMAL VALUE FOR PROPENSITY TO CONSUME
? .60
IF STARTING ,TYPE 100(GNP); IF NOT STARTING, TYPE VALUE OF RETURN GNP. ? 63.21875

ORIGINAL GNP- 100
PROPENSITY TO CONSUME- .6
CONSUMPTION- 37.93125
VALUE- 37.93125
SAVINGS- 25.2875

GNP- 41.68125
TYPE DECIMAL VALUE FOR PROPENSITY TO CONSUME
? .55
IF STARTING ,TYPE 100(GNP); IF NOT STARTING, TYPE VALUE OF RETURN GNP. ? 41.68125
ORIGINAL GNP - 100

PROPENSITY TO CONSUME - .55

CONSUMPTION - 22.92469

VALUE - 22.92469

SAVINGS - 18.75656

GNP - 28.54969

TYPE DECIMAL VALUE FOR PROPENSITY TO CONSUME ?

^C

READY
100REM--PROGRAM BY JAMES EDER, NORTHPORT HS, 8/68
110REM--REVISED--8/12/69--<RD>
115 REM REVISED BY C. LOSIK 8-27-70
120PRINT"THIS PROGRAM SIMULATES THE EFFECTS OF CONSUMPTION ON THE"
130PRINT"GNP. IT PRINTS OUT THE VALUES FOR THE COMPONENTS OF THE"
140PRINT"CIRCULAR FLOW MODEL OF GOODS, SERVICES AND MONEY."
150PRINT
160READY*P1
170DATA100,.75
180PRINT"ASSUME GNP IS 100 BILLION."
190PRINT"TYPE IN A VALUE FOR PROPENSITY TO CONSUME."
200PRINT"MAKE THE VALUE BETWEEN 0 AND .75"
210LET C1=Y*P1
220LET I1=Y-C1
230LET N=0
240INPUT P2
250LET N=N+1
260IF P2<0 THEN 220
270IF P2=.75 THEN 420
280IF P2<.75 THEN 770
290IF N=2 THEN 360
300IF N=3 THEN 390
310PRINT"READ CAREFULLY; INPUT AGAIN."
320GOTO 260
330PRINT"COME ON... I'M WARNING YOU."
340GOTO 260
350PRINT"OK WISE GUY, YOU'RE OFF."
360GOTO 1930
370PRINT
380LET V1=C1
390LET S1=Y-C1
400LET I1=P1
410LET Y1=C1+I1
420PRINT"ORIGINAL GNP = "Y
430PRINT"PROPENSITY TO CONSUME = "P2
440PRINT
450PRINT"CONSUMPTION = "C1
460PRINT
470PRINT"VALUE OF GOODS + SERVICES = "V1
480PRINT
490PRINT"SAVINGS = "S1
500PRINT
510PRINT"INVESTMENT = "I1
520PRINT
530PRINT"LABOR = "I1
540PRINT
550PRINT"RETURN GNP = "Y1
560PRINT
570PRINT"EQUILIBRIUM."
580PRINT
590PRINT"TO PUT IN ANOTHER CONSUMPTION VALUE, TYPE 0."
600PRINT"TO STOP, TYPE 1"
610INPUT Q8
620IF Q8=0 THEN 1930
630IF Q8=1 THEN 1930
640PRINT"TYPE DECIMAL VALUE FOR PROPENSITY TO"
750 PRINT "CONSUME"
760 GOTO 260
770 PRINT "IF STARTING " TYPE 100(GNP) " IF NOT"
780 PRINT "STARTING, TYPE VALUE OF RETURN GNP."
790 INPUT Y8
800 LET C2 = P2 * Y8
810 LET V2 = C2
820 LET S2 = 118 * C2
830 PRINT "ORIGINAL GNP- " Y
840 PRINT "PROPENSITY TO " P2
850 PRINT "CONSUMPTION- " C2
860 PRINT "VALUE- " 3 / 2
870 PRINT "SAVINGS- " S2
880 PRINT "INVESTMENT BY PERIODS:"
890 PRINT "1.3 MONTHS"
900 PRINT "4.6 MONTHS"
910 PRINT "7.9 MONTHS"
920 PRINT "10.12 MONTHS"
930 PRINT "END OF 12TH MONTH"
940 PRINT "TOTAL FOR YEAR"
950 PRINT "OVER-INVESTMENT"

1370 PRINT
1380 LET Q2 = P1 - P2
1390 LET L2 = P1
1400 LET X2 = L2 * .20
1410 LET L3 = P2 + (.75 * Q2)
1420 LET X3 = L3 * .20
1430 LET L4 = P2 + (.50 * Q3)
1440 LET X4 = L4 * .20
1450 LET L5 = P2 + (.25 * Q2)
1460 LET X5 = L5 * .20
1470 LET L6 = P2
1480 LET X6 = P2 * .20
1490 LET L7 = X2 + X3 + X4 + X5 + X6
1500 PRINT "LABOR:"
1510 PRINT "1-3 MONTHS-"; X2
1520 PRINT "4-6 MONTHS-"; X3
1530 PRINT "7-9 MONTHS-"; X4
1540 PRINT "10-12 MONTHS-"; X5
1550 PRINT "END OF 12 MONTH-"; X6
1560 PRINT "TOTAL FOR YEAR-"; L7
1570 PRINT
1580 LET Y2 = (C2 + 12) * .20
1590 LET Y3 = (C2 + Z3) * .20
1600 LET Y4 = (C2 + 44) * .20
1610 LET Y5 = (C2 + Z5) * .20
1620 LET Y6 = (C2 + Z6) * .20
1630 LET Y7 = C2 + 17
1640 PRINT "GNP:"
1650 PRINT "1-3 MONTHS-"; Y2
1660 PRINT "4-6 MONTHS-"; Y3
1670 PRINT "7-9 MONTHS-"; Y4
1680 PRINT "10-12 MONTHS-"; Y5
1690 PRINT "END OF 12 MONTH-"; Y6
1700 PRINT "TOTAL FOR YEAR-"; Y7
1710 PRINT
1720 PRINT "RECESSION"
1730 LET O = 17 - G
1740 PRINT "INVENTORY OVERPRODUCED-"; 10
1750 GOTO 740
1760 PRINT "GNP--"; F
1770 IF F > O THEN 740
1780 PRINT "GNP--"; F1
1790 IF F1 > O THEN 740
1800 PRINT "GNP--"; F2
1810 IF F2 > O THEN 740
1820 PRINT "GNP--"; F3
1830 IF F3 > O THEN 740
1840 PRINT "GNP--"; F4
1850 IF F4 > O THEN 740
1860 PRINT "GNP--"; F5
1870 IF F5 > O THEN 740
1880 PRINT "GNP--"; F6
1890 PRINT
1900 PRINT "TOTAL DEPRESSION"
1910 GOTO 690
1920 PRINT
1930 END
DESCRIPTION:

This program simulates the stock market. Each student is given $10,000 with which he may buy and/or sell shares in five fictitious issues.

OBJECTIVES:

A. To give the student a simple understanding of the operations of the stock market.

B. To motivate the student to reinforce his basic arithmetic skills.

C. To give an example of the use of everyday mathematics and economics in everyday life.

PRELIMINARY PREPARATION:

A. Student - no special preparation

B. Materials - possibly graph paper

DISCUSSION:

This program can be used as a good motivation device in the teaching of basic stock-market concepts, and the basic mathematical skills involved. The computer starts each student with $10,000, and allows him to buy and/or sell shares. Precautionary tests are included for the student who tries to purchase more shares than he has money for, or to sell more shares than he actually owns. The program continues for as many trading days as the student desires.

The stock values rise and fall on a semi-random basis. On each trading day all stocks undergo a small random price change, a trend change (based on a random trend), and the possibility—on a random basis—of a large price change. The structure of the formula is:

\[
\text{new price} = \text{old price} + (\text{trend} \times \text{old price}) + (\text{small random price change}) + (\text{possible large price change})
\]
The trend is a random number between -.1 and +.1. It remains constant for a random number of days, at which time the trend is changed randomly. The trend affects all stocks equally, and attempts to simulate general market trends. The small random change ranges between -3 and +3 points. It occurs every day to every stock. The possible large price change is either +10 or -10 points. The + and - changes each occur at random day intervals, and to random stocks. That is, there may be no large change on some trading days, only a +10 change on others, a -10 change on still others, and both large and small changes on others. In all large-change cases, the change affects only one random stock when it occurs.

Because of the random generation of stock values and their fluctuations, the program does not exactly simulate the real market. It does, however, provide a simplified view of what does happen, and familiarizes the student with the basic functions involved. This should be explained to the students, along with some real causes of stock-market fluctuations.

Graph paper might be used to plot the daily stock values and the exchange average. In this way, the trend will become evident.
THE STOCK MARKET

DO YOU WANT THE INSTRUCTIONS (YES-TYPE 1, NO-TYPE 0)?

THIS PROGRAM PLAYS THE STOCK MARKET. YOU WILL BE GIVEN $10,000 AND MAY BUY OR SELL STOCKS. THE STOCK PRICES WILL BE GENERATED RANDOMLY AND THEREFORE THIS MODEL DOES NOT REPRESENT EXACTLY WHAT HAPPENS ON THE EXCHANGE. A TABLE OF AVAILABLE STOCKS, THEIR PRICES, AND THE NUMBER OF SHARES IN YOUR PORTFOLIO WILL BE PRINTED. FOLLOWING THIS, THE INITIALS OF EACH STOCK WILL BE PRINTED WITH A QUESTION MARK. HERE YOU INDICATE A TRANSACTION TO BUY A STOCK TYPE +40, TO SELL A STOCK TYPE -40. WHERE 40 IS THE NUMBER OF SHARES. A BROKERAGE FEE OF .1% WILL BE CHARGED ON ALL TRANSACTIONS. NOTE THAT IF A STOCK'S VALUE DIPS TO ZERO IT MAY REBOUND TO A POSITIVE VALUE AGAIN. YOU HAVE $10,000 TO INVEST. USE INTEGERS FOR ALL YOUR INPUTS. (NOT TO GET A 'FEEL' FOR THE MARKET RUN FOR AT LEAST 10 DAYS)

---------GOOD LUCK!-------

<table>
<thead>
<tr>
<th>STOCK</th>
<th>INITIALS</th>
<th>PRICE/SHARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT. BALLISTIC MISSELS</td>
<td>IBM</td>
<td>65.75</td>
</tr>
<tr>
<td>RED CROSS OF AMERICA</td>
<td>RCA</td>
<td>85.5</td>
</tr>
<tr>
<td>LICHTENSTEIN: BUCKR &amp; JONE</td>
<td>LBJ</td>
<td>155.85</td>
</tr>
<tr>
<td>AMERICAN BANKRUPT CO.</td>
<td>ABC</td>
<td>138.25</td>
</tr>
<tr>
<td>CENSURED BOOKS STORE</td>
<td>CBS</td>
<td>104.85</td>
</tr>
</tbody>
</table>

NEW YORK STOCK EXCHANGE AVERAGE: 113.75

WHAT IS YOUR TRANSACTION IN

IBM? 5
RCA? 1
LBJ? 1
ABC? 1
CBS? 1

******* END OF DAY'S TRADING

<table>
<thead>
<tr>
<th>STOCK</th>
<th>PRICE/SHARE</th>
<th>HOLDINGS</th>
<th>VALUE</th>
<th>NET PRICE CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM</td>
<td>99.5</td>
<td>2</td>
<td>199</td>
<td>10.75</td>
</tr>
<tr>
<td>RCA</td>
<td>81.5</td>
<td>3</td>
<td>243</td>
<td>-4.5</td>
</tr>
<tr>
<td>LBJ</td>
<td>153.5</td>
<td>1</td>
<td>153.5</td>
<td>-1.75</td>
</tr>
<tr>
<td>ABC</td>
<td>138.5</td>
<td>1</td>
<td>138.5</td>
<td>-8.5</td>
</tr>
<tr>
<td>CBS</td>
<td>99.5</td>
<td>1</td>
<td>99</td>
<td>-5.85</td>
</tr>
</tbody>
</table>

NEW YORK STOCK EXCHANGE AVERAGE: 113.1

NET CHANGE: .65

TOTAL STOCK ASSETS ARE $ 884
TOTAL CASH ASSETS ARE $ 9164.85
TOTAL ASSETS ARE $ 9990.85

DO YOU WISH TO CONTINUE (YES-TYPE 1, NO-TYPE 0)?

WHAT IS YOUR TRANSACTION IN

IBM? 5
RCA? 1
LBJ? 1
ABC? 1
CBS? 0

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### New York Stock Exchange Averages

<table>
<thead>
<tr>
<th>Stock</th>
<th>Price/Share</th>
<th>Holdings</th>
<th>Value</th>
<th>Net Price Change</th>
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<tbody>
<tr>
<td>IBM</td>
<td>98.75</td>
<td>7</td>
<td>691.25</td>
<td>8.25</td>
</tr>
<tr>
<td>ALA</td>
<td>62.5</td>
<td>4</td>
<td>330</td>
<td>+5</td>
</tr>
<tr>
<td>LUJ</td>
<td>154</td>
<td>2</td>
<td>306</td>
<td>-5</td>
</tr>
<tr>
<td>ALC</td>
<td>133.5</td>
<td>8</td>
<td>867</td>
<td>-8</td>
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<tr>
<td>CBS</td>
<td>108.75</td>
<td>1</td>
<td>108.75</td>
<td>3.75</td>
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</table>

**New York Stock Exchange Average**: 114.3  **Net Change**: 1.8

**Total Stock Assets**: $1,679  **Total Cash Assets**: $6,305.83  **Total Assets**: $10,004.83

**Do you wish to continue (yes-type 1, no-type 0)?**: 1

**What is your transaction in**: IBM 3  ALA 2  LUJ 5  ALC -1  CBS 3

### End of Day's Trading

**New York Stock Exchange Average**: 114.6  **Net Change**: 1.2

**Total Stock Assets**: $1,699  **Total Cash Assets**: $6,305.83  **Total Assets**: $10,004.83

**Do you wish to continue (yes-type 1, no-type 0)?**: 1

**What is your transaction in**: IBM 3  ALA 2  LUJ 5  ALC -1  CBS 3

### End of Day's Trading

**New York Stock Exchange Average**: 114.6  **Net Change**: 1.2

**Total Stock Assets**: $1,699  **Total Cash Assets**: $6,305.83  **Total Assets**: $10,004.83

**Do you wish to continue (yes-type 1, no-type 0)?**: 1

**What is your transaction in**: IBM 3  ALA 2  LUJ 5  ALC -1  CBS 3

### End of Day's Trading

**New York Stock Exchange Average**: 114.6  **Net Change**: 1.2

**Total Stock Assets**: $1,699  **Total Cash Assets**: $6,305.83  **Total Assets**: $10,004.83

**Do you wish to continue (yes-type 1, no-type 0)?**: 1

**What is your transaction in**: IBM 3  ALA 2  LUJ 5  ALC -1  CBS 3
**Social Studies**

**STOCK**

**DO YOU WISH TO CONTINUE (YES - TYPE 1, NO - TYPE 0)? 1**

**WHAT IS YOUR TRANSACTION IN**

<table>
<thead>
<tr>
<th>IDB7</th>
<th>RCA</th>
<th>LBJ7</th>
<th>ADC</th>
<th>CBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-5</td>
<td>-7</td>
<td>0</td>
<td>-5</td>
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**END OF DAY'S TRADING**

<table>
<thead>
<tr>
<th>STOCK</th>
<th>PRICE/SHARE</th>
<th>HOLDINGS</th>
<th>VALUE</th>
<th>NET PRICE CHANGE</th>
</tr>
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<tbody>
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<td>IBM</td>
<td>96.75</td>
<td>15</td>
<td>1451.25</td>
<td>0</td>
</tr>
<tr>
<td>RCA</td>
<td>66.75</td>
<td>4</td>
<td>267.75</td>
<td>-13.75</td>
</tr>
<tr>
<td>LBJ</td>
<td>150.75</td>
<td>5</td>
<td>753.75</td>
<td>-75</td>
</tr>
<tr>
<td>ADC</td>
<td>132</td>
<td>4</td>
<td>528</td>
<td>0</td>
</tr>
<tr>
<td>CBS</td>
<td>95.75</td>
<td>3</td>
<td>287.25</td>
<td>-3</td>
</tr>
</tbody>
</table>

**NEW YORK STOCK EXCHANGE AVERAGES: 108.4, NET CHANGE: -8**

**TOTAL STOCK ASSETS ARE: $3267.25**

**TOTAL CASH ASSETS ARE: $6453.74**

**TOTAL ASSETS ARE: $9742.99**

**DO YOU WISH TO CONTINUE (YES - TYPE 1, NO - TYPE 0)? 1**

**WHAT IS YOUR TRANSACTION IN**

<table>
<thead>
<tr>
<th>IDB7</th>
<th>RCA</th>
<th>LBJ7</th>
<th>ADC</th>
<th>CBS</th>
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<tr>
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**END OF DAY'S TRADING**

<table>
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<tr>
<th>STOCK</th>
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<th>HOLDINGS</th>
<th>VALUE</th>
<th>NET PRICE CHANGE</th>
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<td>IBM</td>
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**NEW YORK STOCK EXCHANGE AVERAGES: 100.4, NET CHANGE: -8**

**TOTAL STOCK ASSETS ARE: $2531.5**

**TOTAL CASH ASSETS ARE: $6974.58**

**TOTAL ASSETS ARE: $9506.08**

**DO YOU WISH TO CONTINUE (YES - TYPE 1, NO - TYPE 0)? 1**

**WHAT IS YOUR TRANSACTION IN**

<table>
<thead>
<tr>
<th>IDB7</th>
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<th>ADC</th>
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Copyright 1971, Polytechnic Institute of Brooklyn
### END OF DAY'S TRADING

<table>
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<tr>
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<th>HOLDINGS</th>
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<td>CBS</td>
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<td>-1.5</td>
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</table>

**NEW YORK STOCK EXCHANGE AVERAGE:** 89.65  **NET CHANGE:** -1.1

TOTAL STOCK ASSETS ARE $8945.05
TOTAL CASH ASSETS ARE $9993.49
TOTAL ASSETS ARE $9393.49

DO YOU WISH TO CONTINUE (YES-TYPE 1; NO-TYPE 0)? 1
WHAT IS YOUR TRANSACTION IN
IBM? 0
RCA? 0
LBJ? 0
ABC? 0
CBS? 10
Social Studies
STOCK

NEW YORK STOCK EXCHANGE AVERAGES: 86.85 NET CHANGE: -9.8

TOTAL STOCK ASSETS ARE $ 1341.75
TOTAL CASH ASSETS ARE $ 8013.86
TOTAL ASSETS ARE $ 9355.61

DO YOU WISH TO CONTINUE (YES-TYPE 1, NO-TYPE 0)?
WHAT IS YOUR TRANSACTION IN:
IBM 5
RCA 6
LBJ 10
ABC 10
CBS 10

END OF DAY'S TRADING

<table>
<thead>
<tr>
<th>STOCK</th>
<th>PRICE/SHARE</th>
<th>HOLDINGS</th>
<th>VALUE</th>
<th>NET PRICE CHANGE</th>
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<td>LBJ</td>
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<td>1155</td>
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<tr>
<td>ABC</td>
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<td>1135.75</td>
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<tr>
<td>CBS</td>
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<td>8</td>
<td>1921.5</td>
<td>7.75</td>
</tr>
</tbody>
</table>

NEW YORK STOCK EXCHANGE AVERAGES: 84.85 NET CHANGE: -9

TOTAL STOCK ASSETS ARE $ 5011.75
TOTAL CASH ASSETS ARE $ 4281.92
TOTAL ASSETS ARE $ 9233.67

DO YOU WISH TO CONTINUE (YES-TYPE 1, NO-TYPE 0)? 0
HOPE YOU HAD FUN!

READY

Copyright 1971, Polytechnic Institute of Brooklyn
100 REM STOCK MARKET SIMULATION
101 REM REVISED 6/18/70 (D. PESEEL, L. BRAUN, G. LOSIK)
102 REM IMP VRBLS: A-MAKT TAND SLIP; B5-BAKG FEE; C-TTL CSH ASSTS;
103 REM C5-TTL CSH ASSTS (TEMP); C(I)-CHNG IN STK VAL; D-TTL ASSTS;
104 REM E1,E2-LHG CHNG MISC; 1-STCK #; 11,12-STICKS W LGH CHNG;
105 REM N1,N2-LHG CHNG DAY CNTR; F5-TTL DAYS PAHSS; F(I)-PATFL CNTR;
106 REM W-NEW CYCL; I/A-5GN OF A; S5-TTL DYS SLS; S(I)-VALUE/SHR;
107 REM T-TTL STCK ASSTS; T5-TTL VAL OF TRANSCTNS;
108 REM W3-LAG CHNG; 41-SMLL CHNGC <$1); G4,G5,Z6-NYSE AVE.; L(I)-TRANSCTW
109 PRINT TAB(20);"THE STOCK MARKET"
110 DIM S(5),P(5),4(5),C(5)
111 REM SLOPE OF MARKET THEND:A(SAME FOh ALL STOCKS)
112 RANDOMIZE
113 LET A=INT((RND(X)/10)*100+.5)/100
114 LET T5=0
115 LET X9=0
116 LET N1=0
117 LET N2=U
118 LET E1=0
119 LET E2=U
120 IF 29<1 THEN 200
121 REM INTRODUCTION
122 PRINT "DO YOU WANT THE INSTRUCTIONS (YES-TYPE 1, NO-TYPE 0)"
123 INPUT Z9
124 PRINT
125 PRINT
126 IF Z9<1 THEN 200
127 PRINT "THIS PROGRAM PLAYS THE STOCK MARKET. YOU WILL BE GIVEN"
128 PRINT "$10,000 AND MAY BUY OR SELL STOCKS. THE STOCK PRICES WILL"
129 PRINT "BE GENERATED RANDOMLY AND THEREFORE THIS MODEL DOES NOT"
130 PRINT "REPRESENT EXACTLY WHAT HAPPENS ON THE EXCHANGE. THE TABLE"
131 PRINT "OF AVAILABLE STOCKS, THEIR PRICES, AND THE NUMBER OF SHARES"
132 PRINT "IN YOUR PORTFOLIO WILL BE PRINTED FOLLOWING THIS, THE"
133 PRINT "INITIALS OF EACH STOCK WILL BE PRINTED WITH A QUESTION"
134 PRINT "MARK. HERE YOU INDICATE A TRANSACTION. TO BUY A STOCK"
135 PRINT "TYPE +NNN, TO SELL A STOCK TYPE -NNN, WHERE NNN IS THE"
136 PRINT "NUMBER OF SHARES. A BROKERAGE FEE OF 1% WILL BE CHARGED"
137 PRINT "ON ALL TRANSACTIONS. NOTE THAT IF A STOCK'S VALUE DROPS"
138 PRINT "TO ZERO IT MAY REBOUND TO A POSITIVE VALUE AGAIN. YOU"
139 PRINT "HAVE $10,000 TO INVEST. USE INTEGERS FOR ALL YOUR INPUTS."
140 PRINT "(NOTE: TO GET A 'FEEL' FOR THE MARKET RUN FOR AT LEAST"
141 PRINT "10 DAYS)"
142 PRINT "GOOD LUCK!-----"
143 REM GENERATION OF STOCK TABLE; INPUT REQUESTS
144 REM INITIAL STOCK VALUES
145 LET S(1)=100
146 LET S(2)=85
147 LET S(3)=150
148 LET S(4)=140
LET S(5)=110
REM INITIAL 0-# DAYS FOR FIRST TREND SLOPE (A)
LET ts=INT(4.99*AND(A)+1)
REM RANDMODEL SIGN OF FIRST TREND SLOPE (A)
IF AND(A)>.5 THEN 270
LET A=-A.
REM RANDMODEL INITIAL VALUES
GOSUB 830
REM INITIAL PORTFOLIO CONTENTS
FOR I=1 TO 5
LET r(I)=0
LET z(I)=0
NEXT I
PRINT
REM INITIALIZE CASH ASSETS:
LET C=10000
REM INITIAL PORTFOLIO
PRINT "STOCKS","INITIALS","PRICE/SHARE"
PRINT "INT. BALLISTIC MISSILES"," 100",S(1)
PRINT "RED CROSS OF AMERICA"," RCA",S(2)
PRINT "LICHTENSTEIN, BUMPER & JOKE"," LBJ",S(3)
PRINT "AMERICAN BANKRUPT CO."," ABC",S(4)
PRINT "CENSORED BOOKS STORE"," CBS",S(5)
PRINT
REM NYSE AVERAGE:45 TEMPERATURE VALUE:44 NET CHANGE:46
LET Z4=45
LET Z5=0
LET T=0
FOR I=1 TO 5
LET Z5=Z5+S(I)
LET T=T+S(I)*r(I)
NEXT I
PRINT "TOTAL ASSETS":D
LET D=T+C
IF A9>0 THEN 396
PRINT "NEW YORK STOCK EXCHANGE AVERAGE": "45"
GO TO 399
PRINT "TOTAL STOCK ASSETS ARE ":T
LET C=INT(100*C+.5)/100
PRINT "TOTAL CASH ASSETS ARE ":C
LET D=INT(100*D+.5)/100
PRINT "TOTAL ASSETS ARE ":D
IF A9=0 THEN 416

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412 PRINT "DO YOU WISH TO CONTINUE (YES-TYPE 1, NO-TYPE 0)");
413 INPUT u9
414 IF u9<1 THEN 995
416 REM INPUT TRANSACTIONS
420 PRINT "WHAT IS YOUR TRANSACTION IN"
430 PRINT "IBM";
440 INPUT I(1)
450 PRINT "RCA"
460 INPUT I(2)
470 PRINT "LBJ"
480 INPUT I(3)
490 PRINT "ABC"
500 INPUT I(4)
510 PRINT "CBS"
520 INPUT I(5)
525 PRINT
530 REM TOTAL DAY'S PURCHASES IN S5:S5
540 LET P5=0
550 REM TOTAL DAY'S SALES IN S5:S5
560 LET S5=0
570 FOR I=1 TO 5
575 LET I(I)=INT(I(I)*.5)
580 IF I(I)<0 THEN 610
590 LET P5=P5+I(I)*S(I)
600 GO TO 620
610 LET S5=S5-I(I)*S(I)
612 IF -I(I)<S(I) THEN 620
614 PRINT "YOU HAVE OVERSOLD A STOCK; TRY AGAIN."
616 GO TO 420
620 NEXT I
622 REM TOTAL VALUE OF TRANSACTIONS:T5
625 LET T5=P5+S5
630 REM BROKERAGE FEE:B5
640 LET B5=INT(.01*T5*100+.5)/100
650 REM CASH ASSETS=OLD CASH ASSETS-TOTAL PURCHASES
652 REM -BROKERAGE FEES-TOTAL SALES:C5
654 LET C5=C5-P5-B5+S5
656 IF C5<0 THEN 674
658 PRINT "YOU HAVE USED $"-C5" MORE THAN YOU HAVE."
660 GO TO 420
660 GO TO 420
674 LET C=C5
675 REM CALCULATE NEW PORTFOLIO
680 FOR I=1 TO 5
690 LET P(I)=P(I)+I(I)
700 NEXT I
710 REM CALCULATE NEW STOCK VALUES
720 GOSUB 830
750 REM PRINT PORTFOLIO
REM BELL RINGING-DIFFERENT ON MANY COMPUTERS
751 FOR I=1 TO 20
752 PRINT Chr$(135)
753 NEXT I
754 PRINT "********** END OF DAY'S TRADING"
755 PRINT
756 IF A9<1 THEN 769
757 PRINT "STOCK", "PRICE/Share", "HOLDINGS", "VALUE", "NET PRICE CHANGE"
758 PRINT "IBM", S(1), P(1), S(1)*P(1), C(1)
759 PRINT "RCA", S(2), P(2), S(2)*P(2), C(2)
760 PRINT "LBJ", S(3), P(3), S(3)*P(3), C(3)
761 PRINT "ABC", S(4), P(4), S(4)*P(4), C(4)
762 PRINT "CBS", S(5), P(5), S(5)*P(5), C(5)
763 LET A9=1
764 GO TO 360
765 REM NEW STOCK VALUES - SUBROUTINE
766 REM RANDOMLY PRODUCE NEW STOCK VALUES BASED ON PREVIOUS
767 REM DAY'S VALUES
768 REM N1, N2 ARE RANDOM NUMBERS OF DAYS WHICH RESPECTIVELY
769 REM DETERMINE WHEN STOCK 11 WILL INCREASE 10 PTS. AND STOCK
770 REM 12 WILL DECREASE 10 PTS.
771 REM IF N1 DAYS HAVE PASSED, PICK AN N, SET E1, DETERMINE NEW N1
772 REM IF N2 DAYS HAVE PASSED, PICK AN N, SET E2, DETERMINE NEW N2
773 REM DEDUCT ONE DAY FROM N1 AND N2
774 REM LOOP THROUGH ALL STOCKS
775 FOR I=1 TO 5
776 LET X1=INT(4.99*RAND()+1)
777 IF X1>.25 THEN 920
778 LET X1=.25
779 GO TO 935
780 IF X1>.50 THEN 925
781 LET X1=.50
782 GO TO 935
783 IF X1>.75 THEN 930
784 LET X1=.75
785 GO TO 935

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930  LET W2=I+1
931  REM BIG CHANGE CONSTANT W3 (SET TO 2560 INITIALLY)
935  LET W3=0
936  IF EI<1 THEN 945
937  IF INT(I1+.5)<>INT(I+.5) THEN 945
938  REM ADD 10 PTS TO THIS STOCK; RESET EI
939  LET W3=10
943  LET EI=0
945  IF E2<1 THEN 955
947  IF INT(I2+.5)<>INT(I+.5) THEN 955
948  REM SUBTRACT 10 PTS FROM THIS STOCK; RESET E2
949  LET W3=W3-10
953  LET E2=0
954  REM C(I) IS CHANGE IN STOCK VALUE
955  LET W3=INT(A*S(I)) W3
956  LET C(I)=INT(100*C(I)+.5)/100
957  LET S(I)=S(I)+C(I)
960  IF S(I)<0 THEN 967
964  LET C(I)=0
965  LET S(I)=0
966  GO TO 970
967  LET S(I)=INT(100*S(I)+.5)/100
970  NEXT I
972  REM AFTER T8 DAYS RANDOMLY CHANGE TREND SIGN AND SLOPE
973  LET T8=T8-1
974  IF T8<1 THEN 985
980  RETURN
985  REM RANDOMLY CHANGE TREND SIGN AND SLOPE (A), AND DURATION OF
990  REM OF TREND (T8)
992  LET T8=INT(4.99*HND(A)+1)
993  LET A=INT((HND(A)/10)*100+.5)/100
994  IF S4<=.5 THEN 997
997  LET A=-A
998  PRINT "HOPE YOU HAD FUN!!"
999  END
Teacher Assistance
AVERG1

DESCRIPTION:

This program will average any number of grades. A passing grade must be input by the teacher, and the computer will list the numerical value of the curve and the respective adjusted grades.

```
600 DATA 65,78,76,48,65,78,88,69,71,56,90,67,59,60,70,74,62,57,66
601 DATA 64,63,65,59,60,56,68,66
RUN

PASSING GRADE FOR THIS TEST IS 70

THE AVERAGE OF ALL GRADES ENTERED IS 65.7037.

THE AVERAGE FALLS BELOW THE PASSING GRADE BY 4 POINTS.
(ROUNDED TO NEAREST WHOLE NUMBER.)

ADJUSTED GRADE = ORIGINAL GRADE + 4

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<tr>
<th>STUDENT NUMBER</th>
<th>ORIGINAL GRADE</th>
<th>ADJUSTED GRADE</th>
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<tr>
<td>1</td>
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<td>76</td>
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</table>

READY
```
100 REM COURT, G.M., WALT WHITMAN H.S., REVISED 8/69
105 REM REVISSED BY C. LOSIK 6-26-70
110 REM
120 REM PROGRAM AVERAGES ANY NUMBER OF GRADES FOR CURVING PURPOSES
130 REM YOU ARE ASKED FOR A PASSING GRADE. IF THE AVERAGE FALLS BELOW
140 REM THAT THE DIFFERENCE WILL BE PRINTED OUT AS WELL AS THE CUL-
150 REM CULATED GRADES FOR EACH STUDENT. REMEMBER THAT THIS TYPE OF
160 REM CURVING IS VALID ONLY IF THE ORIGINAL GRADE DISTRIBUTION
170 REM SHOWED A BELL CURVE.
180 REM
190 REM ENTER GRADES ON DATA LINES 600-700.
200 REM
210 READ X
220 IF X=999 THEN 260
230 LET N=N+1
240 GOTO 220
250 RESTORE
260 PRINT "PASSING GRADE FOR THIS TEST IS 73"
270 LET P=73
280 PRINT
290 READ A
300 FOR T=1 TO N
310 LET A=A+A
320 NEXT T
330 LET M=A/N
340 PRINT "THE AVERAGE OF ALL GRADES ENTERED IS " M " ."
350 LET D=0
360 IF M<P THEN 410
370 LET D=INT(P-M+.5)
380 PRINT "THE AVERAGE FALLS BELOW THE PASSING GRADE BY " D " POINTS." 
390 PRINT "(ROUNDED TO NEAREST WHOLE NUMBER.)"
400 RESTORE
410 PRINT "ADJUSTED GRADE = ORIGINAL GRADE +" D 
420 PRINT FOR X=1 TO N
430 PRINT "STUDENT","ORIGINAL","ADJUSTED"
440 PRINT "NUMBER"," GRADE"," GRADE"
450 PRINT "","",""
460 NEXT X
470 READ A
480 PRINT "X","A","A+D"
490 PRINT 500 NEXT X
500 DATA 65,78,76,48,65,78,89,69,71,56,90,67,59,60,70,74,69,57,66
510 DATA 64,63,65,59,60,56,48,66
520 DATA 9999
530 END
DESCRIPTION:

This program will sort and average from 3 to 10 grades for up to 35 students. Data is entered in lines 600-609. The data are entered in order of student number for the first test, followed by the grades for the second test in order of student number, followed by the grades on the third test in order of student number, etc.

The program prints a table listing the grades for each student and his average.

```plaintext
600 DATA 0,70,72,59,66,70,75,100,77,65
601 DATA 50,65,70,68,70,75,70,65,70,70
602 DATA 75,80,65,90,95,85,65,90,85,87
603 DATA 65,70,75,85,87,77,66,90,75,64
604 DATA 65,70,75,90,85,71,78,89,85,75
605 DATA 75,80,80,80,85,75,90,89,70,67
606 DATA 75,70,80,55,59,67,78,54,76,34
607 DATA 75,75,68,90,95,87,54,67,66,70
608 DATA 80,90,35,75,64,66,96,90,90,76
609 DATA 55,69,78,90,80,76,97,56,73

READY

NUMBERS OF STUDENTS IN CLASS IS --- ? 10
NUMBERS OF GRADES TO BE AVERAGED IS --- ? 10

<table>
<thead>
<tr>
<th>STUDs. NO.</th>
<th>LAST COLUMN LISTS AVERAGES</th>
</tr>
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<td>50 75 65 65 75 75 75 90 55 60.3</td>
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<td>2</td>
<td>70 65 80 70 70 80 70 75 90 69 73.9</td>
</tr>
<tr>
<td>3</td>
<td>72 70 85 75 75 80 80 68 55 78 73.6</td>
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<td>66 70 95 87 85 85 59 95 64 8 70.4</td>
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<td>75 70 85 66 78 90 76 54 66 76 77.0</td>
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<td>77 70 92 75 85 78 76 86 90 50 79.5</td>
</tr>
<tr>
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<td>65 70 87 64 75 67 34 70 75 75 69.5</td>
</tr>
</tbody>
</table>

READY

3
Teacher Assistance
AVERG2

100 REM PFAUL-COUNT , WALT WHITMAN M.S., 7/69
110 REM REVISED 10/70 BY DAVID SOBIN - POLYTECH
120 REM
130 REM PROGRAM SORTS AND AVERAGES FROM 3 TO 10 GRADES FOR UP TO 35
140 REM STUDENTS. THEY ARE THEN PRINTED OUT. THE GRADES MAY BE FROM
150 REM TESTS OR QUARTERLY AVERAGES.
160 REM
170 REM NOTE: THE NUMBER OF GRADES PER STUDENT TIMES THE NUMBER
180 REM OF STUDENTS MUST NOT EXCEED 295.
190 REM
200 REM THE GRADES ARE ENTERED IN THE SAME ORDER FOR EACH TEST ON
210 REM QUARTERLY, FROM STUDENT NUMBER ONE TO THE LAST IN THE CLASS. THE
220 REM PROGRAM WILL SORT OUT AND AVERAGE THE GRADES FOR EACH STUDENT
230 REM SEPARATELY. IF A GRADE IS MISSING FOR ANY STUDENT, A ZERO MUST
240 REM BE ENTERED. THESE WILL NOT BE AVERAGED IN. IF YOU WANT TO AVERAGE
250 REM A GRADE AS A ZERO AS A GRADE, ENTER A GRADE OF 1 INSTEAD. IT WILL NOT
260 REM AFFECT THE AVERAGE SIGNIFICANTLY.
270 REM
280 REM REMEMBER TO ENTER THE SAME NUMBER OF GRADES FOR EACH STUDENT IN
290 REM THE ORDER PRESCRIBED ABOVE. IF THIS IS NOT DONE, THE GRADES
300 REM AND AVERAGES WHICH ARE PRINTED OUT WILL NOT BE CORRECT.
310 REM
320 PRINT "NUMBER OF STUDENTS IN CLASS IS --- ";
330 INPUT N
340 PRINT "NUMBER OF GRADES TO BE AVERAGED IS --- ";
350 INPUT G
360 FOR I=1 TO N*G
370 HEAD A
380 IF A=9999 THEN 1020
390 NEXT I
400 HEAD A
410 IF A<>9999 THEN 1020
420 FOR 1=1 TO G
430 PRINT "STUDENT No.", I; " GRADES";
440 PRINT " NO. (LAST COLUMN LISTS AVERAGES)"
450 LET S=0
460 LET Z=0
470 FOR J=1 TO G
480 LET Z=Z+1
490 IF Z=3 OR J=G THEN 1010
500 READ A
510 IF A=9999 THEN 1020
520 NEXT J
530 IF Z=3 OR J=G THEN 1010
540 PRINT "-head A"
550 NEXT J
560 PRINT I;
570 FOR K=1 TO G
580 HEAD A
590 IF A=9999 THEN 1020
600 NEXT K
610 NEXT I
620 STOP
630 END
**Teacher Assistance**

**AVERC2**

```
590 IF A<>U THEN 720
600 DATA 70,72,59,65,70,75,100,77,65
601 DATA 65,65,70,65,75,70,65,70,70
602 DATA 75,80,85,90,95,85,90,92,61
603 DATA 65,70,75,85,87,77,86,90,75,64
604 DATA 65,70,75,90,85,71,78,89,85,75
605 DATA 75,80,85,90,75,90,89,70,67
606 DATA 75,70,80,55,59,67,75,95,76,74
607 DATA 65,65,60,80,85,95,90,54,67,66,76
608 DATA 60,80,75,75,75,75,75,75,75,75
609 DATA 55,60,70,70,70,70,70,70,70,70
700 DATA 9999
710 LET C=C+1
720 LET S=S+A
730 PRINT A;
740 GOSUB 900
750 IF A=G THEN 790
760 FOR L=1 TO N=1
770 READ A
780 NEXT L
790 NEXT A
800 LET S=S/(G-2)
810 PRINT INT((10*S+5)/10
820 RESTORE
830 NEXT I
840 STOP
850 IF I<10 THEN 860
860 GOSUB 990
870 RETURN
880 GOSUB 990
890 RETURN
900 IF A<>U THEN 940
910 IF A<10 THEN 960
920 RETURN
940 GOSUB 990
950 RETURN
960 GOSUB 990
970 RETURN
980 PRINT """
990 PRINT """;
1010 RETURN
1020 PRINT "CHECK YOUR DATA LINES. YOUR ENTRIES DO NOT SHOW"
1030 PRINT "THE SAME NUMBER OF GRADES FOR EACH STUDENT."
1040 END
```
DESCRIPTION:

This program prints a frequency distribution (bar graphs) of grades, for a single test for one or more classes, or for several tests for one student.

```
600 DATA 25,35,40,45,50,55,60,65,70,75,80,85,90,95,100
601 DATA 35,40,45,50,55,60,65,70,75,80,85,90,95
602 DATA 50,55,60,65,70,75,80,85,90
603 DATA 55,60,65,70,75,80,85
604 DATA 60,65,70,75,80,85
605 DATA 65,70,75,80
606 DATA 65,70,75,80
607 DATA 70,75
```

READY

RUN

GRADE FREQUENCY DISTRIBUTION (BAR GRAPH)

```
GRADE
  0  5 10 15 20 25 30
-----
  0  I  +---------------+---+
  5   I                     I
 10   I                     I
 15   I                     I
 20   I                     I
 25   IX                    I
 30   IX                    I
 35   IXX                   I
 40   IXXX                  I
 45   IXXXX                 I
 50   IXXXXX                I
 55   IXXXXXX               I
 60   IXXXXXXXX             I
 65   IXXXXXXXXX            I
 70   IXXXXXXXXX            I
 75   IXXXXXXXXX            I
 80   IXXXXXXXXX            I
 85   IXXXXXXXXX            I
 90   IXXXXX                I
 95   IXXX                 I
100   IX

READY
```

0 Copyright 1971, Polytechnic Institute of Brooklyn
100 REM PEREZ, WALT WHITMAN H.S., REVISED 7/69
105 REM REVISED BY LOOSIK 8-26-70
110 REM
120 REM THIS PROGRAM PRINTS A FREQUENCY DISTRIBUTION OF GRADES.
130 REM ENTRIES ARE ROUNDED OFF TO THE NEAREST 5 AND INDICATED ON A
140 REM BAR GRAPH. IT MAY BE USED FOR A SINGLE TEST FOR ONE OR MORE
150 REM CLASSES OR FOR SEVERAL TESTS FOR ONE STUDENT. THE PROGRAM IS
160 REM SET TO ACCEPT UP TO 150 GRADES. LINES 600-700 ARE SET ASIDE
170 REM FOR DATA ENTRIES. THEY MAY BE ENTERED IN ANY SEQUENCE.
180 REM
190 PRINT "GRADE FREQUENCY DISTRIBUTION (BAR GRAPH)"
200 PRINT
210 PRINT "GRADE" a " 1 5 10 15 20 25 30"
220 PRINT "----------------------"
240 DIM F(150),P(100)
250 READ F
260 IF F=9999 THEN 290
270 LET N=N+1
280 GOTO 250
290 RESTORE
292 IF N>150 THEN 300
294 PRINT "RE- DIMENSION LINE 240. DELETE LINES 292,294,296."
296 STOP
300 FOR I=1 TO N
310 READ F(I)
320 LET F(I)=INT(F(I)/5+0.5)
330 NEXT I
340 FOR I=1 TO N
350 FOR P=0 TO 100 STEP 5
360 IF F(I)>P THEN 380
370 NEXT P
380 LET P(P)=P(P)+1
390 NEXT I
400 IF P=0 THEN 460
410 PRINT "0", "I"
420 PRINT P(P), "I"
430 IF P(P)=1 THEN 460
440 PRINT " "
450 GOTO 250
460 PRINT "STOP"
470 PRINT "NEXT"
480 PRINT "STOP"
490 PRINT "NEXT"
500 NEXT P
600 REM BEGIN DATA ENTRIES HERE. TYPE = 600 DATA 1, 2, 3, ETC.
700 DATA 9999
999 END
DESCRIPTION:

This program is useful in determining the grade of an examination consisting of several examples. By inputing the number of incorrect answers, the corresponding grade in percent and the number of correct answers.

<table>
<thead>
<tr>
<th>NUMBER WRONG</th>
<th>GRADE</th>
<th>NUMBER RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>15</td>
</tr>
<tr>
<td>1</td>
<td>93</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>87</td>
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<tr>
<td>3</td>
<td>80</td>
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<td>4</td>
<td>73</td>
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<td>5</td>
<td>67</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>60</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>53</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>47</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>40</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>33</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>27</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
**Teacher Assistance**

**GRADE**

100REM PEREZ-COURT, WALT WHITMAN H.S., REVISED 8/69
105 REM REVISED BY C.LOSIK 8-86-70
110REM
120REM THIS PROGRAM PRINTS OUT THE GRADES OF STUDENTS, IN PERCENTAGES,
130REM NEXT TO THE NUMBER OF QUESTIONS MISSED ON A TEST AND THE
140REM NUMBER ANSWERED CORRECTLY. WHEN THE QUESTION MARK APPEARS, TYPE
150REM IN THE NUMBER OF QUESTIONS ON THE TEST AND HIT THE RETURN KEY.
160REM
170PRINT"NUMBER OF QUESTIONS IN THIS TEST IS ";
180INPUTA
190PRINT
200PRINT"NUMBE NUMBER"  GRADE  RIGHT"
210PRINT"----- ----- ------"
220FORX=0TOA
230LETZ=Z+1
240LETG=INT((100-(X*100/A))+.5)
250IFG4OTHEN330
260IFG<=0THEN330
270PRINTX,G,(A-X)
280IFZ<5THEN300
290NEXTX
305GO TO 330
310PRINT"**********************"
320LETZ=0
330END
DESCRIPTION:

This program counts and prints the number of times a question is missed on a test.

```
600 DATA 1,2,3,4,5,2,3,5,6,7,8,9,10,7,8,9,11,13,14,15,10,13,15,10
RUN
```

**ITEM ANALYSIS**

**NUMBER OF QUESTIONS IN THE TEST IS? 15**

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>NUMBER OF TIMES MISSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
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</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
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<td>1</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

*Copyright 1971, Polytechnic Institute of Brooklyn*
100 REM PEREZ-COURT, WALT WHITMAN H.S., REVISED 7/69
105 REM REVISED BY C. LOSIK 8-26-70
110 REM
120 REM PROGRAM COUNTS AND PRINTS NUMBER OF TIMES QUESTIONS ARE MISSED ON
130 REM A TEST. THE NUMBERS OF THE QUESTIONS MISSED ARE ENTERED ON DATA
140 REM LINES 600-700. UP TO 200 ITEMS MAY BE ENTERED IN ANY ORDER.
150 REM YOU MIGHT, FOR EXAMPLE, FEED IN THE NUMBERS OF THE QUESTIONS
160 REM MISSED BY ONE STUDENT, GO ON TO THE NEXT STUDENT, ETC., UNTIL ALL
170 REM QUESTIONS MISSED BY A CLASS OR ALL CLASSES HAVE BEEN ENTERED.
180 REM
185 REM
190 PRINT "ITEM ANALYSIS"
200 PRINT "-";
205 PRINT
210 DIM P(200)
220 READ X
230 IF X<15999 THEN 260
240 LET N=IN+1
250 GOTO 220
260 RESTORE
262 IF N<200 THEN 268
264 PRINT "RE-DIMENSION THE ARRAY. DELETE LINES 262, 264, 266.";
266 STOP
268 PRINT "NUMBER OF QUESTIONS IN THE TEST IS":
270 INPUT Q
272 PRINT
274 PRINT "QUESTION: ";
276 PRINT "NUMBER OF TIMES MISSED"
280 FOR I=1 TO Q
282 PRINT
284 PRINT "P:";
286 PRINT "P(P)"
288 NEXT I
290 READ X
292 IF P=1 TO Q
300 NEXT P
302 FOR P=1 TO Q
304 LET P(P)=P(P)+1
306 NEXT P
308 PRINT "P:";
309 NEXT P
310 PRINT
312 FOR P=1 TO Q
314 PRINT P(P)
316 NEXT P
318 DATA 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 10, 13, 15, 10
320 DATA 10099
322 END
Teacher Assistance
ITEMS

DESCRIPTION:
This program will sum item analysis for up to five classes. Question numbers and number of students missing will each be printed out, as well as a validity based on between 30 and 70 percent of the students answering that question correctly.

### CUMULATIVE ITEM ANALYSIS

<table>
<thead>
<tr>
<th>QUESTIONS</th>
<th>CLASSES</th>
<th>TOTAL # MISSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 3 0 2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>5 3 2</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>1 2 2 1</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>6 4 5 3</td>
<td>18 * VALID</td>
</tr>
<tr>
<td>5</td>
<td>7 2 0 1</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>1 2 0 4 2 3</td>
<td>21 * VALID</td>
</tr>
<tr>
<td>7</td>
<td>3 5 5 4</td>
<td>17</td>
</tr>
<tr>
<td>8</td>
<td>8 2 2 4 3</td>
<td>12</td>
</tr>
<tr>
<td>9</td>
<td>3 3 1 2 5</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>1 2 1 4 6</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>1 2 4 1 3</td>
<td>18</td>
</tr>
<tr>
<td>12</td>
<td>3 3 3 1 1</td>
<td>15</td>
</tr>
</tbody>
</table>

* Valid = Between 30 and 70 percent answered question correctly

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Teacher Assistance

ITEM2

100 REM COURT, G.M., WALT WHITMAN H.S., REVISED 8/69
110 REM
120 REM PROGRAM SUMS ITEM ANALYSES FOR UP TO 5 CLASSES. QUESTION
130 REM NUMBERS AND NUMBER OF STUDENTS MISURING EACH WILL BE PRINTED OUT
140 REM AS WELL AS A VALIDITY BASED ON BETWEEN 30 AND 70 PERCENT OF THE
150 REM STUDENTS ANSWERING THAT QUESTION CORRECTLY. THIS MAY BE BY-PASSED
160 REM BY TYPING IN 999 FOR NUMBER OF STUDENTS TAKING TEST.
170 REM
180 REM
190 REM DATA LINES 690-700 HAVE BEEN SET ASIDE FOR ENTRIES. A NUMBER
200 REM MUST BE ENTERED FOR EACH QUESTION, IN SEQUENCE, FOR EACH CLASS.
210 REM IF NO STUDENT MISSED A PARTICULAR QUESTION, ENTER A ZERO). IT
220 REM WOULD BE WISE TO BEGIN ENTRIES OF A NEW CLASS ON A NEW DATA
230 REM LINE FOR EASIER VERIFICATION SHOULD AN ERROR OCCUR.
240 REM
250 DIM A(50), B(50), C(50), D(50), E(50)
260 LET S=0
270 PRINT "CUMULATIVE ITEM ANALYSIS"
280 PRINT
290 PRINT "NUMBER OF QUESTIONS IN TEST IS ---":
300 INPUT T
310 PRINT "NUMBER OF CLASSES ENTERED IS ---":
320 INPUT N
330 IF N>5 THEN 790
340 IF N<1 THEN 790
350 PRINT "NUMBER OF STUDENTS TAKING TEST IS ---":
360 INPUT R
370 LET R=S+1
380 GOTO 330
390 REM BEGIN YOUR DATA ENTRIES HERE. TYPE - 600 DATA 1,2,3, ETC.
400 DATA 9999
410 GOSUB 760
420 FOR I=1 TO N
430 READ A(I)
440 NEXT I
450 GOSUB 760
460 FOR I=1 TO N
470 READ B(I)
480 NEXT I
490 GOSUB 760
500 FOR I=1 TO N
510 READ C(I)
520 NEXT I
530 GOSUB 760
540 FOR I=1 TO R
550 READ D(I)
560 NEXT I
570 GOSUB 760
580 FOR I=1 TO N
590 READ E(I)
600 NEXT I
610 GOSUB 760
620 IF I=N THEN 850
630 RETURN
PRINT "PROGRAM WILL ANALYZE FROM 1 TO 5 CLASSES ONLY."
ITEM2

PRINT "THERE MUST BE ONE NUMBE5 ENTERED FOR EACH QUESTION FOR EACH CLASS. REMEMBER, A ZERO IS ENTERED IF A STUDENT MISSED "
PRINT "A PARTICULAR QUESTION. CHECK YOUR DATA.

651FR=999 THEN 880
660 PRINT
700 PRINT "* VALID = BETWEEN 30 AND 70 PER CENT ANSWERED QUESTION CORRECTLY"
PRINT
820 PRINT "QUESTIONS", "CLASSES"
910 PRINT "1 2 3 4 5 TOTAL MISSED"
100 FOR J=1 TO 0
110 LET T=0
111 NEXT J
120 T=0
130 FOR J=1 TO 5
140 R=INT((.7*T)+.5)
150 IF R=99 THEN 100
160 PRINT "* VALID"
170 GOTO 130
180 PRINT
190 LET T=0
200 FOR J=1 TO (5-N)
210 PRINT " 
220 NEXT J
230 PRINT T;
240 GOTO 90
250 LET Z=R(J)
260 PRINT Z;
270 IF Z>99 THEN 135
280 IF Z>9 THEN 134
290 IF Z=0 THEN 133
300 PRINT " 
310 RETURN
320 END

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DESCRIPTION:

This program treats class sets of laboratory data statistically. Aside from a table of experimental values with errors and percent errors, the teacher has a choice of experimental value distribution with bar graph, ranking by percent error, ranking by experimental value, mean deviation, and standard deviation.

OBJECTIVES:

A. To make percent error in experiments more meaningful.
B. To increase competitive spirit in the laboratory due to ranking portion of statistical analysis.
C. To provide a basis for further discussion of laboratory data and techniques.

PRELIMINARY PREPARATION:

This program is not generally for student use.

DISCUSSION:

Often a teacher is forced to work with some arbitrary percent error scale for marking purposes. With a statistical analysis of the laboratory results, a realistic scale can easily be developed.

Also, it is often desirable to discuss the class results but without a statistical analysis this usually turns out to be rather shallow. The analysis can now be obtained in the few minutes it takes the students to clean their equipment and put it away.

It may be helpful to discuss a few of the ways in which the teacher can input data. First, the teacher may simply call up the program and then either he or his students can input the data as the experiments are finished. Next, with the teletype unit on local, a tape can be made and the analysis can be made at any convenient time. With tapes a teacher can do a statistical analysis of his classes separately or as a group as long as each student gets a different student number.
Teacher Assistance
STAT

THIS PROGRAM WILL DO THE FOLLOWING:
1. PRINT OUT A TABLE OF EXPERIMENTAL VALUES, ERRORS,
   AND PERCENT ERRORS INCLUDING AVERAGES FOR ALL.
2. GIVE YOU A CHOICE OF ALL OF THE FOLLOWING:
   CHOICE 1 - EXPERIMENTAL VALUE DISTRIBUTION
      INCLUDING A BAR GRAPH
   CHOICE 2 - RANKING BY PERCENT ERROR
   CHOICE 3 - RANKING BY EXPERIMENTAL VALUE
   CHOICE 4 - OTHER INFORMATION
   CHOICE 5 - ALL OF THE ABOVE CHOICES
   CHOICE 6 - ENDS PROGRAM

INSTRUCTIONS
1. LINES 100 TO 110 HAVE BEEN RESERVED FOR DATA.
2. NOTE: THE FIRST DATA LINE MUST ALWAYS RE NO. 100
   AND LINE 101 MUST ALWAYS BE USED.
3. THERE IS ROOM FOR DATA FOR A MAXIMUM OF 60 STUDENTS.
4. INPUT SHOULD BE IN THE FORM:
   100 DATA STUDENT NO., VALUE, STUDENT NO., VALUE, ETC.,
5. STUDENT NUMBERS MUST RANGE FROM 1-60.
6. OLD DATA IS ERASED BY IPUTING NEW DATA WITH THE SAME
   LINE NUMBERS DURING SUBSEQUENT RUNS.
7. IF THE FIRST RUN REQUIRES DATA LINES 100-110 AND THE
   SECOND RUN REQUIRES LINES 100-109, LINE 110 IS TYPED
   IN TO ERASE OLD DATA IN THAT LINE.
8. NEVER TYPE SAVE DURING THE RUN OF ANY PART OF THIS
   PROGRAM.

TIME:  3 SECS.

TAPF
READY.
100 DATA 1.37, R, 2.38, 3.39, 7.37, 9.38, 6.49, 6.741, R, R, 37, 6, 9,
101 DATA 39.15, R, 1.11, 39. R, 12.39, 4.13, 35.4, 14, 33.9, 15, 42.8, 15, 39, 6,
102 DATA 17, 38.7, 1R, 37.6, 19, 3R.5, 20, 49.1

RUN
WAIT.

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WHAT IS THE TOTAL NO. OF STUDENTS AND THE CALC. VALUE? 39.0

DATA LISTED BY STUDENT NUMBER

<table>
<thead>
<tr>
<th>STUDENT NO.</th>
<th>VALUE</th>
<th>ERROR</th>
<th>PERCENT ERROR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37.8</td>
<td>-1.2</td>
<td>3.76922</td>
</tr>
<tr>
<td>2</td>
<td>38.6</td>
<td>-1.4</td>
<td>1.02564</td>
</tr>
<tr>
<td>3</td>
<td>39.7</td>
<td>-1.7</td>
<td>1.79487</td>
</tr>
<tr>
<td>4</td>
<td>37.9</td>
<td>-1.1</td>
<td>2.52051</td>
</tr>
<tr>
<td>5</td>
<td>38</td>
<td>-1</td>
<td>2.5641</td>
</tr>
<tr>
<td>6</td>
<td>40.6</td>
<td>-1.6</td>
<td>4.0256</td>
</tr>
<tr>
<td>7</td>
<td>41.8</td>
<td>2.8</td>
<td>7.1794</td>
</tr>
<tr>
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<td>37.6</td>
<td>-1.4</td>
<td>3.58974</td>
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<td>-1.5</td>
<td>3.20305</td>
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<td>40.1</td>
<td>1.1</td>
<td>2.80351</td>
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<td>-1.8</td>
<td>2.8128</td>
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<td>1.02564</td>
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<td>35.4</td>
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<td>-5.1</td>
<td>13.0769</td>
</tr>
<tr>
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<td>42</td>
<td>3</td>
<td>7.6923</td>
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<td>6</td>
<td>1.53846</td>
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<td>17</td>
<td>38.7</td>
<td>-3</td>
<td>7.69231</td>
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<tr>
<td>18</td>
<td>37.6</td>
<td>-1.4</td>
<td>3.58974</td>
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<td>19</td>
<td>38.5</td>
<td>-1.5</td>
<td>1.28205</td>
</tr>
<tr>
<td>20</td>
<td>40.1</td>
<td>1.1</td>
<td>2.80351</td>
</tr>
</tbody>
</table>

THE ARITHMETIC MEAN [AVERAGE] IS 39.83
THE AVERAGE ERROR [ABSOLUTE] IS 1.43
THE AVERAGE PERCENT ERROR IS 3.6667

DO YOU DESIRE ADDITIONAL INFORMATION? IF SO, TYPE IN THE NUMBER OF YOUR CHOICE. 5

FOR THE DISTRIBUTION, WHAT LOWER LIMIT, UPPER LIMIT, AND STEP DO YOU DESIRE? 35, 42.5, 5

EXPERIMENTAL VALUE DISTRIBUTION

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO LESS THAN</th>
<th>NO.</th>
<th>BAR GRAPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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### Ranking by Percent Error

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### Ranking by Experimental Value

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**Other Information**

- The median value is 38.7
- The lowest value is 33.9
- The highest value is 42
- The mean deviation (average deviation) is 1.13
- The standard deviation is 1.87776

This concludes the run.
2 REM STATISTICAL ANALYSIS OF LABORATORY DATA
100 GO TO 1750
101 DATA 0
160 DIM A(50), B(50, Y(50), W(50))
170 DIM Q(50)
180 LET Y(0) = 0
190 FOR I = 1 TO 50
200 LET A(I) = 0
210 LET B(I) = 0
220 LET Q(I) = 0
230 LET W(I) = 0
240 LET Q(I) = 0
250 FOR I = 1 TO 50
260 LET A(I) = 0
270 LET B(I) = 0
280 LET P = 0
290 LET V = 0
300 LET C = 0
310 PRINT "WHAT IS THE TOTAL NO. OF STUDENTS AND THE CALC. VALUE?"
320 INPUT Y, X
330 PRINT
340 FOR I = 1 TO Y
350 READ A(I), B(I)
360 NEXT I
370 PRINT "DATA LISTED BY STUDENT NUMBER"
380 PRINT 
390 PRINT "STUDENT NO." "VALUE" "ERROR" "PERCENT ERROR"
400 PRINT
410 PRINT "STUDENT NO.", "VALUE", "ERROR", "PERCENT ERROR"
420 FOR I = 1 TO Y
430 LET Z = A(I) - K
440 LET A(I) = A + ABS(Z) / B
450 LET P = P + A(I) / B
460 LET W(I) = (ABS(Z) / B) * 100
470 LET A9 = A9 + W(I) / B
480 PRINT A(I), B(I), W(I)
490 NEXT I
500 PRINT "THE ARITHMETIC MEAN (AVERAGE) IS " I
510 PRINT "THE AVERAGE ERROR (ABSOLUTE) IS " I
520 PRINT "THE AVERAGE PERCENT ERROR IS " I
530 PRINT "DO YOU DESIRE ADDITIONAL INFORMATION? IF SO, TYPE" I
540 PRINT "IN THE NUMBER OF YOUR CHOICE."
550 INPUT N
560 IF N = 2 THEN 1010
600 IFN=3 THEN 1200
610 IFN=4 THEN 1490
620 IFN=6 THEN 1730
630 PRINT
640 PRINT "FOR THE DISTRIBUTION, WHAT LOWER LIMIT, UPPER LIMIT,"
650 PRINT "AND STEP DO YOU DESIRE ?"
660 INPUT U, F, G
670 PRINT
680 PRINT
690 PRINT "EXPERIMENTAL VALUE DISTRIBUTION"
700 PRINT "---------------- ----- -------
710 PRINT
720 FOR I=1 TO B
730 LET M=0
740 IF A(I)>=F THEN 850
750 IF A(I)>=E THEN 770
760 LET Y(C)=Y(C)+1
770 FOR J=0 TO C STEP G
780 LET M=M+1
790 IF A(I)>=(J+G) THEN 830
800 LET Y(Y(M)+1)
810 NEXT J
820 LET Y(25)=Y(25)+1
830 NEXT I
840 PRINT "FROM","TO LESS THAN"," NO."," BAR GRAPH"
850 PRINT
860 PRINT O, E, Y(0),
870 LET A=5=Y(0),
880 GOSUB 2000
890 GOTO 850
900 GOSUB 2000
910 FOR J=0 TO C STEP G
920 PRINT J, J+G, Y(M),
930 LET A=5=Y(M),
940 GOSUB 2000
950 LET M=M+1
960 NEXT J
970 PRINT F, "INFINITY", Y(25),
980 LET A=5=Y(25),
990 GOSUB 2000
1000 IFN=1 THEN 540
1010 PRINT
1020 PRINT
1030 PRINT "RANKING BY PERCENT ERROR"
1040 PRINT "------- ------ ------
1050 PRINT
1060 PRINT "RANK", "STUDENT NO.", "PERCENT ERROR"
1070 PRINT
1080 FOR I=1 TO B
1090 LET Y=1E25

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1100 FOR I = 1 TO B
1110 IF W(I) >= T THEN 1140
1120 LET T = W(I)
1130 LET V = I
1140 NEXT I
1150 PRINT S, V, W(V)
1160 LET W(V) = 1E25
1170 NEXT S
1180 PRINT
1190 IF N = 2 THEN 540
1200 PRINT
1210 PRINT
1220 PRINT "RANKING BY EXPERIMENTAL VALUE"
1230 PRINT "-------- -- -------------- ------"
1240 PRINT "RANK", "STUDENT NO.", "EXPER. VALUE"
1250 PRINT
1260 FOR S = 1 TO B
1270 LET T = 1E25
1280 FOR I = 1 TO B
1290 IF A(I) >= T THEN 1330
1300 LET T = A(I)
1310 LET V = I
1320 NEXT I
1330 PRINT S, V, A(V)
1340 LET A(V) = 1E25
1350 NEXT S
1360 LET F = 0
1370 LET G7 = 13/2
1380 FOR I = 1 TO 31
1390 IF G7 = I THEN 1470
1400 NEXT I
1410 LET Z2 = INT(G7)
1420 LET Z4 = INT(G7 + 1)
1430 LET F = (A(G7) + Q(Z4))/2
1440 LET F = (A(G7))
1450 IF N = 3 THEN 540
1460 PRINT
1470 PRINT "OTHER INFORMATION"
1480 PRINT "------- --------------"
1490 PRINT "THE MEDIAN VALUE IS " A(I)
1500 PRINT "THE LOWEST VALUE IS " A(1)
1510 PRINT "THE HIGHEST VALUE IS " A(B)
1520 LET M = 0
1530 LET P9 = F
1540 FOR I = 1 TO B
1550 LET P3 = A(I) - P9
1560 LET M = M + P3
1570 NEXT I
1580 PRINT
1590 PRINT
1630 LET M7 = M/B
1640 PRINT "THE MEAN DEVIATION (AVERAGE DEVIATION) IS" M7
1650 LET M = 0
1660 FOR I = 1 TO B
1670 LET P3 = (Q(I) - P9) ^ 2
1680 LET M = M + P3
1690 NEXT I
1700 LET M7 = SQRT(M/B)
1710 PRINT "THE STANDARD DEVIATION IS" M7
1720 IF N = 4 THEN S40
1730 PRINT " THIS CONCLUDES THE RUN."
1740 STOP
1750 PRINT " THIS PROGRAM WILL DO THE FOLLOWING:"
1760 PRINT " 1. PRINT OUT A TABLE OF EXPERIMENTAL VALUES, ERRORS,"
1770 PRINT " AND PERCENT ERRORS INCLUDING AVERAGES FOR ALL."
1780 PRINT " 2. GIVE YOU A CHOICE OF ALL OF THE FOLLOWING:"
1790 PRINT "  choice 1 - EXPERIMENTAL VALUE DISTRIBUTION"
1791 PRINT "  choice 2 - RANKING BY PERCENT ERROR"
1800 PRINT "  choice 3 - RANKING BY EXPERIMENTAL VALUE"
1810 PRINT "  choice 4 - OTHER INFORMATION"
1820 PRINT "  choice 5 - ALL OF THE ABOVE CHOICES"
1830 PRINT "  choice 6 - ENDS PROGRAM"
1840 PRINT " INSTRUCTIONS"
1850 PRINT " 1. LINES 100 TO 159 HAVE BEEN RESERVED FOR DATA."
1860 PRINT " 2. NOTE: THE FIRST DATA LINE MUST ALWAYS BE NO. 100"
1870 PRINT " AND LINE 101 MUST ALWAYS BE USED."
1880 PRINT " 3. THERE IS ROOM FOR DATA FOR A MAXIMUM OF 50 STUDENTS."
1890 PRINT " 4. INPUT SHOULD BE IN THE FORM:
1900 PRINT " 100 DATA STUDENT NO., VALUE, STUDENT NO., VALUE, ETC.
1910 PRINT " 5. STUDENT NUMBERS MUST RANGE FROM 1-50.
1920 PRINT " 6. OLD DATA IS ERASED BY INPUTING NEW DATA WITH THE SAME
1930 PRINT " 7. IF THE FIRST RUN REQUIRES DATA LINES 100-110 AND THE
1940 PRINT " 8. NEVER TYPE SAVE DURING THE RUN OF ANY PART OF THIS
1950 PRINT " PROGRAM."
1960 PRINT
1970 FOR I = 1 TO A5
1980 PRINT "*
1990 NEXT I
2000 RETURN
2010 END

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DESCRIPTION:

This program will find the mean, median, and deviation of a set of numbers.

MEAN, MEDIAN, AND DEVIATION OF A SET OF NUMBERS.

ENTER YOUR NUMBERS IN DATA STATEMENTS ON LINES 1000 - 2000. FOR EXAMPLE, YOU MIGHT TYPE:

1000 DATA 1, 2, 3, 4 ETC. (YOUR DATA GOES HERE!)

WHEN YOUR DATA HAS BEEN ENTERED, TYPE:

1 GO TO 300
RUN

THEN RELAX WHILE THE MACHINE GRINDS OUT THE ANSWERS. IF AN 'OUT OF DATA' APPEARS, ADJUST LINE 295.

READY

1000 DATA 244, 188, 112, 8, 198, 10, 314, 160, 18, 36
1 GO TO 300
RUN

THESE ARE YOUR NUMBERS:
244 188 112 8 198 10 314 160 18 36

THESE ARE YOUR NUMBERS (HIGHEST TO LOWEST):
314 244 198 182 160 118 36 18 10 8

NUMBER OF VALUES IS 10
SUM OF THE VALUES IS 1278
THE MEAN VALUE IS 127.8
THE MEDIAN VALUE IS 136
THE STANDARD DEVIATION IS 208.2797

FOR ANOTHER RUN, RE-ENTER DATA ON LINES 1000 - 2000. TAKING CARE TO ELIMINATE OLD DATA BY TYPING THOSE LINE NUMBERS WHICH YOU DO NOT USE AGAIN; THEN TYPE 'RUN'.

READY

1000

100 REM CHARLES M. LOSIK, BKLYN POLY, MEAN-MEDIAN-DEVIATION
110 REM (7-66 IN FORTRAN II) I (8-26-70 IN BASIC)
120 REM YOU PUT YOUR NUMBERS IN DATA STATEMENTS AND
130 REM YOU GET WHAT YOU PAY FOR.
140 PRINT "",""MEAN, MEDIAN, AND DEVIATION OF A SET OF NUMBERS."
150 PRINT
160 PRINT "ENTER YOUR NUMBERS IN DATA STATEMENTS ON LINES"
170 PRINT "1000 - 2000. FOR EXAMPLE, YOU MIGHT TYPE I"
171 PRINT
172 PRINT ","1000 DATA 1,2,3,4 ETC. (YOUR DATA GOES HERE)"
173 PRINT
174 PRINT "WHEN YOUR DATA HAS BEEN ENTERED, TYPE I"
180 PRINT
190 PRINT "","""I GO TO 300"
200 PRINT "","""RUN"
210 PRINT
220 PRINT "THEN RELAX WHILE THE MACHINE GRINDS OUT THE ANSWERS."
230 STOP
240 REM A(I) ARE THE NUMBERS, S IS THEIR SUM.
250 REM S2 IS THE SUM OF THEIR SQUARES.
260 REM
270 REM WARNING! DATA ON LINES 999 AND 2001 MAY NOT BE
280 REM USED AS ONE OF YOUR NUMBERS.
290 REM IF THEY ARE, SIMPLY CHANGE 999 AND 2001.
295 DIM A(100)
300 PRINT
303 PRINT " THESE ARE YOUR NUMBERS:
305 LET I = 1
310 READ E
315 LET S = 0
316 LET S2 = 0
320 READ A(I)
330 IF E = A(I) THEN 370
340 PRINT A(I)
345 LET S = S + A(I)
347 LET S2 = S2 + A(I) * A(I)
350 LET I = I + 1
360 GO TO 320
370 LET N = I - 1
380 PRINT
390 PRINT
399 REM **** BUBBLE SORT ****
400 PRINT " THESE ARE YOUR NUMBERS (HIGHEST TO LOWEST):"
405 FOR I = 1 TO N - 1
410 FOR J = 1 TO N
415 IF A(I) > A(J) THEN 440
420 LET T = A(I)
430 LET A(I) = A(J)
440 LET A(J) = T
450 NEXT J
460 NEXT I
470 PRINT A(I)
475 PRINT A(N)
480 PRINT
490 PRINT
500 PRINT " NUMBER OF VALUES IS" I N
510 PRINT " SUM OF THE VALUES IS" I S
520 PRINT " THE MEAN VALUE IS" I S / N
530 PRINT " THE MEDIAN VALUE IS" I E21 / 2 WW INT(N / 2) / " THEN 570
550 PRINT (A(N/2) + A(N/2+1)) / 2
560 GO TO 400
570 PRINT A(N+I)/2
580 PRINT " THE STANDARD DEVIATION IS" I SQR (N * S2 + S * S) / N
600 PRINT
610 PRINT
620 PRINT " FOR ANOTHER RUN, RE-ENTER DATA ON LINES"
630 PRINT " 1000 - 2000. TAKING CARE TO ELIMINATE OLD DATA"
640 PRINT " BY TYPING THOSE LINE NUMBERS WHICH YOU DO NOT USE AGAIN"
645 PRINT " THEN TYPE 'RUN':"
650 STOP
999 DATA 9999
2001 DATA 9999
2010 END