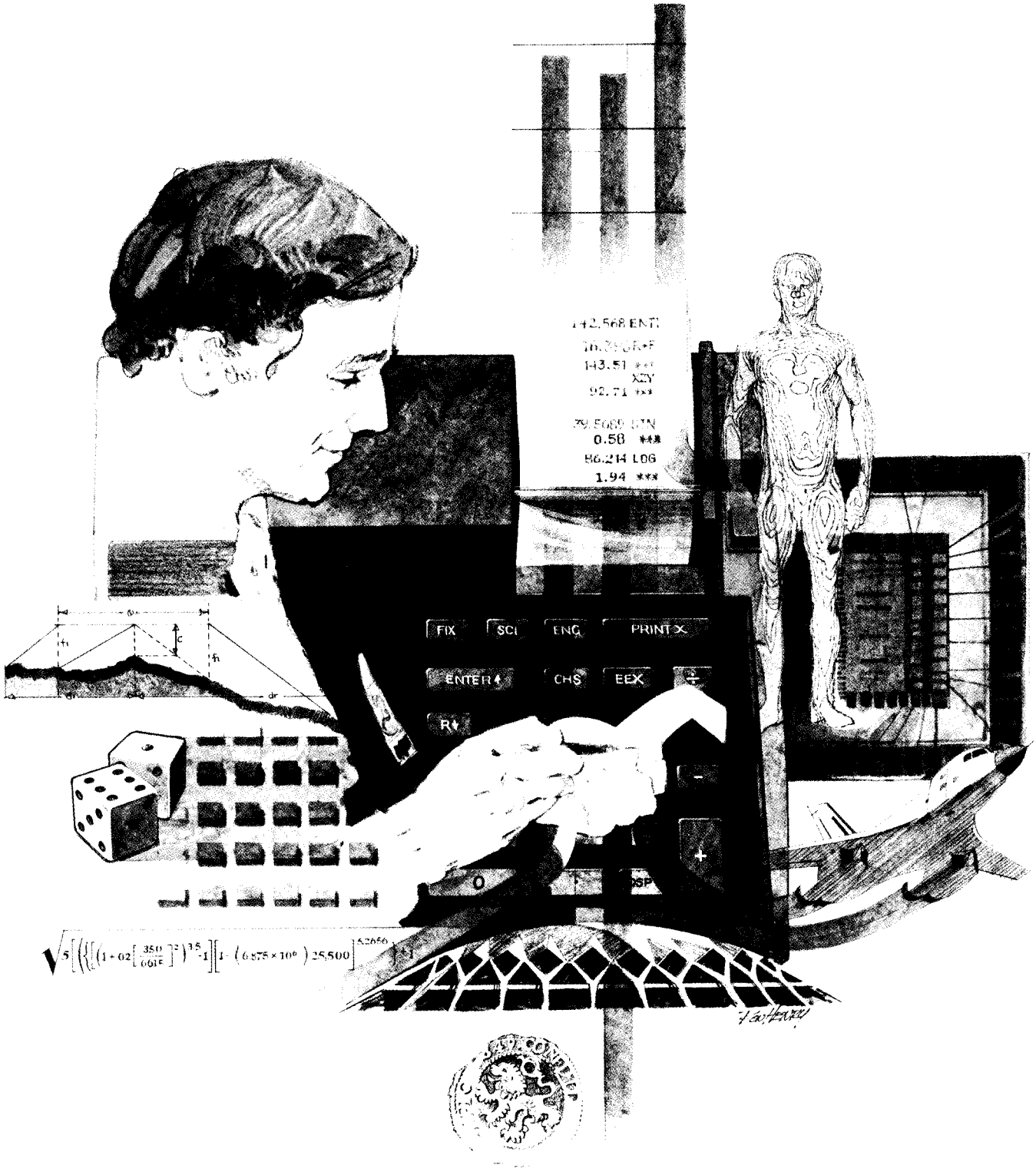
HEWLETT-PACKARD

HP-67/HP-97

Users' Library Solutions

Medical Practitioner



INTRODUCTION

In an effort to provide continued value to it's customers, Hewlett-Packard is introducing a unique service for the HP fully programmable calculator user. This service is designed to save you time and programming effort. As users are aware, Programmable Calculators are capable of delivering tremendous problem solving potential in terms of power and flexibility, but the real genie in the bottle is program solutions. HP's introduction of the first handheld programmable calculator in 1974 immediately led to a request for program **solutions** — hence the beginning of the HP-65 Users' Library. In order to save HP calculator customers time, users wrote their own programs and sent them to the Library for the benefit of other program users. In a short period of time over 5,000 programs were accepted and made available. This overwhelming response indicated the value of the program library and a Users' Library was then established for the HP-67/97 users.

To extend the value of the Users' Library, Hewlett-Packard is introducing a unique service—a service designed to save you time and money. The Users' Library has collected the best programs in the most popular categories from the HP-67/97 and HP-65 Libraries. These programs have been packaged into a series of low-cost books, resulting in substantial savings for our valued HP-67/97 users.

We feel this new software service will extend the capabilities of our programmable calculators and provide a great benefit to our HP-67/97 users.

A WORD ABOUT PROGRAM USAGE

Each program contained herein is reproduced on the standard forms used by the Users' Library. Magnetic cards are not included. The Program Description I page gives a basic description of the program. The Program Description II page provides a sample problem and the keystrokes used to solve it. The User Instructions page contains a description of the keystrokes used to solve problems in general and the options which are available to the user. The Program Listing I and Program Listing II pages list the program steps necessary to operate the calculator. The comments, listed next to the steps, describe the reason for a step or group of steps. Other pertinent information about data register contents, uses of labels and flags and the initial calculator status mode is also found on these pages. Following the directions in your HP-67 or HP-97 **Owners' Handbook and Programming Guide,** "Loading a Program" (page 134, HP-67; page 119, HP-97), key in the program from the Program Listing I and Program Listing II pages. A number at the top of the Program Listing indicates on which calculator the program was written (HP-67 or HP-97). If the calculator indicated differs from the calculator you will be using, consult Appendix E of your **Owner's Handbook** for the corresponding keycodes and keystrokes converting HP-67 to HP-97 keycodes and vice versa. No program conversion is necessary. The HP-67 and HP-97 are totally compatible, but some differences do occur in the keycodes used to represent some of the functions.

A program loaded into the HP-67 or HP-97 is not permanent—once the calculator is turned off, the program will not be retained. You can, however, permanently save any program by recording it on a blank magnetic card, several of which were provided in the Standard Pac that was shipped with your calculator. Consult your **Owner's Handbook** for full instructions. A few points to remember:

The Set Status section indicates the status of flags, angular mode, and display setting. After keying in your program, review the status section and set the conditions as indicated before using or permanently recording the program.

REMEMBER! To save the program permanently, **clip** the corners of the magnetic card once you have recorded the program. This simple step will protect the magnetic card and keep the program from being inadvertently erased.

As a part of HP's continuing effort to provide value to our customers, we hope you will enjoy our newest concept.

TABLE OF CONTENTS

Program Description I

Program Title Blood Pressure Averages and Mean Arterial Pressure

Contributor's Name Hewlett-Packard
Address 1000 N.E. Circle Blvd.
City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

Mean Arterial Pressure (MAP)

$$P\ map = \frac{1}{3}(2P\ diastolic + P\ systolic)$$

$$= P\ diastolic + \frac{1}{3}(P\ systolic - P\ diastolic)$$

P systolic and diastolic are entered, P map is calculated and the data are stored in order to calculate averages in case of erroneous entries.

The calculation and storing can be reversed. All readings are rounded up to the point.

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s)

Blood Pressure Readings

SYST/DIAST

120/80

140/90

130/85

Find the mean arterial pressure for each reading, the average systolic, diastolic and mean arterial pressures for the group of readings.

Solution(s)

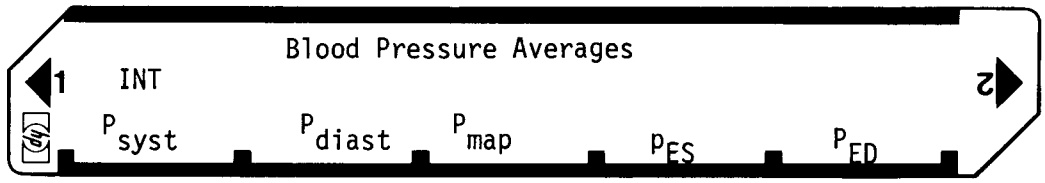
```
[f][A] ------------------------  0
120[A] 80[B] [C] --------------  93. Mean arterial press
140[A] 90[B] [C] --------------  107. Mean arterial press
150[A] 100[B] [C] -------------  117(Erroneous entry, correct it by using
                                   following sequence)
150[D] 100[E] -----------------  117(Erroneous entry corrected)
130[A] [R/S] ------------------  130Average systolic press
85[B] [R/S] -------------------  85 Average diastolic press
[C] [R/S] ---------------------  100 Average mean arterial press
[R/S] -------------------------  3  Number of readings
```

Reference(s)

Bell, G.H. et al, Textbook of Physiology and Biochemistry, Williams and Wilkins, Baltimore, Maryland, 1968, pg. 582.

This program is a translation of the HP-65 Users' Library program #01329A submitted by H. Peter Blumenthal.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Load side 1			
2.	Initialize		f A	0.
	[Perform 3-5 for each reading i-1-2...(n01)]			
3.	Input P_i systolic	P_i syst	A	P_i syst
4.	Input P_i diastolic	P_i diast	B	P_i diast
5.	Calculate mean arterial press		C	P_i map
6.	If erroneous data entry is made, correct it.	P_k syst	D	P_k syst
		P_k diast	E	P_k diast
7.	Input final blood pressure readings			
	(i=n) and calculate averages	P_n syst	A	P_n syst
			R/S	$\overline{P}$syst
		P_n diast	B	P_n diast
			R/S	$\overline{P}$ diast
			C	P_n map
			R/S	$\overline{P}$ map
8.	Recall number of readings		R/S	n
9.	For new group of data go to (2)			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBL a	21 16 11	
002	0	00	
003	CLRG	16-53	Initialize
004	DSP0	-63 00	
005	RTN	24	
006	*LBL A	21 11	
007	1	01	
008	ST+4	35-55 04	
009	X⇄Y	-41	
010	STO5	35 05	Psyst
011	ST+1	35-55 01	
012	R/S	51	
013	RCL1	36 01	
014	RCL4	36 04	
015	÷	-24	Ave. Psyt
016	RTN	24	
017	*LBL B	21 12	
018	STO6	35 06	
019	ST+2	35-55 02	Pdiast
020	R/S	51	
021	RCL2	36 02	
022	RCL4	36 04	
023	÷	-24	Ave. Pdiast
024	RTN	24	
025	*LBL C	21 13	
026	RCL5	36 05	
027	RCL6	36 06	
028	ENT↑	-21	
029	+	-55	
030	+	-55	Map
031	3	03	
032	÷	-24	
033	ST+3	35-55 03	
034	R/S	51	
035	RCL3	36 03	
036	RCL4	36 04	
037	÷	-24	Ave. Map
038	R/S	51	
039	RCL4	36 04	
040	RTN	24	
041	*LBL D	21 14	
042	1	01	
043	ST-4	35-45 04	Delete Erroneous Psyst
044	X⇄Y	-41	
045	ST-1	35-45 01	
046	RTN	24	
047	*LBL E	21 15	
048	ST-2	35-45 02	Delete Erroneous Pdiast
049	ENT↑	-21	
050	+	-55	
051	+	-55	
052	3	03	
053	÷	-24	
054	ST-3	35-45 03	
055	RTN	24	

STEP	KEY ENTRY	KEY CODE	COMMENTS
060			
070			
080			
090			
100			
110			

REGISTERS

0	1 Σ Psyst	2 Σ Pdiast	3 Σ Pmap	4 n	5 Psyst i	6 Pdiast i	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title PACEMAKER RATE AND INTERVAL AVERAGER

Contributor's Name Walter J. Gamble, M.D.
Address 300 Longwood Ave.
City Boston, **State** Mass. **Zip Code** 02115

Program Description, Equations, Variables Pacemaker Rate analizers usually display the pacemaker rate with one digit after the decimal. When using telephone transmission, this last digit usually changes frequently (see example of actual intake.) The operator observes a few beats, then enters the selected base rate (usually two digits to the left of the decimal, or alternately can be 1st digit and zero.) Next the last digit (or last two) is entered without decimal. The calculator converts to the full number for the rate, prints it, calculates the pacemaker interval, and accumulates data for the statistics (see below).

Errors are removed at any time through the use of a different user-definable key (D), and are indicated on the printed tape by a minus sign.

Mean Rate and Standard Error of the Mean are printed for results. (The standard deviation of the sample is displayed) A similar analysis can be made of the pacemaker interval by a different key.

Incidently, the entry can be made of intervals instead of the rate. Then the analysis keys are reversed in function, but with proper results.

Individual Rate Entry = (Base Rate) + (Entry number)÷10

$$\text{Interval (milliseconds)} = \frac{\text{Rate}}{6 \cdot 10^4}$$

$$\text{Standard Error of the Mean} = \sqrt{\frac{N\Sigma X^2 - (\Sigma X)^2}{N^2(N-1)}}; \quad \text{Standard Deviation} = (\text{S.E.M.})(\sqrt{N})$$

Operating Limits and Warnings Program can process about 1 reading every 2.2 seconds.

Program Description II

Sketch(es)

Sample Problem(s)

Case # 1

Rate meter display	71.2 to 72.0	71.5	71.6	71.4	71.9	71.6	71.5	71.0	71.5	71.5	71.6	71.4
Entry & key	71 A	5 E	6 E	4 E	9 E	6 E	5 E	0 E	5 E	5 E	6 E	4 E

Case # 2

Rate Meter display	88.7 to 89.3	88.5	88.7	88.9	89.1	88.9	89.0	89.2	88.8	88.9	89.1	89.0
Entry & Key	80 A	85 E	87 E	89 E	91 E	89 E	90 E	92 E	88 E	89 E	91 E	90 E

Case # 3

Rate meter display	75.1 to 75.8	75.5	75.4	75.1	75.2	75.5	75.3	75.8	75.3	75.3	75.6	75.7
Entry & key	75 A	5 E	4 E	1 E	2 E	5 E	3 E	8 E	3 E	3 E	6 E	7 E

Solution(s)

Case # 1 [B] → Mean Rate = 71.5, S.E.M. = ± 0.06; Mean Interval [C] = 839.2 ± .76

If one considers the 71.Ø to be erroneous, then press Ø and [D] → -71.0

Repeat analysis [E] → Mean Rate 71.6 ± 0.05, and Interval [C] = 838.6 ± 0.53

Case # 2; [B] → Mean Rate 88.9; ± 0.06 S.E.M; [C] → Interval 674.8 ms. ± 0.46 S.E.M.

Case # 3; [B] → Mean Rate 75.4; ± 0.06 S.E.M.; [C] → Interval 795.5 ms., ± 0.68 S.E.M.

Reference(s)

Tips, if using a base and the value drops below it, you can enter a negative number i.e. if in case #1 meter read 70.9, entering 1 & CHS (-1) would give correct result of 70.9 from the base rate of 71.

User Instructions

BASE RATE ENTRY	RATE Solution	INTERVAL Solution	ERROR (Tenths)	ENTRY (Tenths)

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS			OUTPUT DATA/UNITS
1	Load side 1 of program card					
2	Enter "BASE RATE"	Beats/min.	A			Base Rate
3	Input last digit(s)	tenths	E			Rate/N*
4	Repeat step 3 until sufficient number input					
5	To Obtain Rate Data Analysis		B			Mean Rate
						S.E.M. rate
					*	Std.Dev.Rate*
6	To Obtain Interval Data Analysis		C			Mean Interval
						S.E.M. Interval
					*	Std.Dev Intrvl
7	To Remove Erroneous Data	bad number tenths	D			-Rate/N*
8	To obtain number of data points analized		f	E		N
	Note * indicates number left in display, all others are printed out (HP-97)					
	N = number of points retained in analysis pool.					

67 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	LBL E	21 15	
002	.	-62	
003	1	01	
004	x	-35	
005	RCL E	36 15	
006	+	-55	
007	ENT ↑	-21	
008	PRT X	-14	
009	1/X	52	
010	Σ+	56	
011	RTN	24	
012	LBL B	21 12	
013	$\overline{X}$	16 53	
014	X⇄ Y	-41	
015	STO 1	35 01	
016	S	16 54	
017	X⇄Y	-41	
018	LBL 1	21 01	
019	ENT ↑	-21	
020	P⇄S	16-51	
021	RCL 9	36 09	
022	P⇄S	16-51	
023	$\sqrt{X}$	54	
024	÷	-24	
025	RCL 1	36 01	
026	SPC	16-11	
027	DSP 1	-63 01	
028	PRT X	-14	
029	R	-31	
030	DSP 2	-63 02	
031	PRT X	-14	
032	DSP 1	-63 01	
033	R	-31	
034	RTN	24	
035	LBL C	21 13	
036	$\overline{X}$	16 53	
037	RCL D	36 14	
038	x	-35	
039	STO 1	35 01	
040	S	16 54	
041	RCL D	21 14	
042	x	-35	
043	GTO 1	22 01	
044	Ø	00	
045	LBL D	21 14	
046	.	-62	
047	1	01	
048	x	-35	
049	RCL E	36 15	
050	+	-55	
051	CHS	-22	
052	PRT X	-14	
053	CHS	-22	
054	ENT ↑	-21	
055	1/X	52	
056	Σ−	16 56	
057	RTN	24	
058	LBL A	21 11	
059	CL RG	16-53	
060	P⇄S	16-51	
061	CL RG	16-53	
062	STO E	35 15	
063	SPC	16-11	
064	PRT X	-14	
065	SPC	16-11	
066	6	06	
067	EEX	-23	
068	4	04	
069	STO D	35 14	
070	X⇄Y	-41	
071	RTN	24	
072	LBL e	21 16 15	
073	SPC	16-11	
074	P⇄S	16-51	
075	RCL 9	36 09	
076	PRT X	-14	
077	P⇄S	16-51	
078	RTN	24	
079	R/S	51	
080			
090			
100			
110			

REGISTERS

0	1	2	3	4	5	6	7	8	9
	Used								
S0	S1	S2	S3	S4 Σ (1/Rate) Σ X	S5 ΣX^2	S6 Σ Rate Σ Y	S7 ΣY^2	S8 N (Σ XY)	S9 N

A	B	C	D	E	I
			60 000.	Base Value	

Program Description I

Program Title BLOOD ALCOHOL

Contributor's Name HEWLETT-PACKARD
Address 1000 CIRCLE BLVD.
City CORVALLIS **State** OREGON **Zip Code** 97330

Program Description, Equations, Variables Equations were derived from tables in the CRC Handbook of Tables for Applied Engineering Science.

$\%=(((ALC)(OZ)/50)-T)(3.751)/WT$

T=0 if HRS $\leq$ 1
=HRS-1 if HRS > 1

% : Percent alcohol in the blood
ALC : Ounces of the beverage consumed
WT : Weight of the subject in pounds
HRS : Period of time over which the beverage was consumed

Pounds = (2.20462) Kilograms
Ounces = (0.033813087)Milliliters
% alcohol by weight - (0.5) Proof

This program is a translation of the HP-65 User's Library program #00829A submitted by Walter L. Gregory Jr.

Operating Limits and Warnings
All negative values generated by the above equations are displayed as zero (0.000).

Program Description II

Sketch(es)

PERCENT ALCOHOL CONCENTRATION IN THE BLOOD
(Committee on Alcohol and Drugs of the National Safety Council)

0.000 to 0.050	No influence by alcohol under the law.
0.051 to 0.100	Alcoholic influence is usually present.
0.101 to 0.500	Definite evidence of "under the influence".

Sample Problem(s)

(1) WT = 150 lbs OZ = 4 oz ALC = 20 % HRS = 0.5 hrs

(2) WT = 90 kg OZ = 150 ml ALC = 40% HRS = 2 hrs

(3) WT = 180 lbs OZ = 5 oz ALC = 100 proof HRS = 3.5 hrs

Solution(s)

1) 150 [A] 4[B] 20[C] .5[D] [E] ----------> 0.040%

2) 90 [A] [R/S] 150[B] [R/S] 40[C] 2[D] [E] --------> 0.058%

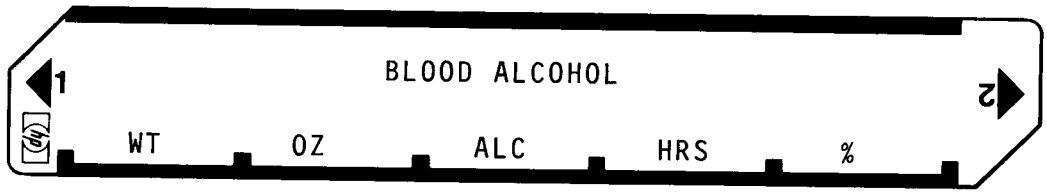
3) 180 [A] 5[B] 100[C] [R/S] 3.5[D] [E] ----------> 0.052%

Reference(s)

This program is a translation of the HP-65 User's Library program #00829A submitted by Walter L. Gregory Jr.

Bolz, Ray E., Tuve, George L., CRC Handbook of Tables for Applied Engineering Science, pages 619, 620, Chemical Rubber Co., 1970.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Load side 1			
2.	Input data (any order)			
	Subject's weight in pounds	lbs	A	lbs
	OR Kilograms	kg	A R/S	lbs
	Amount of beverage consumed in Ounces	oz	B	oz
	OR Milliliters	ml	B R/S	oz
	Alcoholic content of beverage in			
	Percent by volume	%	C	%
	OR Proof	proof	C R/S	%
	Period of time over which the beverage was consumed in hours	hrs	D	hrs
3.	Compute percent alcohol concentration in the blood		E	%
4.	For a new case, go to step 2 (Any or all of the prameters may be changed in step 2.)			

SET STATUS

FLAGS			TRIG	DISP
	ON	OFF		
0	☐	☑	DEG ☑	FIX ☑
1	☐	☑	GRAD ☐	SCI ☐
2	☐	☑	RAD ☐	ENG ☐
3	☐	☑		n ___

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	STO1	35 01	Store WT in lbs.
003	R/S	51	
004	2	02	
005	.	-62	Convert kg to lbs
006	2	02	
007	0	00	
008	4	04	
009	6	06	
010	2	02	
011	×	-35	
012	STO1	35 01	Store lbs.
013	R/S	51	
014	*LBLB	21 12	- - - - - - - - -
015	STO2	35 02	Store bev. in oz
016	R/S	51	
017	.	-62	Convert ml to oz
018	0	00	
019	3	03	
020	3	03	
021	8	08	
022	1	01	
023	3	03	
024	0	00	
025	8	08	
026	7	07	
027	×	-35	
028	STO2	35 02	Store oz
029	R/S	51	
030	*LBLC	21 13	Store alc.cont.
031	STO3	35 03	
032	R/S	51	
033	2	02	Convert proof to %
034	÷	-24	
035	STO3	35 03	Store %
036	R/S	51	
037	*LBLD	21 14	
038	STO4	35 04	Store time
039	R/S	51	
040	*LBLE	21 15	
041	RCL3	36 03	Calculate blood alcohol
042	RCL2	36 02	
043	×	-35	
044	5	05	
045	0	00	
046	÷	-24	
047	1	01	
048	RCL4	36 04	Is time ≤ 1 hr.
049	X≤Y?	16-35	
050	GTO1	22 01	
051	X≷Y	-41	
052	-	-45	
053	GTO2	22 02	
054	*LBL1	21 01	
055	R↓	-31	If T ≤ 1 hr.
056	R↓	-31	
057	0	00	
058	*LBL2	21 02	If T > 1 hr.
059	-	-45	
060	3	03	
061	.	-62	
062	7	07	
063	5	05	
064	1	01	
065	×	-35	
066	RCL1	36 01	
067	÷	-24	
068	0	00	If negative display 0
069	X≤Y?	16-35	
070	X≷Y	-41	
071	DSP3	-63 03	
072	RTN	24	
073	R/S	51	

080 090 100 110

REGISTERS

0	1 WT	2 VOL	3 ALC%	4 Time	5	6	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Human Post-Trauma Epilepsy Seizure Prediction

Contributor's Name James C. Pittman Jr. (HP-65 USERS CLUB MEMBER NUMBER 1002)

Address Department of Psychology, University of New Mexico

City Albuquerque **State** N. M. **Zip Code** 87131

Program Description, Equations, Variables This program computes the probability that a patient with head injury will have seizures within a given time after injury and computes the elapsed time after injury when probability of seizures will have decreased to a given value. Compare your patient's injuries and symptoms to those listed in the Risk Value Table. Select the four (or fewer) epileptogenic factors with the highest theta values. Enter these theta values to compute the initial risk probability R_I. Enter the time (months) since injury and compute the probability of seizure beyond that time. Enter an "acceptable" risk level (e.g., 5%) and compute the time to elapse after injury before the risk of seizure will have declined to that level.

TABLE OF THETA VALUES AND RISK FACTORS FOR BRAIN INJURIES

θ-VALUE	RISK FACTOR	θ-VALUE	RISK FACTOR
.05	Unconsciousness/amnesia, 1 hr or more	.20	Missile wound/dura tear
.10	Persisting EEG abnormality	.05	Linear skull fracture*
.20	Hemiplegia, aphasia	.10	Depressed skull fracture*
.20	Hemorrhage (intracranial)	.25	Central/parietal damage**
.15	Seizure(s) during first week	.15	Temporal damage**
.10	Prefrontal/occipital damage**	.10	Infection of CNS

* Do not use with missile wounds unless the dura is intact.

** With multiple brain damage use the single largest theta value.

Operating Limits and Warnings Theta values must be entered in decreasing order of magnitude (i.e., largest first). Use no more than four theta values (program simply ignores any beyond four). Do not enter times shorter than one week (i.e., 0.25 month) nor longer than five years (i.e., 60 months). Formulas in this program use a constant probability mathematical model and fit published clinical data of human patients. The model predicts at p = .05 confidence level the chance of post-traumatic epileptic seizures in single cases.

Program Description II

EQUATIONS $P_n = P_0 (.925)^n$ [Equation 1]

Where: n = number of months since injury.

P_n = probability of seizure after "n" months after injury.

P_0 = probability of seizure any time after injury (Let $P_0 = R_I$ from Eq. 2).

0.925 = constant of probability of seizure during any given month.

$R_i = R_{i-1} + \theta_i(1.2 - R_{i-1})$ and $R_i \rightarrow R_I$ [Equation 2]

Where: R_0 = initial value of R_i = 0.01, lowest probability of post-trauma seizure.

1.2 = constant to fit R_I value to published clinical data.

Sample Problem A patient has occipital wound, depressed fracture, and 2 hours coma. Look up theta values, then use Equation 2 to calculate the corresponding R values.

1) Depressed skull fracture: $\theta = .10$ $R_1 = .010 + (.10)(1.2 - .010) = 0.129$

2) Occipital damage: $\theta = .10$ $R_2 = .129 + (.10)(1.2 - .129) = 0.236$

3) Unconsciousness: $\theta = .05$ $R_3 = .236 + (.05)(1.2 - .236) = 0.284$

Thus the probability of a fit any time after the injury is $R_I = 0.284$. After six months the probability will have declined and may be calculated by using Equation 1 with n set to 6.0 and P_0 set equal to $R_I = 0.284$ as follows:

a) $P_6 = (.284)(.925)^6 = 0.18$ or 18 percent probability of seizure(s).

The time at which the probability of fits will have decreased to a particular level (say, 5 percent) may be calculated by solving Equation 1 for n as follows:

b) $$n = \frac{\log_e(P_n/P_0)}{\log_e(.925)} \qquad n = \frac{\log_e(.05/.284)}{\log_e(.925)} = 22.3 \text{ months.}$$

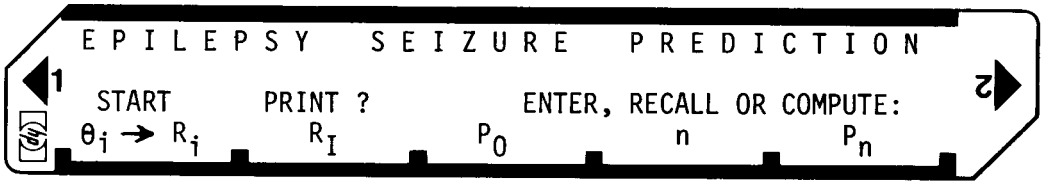
Solution

Initialize (sets R_0)		f a	0.010	R_0	(Initial)
Enter θ values	1) .1	A	0.129	R_1	(Computed)
	2) .1	A	0.236	R_2	(Computed)
	3) .05	A	0.284	R_3	(Computed)
End θ entry		B	0.284	R_I	
Enter n	6	D	6.0	n	(Stored)
Compute P_n		E	0.18	P_n	(Computed)
Enter new P_n	.05	E	0.05	P_n	(Stored)
Compute new n		D	22.3	n	(Computed)

Reference Dennis M. Feeney and A. Earl Walker. MATHEMATICAL PREDICTION OF HUMAN POST-TRAUMATIC EPILEPSY. Neuroscience Abstracts, Vol. III, 1977.

Reprints are available on request.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Load side 1.			
2	Initialize. (Sets initial value of R_0.)		f a	0.010
3	Clear print mode. (For HP-67 or HP-97)		f b	0.000
	Set print mode. (For HP-97)		f b	1.000
4	Compare patient's symptoms to table of risk			
	values (page 1) and select four (or fewer)			
	corresponding theta values.			
5	Enter the largest theta. Compute R_1.	θ_1	A	(1) R_1
6	Repeat step 5 for the other theta values.	θ_i	A	(i) R_i
	a) If a θ value larger than a previous one is			
	entered, "Error" will appear. Clear with [CLx].			
	b) Any θ values beyond four will be ignored.	e.g., θ_5	A	θ_5
			h R↓	θ_4
7	Terminate theta entry. P_0 is set equal to R_I.		B	R_I
8	Enter a value for either n or P_n and compute			
	the value of the other. (If desired, values of			
	P_0 can be computed based on n and P_n values.)	n	D	n
			E	P_n
	NOTES: Keying a number before a letter key	P_n	E	P_n
	results in that number being stored. Keying a		D	n
	letter key without keying a number results in		C	P_0
	that value being computed from the other two			
	stored values. Keying [B] is equivalent to			
	entering a number (R_I) before keying [C].			
9	Recall original R_I at any time. (See step 7.)		B	R_I
10	For a new problem, go to step 2.			
	NOTES ON DISPLAY AND PRINTING:			
	(Print off) Keys [C], [D], and [E] set DSP 3,			
	DSP 1 and DSP 2 respectively, not to indicate			
	accuracy but as a cue to which value is being			
	displayed. [A] sets DSP 0 and displays i for			
	one second, then DSP 3 for display of R_i.			
	(Print on) [A] will print R_i values but not i			
	nor theta values. [C], [D], and [E] will print			
	all three values P_0, n, and P_n when any one is			
	computed, with display set at DSP 4.			

67 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*g LBL f a	32 25 11	Initialize.
	f CL REG	31 43	
	.	83	
	9	09	
	2	02	
	5	05	
	STO 1	33 01	Store constant.
	.	83	
	0	00	
010	1	01	
	STO 0	33 00	Store R_0.
	h CF 0	35 61 00	
	h SF 2	35 51 02	
	h RTN	35 22	
	*g LBL f b	32 25 12	Print clear/set.
	h CF 1	35 61 01	
	0	00	
	R/S	84	"0" No print.
	*g LBL f b	32 25 12	
020	h SF 1	35 51 01	
	1	01	
	h RTN	35 22	"1" Print.
	*f LBL A	31 25 11	θ_i
	h F? 0	35 71 00	Over four θs ?
	h RTN	35 22	
	h F? 2	35 71 02	Is this θ_1 ?
	STO A	33 11	
	RCL A	34 11	θ_{i-1}
	h x≷y	35 52	
030	g x≤y ?	32 71	θ_i θ_{i-1}
	GTO 1	22 01	
	GTO 0	22 00	"Error" message.
	*f LBL 1	31 25 01	
	STO A	33 11	θ_i
	f ISZ	31 34	
	1	01	
	.	83	
	2	02	
	RCL 0	34 00	R_{i-1}
040	-	51	
	x	71	
	STO + 0	33 61 00	
	h RC I	35 34	i
	4	04	
	g x≤y ?	32 71	Is this θ_4 ?
	h SF 0	35 51 00	End θ entry.
	h R↓	35 53	i
	DSP 0	23 00	
	h PAUSE	35 72	
050	RCL 0	34 00	R_i
	STO B	33 12	
	STO C	33 13	
	DSP 3	23 03	
	h F? 1	35 71 01	Print ?
	f - x -	31 84	
	h RTN	35 22	

STEP	KEY ENTRY	KEY CODE	COMMENTS
057	*f LBL B	31 25 12	
	DSP 3	23 03	
	RCL 0	34 00	
060	STO C	33 13	Set $P_0 = R_I$.
	h SF 3	35 51 03	Digit entry flag.
	h SF 0	35 51 00	End θ entry.
	h RTN	35 22	
	*f LBL C	31 25 13	
	DSP 3	23 03	P_0
	STO C	33 13	
	h F? 3	35 71 03	New P_0 ?
	R/S	84	Yes; stop.
	RCL E	34 15	No; compute.
070	RCL 1	34 01	.925
	RCL D	34 14	
	h y^x	35 63	
	%	81	
	STO C	33 13	Computed P_0.
	GTO 9	22 09	To print routine.
	*f LBL D	31 25 14	
	DSP 1	23 01	n
	STO D	33 14	
	h F? 3	35 71 03	New n ?
080	R/S	84	Yes; stop.
	RCL E	34 15	No; compute.
	RCL C	34 13	
	%	81	
	f LN	31 52	
	RCL 1	34 01	.925
	f LN	31 52	
	%	81	
	STO D	33 14	Computed n.
	GTO 9	22 09	To print routine.
090	*f LBL E	31 25 15	
	DSP 2	23 02	P_n
	STO E	33 15	
	h F? 3	35 71 03	New P_n ?
	R/S	84	Yes; stop.
	RCL C	34 13	No; compute.
	RCL 1	34 01	.925
	RCL D	34 14	
	h y^x	35 63	
	x	71	
100	STO E	33 15	Computed P_n.
	*f LBL 9	31 25 09	
	h F? 1	35 71 01	Print ?
	GTO 8	22 08	Yes.
	h RTN	35 22	No; stop.
	*f LBL 8	31 25 08	
	DSP 4	23 04	
	RCL C	34 13	P_0 print.
	f - x -	31 84	
	RCL D	34 14	n print.
110	f - x -	31 84	
	RCL E	34 15	P_n print.
	f - x -	31 84	

REGISTERS

0	1	2	3	4	5	6	7	8	9
R_0, R_i	0.925								
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I
θ_{i-1}, θ_i	R_i, R_I	R_i, R_I, P_0	n	P_n	θ Counter

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	R/S	84	

Program Listing for HP-97:

001	*LBLc	21 16 11	
002	CLRG	16-53	
003	.	-62	
004	9	09	
005	2	02	
006	5	05	
007	STO1	35 01	
008	.	-62	
009	0	00	
010	1	01	
011	STO0	35 00	
012	CF0	16 22 00	
013	SF2	16 21 02	
014	RTN	24	
015	*LBLb	21 16 12	
016	CF1	16 22 01	
017	0	00	
018	R/S	51	
019	*LBLb	21 16 12	
020	SF1	16 21 01	
021	1	01	
022	RTN	24	
023	*LBLA	21 11	
024	F0?	16 23 00	
025	RTN	24	
026	F2?	16 23 02	
027	STOA	35 11	
028	RCLA	36 11	
029	X≠Y	-41	
030	X≠Y?	16-35	
031	GTO1	22 01	
032	GTO0	22 00	
033	*LBL1	21 01	
034	STOA	35 11	
035	ISZI	16 26 46	
036	1	01	
037	.	-62	
038	2	02	
039	RCL0	36 00	
040	-	-45	
041	×	-35	
042	ST+0	35-55 00	
043	RCLI	36 46	
044	4	04	
045	X≠Y?	16-35	
046	SF0	16 21 00	
047	R↓	-31	
048	DSP0	-63 00	
049	PSE	16 51	
050	RCL0	36 00	
051	STOB	35 12	
052	STOC	35 13	
053	DSP3	-63 03	
054	F1?	16 23 01	
055	PRTX	-14	
056	RTN	24	
057	*LBLB	21 12	
058	DSP3	-63 03	
059	RCL0	36 00	
060	STOC	35 13	
061	SF3	16 21 03	
062	SF0	16 21 00	
063	RTN	24	
064	*LBLC	21 13	
065	DSP3	-63 03	
066	STOC	35 13	
067	F3?	16 23 03	
068	R/S	51	
069	RCLE	36 15	
070	RCL1	36 01	
071	RCLD	36 14	
072	Y^x	31	
073	÷	-24	
074	STOC	35 13	
075	GTO9	22 09	
076	*LBLD	21 14	
077	DSP1	-63 01	
078	STOD	35 14	
079	F3?	16 23 03	
080	R/S	51	
081	RCLE	36 15	
082	RCLC	36 13	
083	÷	-24	
084	LN	32	
085	RCL1	36 01	
086	LN	32	
087	÷	-24	
088	STOD	35 14	
089	GTO9	22 09	
090	*LBLE	21 15	
091	DSP2	-63 02	
092	STOE	35 15	
093	F3?	16 23 03	
094	R/S	51	
095	RCLC	36 13	
096	RCL1	36 01	
097	RCLD	36 14	
098	Y^x	31	
099	×	-35	
100	STOE	35 15	
101	*LBL9	21 09	
102	F1?	16 23 01	
103	GTO8	22 08	
104	RTN	24	
105	*LBL8	21 08	
106	DSP4	-63 04	
107	RCLC	36 13	
108	PRTX	-14	
109	RCLD	36 14	
110	PRTX	-14	
111	RCLE	36 15	
112	PRTX	-14	
113	R/S	51	

HP-97 owners: This program was intentionally limited to one side of a program card, but by adding a few steps the printout capability can be improved. Enter the program as given, then, in PRGM mode, perform the following:

GTO.112 f SPACE RTN (HP-97)	GTO.112 h SPACE h RTN (HP-67)
GTO.049 f F? 1 PRINTx	GTO.049 h F? 1 f -x-
GTO.034 f F? 1 PRINTx	GTO.034 h F? 1 f -x-
GTO.023 f SPACE DSP 3	GTO.023 h SPACE DSP 3
GTO.013 DSP 2 f F? 1 PRINTx	GTO.013 DSP 2 h F? 1 f -x-

Go to RUN mode, test and list your program, which now will have 123 steps.

The program will now print: After [f a]: 0.10 = R_0 to indicate a new problem.

After [A]: θ_i, i, R_i for each entry.

LABELS

A $\theta_i \rightarrow R_i$	B $R_i \rightarrow R_I$	C $P_0 \rightarrow P_0$	D n → n	E $P_n \rightarrow P_n$
a Init.	b Print ?	c	d	e
0 OMIT.	1 Routine A	2	3	4
5	6	7	8 Print C.D.E	9 Print

FLAGS

0 θ_4 ?
1 Print ?
2 θ_1 ?
3 Store or Compute ?

SET STATUS

FLAGS		TRIG	DISP
	ON OFF		
0	☐ ☒	DEG ☒	FIX ☒
1	☐ ☒	GRAD ☐	SCI ☐
2	☐ ☒	RAD ☐	ENG ☐
3	☐ ☒		n 3

Program Description I

Program Title Bedside Blood-Gas Interpreter

Contributor's Name Charles W. Bollinger
Address 644 Longshaw Drive
City Bremerton **State** Washington **Zip Code** 98310

Program Description, Equations, Variables Lbl's a and A accept patient data and store in metric form.

Lbl B: Computes ideal alveolar gas: $P_AO_2 = P_IO_2 - PCO_2(F_IO_2 + \frac{1-F_IO_2}{R})$. $P_IO_2 = F_IO_2 \times P_B$.

For this "bedside" program, P_B is 760 (appears as "dry" P_B=760-47.713). Difference in O_2 values over scale of barometric pressures at sea level is 8 Torr, maximum. Users living in altitudes or other places with differing average P_B should modify steps 038-040 accordingly. The (A-a) DO_2 varies with age and oxygen concentration. This figure is calculated and subtracted from the actual (A-a) DO_2 to give a "significant" figure. The actual figure, however, is the one stored for shunt computation.

Lbl C: If the patient is on 100% oxygen, the (A-a) DO_2 can be used to estimate venous admixture, or shunt. Laboratory accuracy is not sought. The A-J content difference is taken to be 4.5 %. $\frac{Q_s}{Q_t} = \frac{(A\text{-}a)\ DO_2 \times 0.0031}{(A\text{-}a)\ DO_2 \times 0.0031 + (C_aO_2 - C_{\bar{v}}O_2)}$

Lbl D: When various respiratory therapy equipment are air-driven, and it is desirable to enrich with oxygen to a known percentage, this routine calculates the oxygen flow required in L/min.

Lbl e: This is a convenience routine to work the Henderson-Hasselback equation. If the pH and total CO_2 are known, PCO_2 and HCO_3^- can be found.

Lbl E: Finds base deficit and calculates the amount of sodium bicarbonate to correct it. See below regarding calc. used.

Operating Limits and Warnings Pt. height is not used in this program, but provision for storing and converting is included to keep program compatible with a series under developement.

Computation of N_aHCO_3 - to administer uses a multiplier of 0.3xBExwt. Clinicians preferring another unit should change step #146.

"Base deficit" is similar to "Base Excess" of Astrup, but not identical, which is why the different terminology is used.

Program Description II

Sketch(es)

Sample Problem(s)

A. Pt is 64 years old and weighs 195 pounds. On room air his P_aO_2 is 50 Torr, PCO_2 is 63 Torr., HCO_3 21 meq/L pH: 7.15. Find $(A\text{-}a)DO_2$ and Base deficit, and amount of sodium bicarbonate to correct.

B. On 100% oxygen a patient has a P_aO_2 of Torr and a PCO_2 of 17 Torr. Find $(A\text{-}a)DO_2$ and estimate shunt.

C. A patient receiving mist from air-powered nebulizer at 12 L/min is to have 44% O_2. How much oxygen must be added to airflow to accomplish this?

D. A patient comes in hyperventilating but with poor exchange of air. Blood gas machine is "cold" but lab technician can get a pH and CO_2 content right away. They are: pH 7.2, CO_2 ct 18, find other values and base situation.

Solution(s)

A. 195[↑] 64[A]

50[↑] 63[↑] .21[B]--------- 74 P_AO_2

--------- 24 $(A\text{-}a)DO_2$

--------- 8 Sign$(A\text{-}a)DO_2$

21[↑] 7.15[E] --------- -5.5 Base Def

---------146 N_aHCO_3 meg

B. 150[↑] 17[↑] 1[B] ---- 696(P_AO_2)

---- 546$(A\text{-}a)DO_2$

---- 480sig.$(A\text{-}a)DO_2$

[C] ---- 27 % shunt

C. 12[↑] .44[D] ---- 4.9 L/min O_2

D. 7.2[↑](CO_2ct)18[f][e]- 44 PCO_2

16.7HCO_3^-

* 7.2[E] ---- -9.3Base Def.

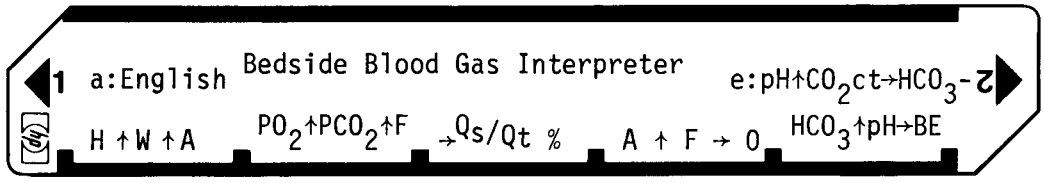
*Note:16.7 is result in x-will enter automatically ---- 247 $NaHCO_3$ meg.

Reference(s)

Paulin, Edw G and Hornbein, T.F.: HSA Workshop in Acid-Base #114,115-San Francisco 1976

Comroe, J.H. et al: The lung. Yearbook Medical Publishers, Inc.-Chicago 1970.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Load program side 1 and side 2			
2.	Input patient data: Height in inches or cm	H	ENTER↑	
	Weight is pounds or km	W	ENTER↑	
	Age(yr) English	A	f a	
	Metric	A	A	
3.	To find alveolar Oxygen and Alveolar-Arterial diff:			
	Input P_aO_2 in Torr	P_aO_2	ENTER↑	
	Input PCO_2 in Torr	PCO_2	ENTER↑	
	Input F_1O_2 as fraction	F_1O_2	B	P_AO_2
				$(A\text{-}a)DO_2$
				Signif$(A\text{-}a)DO_2$
4.	To find per-cent venous admixture (shunt)Qs/Qt			
	(valid only when F_1O_2 above is 1)	-	C	Qs/Qt %
5.	To find amount of oxygen to add to airflow for a desired F_1O_2:			
	Input airflow in L/min	A	ENTER↑	
	Input desired F_1O_2 in decimal	F_1O_2	D	0
6.	To find PCO_2 and HCO_3^- when pH and CO_2 content are known:			
	Input pH	pH	ENTER↑	
	Input CO_2 Ct	CO_2Ct	f E	PCO_2
				HCO_3^-
7.	To find base deficit and amount of sodium bicarbonate to correct			
	Input HCO_3^- (or use value from above)	HCO_3^-	ENTER↑	
	Input pH	pH	E	Base Deficit
				$NaHCO_3$ in meg.

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBL a	21 16 11	
002	STO C	35 13	
003	R↓	-31	Convert English values to metric and store
004	2	02	
005	.	-62	
006	2	02	
007	0	00	
008	5	05	
009	÷	-24	
010	STO B	35 12	
011	R↓	-31	
012	2	02	
013	.	-62	
014	5	05	
015	4	04	
016	×	-35	
017	STO A	35 11	
018	RTN	24	
019	*LBL A	21 11	Store Ht, Wt. and Age in A,B, and C
020	STO C	35 13	
021	R↓	-31	
022	STO B	35 12	
023	R↓	-31	
024	STO A	35 11	
025	RTN	24	
026	*LBL B	21 12	Calculate the alveolar air equation: $P_1O_2-PCO_2(F_1O_2+\frac{1-F_1O_2}{R})$
027	1	01	
028	X≷Y	-41	
029	STO 5	35 05	
030	-	-45	
031	.	-62	
032	8	08	
033	÷	-24	
034	RCL 5	36 05	
035	+	-55	
036	×	-35	
037	CHS	-22	
038	7	07	
039	1	01	
040	3	03	
041	RCL 5	36 05	
042	×	-35	
043	+	-55	
044	PRT X	-14	Print "ideal" alveolar gas
045	X≷Y	-41	
046	-	-45	
047	PRT X	-14	Print $(A-a)DO_2$
048	STO 1	35 01	
049	RCL C	36 13	Perform age regression to find allowable $(A-a)DO_2$
050	RCL 5	36 05	
051	×	-35	
052	2	02	
053	.	-62	
054	5	05	
055	+	-55	
056	-	-45	
057	PRT X	-14	Print "significant" $(A-a)DO_2$
058	SPC	16-11	
059	RTN	24	
060	*LBL C	21 13	Convert $(A-a)DO_2$ to content difference
061	RCL 1	36 01	
062	.	-62	
063	0	00	
064	0	00	
065	3	03	
066	1	01	
067	×	-35	
068	ENT↑	-21	
069	ENT↑	-21	Add average $(a-\bar{v})DCO_2$ to denominator
070	4	04	
071	.	-62	
072	5	05	
073	+	-55	
074	÷	-24	
075	EEX	-23	Express as percent
076	2	02	
077	×	-35	
078	PRT X	-14	
079	SPC	16-11	
080	RTN	24	
081	*LBL D	21 14	Calculate oxygen flow to add to airflow: $\dot{O}=\frac{\dot{F}A-.21\dot{A}}{1-F}$
082	STO 5	35 05	
083	X≷Y	-41	
084	STO 6	35 06	
085	×	-35	
086	.	-62	
087	2	02	
088	1	01	
089	RCL 6	36 06	
090	×	-35	
091	-	-45	
092	1	01	
093	RCL 5	36 05	
094	-	-45	
095	÷	-24	
096	DSP 1	-63 01	Print $\dot{O}$ in L/min
097	PRT X	-14	
098	SPC	16-11	
099	DSP 0	-63 00	
100	RTN	24	
101	*LBL e	21 16 15	Calculate Henderson-Hasselback equation: $pH-pK+\log(\frac{HCO_3^-}{H_2CO_3})$
102	STO 3	35 03	
103	X≷Y	-41	
104	6	06	
105	.	-62	
106	1	01	
107	-	-45	
108	10^x	16 33	
109	1	01	
110	+	-55	
111	÷	-24	
112	STO 4	35 04	

REGISTERS

0	1 (A-a)DO_2	2	3 CO_2ct	4 HCO_3^-	5 F_1O_2	6 $\dot{A}$	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A Height(cm)	B Weight(kg)	C Age (yr)	D	E	I

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	.	-62	
114	0	00	
115	3	03	
116	0	00	
117	1	01	
118	÷	-24	
119	PRTX	-14	
120	RCL3	36 03	
121	RCL4	36 04	
122	-	-45	
123	DSP1	-63 01	
124	PRTX	-14	
125	DSP0	-63 00	
126	SPC	16-11	
127	RTN	24	
128	*LBLE	21 15	Perform calculation to find Base deficit
129	CHS	-22	
130	7	07	
131	.	-62	
132	4	04	
133	+	-55	
134	1	01	
135	0	00	
136	×	-35	
137	-	-45	
138	2	02	
139	4	04	
140	-	-45	
141	DSP1	-63 01	
142	PRTX	-14	
143	DSP0	-63 00	
144	RCLB	36 12	Determine amount of $NaHCO_3$ to correct
145	.	-62	
146	3	03	
147	×	-35	
148	×	-35	
149	CHS	-22	
150	PRTX	-14	
151	SPC	16-11	
152	RTN	24	
153	R/S	51	

STEP	KEY ENTRY	KEY CODE	COMMENTS
170			
180			
190			
200			
210			
220			

LABELS

A Sto Pt data	B (A-a)DO_2	C Qs/Qt%	D Oxygen add	E Base deficit	o -
a Conv and Sto Pt data	b	c	d	e $PCO_2+HCO_3^-$	1 -
0	1	2	3	4	2 -
5	6	7	8	9	3 -

FLAGS

	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

SET STATUS

TRIG		DISP	
DEG	☒	FIX	☒
GRAD	☐	SCI	☐
RAD	☐	ENG	☐
		n	0

Program Description I

Program Title Body Density , Fat and Lean Mass From Skinfolds

Contributor's Name Hewlett-Packard
Address 1000 N.E. Circle Blvd.
City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

For adult males:

Given the triceps & scapular skinfold thicknesses in millimeters and body weight (in lbs. or kg).

Body Density (1) = 1.0923-0.000202 (triceps thickness)

Body Density (2) = 1.0896-0.000179 (scapular thickness)

$$\text{Body Density} = \frac{BD1 + BD2}{2}$$

For adult females:

Given the triceps & iliac crest (mid axillary line) skinfold thickness in millimeters and body weight (in lbs. or kg)

Body Density = 1.0764 - 0.00081 (iliac thickness) - 0.00088 (triceps thickness)

for both adult males & females

$$\% \text{ body fat} = \left[\frac{4.57}{D_B} - 4.142\right] \times 100$$

$$\text{Fat weight} = \text{Body weight} \times \frac{\% \text{ Fat}}{100} = \text{kg}$$

Lean body mass (LBM) = Body weight - Fat weight = kg

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s)

1) For an adult male: Body weight 132 lbs., triceps skinfold 9mm, scapular skinfold 12mm, calculate body density, % body fat, fat weight (kg) and lean body mass (kg).

2) For an adult female: Body weight 54 kg., iliac skinfold 15mm, triceps skinfold 8mm, calculate body density,% body fat, fat weight (kg) and lean body mass (kg).

Solution(s)

1) [f][A] ----------->0.00 (choose mode for male)
9[f][B] 12[f][C] 132[CHS][f][E]->60
[A] ---> 1.07112 (body dens.) [B] --->12.46 (%body fat)
[C] ---> 7.47 (fat weight, kg) [D] -->52.53 (lean body mass, kg)

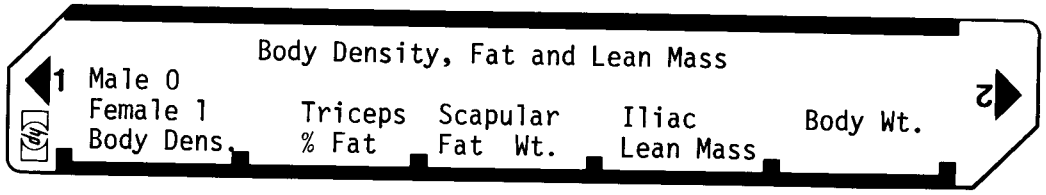
2) [f][A]----->1.00 (choose mode for female)
8[f][B] 15[f][D] 54[f][E] ---------> 54
[A] ------->1.05721 (body dens.) [B] ------->18.07% (body fat)
[C] ------->9.76(fat weight, kg) [D] ------->44.24 (lean body mass, kg.)

Reference(s)

This program is adapted from 2 HP-65 programs #0966A and #01954A submitted by Gerald A. Spurr, Ph.D.

1) Pascale, L.R., Grossman, M.I., et.al., Human Biology 28: 165-176, 1956
2) Brozek, J., Grande, F., et. al., Ann. N.Y. Acad. Sci. 110: 113-140, 1963
3) Sloan, A.W. & Weir, J.B. de V., J. Appl. Physiol. 28: 221-22, 1970

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Load side 1 and side 2			
2.	Choose: Male, or		f A	0.00
	Female*		f A	1.00
3.	For males:			
	Input triceps skinfold thickness	mm.	f B	Input
	Input Scapular " "	mm.	f C	Input
3'.	For females:			
	Input triceps skinfold thickness	mm.	f B	Input
	Input iliac " "	mm.	f D	Input
4.	Input body weight			
	in kilograms	Wt.kg.	f E	Wt. kg.
	OR, in pounds (as a negative value)	Wt.lbs.	CHS	
			f E	Wt. kg.
5.	Calculate values:			
	Body density		A	B.D.
	% body fat		B	% Fat
	Fat weight		C	Fat, kg.
	Lean body mass		D	LBM, kg.
6.	Calculated values available for review from registers:			
	Body density		RCL 0	B.D.
	% body fat		RCL 1	% Fat
	Fat weight		RCL 2	Fat, kg.
	Lean body mass		RCL 3	LBM, kg.
*	If you don't get the display desired repeat [f][A]			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBL a	21 16 11	
002	CLRG	16-53	Toggle for male,
003	F0?	16 23 00	female
004	GTO6	22 00	
005	SF0	16 21 00	
006	0	00	
007	RTN	24	
008	*LBL0	21 00	
009	CF0	16 22 00	
010	1	01	
011	RTN	24	
012	*LBL b	21 16 12	Store triceps
013	STOB	35 12	
014	RTN	24	
015	*LBL c	21 16 13	
016	STOC	35 13	Store Scapular
017	RTN	24	
018	*LBL d	21 16 14	
019	STOD	35 14	Store Iliac
020	RTN	24	
021	*LBL e	21 16 15	Body Wt.
022	X<0?	16-45	Is input lbs or kg
023	GTO1	22 01	Go to lbs
024	STOE	35 15	Store kg
025	RTN	24	
026	*LBL1	21 01	
027	CHS	-22	Convert lbs to kg
028	2	02	
029	.	-62	
030	2	02	
031	÷	-24	
032	STOE	35 15	Store kg
033	RTN	24	
034	*LBL A	21 11	
035	F0?	16 23 00	Male or female
036	GTO2	22 02	Go to male
037	1	01	Calculate female
038	.	-62	body density
039	0	00	
040	7	07	
041	6	06	
042	4	04	
043	RCLD	36 14	
044	8	08	
045	1	01	
046	EEX	-23	
047	5	05	
048	CHS	-22	
049	×	-35	
050	-	-45	
051	8	08	
052	8	08	
053	EEX	-23	
054	5	05	
055	CHS	-22	
056	RCLB	36 12	
057	×	-35	
058	-	-45	
059	STO0	35 00	Store body density
060	DSP5	-63 05	
061	PRTX	-14	Print body density
062	RTN	24	
063	*LBL2	21 02	
064	1	01	Calculate male
065	.	-62	body density
066	0	00	
067	9	09	
068	2	02	
069	3	03	
070	RCLB	36 12	
071	2	02	
072	.	-62	
073	0	00	
074	2	02	
075	EEX	-23	
076	3	03	
077	CHS	-22	
078	×	-35	
079	-	-45	
080	1	01	
081	.	-62	
082	0	00	
083	8	08	
084	9	09	
085	6	06	
086	RCLC	36 13	
087	1	01	
088	.	-62	
089	7	07	
090	9	09	
091	EEX	-23	
092	3	03	
093	CHS	-22	
094	×	-35	
095	-	-45	
096	+	-55	
097	2	02	
098	÷	-24	
099	STO0	35 00	Store body density
100	DSP5	-63 05	
101	PRTX	-14	Print body density
102	RTN	24	
103	*LBLB	21 12	
104	DSP2	-63 02	Calculate % body fat
105	4	04	
106	.	-62	
107	5	05	
108	7	07	
109	RCL0	36 00	
110	÷	-24	
111	4	04	
112	.	-62	

REGISTERS

0	1	2	3	4	5	6	7	8	9
Body dens	%Fat	Fat Wt.	LBM						
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I
	Triceps	Scapular	Iliac	Wt.	

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	1	01	
114	4	04	
115	2	02	
116	-	-45	
117	EEX	-23	
118	2	02	
119	x	-35	
120	STO1	35 01	
121	PRTX	-14	
122	RTN	24	
123	*LBLC	21 13	Calculate fat wt.
124	RCLE	36 15	
125	RCL1	36 01	
126	x	-35	
127	EEX	-23	
128	2	02	
129	÷	-24	
130	STO2	35 02	
131	PRTX	-14	
132	RTN	24	
133	*LBLD	21 14	Calculate lean body mass
134	RCLE	36 15	
135	RCL2	36 02	
136	-	-45	
137	STO3	35 03	
138	PRTX	-14	
139	RTN	24	
140			
150			
160			
170			
180			
190			
200			
210			
220			

LABELS

A Body Dens.	B %Fat	C Fat Wt.	D LBM	E
a Toggle	b Triceps	c Scapular	d Iliac	e Wt.
0	1	2	3	4
5	6	7	8	9

FLAGS

0	Used
1	
2	
3	

SET STATUS

FLAGS	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

TRIG	
DEG	☒
GRAD	☐
RAD	☐

DISP	
FIX	☒
SCI	☐
ENG	☐
n	2

Program Description I

Program Title	Estimating Obesity, Body Fat, Surface Area, and Total Body Water.
Contributor's Name	Andrew C. M. Coile
Address	4323 Rosedale Avenue
City	Bethesda **State** Maryland **Zip Code** 20014

Program Description, Equations, Variables

A. Weight-height Index (sometimes called Quetelet's Index) (Reference 1)

$$I = \frac{W}{H^2}$$

where W is weight in kilograms and H is height in metres.

Cut-off point for Obesity

Sex	Frame	Obesity if I >
Men	Medium	27.5
Women	Medium	27.0
Men	Large	29.9
Women	Large	29.5

B. Body Fat, F (Reference 1)

$$\text{Men } \%F = 1.281 \left\{\frac{W}{H^2}\right\} - 10.13$$

$$\text{Women } \%F = 1.48 \left\{\frac{W}{H^2}\right\} - 7.0$$

C. Body Surface Area, B.S.A. in square metres. (Reference 2)

$$B.S.A. = 0.007185\ W^{0.425}\ H^{0.725}$$

D. Total Body Water, T.B.W. in litres. (Reference 2)

$$\text{Men } T.B.W. = 0.296785W + 19.4786H - 14.012934$$

$$\text{Women } T.B.W. = 0.183809W + 34.4547H - 35.270121$$

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s)

1. Is a 6'6" male basketball player weighing 200 lbs. with a large frame obese?
2. What is his percent body fat?
3. What is his body surface area?
4. What is his total body water?

Solution(s)

1. Obese?

{f}{A} → 1.00 for male.
{f}{D} → 4.00 for large frame.
78 inches {A} → 1.98 metres.
200 lbs. {B} → 90.72 kilos.
{C} → 29.90 critical Index.
23.11 subject's Index.

2. Percent body fat.

{D}→ 19.48 %

3. Body surface area.

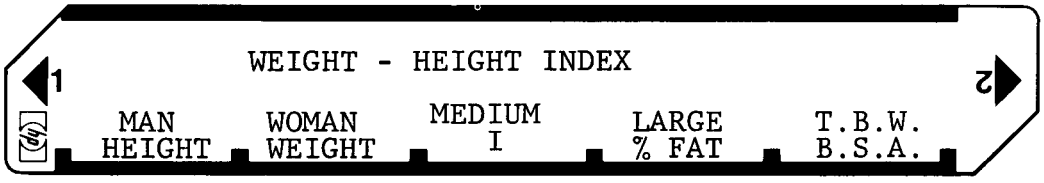
{E} → 2.26 square metres.

4. Total body water.

{f}{E} → 51.50 litres.

Reference(s) Reference 1: *Research on Obesity*,(A DHSS/MRC Report) by W.P.T. James. Her Majesty's Stationery Office, London, 1976,ISBN 0 11 450034 7
Reference 2: Hume, R and Weyers, Elspeth, "Relationship between total body water and surface area in normal and obese subjects", *Journal of Clinical Pathology*, Vol.24, pages 234-238, 1971.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Load side 1 and 2 of the magnetic card.			
2.	Select: Man		f A	1.00
	Woman		f B	2.00
3.	Select: Medium frame		f C	3.00
	Large frame		f D	4.00
4.	If height is in metres, do step 5;			
	if height is in inches, do step 6.			
5.	Enter height in metres.	metres	STO A	metres
6.	Enter height in inches.	inches	A	metres
7.	If weight is in kilograms, do step 8;			
	if weight is in pounds, do step 9.			
8.	Enter weight in kilograms.	kilos.	STO B	kilos.
9.	Enter weight in pounds.	pounds	B	kilos.
10.	Find weight-height index.		C	critical
				value,
	If subject's value is > critical			subject's
	value, subject's value will flash,			value.
	indicating subject is obese.			
11.	Find Percent body fat.		D	% fat.
12.	Find Body Surface Area in square metres		E	m^2
13.	Find Total Body Water in litres.		f E	litres.
14.	For a new case, go to step 2.			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLa	21 16 11	Man.
002	CF0	16 22 00	
003	1	01	
004	RTN	24	
005	*LBLb	21 16 12	Woman.
006	SF0	16 21 00	
007	2	02	
008	RTN	24	
009	*LBLc	21 16 13	Medium frame.
010	CF1	16 22 01	
011	3	03	
012	RTN	24	
013	*LBLd	21 16 14	Large frame.
014	SF1	16 21 01	
015	4	04	
016	RTN	24	
017	*LBLA	21 11	Height.
018	1	01	(in inches).
019	2	02	
020	÷	-24	Convert to feet.
021	.	-62	
022	3	03	
023	0	00	
024	4	04	
025	8	08	
026	×	-35	Convert to metre
027	STOA	35 11	Store in metres.
028	RTN	24	
029	*LBLB	21 12	Weight.
030	.	-62	(in kilos).
031	4	04	
032	5	05	
033	3	03	
034	5	05	
035	9	09	
036	2	02	
037	3	03	
038	7	07	
039	×	-35	Convert to kilos
040	STOB	35 12	Store in kilos.
041	RTN	24	
042	*LBLC	21 13	Index.
043	RCLB	36 12	
044	RCLA	36 11	
045	X²	53	
046	÷	-24	W/H²
047	STOC	35 13	
048	F1?	16 23 01	Large frame?
049	GTO1	22 01	
050	F0?	16 23 00	No. Female?
051	GTO2	22 02	
052	2	02	
053	7	07	
054	.	-62	
055	5	05	Critical value.
056	GTO3	22 03	
057	*LBL2	21 02	Female.
058	2	02	
059	7	07	Critical value.
060	*LBL3	21 03	
061	PSE	16 51	Display critical
062	X≷Y	-41	value.
063	X>Y?	16-34	Obese?
064	GTO9	22 09	
065	RTN	24	
066	*LBL1	21 01	Large frame.
067	F0?	16 23 00	Female?
068	GTO4	22 04	
069	2	02	No.
070	9	09	
071	.	-62	
072	9	09	Critical value.
073	GTO3	22 03	
074	*LBL4	21 04	Female.
075	2	02	
076	9	09	
077	.	-62	
078	5	05	Critical value.
079	GTO3	22 03	
080	*LBLD	21 14	% Fat.
081	F0?	16 23 00	Female?
082	GTO5	22 05	
083	RCLC	36 13	
084	1	01	
085	.	-62	
086	2	02	
087	8	08	
088	1	01	
089	×	-35	1.281 x W/H²
090	1	01	
091	0	00	
092	.	-62	
093	1	01	
094	3	03	
095	-	-45	- 10.13.
096	RTN	24	
097	*LBL5	21 05	Female.
098	RCLC	36 13	
099	1	01	
100	.	-62	
101	4	04	
102	8	08	
103	×	-35	1.48 x W/H²
104	7	07	
105	-	-45	- 7
106	RTN	24	
107	*LBL9	21 09	Obese blink.
108	PSE	16 51	
109	GTO9	22 09	Endless loop.
110	*LBLE	21 15	B.S.A.
111	RCLA	36 11	
112	EEX	-23	

REGISTERS

0	1	2	3	4	5	6	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I
Height (in metres).	Weight (in kilos).	W-H Index			

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	2	02	
114	×	-35	
115	.	-62	
116	7	07	
117	2	02	
118	5	05	
119	Y^x	31	
120	RCLB	36 12	
121	.	-62	
122	4	04	
123	2	02	
124	5	05	
125	Y^x	31	
126	×	-35	
127	7	07	
128	.	-62	
129	1	01	
130	8	08	
131	5	05	
132	EEX	-23	
133	3	03	
134	CHS	-22	
135	×	-35	
136	RTN	24	
137	*LBLe	21 16 15	Total Body Water
138	F0?	16 23 00	Female?
139	GTO8	22 08	No.
140	RCLB	36 12	
141	.	-62	
142	2	02	
143	9	09	
144	6	06	
145	7	07	
146	8	08	
147	5	05	
148	×	-35	
149	RCLA	36 11	
150	1	01	
151	9	09	
152	.	-62	
153	4	04	
154	7	07	Calculate: T.B.W. = 0.296785 W + 19.4786 H - 14.012934
155	8	08	
156	6	06	
157	×	-35	
158	+	-55	
159	1	01	
160	4	04	
161	.	-62	
162	0	00	
163	1	01	
164	2	02	
165	9	09	
166	3	03	
167	4	04	
168	-	-45	
169	RTN	24	
170	*LBL8	21 08	Female T.B.W.
171	.	-62	
172	1	01	
173	8	08	
174	3	03	
175	8	08	
176	0	00	
177	9	09	
178	RCLB	36 12	
179	×	-35	
180	3	03	
181	4	04	
182	.	-62	
183	4	04	Calculate: T.B.W.= 0.183809 W + 34.4547 H - 35.270121
184	5	05	
185	4	04	
186	7	07	
187	RCLA	36 11	
188	×	-35	
189	+	-55	
190	3	03	
191	5	05	
192	.	-62	
193	2	02	
194	7	07	
195	0	00	
196	1	01	
197	2	02	
198	1	01	
199	-	-45	
200	RTN	24	
210			
220			

LABELS

A Height	B Weight	C Index	D % Fat	E B.S.A.	0 Female
a Man	b Woman	c Medium	d Large	e T.B.W.	1 Large
0	1 Large	2 Female	3 Entry	4 Female	2
5 Female	6	7	8 Female	9 Obese	3

FLAGS

FLAGS	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

SET STATUS

TRIG		DISP	
DEG	☒	FIX	☒
GRAD	☐	SCI	☐
RAD	☐	ENG	☐
		n	2

Program Description I

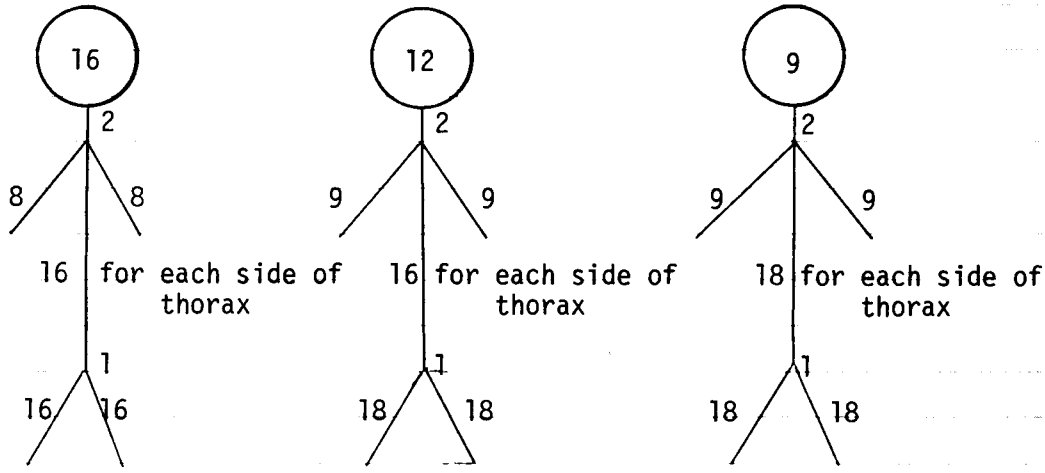
Program Title 67-Fluid & Electrolytes/Body Burn Area

Contributor's Name Richard C. Rodgers, M.D

Address 2045 Oak Street Apt 3

City San Francisco **State** CA **Zip Code** 94117

Program Description, Equations, Variables Scribner et. al. suggest these approximations for % of body surface area for patients of given age (figures are % values):



0-4 Years 4-10 Years 10 Yrs→ Adulthood

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s)

Given the following percentage burn areas:

Head = 5%

Neck = 100%

R Arm = 20%

L Arm = 10%

Anterior Torso = 50%

Posterior Torso = 20%

Genitalia = 0%

R Leg = 10%

L Leg = 0%

Calculate total burn area for patient 1) 3 years old 2) 5 years old 3) 20 years old.

Solution(s)

1) [f][A] 3[A], input data according to data input routine below, [f][C] ----------> 18

2) [f][A] 5[A], input data according to data input routine below, [f][C] ----------> 18

3) [f][A] 20[A], input data according to data input routine below, [f][C] ----------> 20

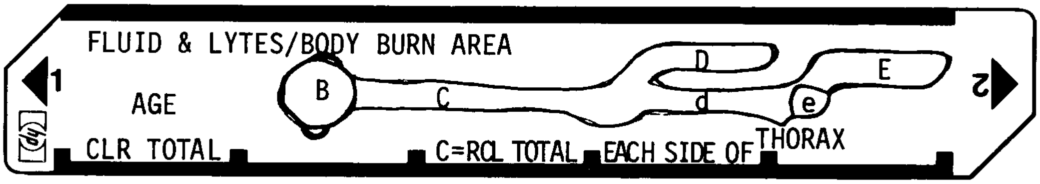
Data input routine for above problems:

5[B] 100[C] 20[D] 10[D] 50[f][D] 20[f][D] 0[f][E] 10[E] 0[E]

Reference(s)

Scribner, et. al., Fluid & Electrolyte Balance, Washington University Bookstore, 1963.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1.	Enter sides 1 or 2 of card 1/1				
2.	Input age (years)	Age	A		AGE
3.	Clear previous totals, if any		f	a	-0-
4.	Input % area burned for each of the following				
	body pars:				
	1) Head	% Area	B		% Total Area
	2) Neck	"	C		"
	3) Anterior Torso	"	f	d	"
	4) Posterior Torso	"	f	d	"
	5) R Arm	"	D		"
	6) L Arm	"	D		"
	7) Genitalia	"	f	e	"
	8) R Leg	"	E		"
	9) L Leg	"	E		"
5.	Recall and print body surface area burned,				
	total (%)		f	c	Body area Burned

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	F3?	16 23 03	Input age
003	GTO0	22 00	If no data entered
004	RCL8	36 08	recall age
005	RTN	24	Yrs←(8)
006	*LBL0	21 00	
007	X<0?	16-45	
008	√X	54	
009	STO8	35 08	Yrs→(8)
010	CF0	16 22 00	
011	CF1	16 22 01	
012	4	04	
013	X≤Y?	16-35	
014	GTO1	22 01	
015	SF0	16 21 00	
016	RCL8	36 08	
017	RTN	24	
018	*LBL1	21 01	
019	CLX	-51	
020	1	01	
021	0	00	
022	X≤Y?	16-35	
023	GTO8	22 08	
024	SF1	16 21 01	
025	RCL8	36 08	
026	RTN	24	
027	*LBL8	21 08	
028	RCL8	36 08	
029	RTN	24	
030	*LBLa	21 16 11	
031	CLX	-51	Clear total
032	STO9	35 09	
033	RTN	24	
034	*LBLB	21 12	
035	*LBLb	21 16 12	Head
036	F0?	16 23 00	
037	GTO2	22 02	
038	F1?	16 23 01	
039	GTO3	22 03	
040	9	09	
041	GTO7	22 07	
042	*LBL2	21 02	
043	1	01	
044	6	06	
045	GTO7	22 07	
046	*LBL3	21 03	
047	1	01	
048	2	02	
049	GTO7	22 07	
050	*LBLC	21 13	Neck
051	2	02	
052	GTO7	22 07	
053	*LBLc	21 16 13	Recall total
054	RCL9	36 09	
055	PRTX	-14	
056	RTN	24	
057	*LBLD	21 14	Arm, R&L
058	F0?	16 23 00	
059	GTO4	22 04	
060	9	09	
061	GTO7	22 07	
062	*LBL4	21 04	
063	8	08	
064	GTO7	22 07	
065	*LBLd	21 16 14	Torso, A&P
066	1	01	
067	8	08	
068	F0?	16 23 00	
069	GTO5	22 05	
070	F1?	16 23 01	
071	GTO5	22 05	
072	GTO7	22 07	
073	*LBL5	21 05	
074	CLX	-51	
075	1	01	
076	6	06	
077	GTO7	22 07	
078	*LBLE	21 15	Leg, R&L
079	1	01	
080	8	08	
081	F0?	16 23 00	
082	GTO6	22 06	
083	GTO7	22 07	
084	*LBL6	21 06	
085	CLX	-51	
086	1	01	
087	6	06	
088	GTO7	22 07	
089	*LBLe	21 16 15	Genitalia
090	1	01	
091	*LBL7	21 07	
092	EEX	-23	
093	2	02	
094	÷	-24	
095	×	-35	
096	ST+9	35-55 09	
097	RTN	24	
098	R/S	51	

100		
110		

REGISTERS

0	1	2	3	4	5	6	7	8 Age(Yrs.)	9 Total
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
A	B	C	D	E	I				

Program Description I

Program Title 67 Fluid & Electrolytes/Potassium Balance (Scribner)

Contributor's Name Richard C. Rodgers, M.D.

Address 2045 Oak Street, Apt. 3

City San Francisco **State** California **Zip Code** 94117

Program Description, Equations, Variables The present author has fit an empirical equation to the Nomogram of Scribner et al. 17), such that:

$$(\%\Delta K) = \frac{\log (K) - 4.734 + .556\ (pH)}{1.15 \times 10^{-2}}$$

$$K = 10\ [1.15 \times 10^{-2}(\%\Delta K)+4.734-.556(pH)]$$

$$pH = \frac{1.15 \times 10^{-2}(\%\ K) + 4.734 - \log (K)}{.556}$$

where; K, ΔK = mEq

also, K capacity is calculated as mFq from:

	♂	♀
Normal	45 mEq/kg	35 mEq/kg
Moderate wasting	32 "	25 "
Marked wasting	23 "	20 "

Operating Limits and Warnings See reference 1 concerning proper clincial use of data resulting from program.

Program Description II

Sketch(es)

Sample Problem(s)

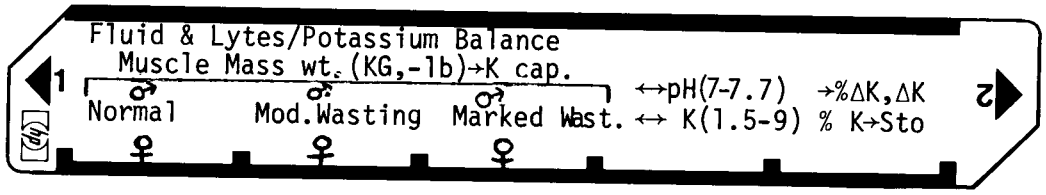
For male pt., normal build, with pH = 7.18, k = 4.5, Estimate %ΔK and ΔK.
Pt. wt. = 150 lbs.

Solution(s)

```
[f][E] ----------->   -1. (non-print)
150[CHS][A] ------------>   3062 mEq, K capacity
7.18[D] 4.5[f][D][E] ---->   -8, % K
                [R/S] --->   -236, ΔK, mEq.
OR [f][E] -------------->   1. (print)
150[CHS][A] ------------>   68 kg; 3062 mEq, K cap.
7.18[D] ----------------->   7.18, pH
4.5[f][D] -------------->   4.5, K
[E] --------------------->   -8,% K; -236ΔK, mEq.
```

Reference(s) Scribner Et Al., Fluid and Electrolyte Balance, 1963 (available from University Washington Bookstore).

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Enter program card sides 1 & 2			
2.	To change between print & non-print mode, press "f e" if 1 appears, IM print mode; If -1, then in non-print		f E f E	1,Print -1,nonprint
3.	Input pt. wt. in-lbs. or KG, for			
	a) normal build, males	KG,-lbs	A	K cap.mEq.
	b) normal build, females	"	f A	"
	c) moderate wasting, males	"	B	"
	d) moderate wasting, females	"	f B	"
	e) marked wasting, males	"	C	"
	f) makred wasting, females	"	f C	"
4.	Input pH (or, if no data input, calculate value from data already stored).		D	pH
5.	Input K (or, no data input, calculate value from data already stored).		f D	K
6.	Input %ΔK and store it, or calculate %ΔK and ΔK(mEq) if no data entered.		E R/S	%ΔK ΔK
7.	Repeat any of above steps in any order			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	Normal male
002	GSB1	23 01	
003	4	04	
004	5	05	
005	GTO0	22 00	
006	*LBLa	21 16 11	Normal female
007	GSB1	23 01	
008	3	03	
009	5	05	
010	GTO0	22 00	
011	*LBLB	21 12	Mod. Wasting male
012	GSB1	23 01	
013	3	03	
014	2	02	
015	GTO0	22 00	
016	*LBLb	21 16 12	Mod. Wasting Female
017	GSB1	23 01	
018	2	02	
019	5	05	
020	GTO0	22 00	
021	*LBLC	21 13	Marked Wasting
022	GSB1	23 01	Male
023	2	02	
024	3	03	
025	GTO0	22 00	
026	*LBLc	21 16 13	Marked Wasting
027	GSB1	23 01	Female
028	2	02	
029	0	00	
030	*LBL0	21 00	
031	×	-35	
032	STOA	35 11	
033	DSP0	-63 00	
034	F0?	16 23 00	
035	PRTX	-14	
036	RTN	24	
037	*LBL1	21 01	
038	X>0?	16-44	
039	GTO2	22 02	
040	CHS	-22	
041	.	-62	
042	4	04	
043	5	05	
044	3	03	
045	6	06	
046	×	-35	
047	*LBL2	21 02	
048	STO7	35 07	
049	F0?	16 23 00	
050	PRTX	-14	
051	RTN	24	
052	*LBLD	21 14	pH
053	F3?	16 23 03	
054	GTO3	22 03	
055	RCLD	36 14	Calculate pH
056	.	-62	
057	0	00	
058	1	01	
059	1	01	
060	5	05	
061	×	-35	
062	4	04	
063	.	-62	
064	7	07	
065	3	03	
066	4	04	
067	+	-55	
068	RCLC	36 13	
069	LOG	16 32	
070	-	-45	
071	.	-62	
072	5	05	
073	5	05	
074	6	06	
075	÷	-24	
076	*LBL3	21 03	Store pH
077	STOB	35 12	
078	DSP2	-63 02	
079	F0?	16 23 00	
080	PRTX	-14	
081	RTN	24	
082	*LBLd	21 16 14	Potassium K
083	F3?	16 23 03	
084	GTO4	22 04	
085	RCLD	36 14	Calculate K
086	.	-62	
087	0	00	
088	1	01	
089	1	01	
090	5	05	
091	×	-35	
092	RCLB	36 12	
093	.	-62	
094	5	05	
095	5	05	
096	6	06	
097	×	-35	
098	-	-45	
099	4	04	
100	.	-62	
101	7	07	
102	3	03	
103	4	04	
104	+	-55	
105	10^x	16 33	
106	*LBL4	21 04	Store K
107	STOC	35 13	
108	DSP1	-63 01	
109	F0?	16 23 00	
110	PRTX	-14	
111	RTN	24	Store %ΔK
112	*LBL5	21 05	

REGISTERS

0	1	2	3	4	5	6	7 Wt. (KG)	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I
K Capacity	pH	Serum K	%ΔK		

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	STOD	35 14	
114	F0?	16 23 00	
115	PRTX	-14	
116	RTN	24	
117	*LBLE	21 15	%ΔK,ΔK
118	F3?	16 23 03	
119	GTO5	22 05	
120	RCLC	36 13	Calculate %ΔK
121	LOG	16 32	
122	4	04	
123	.	-62	
124	7	07	
125	3	03	
126	4	04	
127	-	-45	
128	RCLB	36 12	
129	.	-62	
130	5	05	
131	5	05	
132	6	06	
133	×	-35	
134	+	-55	
135	.	-62	
136	0	00	
137	1	01	
138	1	01	
139	5	05	
140	÷	-24	
141	STOD	35 14	
142	DSP0	-63 00	
143	F0?	16 23 00	
144	PRTX	-14	
145	F0?	16 23 00	
146	GTO7	22 07	
147	R/S	51	Calculate ΔK
148	*LBL7	21 07	
149	RCLA	36 11	
150	RCLD	36 14	
151	%	55	
152	F0?	16 23 00	
153	PRTX	-14	
154	RTN	24	Print Option
155	*LBLe	21 16 15	
156	DSP0	-63 00	
157	F0?	16 23 00	
158	GTO6	22 06	
159	SF0	16 21 00	
160	1	01	
161	RTN	24	
162	*LBL6	21 06	
163	CF0	16 23 00	
164	1	01	
165	CHS	-22	
166	RTN	24	
167	R/S	51	

STEP	KEY ENTRY	KEY CODE	COMMENTS
170			
180			
190			
200			
210			
220			

LABELS

A Normal ♂	B Mod. Wasting ♂	C Marked Wasting ♂	D ↔ pH	E→%ΔK,ΔK %ΔK→STO	
a " ♀	b " ♀	c " ♀	d ↔ K	e PMT	
0	1	2	3	4	
5	6	7	8	9	

FLAGS

0	Used
1	
2	
3	Used

SET STATUS

FLAGS			TRIG	DISP	
	ON	OFF			
0	☐	☒	DEG ☒	FIX ☒	
1	☐	☒	GRAD ☐	SCI ☐	
2	☐	☒	RAD ☐	ENG ☐	
3	☐	☒		n = 2	

Program Description I

Program Title Anesthesiology Parameters

Contributor's Name Charles W. Bollinger
Address 644 Longshaw Drive
City Bremerton **State** Wash **Zip Code** 98310

Program Description, Equations, Variables

Height, weight and age can be input in English or metric terms. Program computes and stores estimated blood volume for weight and age groups (below or above 10 years old). Given the number of drops per ml. of intravenous delivery system, one routine gives the sodium nitroprusside dose in mcg/min as well as recommended solution strength in percent and administration rate in drops/min.
Given the surgery starting time (hours and minutes since last intake, usually midnight) program calculates body surface area and normal fluid requirement (1500 ml/m²/24 h) and deficit, then the surgical requirement (2500 ml/m²/24 h) and will give surgical requirement and total deficit.
Given systolic and diastolic blood pressures, calculates mean arterial pressure
If a laboratory-determined blood volumes is available, it should be used in preference to figure calculated and stored in E. Enter Hct and BV in LBL d.
For repeat cases, of if no laboratory value available, enter Hct. and use LBL D
When finding delivered concentration first time, use of routine LBL e will store vaporpressure for agent in use. Repeat performances require only diluent and kettle flowms to LBL E, unless agent or temperature changes.

Operating Limits and Warnings

Use 24-hour clock. If a patient has been NPO since 0400 instead of 0000, and surgery begins at 0800, use "4.0" to enter Routine B.
If prevalent barometric pressure other than 760, alter program prior to use
Clinical: Acceptable loss assumes and depends on full hydration. Combining hydration figures (LBL B) and ABL (LBL D): when amount equal to ABL is shed, HCT will be 30%
Serum protein measured periodically - deficit replaced with albumin. Packed RBC's for Hct < 30%

Program Description II

Sketch(es)

Sample Problem(s)

① Patient is 68.5" tall, 175#, age 41 enter data

③ Surgery begins at 9:15. Patient NPO since midnight. What is starting deficit + requirements? What is the status at 10:25? Pt has received 1100 ml intravenously, how is his hydration?

③ Patients hematocrit is 45%. What is acceptable loss? During procedure, hematocrit is found to be 25%. Hydration is good. How many ml. of packed RBC to transfuse? (negative sign indicates difference between acceptable loss and RBC's to infuse)

④ At this temperature, the vapor pressure of Wonderthane is 170. Diluent 2500 ml. Kettle flow 120. What is delivered concentration? how flow technique: F$_D$ is 2000 ml, kettle flow 80:

⑤ Intravenous sets administer 12 drops/min. How is sodium nitroprusside to be given?

Solution(s)

① 68.5↑ 175#↑ 41 [f][a] → 5556 (Est. B.V.).

② 9:15 [B] → 1.94 BSA m^2

→ 121 ml EFR normally

→ -1122 Starting deficit ml.

→ 202 Surgical EFR

10:25 [R/S] → "238" Surgical deficit

→ -1358 Total deficit

1100 [+] → -258 Remaining deficit

③ 45 [D] → 1852 ml. RBC

25 [D] → -278 ml RBC

④ 2500↑ 120↑ 170[fe] → 1.4 %

2000↑ 80 [E] → 1.2%

⑤ 12 [f][b] → 192 µg/min

→ 0.01000 % sol

→ 23 drops/min

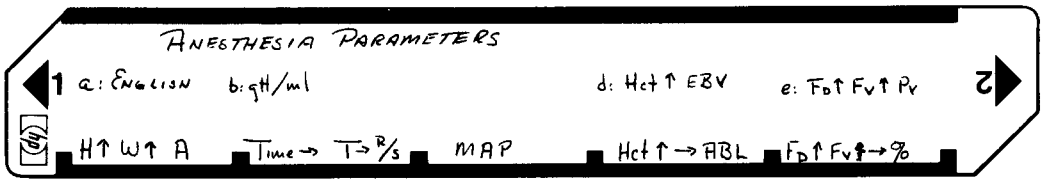
Reference(s) Mazze, Richard I: Intraoperative fluid therapy - ASA Refresher Course - 1976

Lawson, N.W. et. al: A dosage nomogram for sodium - nitroprusside - induced hypotension under anesthesia. Anes + Analg 55: 574-579, 1976

Bennett, Edward J: Fluid replacement in infants and children - ASA Refresher Course 1976

Forman, Eric J.: Acceptable blood loss computation - personal communication.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Load program side 1 and side 2.			
2.	Enter patient data — Height in inches or cm	H	ENTER ↑	
	Weight in pounds or kg	W	ENTER ↑	
	Age: if above entered in English units (inch/pound)	A	f a	EBV
	if above entered in Metric units (cm/kg)	A	A	EBV
3.	To find body surface area and fluid factors:			
	Input start of surgery or time NPO	H.M	B	BSA (m^2)
				NORMAL EFR (ml)
				STARTING DEFICIT
				SURGICAL EFR
	FOR PRESENT STATUS, INPUT Present time	H.M	R/S	"SURG DEF"
	Fluid administered may be added to last figure for balance figure (positive value, overload; negative, deficit)			TOTAL DEFICIT
4.	For sodium nitroprusside administration, input number of drops/ml of I.V. administration set (recompute with different set type if drops too high or too low.)	gtt/ml.	f b	Admin: µg/min % solution Admin: gtt/min.
5.	For mean arterial pressure — Input systolic	Sys.	ENTER ↑	
	INPUT diastolic	Dias	C	M.A.P. mmHg
6.	For acceptable blood loss, input hemotocrit	Hct	ENTER ↑	
	if EBV determined, input	EBV	f d	ABL (ml)
	for new case, or if EBV not known, input hem	HCT	D	OR – RBC (ml)
7.	For delivered concentration, Input diluent flow	FD (ml)	ENTER ↑	
	Input kettle flow	FV (ml)	ENTER ↑	
	Input vapor press	PV (mmHg)	f e	% conc.
	for new case, same agent, same temp:			
	Input diluent flow	FD (ml)	ENTER ↑	
	Input kettle flow	FV (ml)	E	% conc.

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLa	21 16 11	Store & convert patient data
002	STOC	35 13	
003	R↓	-31	
004	2	02	
005	.	-62	
006	2	02	
007	0	00	
008	5	05	
009	÷	-24	
010	STOB	35 12	
011	R↓	-31	
012	2	02	
013	.	-62	
014	5	05	
015	4	04	
016	×	-35	
017	GTO3	22 03	
018	*LBLA	21 11	
019	STOC	35 13	Store patient data
020	R↓	-31	
021	STOB	35 12	
022	R↓	-31	
023	*LBL3	21 03	
024	STOA	35 11	
025	RCLC	36 13	
026	1	01	Is the patient older
027	0	00	than 10 years?
028	X≤Y?	16-35	
029	FRC	16 44	Yes, eliminate
030	7	07	addend. (wt. x 70)
031	0	00	
032	+	-55	
033	RCLB	36 12	
034	×	-35	
035	STOE	35 15	
036	RTN	24	
037	*LBLb	21 16 12	
038	RCLC	36 13	
039	RCLB	36 12	Compute dose of sod.
040	÷	-24	intraprusside based
041	2	02	on age/wt.
042	.	-62	
043	6	06	
044	3	03	
045	CHS	-22	
046	×	-35	
047	e^x	33	
048	7	07	
049	4	04	
050	8	08	
051	.	-62	
052	7	07	
053	×	-35	
054	PRTX	-14	
055	RND	16 24	
056	EEX	-23	
057	2	02	Compare dose with
058	X≤Y?	16-35	constants to deter-
059	GTO1	22 01	mine proper con-
060	CLX	-51	centration
061	2	02	
062	5	05	
063	X≤Y?	16-35	
064	GTO2	22 02	
065	EEX	-23	
066	5	05	
067	÷	-24	
068	*LBL0	21 00	
069	DSP5	-63 05	
070	PRTX	-14	Display concentra-
071	DSP0	-63 00	tion in percent.
072	CLX	-51	
073	LSTX	16-63	
074	÷	-24	Determine proper
075	×	-35	administration rate
076	PRTX	-14	
077	SPC	16-11	
078	RTN	24	
079	*LBL1	21 01	
080	1/X	52	
081	GTO0	22 00	
082	*LBL2	21 02	
083	2	02	
084	×	-35	
085	EEX	-23	
086	3	03	
087	÷	-24	
088	GTO0	22 00	
089	RTN	24	
090	*LBLB	21 12	
091	HMS→	16 36	
092	STO0	35 00	
093	RCLB	36 12	Compute body surface
094	.	-62	area.
095	4	04	
096	2	02	
097	5	05	
098	Y^x	31	
099	RCLA	36 11	
100	.	-62	
101	7	07	
102	2	02	
103	5	05	
104	Y^x	31	
105	.	-62	
106	0	00	
107	0	00	
108	7	07	
109	1	01	
110	8	06	
111	4	04	
112	x	-35	

REGISTERS

0 Start time/dec.	1 Vapor pressure	2	3	4	5	6	7	8	9
S0 hrs.	S1	S2	S3	S4	S5	S6	S7	S8	S9

A Height (cm)	B Weight (bg)	C Age (yr)	D BSA (M^2)	E EBV (ml)	I Used

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	x	-35	
114	DSP2	-63 02	
115	PRTX	-14	
116	DSP0	-63 00	
117	STOD	35 14	
118	1	01	Normal EFR is
119	5	05	1500ml/m^2/24^h
120	0	00	
121	0	00	
122	x	-35	
123	2	02	
124	4	04	
125	÷	-24	
126	PRTX	-14	
127	RCL0	36 00	
128	x	-35	
129	CHS	-22	
130	PRTX	-14	
131	RCLD	36 14	
132	2	02	Surgical EFR is
133	5	05	2500ml/m^2/24^h
134	0	00	
135	0	00	
136	x	-35	
137	2	02	
138	4	04	
139	÷	-24	
140	PRTX	-14	
141	SPC	16-11	
142	R/S	51	
143	HMS→	16 36	Find duration of
144	RCL0	36 00	surgery to present
145	-	-45	time
146	x	-35	
147	PSE	16 51	Show deficit gener-
148	-	-45	ated since start of
149	RTN	24	surgery
150	*LBLC	21 13	Display total defi-
151	STOI	35 46	cit
152	-	-45	Mean arterial
153	3	03	pressure:
154	÷	-24	$\frac{\text{Sys-Dias}}{3}$+Dias
155	RCLI	36 46	
156	+	-55	
157	RTN	24	
158	*LBLd	21 16 14	
159	STOE	35 15	Store est. blood
160	R↓	-31	vol. from labora-
161	*LBLD	21 14	tory determination
162	STOI	35 46	
163	RCLE	36 15	Find est. red cell
164	x	-35	mass
165	3	03	
166	0	00	
167	RCLE	36 15	Subtract est. red
168	x	-35	cell mass @ HCT 30%
169	-	-45	Does pt. have less
170	X<0?	16-45	than HCT 30% - jump
171	GTO4	22 04	
172	RCLI	36 46	Divide acceptable
173	÷	-24	red cell loss by HCT
174	PRTX	-14	to find ABL
175	RTN	24	
176	*LBL4	21 04	
177	EEX	-23	Adjust figure for
178	2	02	ml. red blood cell
179	÷	-24	deficit
180	PRTX	-14	
181	RTN	24	
182	*LBLe	21 16 15	Store vapor pressure
183	STO1	35 01	
184	R↓	-31	
185	*LBLE	21 15	Calculate delivered
186	RCL1	36 01	concentration
187	x	-35	
188	X≷Y	-41	
189	7	07	
190	6	06	
191	0	00	
192	RCL1	36 01	
193	-	-45	
194	x	-35	
195	÷	-24	
196	EEX	-23	
197	2	02	
198	x	-35	
199	DSP1	-63 01	
200	PRTX	-14	
201	DSP0	-63 00	
202	SPC	16-11	
203	RTN	24	

LABELS					FLAGS	SET STATUS		
A store data	B BSA EFR	C M.A.P.	D A.B.L.	E % conc	0	FLAGS	TRIG	DISP
a convert & store data	b Sod. nitro procs	c	d ABL Lab. EBV	e % conc. Pv supplied	1	ON OFF		
9 Subr. conc	1 Comparison	2 Comparison	3 Compute EBV	4 Compute RBC	2	0 ☐ ☑	DEG ☑	FIX ☑
5 (b)	6	7	8	9	3	1 ☐ ☑	GRAD ☐	SCI ☐
						2 ☐ ☑	RAD ☐	ENG ☐
						3 ☐ ☑		n

Program Description I

Program Title DISCOUNTED CASH FLOW ANALYSIS NET PRESENT VALUE

Contributor's Name HEWLETT-PACKARD COMPANY
Address Corvallis Division
1000 N.E. Circle Boulevard
City Corvallis, OR 97330 **State** **Zip Code**

Program Description, Equations, Variables

Assuming a minimum desired yield (cost of capital, discount rate), this program finds the present value of the future cash flows generated by the investment and subtracts the initial investment from this amount. If the final net present value is a positive value, the investment exceeds the profit objectives assumed. If the final net present value is a negative value, then the investment is not profitable to the extent of the desired yield. If the net present value is zero, the investment meets the profit objectives.

The function associated with the C key (#) is designed to accommodate those situations where a series of the cash flows are equal. You enter the number of times these equal periodic cash flows occur with C, and then the amount only once with D. The program automatically assumes 1 for #. If the cash flow occurs only once, there is no need to enter anything for #.

Zero must be entered for all periods with no cash flow. When a cash flow other than the initial investment is an outlay (additional investment, loss, etc.) the value must be entered as a negative number with CHS.

Cash flows are assumed to occur at the end of cash flow periods.

This program can also be used to find the present value of a series of irregular cash flows that cannot be accommodated by the DIRECT REDUCTION LOANS program by simply entering zero as the initial investment.

An option is provided to print the initial investment and the NPV after each cash flow. Pressing f E sets and clears the print flag. Successive use of f E will alternately display 1.00 and 0.00, indicating that the print mode is on or off respectively.

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s)

3. Discounted Cash Flow Analysis—Net Present Value

$$NPV_k = -INV + \sum_{k=1}^{n} \frac{CF_k}{(1 + i)^k}$$

where:

n = number of cash flows
CF_k = k^{th} cash flow
NPV_k = net present value after k^{th} cash flow

Solution(s)

Reference(s)

Program Description II

Sketch(es)

Sample Problem(s)

Example 1:

An investor has an opportunity to purchase a piece of property for $70,000. If the going rate of return on this type of investment is 13.75%, and the after-tax cash flows are forecast as follows, should the investor purchase the property?

Year	Cash Flow ($)	
1	$14,000	
2	11,000	
3	10,000	
4	10,000	
5	10,000	
6	9,100	
7	9,000	
8	9,000	
9	4,500	
10	71,000	(property sold in 10th year)

Solution(s)

Keystrokes:		Outputs:	
70000 A 13.75 B			
14000 D	→	-57692.31	(NPV after 1 cash flow)
11000 D	→	-49190.92	(NPV after 2 cash flows)
3 C 10000 D	→	-31172.57	(NPV after 5 cash flows)
9100 D	→	-26971.76	(NPV after 6 cash flows)
2 C 9000 D	→	-20108.39	(NPV after 8 cash flows)
E	→	8.00	(checking that we've entered 8 periods cash flows so far)
4500 D	→	-18696.99	(NPV after 9 cash flows)
71000 D	→	879.93	(NPV after 10 cash flows)

Reference(s)

Since the final NPV is positive, the investment meets the profit objectives.

Program Description II

Sketch(es)

Sample Problem(s)

Example 2:

The Cooper Company needs a new photocopier and is considering leasing the equipment as an alternative to buying. The end-of-the-year net cash cost of each option is:

PURCHASE

Year	Net Cash Cost
1	$ 533
2	948
3	1,375
4	1,815
5	2,270
Total Net Cash Cost	$6,941

LEASE

Year	Net Cash Cost
1	$1,310
2	1,310
3	1,310
4	1,310
5	1,310
Total Net Cash Cost	$6,550

Solution(s)

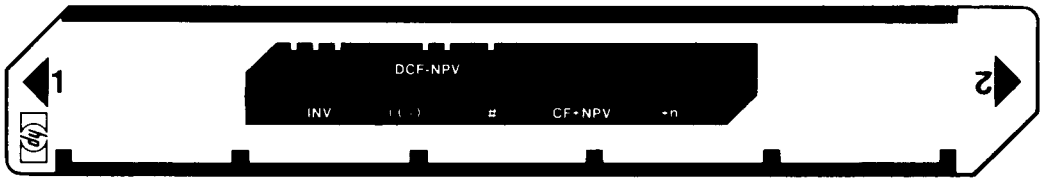
Looking at total cost, leasing appears to be less. But, purchasing costs less the first two years. Mr. Cooper knows that he can make a 15% return on every dollar he puts in the business; the sooner he can reinvest money, the sooner he earns 15%. Therefore, he decides to consider the **timing of the costs,** discounting the cash flows at 15% to find the present value of the alternatives. Which option should he choose?

Keystokes:	**Outputs:**
PURCHASE	
0 [A] 15 [B] 533 [D] 948 [D] 1375 [D] 1815 [D] 2270 [D] ⟶	4250.71
LEASE	
0 [A] 5 [C] 1310 [D] ⟶	4391.32

Reference(s)

Leasing has a present value cost of $4391.32, while purchasing has a present value cost of $4250.71. Since these are both expense items, the lowest present value is the most desirable. So, in this case, purchase is the least costly alternative.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Load side 1.			
2	Optional: Select			
	print/pause mode.		f E	1.00 or 0.00
3	Key in			
	• Initial investment amount	INV	A	INV
	• Periodic interest (discount) rate	i (%)	B	i (%)
4	Key in the number of equal			
	cash flows if greater than 1.	#	C	#
5	Key in cash flow amount(s) and			
	calculate net present value.	CF	D	NPV
6	Optional: Display total number			
	of cash flows entered so far.		E	n
7	For next cash flow(s) go to			
	step 4.			
8	For a new case go to step 2.			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	CHS	-22	
003	STOA	35 11	-NPV→R_A
004	0	00	0→R_9
005	STO9	35 09	1→R_{10}
006	1	01	
007	STOC	35 13	
008	RCLA	36 11	
009	CHS	-22	
010	GSB9	23 09	
011	RTN	24	
012	*LBLB	21 12	i/100→R_B
013	EEX	-23	
014	2	02	
015	÷	-24	
016	STOB	35 12	
017	LSTX	16-63	
018	×	-35	
019	RTN	24	
020	*LBLC	21 13	#→R_C
021	STOC	35 13	
022	RTN	24	
023	*LBLD	21 14	
024	STOD	35 14	
025	1	01	
026	RCLB	36 12	
027	+	-55	Calculate present
028	RCLC	36 13	value of series.
029	ST+9	35-55 09	
030	Y^x	31	
031	STOE	35 15	
032	RCLA	36 11	
033	×	-35	
034	RCLE	36 15	
035	1	01	
036	-	-45	
037	RCLB	36 12	
038	÷	-24	
039	RCLD	36 14	
040	×	-35	
041	+	-55	
042	STOA	35 11	
043	1	01	
044	RCLB	36 12	
045	+	-55	
046	RCL9	36 09	
047	Y^x	31	
048	÷	-24	
049	1	01	
050	STOC	35 13	
051	R↓	-31	Reset n to 1.
052	GSB9	23 09	
053	RTN	24	
054	*LBLE	21 15	
055	RCL9	36 09	Recall Σn.
056	RTN	24	
057	*LBLe	21 16 15	Print option.
058	F0?	16 23 00	
059	GTO1	22 01	
060	SF0	16 21 00	
061	1	01	
062	RTN	24	
063	*LBL1	21 01	
064	0	00	
065	CF0	16 22 00	
066	RTN	24	
067	*LBL9	21 09	
068	F0?	16 23 00	
069	GTO2	22 02	
070	R/S	51	
071	RTN	24	
072	*LBL2	21 02	
073	PRTX	-14	
074	R/S	51	

080 090 100 110

FLAGS	
0	Print?
1	
2	
3	

SET STATUS

FLAGS			TRIG	DISP
	ON	OFF		
0	☐	☒	DEG ☒	FIX ☒
1	☐	☒	GRAD ☐	SCI ☐
2	☐	☒	RAD ☐	ENG ☐
3	☐	☒		n 2

REGISTERS

0	1	2	3	4	5	6	7	8	9 Σn
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A NPV	B i/100	C #	D CF	E $(1+i)^n$	I

Program Description I

Program Title INCOME PROPERTY ANALYSIS

Contributor's Name JACK B. BUSTER

Address P. O. BOX 8062

City ANCHORAGE **State** ALASKA **Zip Code** 99508

Program Description, Equations, Variables

$$\text{Capitalization Rate} = \frac{\text{Net Operating Income}}{\text{Purchase Price}}$$

$$\text{Taxable Income} = \text{Net Operating Income} - \text{Depreciation} - \text{Interest}$$

$$\text{Spendable Income} = \text{Net Operating Income} - \text{Payments} - \text{Income tax}$$

$$\text{Spendable Income Rate} = \frac{\text{Spendable Income}}{\text{Equity}}$$

$$\text{Equity Income} = \text{Net Operating Income} - \text{Interest} - \text{Income tax}$$

$$\text{Equity Income Rate} = \frac{\text{Equity Income}}{\text{Equity}}$$

$$\text{Interest} = PMT\left[12 - \frac{(1+i)^{12-n}}{i}\left[1-(1+i)^{-12}\right]\right]$$

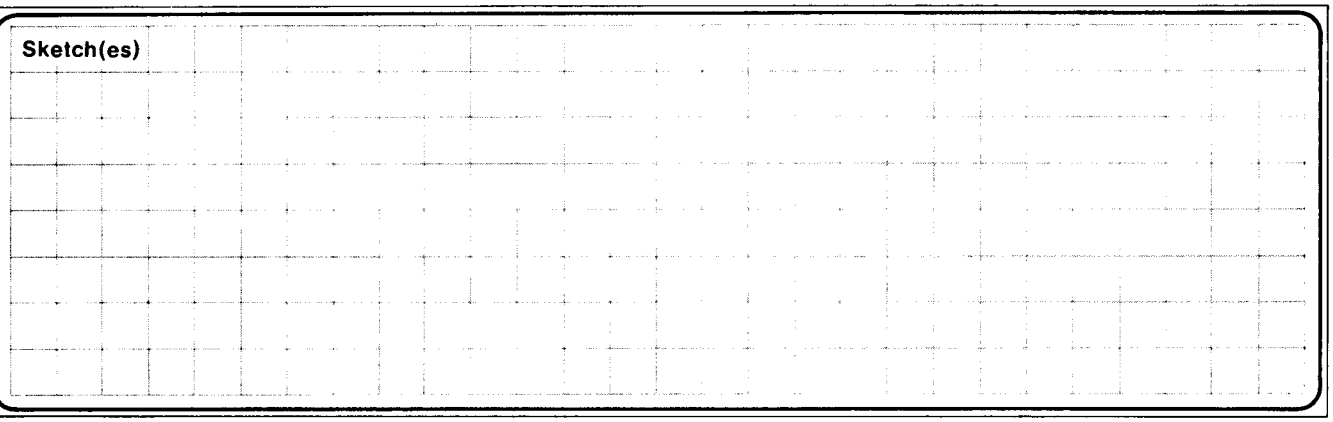
The above variables are the generally accepted parameters for the analysis and evaluation of income properties. This program follows the standard NIREB recommended format. Net Operating Income is gross income decreased by vacancies and operating expenses.

Operating Limits and Warnings

This program will operate with only one level of mortgage, i.e. properties with second mortgages cannot be analyzed by this program. This valuation or analysis technique is ubiquitous particularily since it takes explicit tax consequences into consideration.

Program Description II

Sketch(es)



Sample Problem(s) *An investor wishes to know the performance of a large apartment complex over the next five yearswith respect to initial capitalization rate, taxable income, net spendable income, spendable income rate, equity income, and equity income rate. The following particulars apply:*

Purchase Price	*$ 750,000.00*	*Inflation/Appreciation rate:*	
Loan Amount	*635,000.00*	*Current year:*	*= 7%*
Interest rate	*9 3/4%*	*Next year:*	*= 7 1/2%*
Land Value	*$ 95,000.00*	*Next Year:*	*= 8%*
Building life	*35 years*	*Thereafter:*	*= 8 1/2%*
Monthly payment	*$ 7,000.00*		
Net Operating Income	*$ 112,500.00*		
Income tax bracket	*40%*		

SAMPLE SOLUTION

Cap rate = 15.00	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*
Taxable	*32,887.48*	*43,118.33*	*54,742.55*	*67,955.64*	*82,987.43*
Spendable	*15,345.01*	*19,127.67*	*23,506.10*	*28,573.12*	*34,439.61*
Rate	*13.34 %*	*10.04 %*	*8.51 %*	*7.65 %*	*7.12 %*
Equity	*38,446.77*	*44,585.28*	*51,559.82*	*59,487.67*	*68,506.74*
Rate	*33.43 %*	*23.39 %*	*18.66 %*	*15.93 %*	*14.17 %*

Solution(s) *Input variables as follows:*

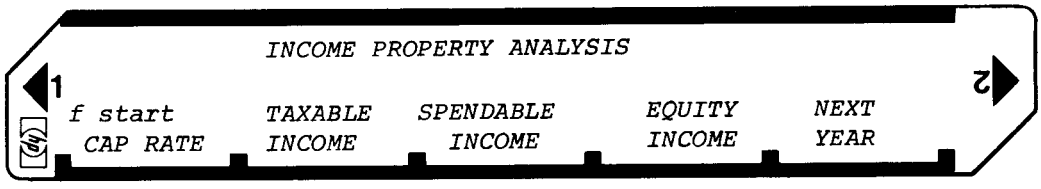
Interest Rate	*STO B*	*(.8125)*
Monthly Payment	*STO C*	
Loan Amount	*STO D*	
Purchase Price	*STO 0*	
N.O. INCOME	*STO 1*	
Economic Life	*STO 2*	
Land value	*STO 3*	
Tax Bracket	*STO 4*	*(40)*

SOLVE AS FOLLOWS:

(1) f A ---Initialize
(2) Store variables
(3) A -----Capitalization Rate
(4) B -----Taxable Income
(5) C -----Spendable Income ----Spendable Income Rate
(6) D -----Equity Income-----Equity Income Rate
(7) Key in inflation rate
(8) E -----Advances totals for one year
(9) Return to step (4) for additional totals

Reference(s) *National Institute of Real Estate Brokers income property analysis data sheet.*

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Load sides 1 and 2			
2	Initialize		f A	
3	Input Data:			
	Interest rate per period		STO B	
	Monthly payment		STO C	
	Loan amount		STO D	
	Purchase price		STO 0	
	Net Operating Income		STO 1	
	Remaining economic life of improvements		STO 2	
	Land value		STO 3	
	Investor's income tax bracket (as a %)		STO 4	
4	CALCULATE Capitalization Rate		A	Cap Rate %
5	CALCULATE Taxable Income		B	Taxable $
6	CALCULATE Net Spendable Income and Rate		C	Spendable $ & %
7	CALCULATE Equity Income and Rate		D	Equity $ & %
8	Input current inflation/appreciation rate		E	years beyond base year
9	Return to step 5 for the next year			

67 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001 *	f LBL A	31 25 11	Figure Cap Rate
	RCL 1	34 01	
	RCL 0	34 00	
	Divide	81	
	EEX	43	
	2	02	
	X	71	
	h RTN	35 22	
*	f LBL B	31 25 12	Figure straight line Depreciation
010	DSP 2	23 02	
	h F? 0	35 71 00	
	GTO 1	22 01	
	RCL 0	34 00	
	RCL 3	34 03	
	-	51	
	RCL 2	34 02	
	Divide	81	
	STO 2	33 02	
	1	01	Figure Loan Amortization Period
020	RCL B	34 12	
	f %	31 82	
	STO 9	33 09	
	+	61	
	STO 7	33 07	
	RCL C	34 13	
	RCL 9	34 09	
	Divide	81	
	Enter	41	
	Enter	41	
030	RCL D	34 14	
	-	51	
	Divide	81	
	f LN	31 52	
	RCL 7	34 07	
	f LN	31 52	
	Divide	81	
	STO A	33 11	
*	f LBL 1	31 25 01	Figure Accumulated Interest for 12 months
	f GSB 0	31 22 00	
040	STO 6	33 06	
	RCL 2	34 02	
	+	61	
	CHS	42	
	RCL 1	34 01	
	+	61	
	STO 3	33 03	Figure Taxable
	h RTN	35 22	
*	f LBL 0	31 25 00	
	RCL B	34 12	
050	EEX	43	
	2	02	
	Divide	81	
	STO 9	33 09	
	1	01	
	+	61	
	STO 5	33 05	

STEP	KEY ENTRY	KEY CODE	COMMENTS
	1	01	
	2	02	
	STO 8	33 08	
060	CHS	42	
	y^x	35 63	
	1	01	
	$x \geq y$	35 52	
	-	51	
	RCL 5	34 05	
	RCL 8	34 08	
	RCL A	34 11	Interest Calculation Routine
	-	51	
	y^x	35 63	
070	RCL 9	34 09	
	Divide	81	
	X	71	
	RCL 8	34 08	
	$x \geq y$	35 52	
	-	51	
	RCL C	34 13	
	X	71	
	h RTN	35 22	
*	f LBL C	31 25 13	
080	RCL 4	34 04	Figure Spendable
	EEX	43	
	2	02	
	Divide	81	
	RCL 3	34 03	
	X	71	
	STO 7	33 07	
	RCL C	34 13	
	RCL 8	34 08	
	X	71	
090	STO E	33 15	
	+	61	
	CHS	42	
	RCL 1	34 01	
	+	61	
	-x-	31 84	show spendable
	RCL 0	34 00	
	RCL D	34 14	
	-	51	
	STO 9	33 09	
100	Divide	81	
	EEX	43	
	2	02	
	X	71	
	h RTN	35 22	show rate
*	f LBL D	31 25 14	
	RCL 7	34 07	
	RCL 6	34 06	Figure Equity Income
	+	61	
	CHS	42	
110	RCL 1	34 01	
	+	61	
	-x-	31 84	show equity

REGISTERS

0	1	2	3	4	5	6	7	8	9
Price	N.O.I.	Life	Land val.	tax rate	used	used	tax	12	used
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I
Loan Amort.	Interest Rate	Monthly PMT	Loan Balance	USED	Year counter

67 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
	RCL 9	34 09	
	Divide	81	
	EEX	43	
	2	02	
	X	71	
	h RTN	35 22	
*	f LBL E	31 25 15	
120	RCL E	34 15	Adjust for inflation and housekeep for new year's run
	RCL 6	34 06	
	-	51	
	CHS	42	
	RCL D	34 14	
	+	61	
	STO D	33 14	
	h ↓	35 53	
	STO E	33 15	
	RCL 0	34 00	
130	x≷y	35 52	
	f %	31 82	
	+	61	
	STO 0	33 00	
	RCL 1	34 01	
	RCL E	34 15	
	f %	31 82	
	+	61	
	STO 1	33 01	
	h SF 0	35 51 00	
140	RCL A	34 11	
	RCL 8	34 08	
	-	51	
	STO A	33 11	
	f ISZ	31 34	
	h RC I	35 34	
	DSP 0	23 00	
	h RTN	35 22	
*	g LBL a	32 25 11	Initialize
	h CF 0	35 61 00	
150	f CL REG	31 43	
	CL X	44	
	DSP 2	23 02	
	h RTN	35 22	
160			

STEP	KEY ENTRY	KEY CODE	COMMENTS
170			
180			
190			
200			
210			
220			

LABELS

A	B	C	D	E
Cap Rate	Taxable	Spendable	Equity	Next Year
a Initialize	b	c	d	e
0	1	2	3	4
5	6	7	8	9

FLAGS

0
Toggle
1
2
3

SET STATUS

FLAGS			TRIG	DISP
	ON	OFF		
0	☐	☒	DEG ☒	FIX ☒
1	☐	☒	GRAD ☐	SCI ☐
2	☐	☒	RAD ☐	ENG ☐
3	☐	☒		n 2

Program Description I

Program Title: INCOME TAX PLANNING - I

Contributor's Name: RICHARD D. RUTTER
Address: ARTHUR YOUNG & G. 780 N. WATER ST.
City: MILWAUKEE State: WI. Zip Code: 53202

Program Description, Equations, Variables

THIS PROGRAM CALCULATES REGULAR, ALTERNATIVE, AND AVERAGED INCOME TAXES FOR INDIVIDUALS AS SPECIFIED BY IRS FORMS 1040, SCHEDULE D, AND SCHEDULE G. THE FOLLOWING MNEMONICS ARE USED IN DOCUMENTING COMPUTATIONS:

OTI	ORDINARY TAXABLE INCOME (FORM 1040, LINE 47 - $\frac{1}{2}$ CG)
CG	CAPITAL GAINS (SCHEDULE D, LINE 13)
4YRTI	TOTAL TAXABLE INCOME FOR PRECEDING 4 YEARS (SCHEDULE G, LINE 5 (b), (c), (d), (e)

ALL EQUATIONS FOR COMPUTATIONS ARE SHOWN AS COMMENTS ON THE PROGRAM LISTING. PROCESSING LOGIC IS SHOWN ON THE ACCOMPANYING FLOWCHART. THIS PROGRAM REQUIRES THE USE OF ONE OR MORE PAIRS OF TAX TABLE DATA CARDS AS SPECIFIED IN THE ACCOMPANYING TAX TABLE LISTINGS.

Operating Limits and Warnings

TAX CALCULATIONS CANNOT BE PERFORMED FOR VALUES LESS THAN $1,000 (IF ATTEMPTED, ERROR CODE '9' WILL FLASH IN THE DISPLAY). ALL INPUT DATA MUST CONFORM WITH THE FOLLOWING LIMITS:

OTI ≥ $1,000
CG > 0
4YRTI > 0

Program Description II

Sketch(es) (SEE ATTACHED FLOWCHART)

Sample Problem(s) MR. AND MRS. SMITH WILL FILE A JOINT RETURN FOR TAX YEAR 1977. THE FOLLOWING DATA ARE APPLICABLE:

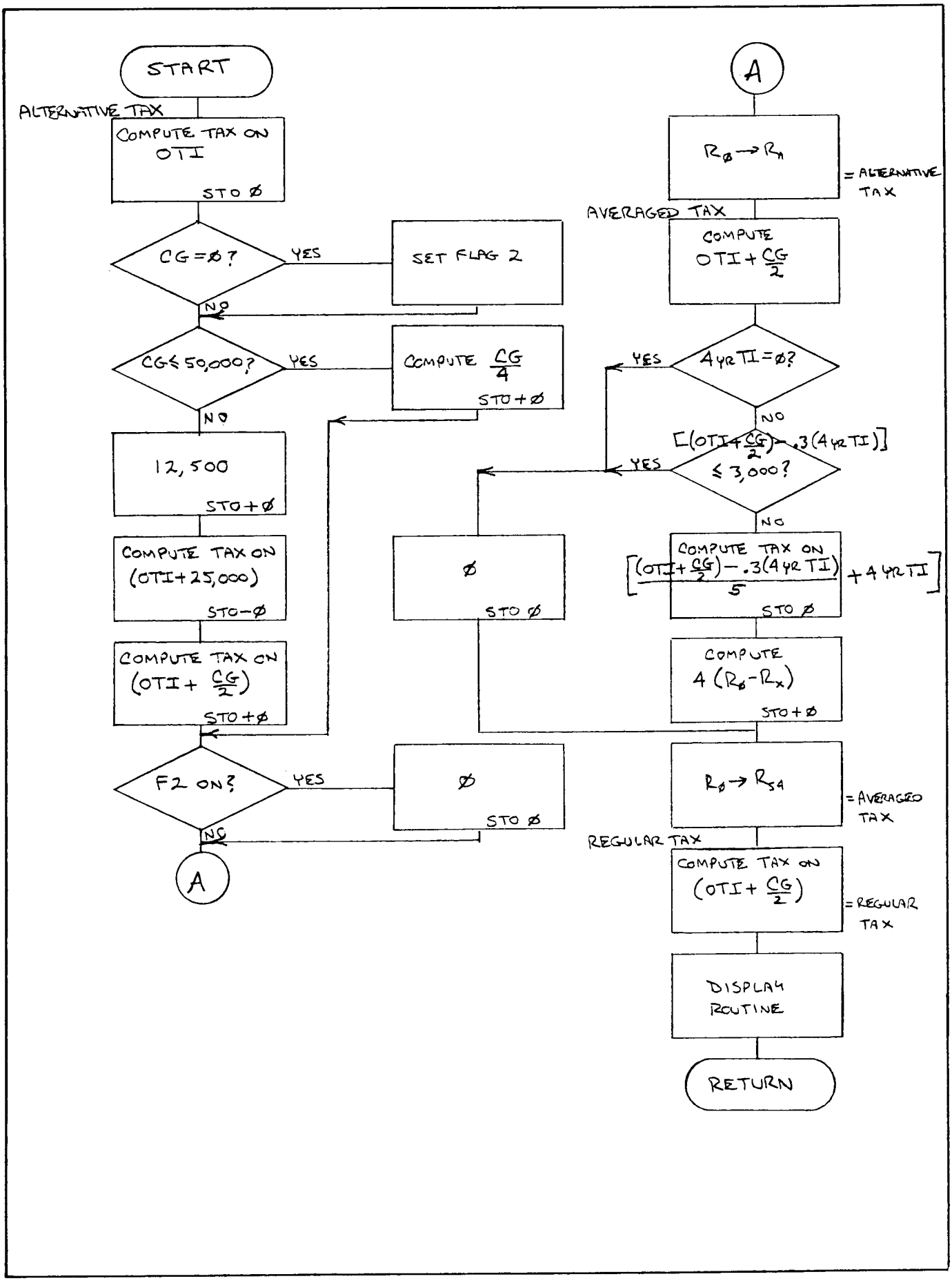
OTI	$95,000
CG	10,000
APP TI	160,000

Solution

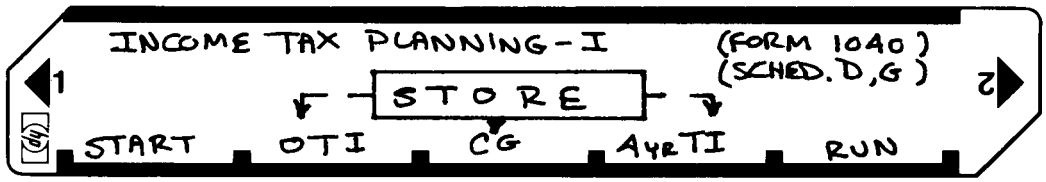
```
95,000 [STO][B]
10 000 [STO][C]
160000 [STO][D]

[E] . . . . . .
```

REGULAR TAX	$45,180	Y RE
ALTERNATIVE TAX	44,680	
AVERAGED TAX	43,020	

Reference(s) 1977 U.S. MASTER TAX GUIDE
1977 INDIVIDUALS' FILLED-IN TAX FORMS
COMMERCE CLEARING HOUSE, INC.
4025 W. PETERSON AVE.
CHICAGO, ILLINOIS 60646


START
ALTERNATIVE TAX
COMPUTE TAX ON OTI
STO Ø
CG = Ø ?
YES
SET FLAG 2
NO
CG ≤ 50,000?
YES
COMPUTE CG/4
STO + Ø
NO
12,500
STO + Ø
COMPUTE TAX ON (OTI + 25,000)
STO − Ø
COMPUTE TAX ON (OTI + CG/2)
STO + Ø
F2 ON?
YES
Ø
STO Ø
NO
A
A
RØ → Rn
= ALTERNATIVE TAX
AVERAGED TAX
COMPUTE OTI + CG/2
4 YR TI = Ø?
YES
NO
[(OTI + CG/2) − .3(4 YR TI)] ≤ 3,000?
YES
NO
Ø
STO Ø
COMPUTE TAX ON [((OTI + CG/2) − .3(4 YR TI))/5 + 4 YR TI]
STO Ø
COMPUTE 4 (RØ − Rx)
STO + Ø
RØ → RS4
= AVERAGED TAX
REGULAR TAX
COMPUTE TAX ON (OTI + CG/2)
= REGULAR TAX
DISPLAY ROUTINE
RETURN

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	LOAD PROGRAM CARD SIDES 1 AND 2			
2	START BY SPECIFYING TAX TABLE CARD 1 OR 2 TO BE LOADED. BE SURE TO SELECT THE PAIR OF TAX TABLE CARDS TO CORRESPOND TO THE TYPE OF TAX RETURN (E.G. JOINT RETURN). '1' OR '2' WILL FLASH IN THE DISPLAY UNTIL THE SPECIFIED TAX TABLE CARD HAS BEEN LOADED. DURING EXECUTION THE PROGRAM WILL AUTOMATICALLY REQUEST TAX TABLE CARD LOADING (IF NECESSARY) BY FLASHING '1' OR '2' IN THE DISPLAY UNTIL THE REQUIRED TAX TABLE CARD HAS BEEN LOADED.	1 OR 2	A	1 OR 2
3	STORE THE FOLLOWING DATA:	OTI	STO B	OTI
		CG	STO C	CG
		4YRTI	STO D	4YRTI
4	RUN THE PROGRAM TO CALCULATE REGULAR, ALTERNATIVE, AND AVERAGED TAXES. RESULTS ARE LEFT IN THE STACK AND MAY BE REVIEWED BY:		E	'3.00'
				'REG TAX'
				'ALT TAX'
			9 STK	'AVE TAX'
	NOTE: EXECUTION TIMES RANGE FROM 30-45 SECONDS.			
5	TAX CALCULATIONS MUST BE FOR TAXABLE AMOUNTS ≥ $1,000. IF A TAX CALCULATION FOR A LESSER AMOUNT IS ATTEMPTED, THE PROGRAM WILL HALT WITH ERROR CODE '9' IN THE DISPLAY.			9

User Instructions

TAX TABLE CARD 1 (OR 2)

1 { MARRIED-JOINT $1,000 - 39,999 (OR $40,000+)
MARRIED-SEPARATE $1,000 - 19,999 (OR $20,000+)
INDIVIDUAL $1,000 - 19,999 (OR $20,000+) } 2

STEP	INSTRUCTIONS			INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	RECORD THE FOLLOWING DATA ON PAIRS OF DATA CARDS FOR USE WITH INCOME TAX PLANNING I AND II PROGRAMS. RECORD ONLY THE TAX TABLE(S) THAT YOU WILL USE.					
	REGISTER	MARRIED-JOINT	MARRIED-SEP.	INDIVIDUAL		
		CARD 1				
	R_0	1.0401	1.0201	1.0201	STO 0	
	R_1	1.0001415	0.	0.	STO 1	
	R_2	2.0002916	0.	0.	STO 2	
	R_3	3.0004517	1.0001416	1.0001416	STO 3	
	R_4	4.0006219	2.0003119	2.0003119	STO 4	
	R_5	8.0013822	4.0006922	4.0006921	STO 5	
	R_6	12.0022625	6.0011325	6.0011124	STO 6	
	R_7	16.0032628	8.0016328	8.0015925	STO 7	
	R_8	20.0043832	10.0021932	10.0020927	STO 8	
	R_9	24.0056636	12.0028336	12.0026329	STO 9	
					P≥S	
	R_{S0}	28.0071039	14.0035539	14.0032131	STO 0	
	R_{S1}	32.0086642	16.0043342	16.0038334	STO 1	
	R_{S2}	36.0103445	18.0051745	18.0045136	STO 2	
	R_{S3}	52000.	26000.	38000.	STO 3	
		CARD 2			P≥S W/DATA	
	R_0	2.0402	2.0202	2.0202	STO 0	
	R_1	40.0121448	20.0060748	20.0052338	STO 1	
	R_2	44.0140650	22.0070350	22.0059940	STO 2	
	R_3	52.0180653	26.0090353	26.0075945	STO 3	
	R_4	64.0244255	32.0122155	32.0102950	STO 4	
	R_5	76.0310258	38.0155158	38.0132955	STO 5	
	R_6	88.0379860	44.0189960	44.0165960	STO 6	
	R_7	100.0451862	50.0225962	50.0201962	STO 7	
	R_8	120.0575864	60.0287964	60.0263964	STO 8	
	R_9	140.0703866	70.0351966	70.0327966	STO 9	
					P≥S	
	R_{S0}	160.0835868	80.0417968	80.0393968	STO 0	
	R_{S1}	180.0971869	90.0485969	90.0461969	STO 1	
	R_{S2}	200.1109870	100.0554970	100.0530970	STO 2	
	R_{S3}	52000.	26000.	38000.	STO 3	
					P≥S W/DATA	

67 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBL 0	31 25 00	TAX CALCULATION SUBROUTINE
	EEX	43	
	3	03	
	÷	81	
	STO E	33 15	FORMAT TAX TABLE SEARCH ARGUMENT
	1	01	IF ARGUMENT < 1
	X≤Y?	32 71	HALT WITH
	GTO 6	22 06	ERROR CODE '9'
	9	09	
010	R/S	84	
	*LBL 6	31 25 06	DETERMINE WHICH
	RC I	35 34	HALF OF TAX TABLE
	FRAC	32 83	IS REQUIRED BY
	EEX	43	COMPARING ARGUMENT
	3	03	TO 'TABLE SPLIT'
	X	71	VALUE STORED IN
	ENTER↑	41	R_I (FRAC).
	INT	31 83	
	RCL E	34 15	REQUEST THE
020	X≥Y	35 52	OTHER HALF OF THE
	X>Y?	32 81	TAX TABLE ('1' OR
	GTO 1	22 01	'2') IF NECESSARY,
	2	02	AND BRANCH TO
	GTO B	22 12	TAX TABLE LOAD
	*LBL 1	31 25 01	ROUTINE. ELSE,
	1	01	BRANCH TO TAX
	*LBL B	31 25 12	TABLE SEARCH
	R↑	35 54	ROUTINE.
	FRAC	32 83	
030	EEX	43	
	1	01	
	X	71	
	INT	31 83	
	X=Y?	32 51	
	GTO 5	22 05	
	R↓	35 53	
	GTO 3	22 03	
	*LBL A	31 25 11	ENTRY FOR INITIAL TAX TABLE LOAD.
	SF 2	35 51 02	
040	*LBL 3	31 25 03	TAX TABLE LOAD ROUTINE
	1	01	
	3	03	REQUESTED CARD CODE ('1' OR '2') IS IN R_X. LOOP UNTIL REQUESTED HALF OF TAX TABLE IS LOADED.
	ST I	35 33	
	X≥Y	35 52	
	*LBL 2	31 25 02	
	MERGE	32 41	
	PAUSE	35 72	
	F3?	35 71 03	
	GTO 4	22 04	
050	GTO 2	22 02	STORE 'TABLE SPLIT' VALUE IN R_I (FRAC).
	*LBL 4	31 25 04	
	RCL 0	34 00	
	INT	31 83	
	X=Y?	32 51	
	GTO 9	22 09	
	R↓	35 53	

STEP	KEY ENTRY	KEY CODE	COMMENTS
	GTO 7	22 07	
	*LBL 9	31 25 09	
	RCL 0	34 00	
060	ST I	35 33	
	R↓	35 53	
	F2?	35 71 02	EXIT FOR INITIAL TAX TABLE LOAD.
	RTN	35 22	
	*LBL 5	31 25 05	TAX TABLE SEARCH ROUTINE
	RC I	35 34	
	FRAC	32 83	PERFORM INDIRECT READ LOOP THROUGH TAX TABLE (DESCENDING) UNTIL CORRECT ENTRY IS FOUND. THEN BRANCH TO TAX CALCULATION ROUTINE.
	1	01	
	2	02	
	+	61	
070	ST I	35 33	
	*LBL 7	31 25 07	
	RCL E	34 15	
	RCL (i)	34 24	
	INT	31 83	
	X≤Y?	32 71	
	GTO 8	22 08	
	DSZ	31 33	
	GTO 7	22 07	
	*LBL 8	31 25 08	TAX CALCULATION ROUTINE
080	RCL (i)	34 24	
	FRAC	32 83	
	EEX	43	
	5	05	
	X	71	
	ENTER↑	41	
	INT	31 83	
	EEX	43	
	1	01	
	X	71	
090	X≥Y	35 52	
	FRAC	32 83	
	RCL E	34 15	
	RCL (i)	34 24	
	INT	31 83	
	−	51	
	EEX	43	
	3	03	
	X	71	
	X	71	
100	+	61	
	RTN	35 22	
	*LBL E	31 25 15	MAINLINE
	RCL B	34 12	CALCULATE ALTERNATIVE TAX
	GSB 0	31 22 00	COMPUTE TAX ON OTI
	STO 0	33 00	STORE IN R_0
	5	05	
	EEX	43	IF CG=0
	4	04	SET FLAG 2
	RCL C	34 13	
110	X=0?	31 51	IF CG≤50000
	SF 2	35 51 02	BRANCH TO LBL C
	X≤Y?	32 71	

REGISTERS

0 ACCUMULATED TAX AMOUNT	1 TAX TABLE	2	3	4	5	6	7	8	9 →
S0 TAX TABLE	S1	S2 →	S3 CONSTANT 38/26/52000	S4 AVE. TAX	S5	S6	S7	S8	S9 WORK

A	B	C	D	E	I
ALT. TAX	OTI	CG	4 YR TI	WORK	LOOP CONTRL (INT). TABLE SPLIT (FRAC)

67 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
	GTO c	22 31 13	— — —
	x≥y	35 52	IF CG > 50000
	4	04	ADD 12500 TO R_0
	÷	81	
	STO+0	33 61 00	— — — —
	2	02	COMPUTE TAX ON
	x	71	(OTI + 25000)
120	RCL B	34 12	SUBTRACT FROM R_0
	+	61	
	GSB 0	31 22 00	
	STO-0	33 51 00	— — — —
	RCL B	34 12	COMPUTE TAX ON
	RCL C	34 13	$(OTI + \frac{CG}{2})$
	2	02	
	÷	81	BRANCH TO LBL d
	+	61	
	GSB 0	31 22 00	
130	GTO d	22 31 14	— — —
	*LBL c	32 25 13	IF CG ≤ 50000
	4	04	COMPUTE $\frac{CG}{4}$
	÷	81	— — — —
	*LBL d	32 25 14	ADD (TAX ON OTI + $\frac{CG}{2}$)
	STO+0	33 61 00	OR ($\frac{CG}{4}$) TO R_0
	RCL 0	34 00	— — — —
	F2?	35 71 02	IF CG = 0, ALT. TAX
	0	00	= 0
	STO A	33 11	STORE ALT. TAX IN R_A
140	RCL B	34 12	CALCULATE INCOME
	RCL C	34 13	AVERAGED TAX
	2	02	
	÷	81	CALCULATE OTI + $\frac{CG}{2}$
	+	61	
	RCL D	34 14	IF 4YR TI = 0
	x=0?	31 51	BRANCH TO LBL b
	GTO b	22 31 12	— — —
	.	83	COMPUTE
	3	03	.3(4YR TI)
150	x	71	STORE IN R_D
	STO D	33 14	— — —
	—	51	IF $(OTI + \frac{CG}{2}) -$
	3	03	$.3(4YR\ TI)$
	EEX	43	≤ 3000
	3	03	
	x≥y	35 52	BRANCH TO LBL b
	x≤y?	32 71	
	GTO b	22 31 12	— — —
	5	05	COMPUTE TAX ON
160	÷	81	$\left[\frac{(OTI + \frac{CG}{2} - .3(4YR\ TI)}{5}\right.$
	RCL D	34 14	
	+	61	$\left. + 4\ 4YR\ TI\right]$
	GSB 0	31 22 00	STORE IN R_0
	STO 0	33 00	— — —
	RCL D	34 14	COMPUTE TAX ON 4YR TI
	GSB 0	31 22 00	LEAVE IN R_X
	RCL 0	34 00	COMPUTE $4(R_0 - R_X)$
	x≤y	35 52	ADD TO R_0

STEP	KEY ENTRY	KEY CODE	COMMENTS
	—	51	
170	4	04	
	x	71	
	STO+0	33 61 00	
	GTO a	22 31 11	— — — —
	*LBL b	32 25 12	LEAVE 0 IN R_0
	0	00	
	STO 0	33 00	— — — —
	*LBL a	32 25 11	STORE
	RCL 0	34 00	AVERAGED TAX
	P≥S	31 42	IN $R_{.4}$
180	STO 4	33 04	
	P≥S	31 42	— — —
	RCL D	34 14	RESTORE 4YR TI
	.	83	IN R_0
	3	03	
	÷	81	
	STO D	33 14	— — — — — — —
	RCL B	34 12	CALCULATE
	RCL C	34 13	REGULAR TAX
	2	02	COMPUTE TAX ON
190	÷	81	$(OTI + \frac{CG}{2})$
	+	61	
	GSB 0	31 22 00	LEAVE IN R_X — — —
	3	03	DISPLAY ROUTINE
	x≥y	35 52	DISPLAY
	RCL A	34 11	'3.00'
	P≥S	31 42	'REGULAR TAX'
	RCL 4	34 04	'ALTERNATIVE TAX'
	P≥S	31 42	'AVERAGED TAX'
	STK	32 84	
200	RTN	35 22	— — — — — — —
210			
220			

LABELS (ADDRESS WHERE USED)

A	B	C	D	E
038	027			102
a	b	c	d	e
177	174	131	134	
0	1	2	3	4
001	025	045	040	051
5	6	7	8	9
064	011	071	079	058

FLAGS

0	
1	
2	USED
3	

SET STATUS

FLAGS	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

TRIG	
DEG	☒
GRAD	☐
RAD	☐

DISP	
FIX	☒
SCI	☐
ENG	☐
n	2

Program Description I

Program Title	INCOME TAX PLANNING - II
Contributor's Name	RICHARD D. RUTTER
Address	ARTHUR YOUNG & CO. 780 N. WATER ST.
City	MILWAUKEE State WI. Zip Code 53202

Program Description, Equations, Variables THIS PROGRAM CALCULATES BOTH REGULAR AND ALTERNATIVE INCOME TAXES FOR INDIVIDUALS AS SPECIFIED BY IRS FORM 4726.* THE FOLLOWING MNEMONICS ARE USED IN DOCUMENTING COMPUTATIONS:

ENI	EARNED NET INCOME (LINE 3)
AGI	ADJUSTED GROSS INCOME (LINE 4)
CG	CAPITAL GAINS (LINE 21)
TI	TAXABLE INCOME (LINE 6)
TPI	TAX PREFERENCE ITEMS (LINE 8)
ETI	EARNED TAXABLE INCOME (LINE 9)

ALL EQUATIONS FOR COMPUTATIONS ARE SHOWN AS COMMENTS ON THE PROGRAM LISTING. PROCESSING LOGIC IS SHOWN ON THE ACCOMPANYING FLOWCHART. THIS PROGRAM REQUIRES THE USE OF ONE OR MORE PAIRS OF TAX TABLE DATA CARDS AS SPECIFIED IN THE ACCOMPANYING TAX TABLE LISTINGS.

* NOTE: DO NOT USE THIS PROGRAM IF LINE 22 (SUBSECTION d GAINS) OF FORM 4726 $\neq 0$.

Operating Limits and Warnings TAX CALCULATIONS CANNOT BE PERFORMED FOR VALUES LESS THAN $1,000 (IF ATTEMPTED, ERROR CODE '9' WILL FLASH IN THE DISPLAY). ALL INPUT DATA MUST CONFORM WITH THE FOLLOWING LIMITS:

ENI, AGI > 0
CG ≥ 0
TI $\geq \$1{,}000$
TPI ≥ 0

Program Description II

Sketch(es) (SEE ATTACHED FLOWCHART)

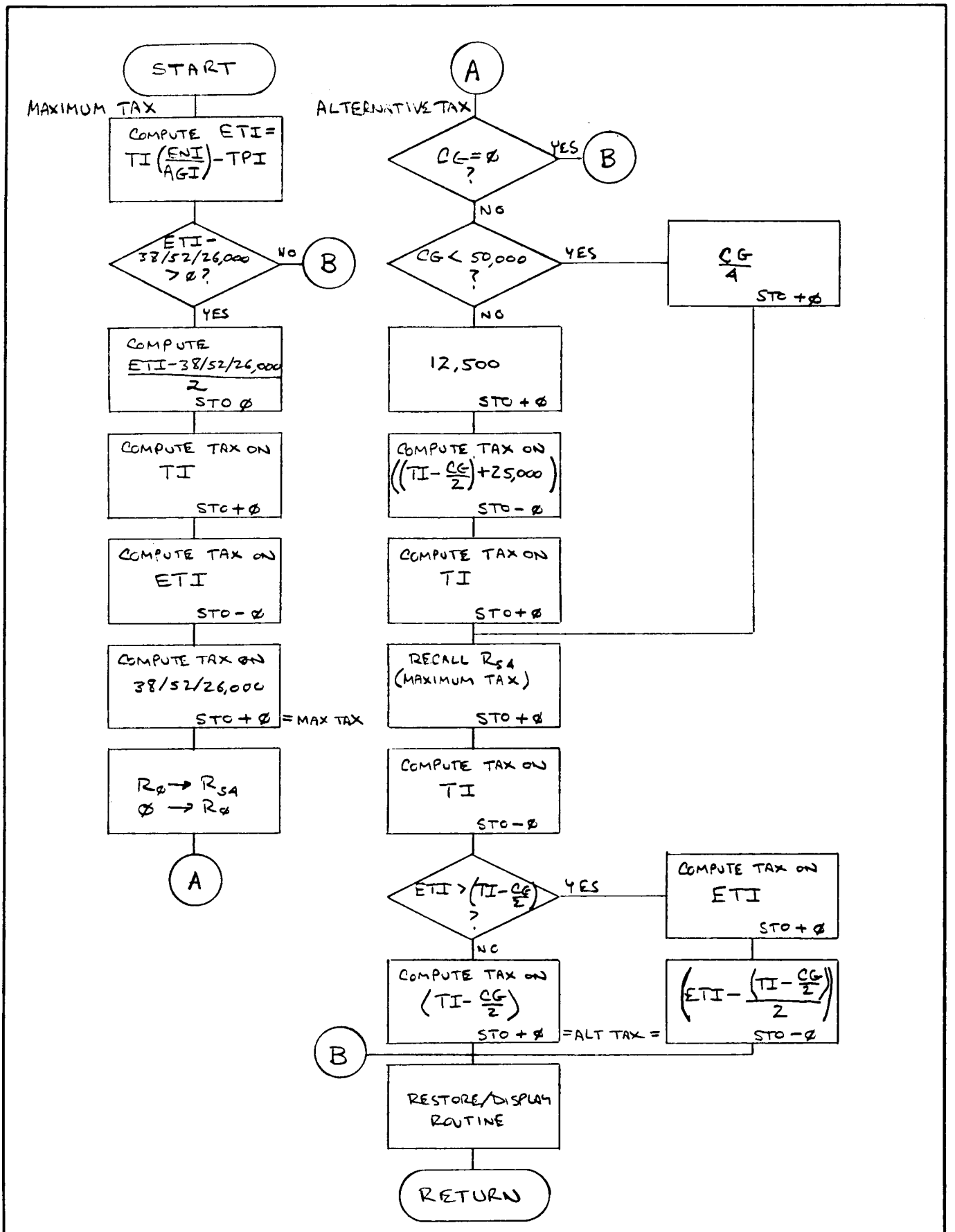
Sample Problem(s) MR. AND MRS. SMITH WILL FILE A JOINT RETURN FOR TAX YEAR 1977. THE FOLLOWING DATA ARE APPLICABLE:

ENI	* 80,000
AGI	120,000
CG	10,000
TI	100,000
TPI	10,000

Solution(s)

MAXIMUM TAX (REGULAR)	*45,040
MAXIMUM TAX (ALTERNATIVE)	44,540

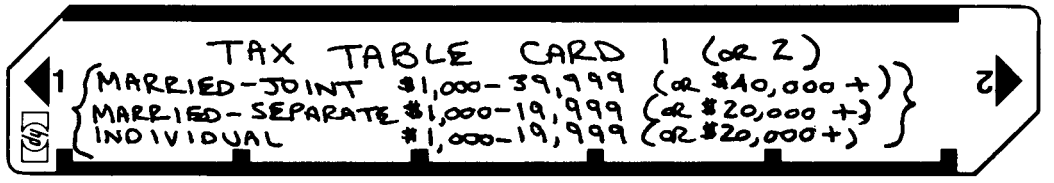
Reference(s) 1977 U.S. MASTER TAX GUIDE
1977 INDIVIDUALS' FILLED-IN TAX FORMS
COMMERCE CLEARINGHOUSE, INC.
4025 W. PETERSON AVE.
CHICAGO, ILLINOIS 60646


START
MAXIMUM TAX
COMPUTE ETI = TI (ENI/AGI) - TPI
ETI - 38/52/26,000 > Ø ?
NO
B
YES
COMPUTE ETI-38/52/26,000 / 2 STO Ø
COMPUTE TAX ON TI STO + Ø
COMPUTE TAX ON ETI STO - Ø
COMPUTE TAX ON 38/52/26,000 STO + Ø = MAX TAX
Rø → R54
Ø → Rø
A
A
ALTERNATIVE TAX
CG = Ø ?
YES
B
NO
CG < 50,000 ?
YES
CG / 4 STO + Ø
NO
12,500 STO + Ø
COMPUTE TAX ON ((TI - CG/2) + 25,000) STO - Ø
COMPUTE TAX ON TI STO + Ø
RECALL R54 (MAXIMUM TAX) STO + Ø
COMPUTE TAX ON TI STO - Ø
ETI > (TI - CG/2) ?
YES
COMPUTE TAX ON ETI STO + Ø
NO
COMPUTE TAX ON (TI - CG/2) STO + Ø = ALT TAX =
(ETI - (TI - CG/2)/2) STO - Ø
B
RESTORE/DISPLAY ROUTINE
RETURN

User Instructions

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	LOAD PROGRAM CARD SIDES 1 AND 2			
2	START BY SPECIFYING TAX TABLE CARD 1 OR 2 TO BE LOADED. BE SURE TO SELECT THE PAIR OF TAX TABLE CARDS TO CORRESPOND TO THE TYPE OF TAX RETURN (E.G. JOINT RETURN). '1' OR '2' WILL FLASH IN THE DISPLAY UNTIL THE SPECIFIED TAX TABLE CARD HAS BEEN LOADED. DURING EXECUTION THE PROGRAM WILL AUTOMATICALLY REQUEST TAX TABLE CARD LOADING (IF NECESSARY) BY FLASHING '1' OR '2' IN THE DISPLAY UNTIL THE REQUIRED TAX TABLE CARD HAS BEEN LOADED.	1 OR 2	f q	1 OR 2
3	STORE THE FOLLOWING DATA:	ENI	STO A	ENI
		AGI	STO B	AGI
		CG	STO C	CG
		TI	STO D	TI
		TPI	STO E	TPI
4	RUN THE PROGRAM TO CALCULATE MAXIMUM AND ALTERNATIVE TAXES. RESULTS ARE LEFT IN THE STACK AND MAY BE REVIEWED BY:		f e	'4.00'
				'4.00'
				MAX TAX
			g STK	ALT TAX
	NOTE: EXECUTION TIMES RANGE FROM 30-60 SECONDS.			
5	TAX CALCULATIONS MUST BE FOR TAXABLE AMOUNTS ≥ $1,000. IF A TAX CALCULATION FOR A LESSER AMOUNT IS ATTEMPTED, THE PROGRAM WILL HALT WITH ERROR CODE '9' IN THE DISPLAY.			9

User Instructions



STEP	INSTRUCTIONS			INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	RECORD THE FOLLOWING DATA ON PAIRS OF DATA CARDS FOR USE WITH INCOME TAX PLANNING I AND II PROGRAMS. RECORD ONLY THE TAX TABLE(S) THAT YOU WILL USE.					
	REGISTER	MARRIED-JOINT	MARRIED-SEP.	INDIVIDUAL		
		CARD 1				
	R_0	1.0401	1.0201	1.0201	STO 0	
	R_1	1.0001415	0.	0.	STO 1	
	R_2	2.0002916	0.	0.	STO 2	
	R_3	3.0004517	1.0001416	1.0001416	STO 3	
	R_4	4.0006219	2.0003119	2.0003119	STO 4	
	R_5	8.0013822	4.0006922	4.0006921	STO 5	
	R_6	12.0022625	6.0011325	6.0011124	STO 6	
	R_7	16.0032628	8.0016328	8.0015925	STO 7	
	R_8	20.0043832	10.0021932	10.0020927	STO 8	
	R_9	24.0056636	12.0028336	12.0026329	STO 9	
					P≷S	
	R_{50}	28.0071039	14.0035539	14.0032131	STO 0	
	R_{51}	32.0086642	16.0043342	16.0038334	STO 1	
	R_{52}	36.0103445	18.0051745	18.0045136	STO 2	
	R_{53}	52000.	26000.	38000.	STO 3	
		CARD 2			P≷S W/DATA	
	R_0	2.0402	2.0202	2.0202	STO 0	
	R_1	40.0121448	20.0060748	20.0052338	STO 1	
	R_2	44.0140650	22.0070350	22.0059940	STO 2	
	R_3	52.0180653	26.0090353	26.0075945	STO 3	
	R_4	64.0244255	32.0122155	32.0102950	STO 4	
	R_5	76.0310258	38.0155158	38.0132955	STO 5	
	R_6	88.0379860	44.0189960	44.0165960	STO 6	
	R_7	100.0451862	50.0225962	50.0201962	STO 7	
	R_8	120.0575864	60.0287964	60.0263964	STO 8	
	R_9	140.0703866	70.0351966	70.0327966	STO 9	
					P≷S	
	R_{50}	160.0835868	80.0417968	80.0393968	STO 0	
	R_{51}	180.0971869	90.0485969	90.0461969	STO 1	
	R_{52}	200.1109870	100.0554970	100.0530970	STO 2	
	R_{53}	52000.	26000.	38000.	STO 3	
					P≷S W/DATA	

67 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	* LBL 0	31 25 00	TAX CALCULATION SUBROUTINE
	EEX	43	
	3	03	FORMAT TAX TABLE SEARCH ARGUMENT
	÷	81	
	STO E	33 15	
	1	01	IF ARGUMENT < 1 HALT WITH ERROR CODE '9'
	x≤y?	32 71	
	GTO 6	22 06	
	9	09	
010	R/S	84	
	* LBL 6	31 25 06	DETERMINE WHICH HALF OF TAX TABLE IS REQUIRED BY COMPARING ARGUMENT TO 'TABLE SPLIT' VALUE STORED IN R_I (FRAC).
	RC I	35 34	
	FRAC	32 83	
	EEX	43	
	3	03	
	X	71	
	ENTER↑	41	
	INT	31 83	
	RCL E	34 15	
020	x≥y	35 52	REQUEST THE OTHER HALF OF THE TAX TABLE ('1' OR '2') IF NECESSARY, AND BRANCH TO TAX TABLE LOAD ROUTINE. ELSE, BRANCH TO TAX TABLE SEARCH ROUTINE.
	x>y?	32 81	
	GTO 1	22 01	
	2	02	
	GTO B	22 12	
	* LBL 1	31 25 01	
	1	01	
	* LBL B	31 25 12	
	R↑	35 54	
	FRAC	32 83	
030	EEX	43	
	1	01	
	X	71	
	INT	31 83	
	x=y?	32 51	
	GTO 5	22 05	
	R↓	35 53	
	GTO 3	22 03	
	* LBL a	32 25 11	ENTRY FOR INITIAL TAX TABLE LOAD.
	SF 2	35 51 02	
040	* LBL 3	31 25 03	TAX TABLE LOAD ROUTINE
	1	01	
	3	03	REQUESTED CARD CODE ('1' OR '2') IS IN R_X. LOOP UNTIL REQUESTED HALF OF TAX TABLE IS LOADED.
	ST I	35 33	
	x≥y	35 52	
	* LBL 2	31 25 02	
	MERGE	32 41	
	PAUSE	35 72	
	F3?	35 71 03	
	GTO 4	22 04	
050	GTO 2	22 02	STORE 'TABLE SPLIT' VALUE IN R_I (FRAC).
	* LBL 4	31 25 04	
	RCL 0	34 00	
	INT	31 83	
	x=y?	32 51	
	GTO 9	22 09	
	R↓	35 53	
	GTO 7	22 07	
	* LBL 9	31 25 09	
	RCL 0	34 00	
060	ST I	35 33	
	R↓	35 53	
	F2?	35 71 02	EXIT FOR INITIAL TAX TABLE LOAD
	RTN	35 22	
	* LBL 5	31 25 05	TAX TABLE SEARCH ROUTINE
	RC I	35 34	
	FRAC	32 83	PERFORM INDIRECT READ LOOP THRU TAX TABLE (DESCENDING) UNTIL CORRECT ENTRY IS FOUND. THEN BRANCH TO TAX CALCULATION ROUTINE.
	1	01	
	2	02	
	+	61	
070	ST I	35 33	
	* LBL 7	31 25 07	
	RCL E	34 15	
	RCL (i)	34 24	
	INT	31 83	
	x≤y?	32 71	
	GTO 8	22 08	
	DSZ	31 33	
	GTO 7	22 07	
	* LBL 8	31 25 08	TAX CALCULATION ROUTINE
080	RCL (i)	34 24	
	FRAC	32 83	
	EEX	43	
	5	05	
	X	71	
	ENTER↑	41	
	INT	31 83	
	EEX	43	
	1	01	
	X	71	
090	x≥y	35 52	
	FRAC	32 83	
	RCL E	34 15	
	RCL (i)	34 24	
	INT	31 83	
	−	51	
	EEX	43	
	3	03	
	X	71	
	X	71	
100	+	61	
	RTN	35 22	
	* LBL e	32 25 15	MAINLINE
	0	00	CALCULATE MAXIMUM TAX
	STO 0	33 00	
	P≥S	31 42	STORE INPUT DATA IN SECONDARY REGISTERS
	STO A	33 04	
	RCL A	34 11	ENI $R_A \rightarrow R_{55}$
	STO 5	33 05	
	RCL B	34 12	AGI $R_B \rightarrow R_{56}$
110	STO 6	33 06	TPI $R_E \rightarrow R_{57}$
	÷	81	
	RCL D	34 14	

REGISTERS

0 ACCUMULATES TAX AMOUNT	1 TAX TABLE	2	3	4	5	6	7	8	9 →
S0 TAX TABLE	S1	S2 →	S3 CONSTANTS 38/26/52000	S4	S5 ENI (TEMP)	S6 AGI (TEMP)	S7 TPI (TEMP)	S8	S9

A	B	C	D	E	I
ENI/WORK	AGI/WORK	CG	TI	TPI/WORK	LOOP CONTROL (INT) TABLE SPLIT (FRAC)

67 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
	X	71	COMPUTE
	RCL E	34 15	$ETI = TI\left(\frac{ENI}{AGI}\right) - TPI$
	STO 7	33 07	
	−	51	STORE IN R_A
	STO A	33 11	— — — —
	RCL 3	34 03	RECALL CONSTANT
	P≥S	31 42	'38/52/26000',
120	STO B	33 12	STORE IN R_B
	−	51	COMPUTE
	0	00	(ETI-38/52/26000)
	X≥Y	35 52	IF ≥0, BRANCH TO
	X≤Y?	32 71	RESTORE/DISPLAY
	GTO D	22 14	ROUTINE
	2	02	COMPUTE
	÷	81	$\left(\frac{ETI-38/52/26000}{2}\right)$
	STO 0	33 00	STORE IN R_0
	RCL D	34 14	COMPUTE TAX ON TI
130	GSB 0	31 22 00	ADD TO R_0
	STO+0	33 61 00	— — — —
	RCL A	34 11	COMPUTE TAX ON ETI
	GSB 0	31 22 00	SUBTRACT FROM R_0
	STO-0	33 51 00	— — — —
	RCL B	34 12	COMPUTE TAX ON
	GSB 0	31 22 00	38/52/26000
	STO+0	33 61 00	ADD TO R_0
	RCL 0	34 00	STORE MAXIMUM
	P≥S	31 42	TAX IN R_{14}
140	STO 4	33 04	
	P≥S	31 42	— — — — — —
	0	00	CALCULATE
	STO 0	33 00	ALTERNATIVE TAX
	RCL C	34 13	IF CG=0, BRANCH TO
	X=0?	31 51	RESTORE/DISPLAY
	GTO D	22 14	ROUTINE
	RCL D	34 14	COMPUTE
	RCL C	34 13	$\left(TI-\frac{CG}{2}\right)$
	2	02	
150	÷	81	STORE IN R_B
	−	51	
	STO B	33 12	— — — —
	5	05	IF CG < 50000
	EEX	43	BRANCH TO LBL b
	4	04	WITH CG IN R_X
	RCL C	34 13	
	X≤Y?	32 71	
	GTO b	22 31 12	— — — —
	R↓	35 53	ADD 12500 TO R_0
160	4	04	
	÷	81	
	STO+0	33 61 00	— — — —
	2	02	COMPUTE TAX ON
	X	71	$\left(TI-\frac{CG}{2}+25000\right)$
	RCL B	34 12	
	+	61	SUBTRACT FROM R_0
	GSB 0	31 22 00	
	STO-0	33 51 00	— — — —

STEP	KEY ENTRY	KEY CODE	COMMENTS
	RCL D	34 14	COMPUTE TAX ON TI
170	GSB 0	31 22 00	ADD TO R_0
	STO+0	33 61 00	— — — —
	0	00	ADD 0 OR $\frac{CG}{4}$ TO R_0
	* LBL b	32 25 12	
	4	04	
	÷	81	
	STO+0	33 61 00	— — — —
	P≥S	31 42	RECALL MAXIMUM
	RCL 4	34 04	TAX
	P≥S	31 42	ADD TO R_0
180	STO+0	33 61 00	— — — —
	RCL D	34 14	COMPUTE TAX ON TI
	GSB 0	31 22 00	SUBTRACT FROM R_0
	STO-0	33 51 00	— — — —
	RCL B	34 12	IF ETI > $\left(TI-\frac{CG}{2}\right)$
	RCL A	34 11	
	X>Y?	32 81	BRANCH TO LBL c
	GTO c	22 31 13	— — — —
	RCL B	34 12	COMPUTE TAX ON
	GSB 0	31 22 00	$\left(TI-\frac{CG}{2}\right)$
190	STO+0	33 61 00	ADD TO R_0
	GTO D	22 14	BRANCH TO RESTORE/
	* LBL c	32 25 13	DISPLAY ROUTINE
	RCL A	34 11	COMPUTE TAX ON ETI
	GSB 0	31 22 00	ADD TO R_0
	STO+0	33 61 00	— — — —
	RCL A	34 11	COMPUTE
	RCL B	34 12	$\left(ETI-\left(\frac{TI-\frac{CG}{2}}{2}\right)\right)$
	2	02	
	÷	81	
200	−	51	SUBTRACT FROM R_0
	STO-0	33 51 00	— — — — — —
	* LBL D	31 25 14	RESTORE/DISPLAY
	P≥S	31 42	ROUTINE
	RCL 5	34 05	RESTORE INPUT DATA
	STO A	33 11	TO PRIMARY REGISTERS
	RCL 6	34 06	ENI R_{05} → R_A
	STO B	33 12	AGI R_{06} → R_B
	RCL 7	34 07	TPI R_{07} → R_E
	STO E	33 15	— — —
210	4	04	DISPLAY
	ENTER↑	41	'4.00'
	ENTER↑	41	'4.00'
	RCL 4	34 04	'MAXIMUM TAX'
	P≥S	31 42	'ALTERNATIVE TAX'
	RCL 0	34 00	
	STK	32 84	
	RTN	35 22	— — — — — —
220			

LABELS (ADDRESS WHERE USED)

A	B 027	C	D 202	E	
a 038	b 173	c 192	d	e 102	
0 001	1 025	2 045	3 040	4 051	
5 064	6 011	7 071	8 079	9 058	

FLAGS

0	
1	
2	EXIT CONTROL
3	TAX TABLE CARD READ?

SET STATUS

FLAGS	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

TRIG	
DEG	☒
GRAD	☐
RAD	☐

DISP	
FIX	☒
SCI	☐
ENG	☐
n	2

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