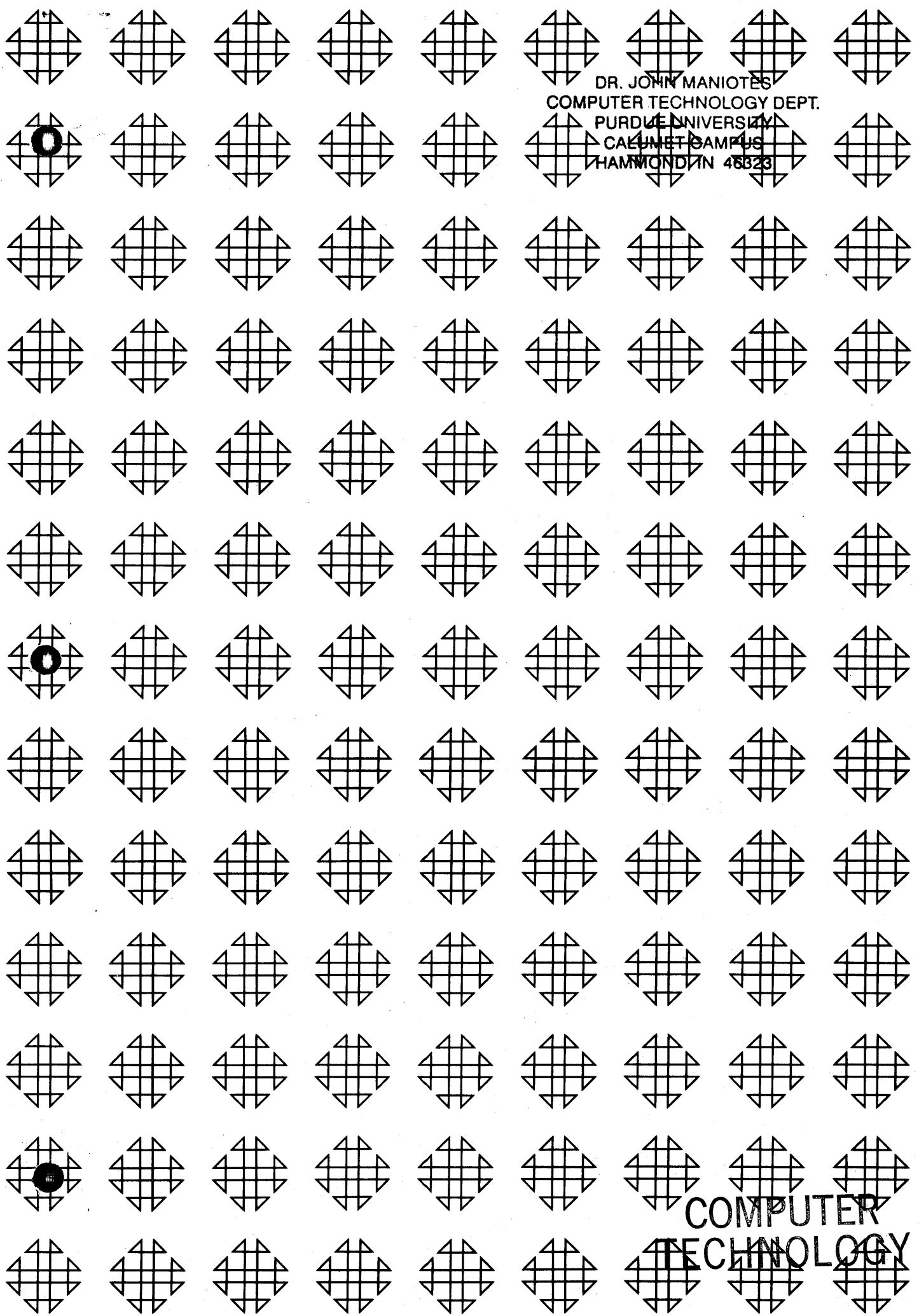


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1620 GENERAL PROGRAM LIBRARY

Baseball Game Program for IBM 1620 Computer 11.0.037

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1620 USERS GROUP PROGRAM REVIEW AND EVALUATION

Program No. \_\_\_\_\_

Date \_\_\_\_\_

Program Name: \_\_\_\_\_

1. Does the abstract adequately describe what the program is and what it does? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
2. Does the program do what the abstract says? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
3. Is the Description clear, understandable, and adequate? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
4. Are the Operating Instructions understandable and in sufficient detail? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_  
Are the Sense Switch options adequately described (if applicable)? Yes \_\_\_ No \_\_\_  
Are the mnemonic labels identified or sufficiently understandable? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
5. Does the source program compile satisfactorily (if applicable)? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
6. Does the object program run satisfactorily? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
7. Number of test cases run \_\_\_\_\_  
Are any restrictions as to data, size, range, etc. covered adequately in description? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
8. Does the Program meet the minimal standards of the 1620 Users Group? Yes \_\_\_ No \_\_\_  
Comment \_\_\_\_\_
9. Please list any suggestions to improve the usefulness of the program. These will be passed on to the author for his consideration.  
Comment \_\_\_\_\_

Please return to:

Mr. Robert J. Robinson (PREP)  
Marquette University  
Computing Center  
1515 W. Wisconsin Avenue  
Milwaukee 3, Wisconsin

Your Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

User Group Code \_\_\_\_\_

THIS REVIEW FORM IS PART OF THE 1620 USER GROUP ORGANIZATION'S PROGRAM REVIEW AND EVALUATION PROCEDURE. NONMEMBERS ARE CORDIALLY INVITED TO PARTICIPATE IN THIS EVALUATION.

BASEBALL GAME PROGRAM FOR IBM 1620 COMPUTER

Dennis R. Iverson

January 21, 1964

Modifications or revisions to this program, as they occur, will be announced in the appropriate Catalog of Programs for the IBM Data Processing Systems. If such announcement indicates a change to the program decks or tapes, a complete new program, if needed, should be requested from the Program Distribution Center.

Direct Inquiries to:

Dennis R. Iverson  
903 Linley Street  
Torrance, California

DECK KEY

BASIC:

1. SPS Object Deck-This deck uses the format of the standard SPS object deck (Reference 1). The last card is number 00189. 00171
2. Data Cards for Baseball Game Program  
5000-digit table (63 cards)
3. Data cards for Baseball Game Program  
2000-digit random-number table (50 cards)
4. Data Cards for Baseball Game Program  
Sample player data cards for 1963 edition of  
Yankee and Dodgers
5. Fortran Source Program to Compute Batting Input  
Data (36 cards)
6. Object Program to Compute Batting Input Data-This deck  
uses the format of the standard Fortran object deck. (Re-  
ference 2). The last card is number 0138.
7. Sample Data Cards for Program to Compute Batting Data
8. Sample Batting Data cards for SPS Baseball Game Program-  
Input for Decks 1 and Output from Deck 7.
9. Fortran Source Program to Compute Pitching Input Data  
(60 cards)
10. Object Program to Compute Pitching Input Data-The last  
card is number 0208.
11. Sample Data Cards for Program to Compute Pitching Data
12. Sample Pitching Data cards fo. SPS Baseball Game Program-  
Input for Deck 1 and Output from Deck 11.

BASIC:

13. Second set of Random Number Table Cards.

OPTIONAL:

1. SPS Source Deck (sequenced in columns one through five)

Card Numbers

01001 through 01031	Data storage
02001 through 02028	Storage of messages
03001 through 03046	Data input
04001 through 04007	Switch setting interrogation
05001 through 05091	Steal subroutine
06001 through 06050	Switch setting interrogation
07001 through 07102	Sacrifice subroutine
08001 through 08029	SPIN subroutine
09001 through 09026	OUT subroutine
10001 through 10005	COMB subroutine
11001 through 11005	FITCH subroutine
12001 through 12006	START subroutine
13001 through 13009	NAME subroutine
14001 through 14008	STEAL subroutine
15001 through 15042	Check for walk
16001 through 16128	Check for hit
17001 through 17080	Determine out
18000	DEND card

The optional material will be forwarded only when specifically requested.

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## GLOSSARY

branch: An instruction which causes the computer to go to a specified address in core for its next instruction instead of executing the next sequential instruction.

card reader: The auxiliary 1622 unit to the 1620 computer which has the function of reading cards.

console: The main unit of the 1620 computer, in which is included the memory unit, typewriter, panel indicators, and control switches.

core: The internal memory unit of the computer.

execute: To execute a program is to load it into the computer for performance by the computer.

flag: A symbol in core which defines the length of a number and determines the parity of a given number in core.

Fortran: A method of programming which uses symbols and words to produce instructions instead of the coded numeric machine language instructions.

high order: (adj.) A term which designates the leftmost position of a number in core.

input: Data which is transferred into the memory unit of the computer; the means of transfer may be cards, typewriter, magnetic tape, etc.

load: A program is loaded by reading it into the computer.

object deck: The complete set of cards which are read into the computer when a program is loaded; it may include such things as the object program, data cards, subroutines, etc.

object program: The translation of an SFS or Fortran program into a coded machine language program.

output: Internal data which is transferred to a tangible form such as punched cards, typed data, etc.

program: A sequence of instructions to the computer which combine to perform a given task when executed by the computer.

q-field: One of the operands of a 1620 computer instruction which gives the address of the argument, or in some cases, the argument itself.

read: The computer reads input data by transferring it to its memory unit.

record mark: A symbol in core which causes the termination of the execution of an instruction to type data.

SFS (Symbolic Programming System): A method of programming the 1620 computer which uses symbols and words to produce instructions instead of the coded numeric machine language instructions.

subroutine (subprogram): A program which is incorporated into a larger program.



#### ABSTRACT

This SPS program is designed to play baseball on the IBM 1620 computer. The program uses random numbers to generate different games and is based on major league statistics. The operator calls the strategy he desires by throwing console switches. The 1622 card reader and 1620 computer with no extra features and minimum storage are required for the program.

#### PROGRAM BRIEF

This SPS program permits the operator to play major league baseball on the IBM 1620 computer. It is primarily intended to be executed by two persons, since the operator calls the strategy he desires and a manager is needed for each team (conceivably, though, one person could manage both teams). The operator informs the computer of his desired strategy by throwing one or a combination of the four console switches.

The program is based on actual major league statistics, and the operator has the option of what teams he wants to play based on a specified year's performance. This characteristic is accomplished by reading in data cards for the desired players when the program is loaded into the computer. The operator must, therefore, prepare data cards for the players he wants to use. As an aid in the preparation of these data cards, two Fortran programs have also been written in conjunction with the main baseball program.

Instructions for using these programs are contained in the section on input/output specifications.

Random numbers are used to generate different games. Data for the players determine the probability of success, and a random number is then used to determine the outcome of a specific action. They are obtained from a table of random numbers which is read into the computer when the program is loaded. No attempt will be made to explain how to produce these random-number cards, but many random-digit generator programs are available through IBM.

The average time for a game has been about twenty minutes, and thirty successful games have been played as a checkout procedure.

#### PROGRAM DESCRIPTION

The program begins by reading in the the 5000-digit matrix table, the random-number table, and data for the players. It is then ready to accept the batting orders (see Operating Procedure for method of typing line-up).

#### Input Batting Data

Batting data is read in for every player. The following is a list of the batting statistics to be read in for each player, with an explanation of the significance of each symbol:

XF: Frequency of errors per hundred chances  
BB: Frequency of walks per hundred appearances  
BA: Frequency of hits per hundred at bats  
K2B: Frequency of doubles per hundred hits  
K3B: Frequency of doubles and triples per hundred hits  
HR: Frequency of extra-base hits per hundred hits  
XK: Frequency of strikeouts per hundred outs  
SBA: Scaled number, which rates player's speed

Input Pitching Data

In addition, pitching data is read in for each of the pitchers. The following is a list of the pitching numbers and their significance:

XW: Compensating walk number, which is added to the batter's BE number to determine the probability of a walk  
PC: Compensating hit number, which is added to the batter's BA number with the bases empty  
MOB: Compensating hit number, which is added to the batter's BA number with men on base  
KC: Compensating strikeout number which is added to the batter's XK number  
WF: Scaled number which rates the pitcher's control and probability of committing a wild pitch  
PHR: Compensating home-run number which is added to the batter's HR number  
SPC: Scaled number which rates the pitcher's ability to pitch effectively for an extended length of time; each walk and hit reduce this number, and when it becomes negative, its absolute value is added to the batter's BA number in determining the batter's probability of obtaining a base hit

Function of 100 x 50 Matrix TABLE

A 100 x 50 matrix is stored in the 5000-digit TABLE in core. This matrix works in conjunction with 2000-digit RANDOM table to generate the results of every action that takes place in the game. Column one of the matrix contains one zero, column two has two zeroes, and in general, column n has n zeroes. If an action has probability of success  $p/100$  ( $p \leq 50$ ; p an integer), as determined by the input data for the players, the results of a specific performance may be obtained by noting the number in column p and row n (where n is the next random number from zero to ninety-nine taken from the RANDOM table). If that number is a zero, a success is noted, and otherwise a failure. Observe that the probability of there being a zero in that position is  $p/100$ . If  $p > 50$ , the probability of failure is used instead to determine the results; i.e.  $q = 100 - p$ , and the necessary interpretation of the results is made.

Accession of Matrix TABLE by SPIN Subroutine

For each action, the probability of success is computed as a function of the appropriate input data of the player involved and the action to be taken, and placed in ARG. The program then branches to the SPIN subroutine which uses the number in ARG and the next random number as the column and row, respectively, and places the number corresponding to this position in the matrix in ANS. A branch back to the

mainline program is then made, and the results of the action being undertaken are computed as a function of the number existing in ANS at this point. The number in ANS, however, is a two-digit number, the first of which is the number from the matrix. The second digit put in ANS is the first digit of the next random number to be taken from the RANDOM table. The first digit determines the results of a specific action, and the second modifies the results in various ways throughout the program.

Accession of Player Data by COMB and FITCH Subroutines

The question of how the probabilities are determined now arises. A generalized description of the programming methods involved will be presented here. The COMB and FITCH subroutines are used for this purpose. These two subroutines function to access the batting and pitching numbers of the players respectively, and place these numbers in ARG for the SFIN subroutine to use as an argument. The data for the players is stored in core in a continuous array; i.e. the data for player two immediately follows player one, etc. There are eight two-digit batting numbers for each player, so that corresponding data for consecutive players are sixteen digits apart. The same situation exists for pitching data, except that there are only seven two-digit pitching numbers for each pitcher.

Observe in the program listing that the data for only player number one may be referenced directly. The corresponding data for other players may be referenced by the corresponding data address for player one and adding an integral multiple of sixteen for batting data and fourteen for pitching data. If  $n$  is the player number,  $X$  the symbol representing one of the batting data, and  $Y$  the symbol representing one of the pitching data, then the address of the batting data  $X$  for player  $n$  and the address of the pitching data for player  $n$  are given by the formulae:

$$B(n,X) = X + 16(n - 1)$$

$$P(n,Y) = Y + 14(n - 1),$$

where  $B(n,X)$  and  $P(n,Y)$  designate the respective desired addresses.

The general procedure in the program then is to branch and transmit immediate to the COMB and FITCH subroutines, using the address of the data for the first player (i.e.  $X$  or  $Y$  in the above formulae) as the argument in the Q-field of the BTM instruction. These subroutines then extract the desired number from the stored data for the player by using the method explained above and add it to the contents of ARG. Note that a number may be modified for a specific action by placing a correction factor in ARG before branching to the subroutine. This is necessary, for instance, in checking for a hit. With the infield playing half-way the batter's chances of getting a hit are three plus his

BA number plus the pitcher's PC (or MOB) number. If the infield is normal, the three is not added to the sum of the BA and PC. So, if the infield is half-way, the three must be put in ARG before branching to the COMB subroutine to add the batter's BA number. With this sum in ARG, a branch is made to the PITCH subroutine to add the pitcher's PC number. If the infield were playing normal, ARG would have had to have been cleared to zero before branching to COMB. After adding the desired number to ARG these subroutines branch back to the mainline program, which, in most cases, branches to the SPIN subroutine with the proper number in ARG.

#### OUT Subroutine

After each out is made, the program increases the number of outs by one, and branches to the OUT subroutine. This subroutine determines whether or not there are three outs. If not, it branches immediately back to the mainline program. If there are three outs, it interchanges the defensive end batting line-ups, resets OUTS to zero, and branches to the next batter.

#### Decreasing Effectiveness of Pitcher

The program has been written so that a pitcher's efficiency decreases after a certain point. Each pitcher is assigned an SPC number as part of his pitching data.

Each walk reduces this number by one, each single by two, each double by three, each triple by four, and each home run by five. After his SPC is decreased below zero, its absolute value is added to the BA of every batter that he faces, and it continues to be decreased by each walk and hit. The START subroutine has been written to perform this task. Each time that one of the above actions occur (i.e. a walk, single, double, triple, or home run), the program has a branch and transmit immediate to the START subroutine, with the corresponding reduction factor as the argument in the Q-field of the BTM instruction. The START subroutine then accesses the SPC number of the pitcher in the same manner as the PITCH subroutine and subtracts the argument placed before it by the BTM instruction from this SPC NUMBER. The program then branches back for continuation. The SPC number of the pitcher is then checked each time a batter comes to bat, and the proper correction is made in the BA if the SPC number is negative.

### INPUT/OUTPUT SPECIFICATIONS

In order for the user to be able to keep the program current, two Fortran programs have been written, which compute the required data for whatever teams he wants to put on the computer.

#### Program for Batting Data

The following batting statistics are required for the players to be used: at bats, hits, doubles, triples, home runs, stolen bases, times caught stealing, batting average, walks, strikeouts, and fielding percentage. The input data should be punched on cards according to the specifications of the statements:

```
READ 1, AB, HITS, DBLE, TRPL, HR, SB, CS, AVE, BB, SO, PCT
1 FORMAT (9X, F3.0, F3.0, F2.0, F2.0, F2.0, F3.0, F2.0, F3.3, F3.0,
          F3.0, F3.3)
```

The following steps are necessary for execution of the program to compute batting data: (a) punch input data cards; (b) clear core to zeroes; (c) load object program; (d) load subroutines; and (e) load data.

#### a. Punch input data cards

The input data cards are punched according to the specifications mentioned above. Each card contains the statistics for one player and twenty-five cards are necessary for each execution of the program. Table 1 gives a listing of sample data cards for this program.

#### b. Clear core to zeroes

The computer may be cleared by carrying out the following steps:

1. Press INSERT key on console.
2. Type "160001000000" on the console typewriter.
3. Press RELEASE key on console.
4. Press START key on console.
5. Press INSTANT STOP key on console.
6. Press RESET key on console.

#### c. Load object program

Place the object program in the hopper of the card reader and press LOAD on the card reader.

#### d. Load subroutines

After the object program has been read in, the message "LOAD SUBROUTINES" will be typed on the console typewriter. Place the 1620 Fortran/with format subroutine deck in the card hopper, press START on the console, and press READER START on the card reader.

#### e. Load data

After the subroutines have been read in, the typewriter will print the message "LOAD DATA." Place the data prepared in part (e) in the card hopper, press START on the console, and press READER START on the card reader.

The results are then typed out at the typewriter. The output for the sample data in Table 1 appears in Table 2.

SAMPLE DATA FOR FORTRAN PROGRAM TO COMPUTE BATTING DATA

47812916062300001270037099991  
 66523027092701806346029065961  
 49314625063100100296033108972  
 24405909010400502242028033980  
 10902905000000400266010021980  
 8802505000400000284010015980  
 38909716070701203250046060985  
 58815924010401707270093035941  
 24005910010200202246020030977  
 23205208001000001224022018990  
 46012815071400101278069059989  
 24605707001300000232029032985  
 49413823052100101279031076995  
 56615424011800302272046106964  
 12903708000100602287011016960  
 16905304000400400314012018970  
 28507412000800601260037031995  
 69220938050801109302037024982  
 33509219010600001275031053984  
 37712115013000900321114078978  
 59015134013300100256082078991  
 4301302010100201302005010975  
 62217826052000408286072074970  
 69520813100610413299052057956  
 60017118102103207285038072963

Table 1. Sample Input Data for Program to Compute Batting Data. The first nine columns are blank and the numbers begin in column ten.

F	1	BB	7	BA	27	2B	12
3B	16	HR	33	K	28	SBA	30
F	4	BB	4	BA	34	2B	11
3B	14	HR	25	K	14	SBA	66
F	3	BB	6	BA	29	2B	17
3B	21	HR	42	K	31	SBA	32
F	2	BB	10	BA	24	2B	15
3B	16	HR	22	K	17	SBA	40
F	2	BB	8	BA	26	2B	17
3B	17	HR	17	K	26	SBA	38
F	2	BB	10	BA	28	2B	20
3B	20	HR	36	K	23	SBA	30
F	2	BB	10	BA	25	2B	16
3B	23	HR	30	K	20	SBA	63
F	6	BB	13	BA	27	2B	15
3B	15	HR	17	K	8	SBA	64
F	3	BB	7	BA	24	2B	16
3B	17	HR	20	K	16	SBA	34
F	1	BB	8	BA	22	2B	15
3B	15	HR	34	K	10	SBA	30
F	2	BB	13	BA	27	2B	11
3B	16	HR	26	K	17	SBA	32
F	2	BB	10	BA	23	2B	12
3B	12	HR	34	K	16	SBA	30
F	1	BB	5	BA	27	2B	16
3B	19	HR	34	K	21	SBA	32
F	4	BB	7	BA	27	2B	15
3B	15	HR	26	K	25	SBA	36
F	4	BB	7	BA	28	2B	21
3B	21	HR	23	K	17	SBA	42
F	3	BB	6	BA	31	2B	7
3B	7	HR	14	K	15	SBA	38
F	1	BB	11	BA	26	2B	16
3B	16	HR	26	K	14	SBA	42
F	2	BB	5	BA	30	2B	18
3B	20	HR	23	K	4	SBA	51
F	2	BB	8	BA	27	2B	20
3B	21	HR	27	K	21	SBA	30
F	3	BB	23	BA	32	2B	12
3B	12	HR	36	K	30	SBA	72

(cont.)

F	1	BB	12	BA	25	2B	22
3B	22	HR	43	K	17	SBA	32
F	3	BB	10	BA	30	2B	15
3B	22	HR	29	K	33	SBA	34
F	3	BB	10	BA	28	2B	14
3B	16	HR	27	K	16	SBA	38
F	5	BB	6	BA	29	2B	6
3B	10	HR	12	K	11	SBA	79
F	4	BB	5	BA	28	2B	10
3B	15	HR	27	K	16	SBA	76

STOP

Table 2. Sample Output of Fortran Program to Compute Batting Data

The output data of this program when punched on cards according to proper specifications will then form the batting input data for the baseball program.

You will observe from the sample above that the input batting data will consist of eight two-digit numbers for each player entered. These are punched consecutively in the same order on a card with a flag in the high order position of each number. So the batting data for each of the fifty players will use sixteen card columns. The batting data for the different players should be placed in juxtaposition on the card; i.e. batting data for five players is punched on each card of eighty columns. Batting data for the players one to five should be punched on the first data card; for players six to ten, on the second data card; etc. Data for fifty players should be entered. Each player is then assigned a player number which corresponds to the position of the set of batting data for him in the set of batting data cards. Since the player for a pitcher is the same for both batting and pitching data, it is necessary that all the pitchers for both teams be assigned the lowest numbers.

#### Program for Pitching Data

The procedure for executing this program is the same as the last except that different specifications are required for the pitching data and additional data cards are necessary. Eight prepared data cards which are provided

should be placed in front of the pitching data cards.

The following information is necessary for the pitching data cards: base on balls allowed, at bats against pitcher, earned run average, hits off pitcher, strikeouts, games started, complete games, home runs allowed, and innings pitched. The information should be punched according to the following input specification statements:

```
READ 2,BB,AB,ERA,HITS,SO,GS,CG,HR,IP
2 FORMAT (F3.0,F4.0,F4.2,F3.0,F3.0,F2.0,F2.0,I3)
```

Table 3 is a sample input for this program, and Table 4 is the output for this set of data.

In the same manner, the output of this program will form the input data for the baseball program. The same format is used for punching the pitching data cards as was used to punch the batting input data of the baseball program. There are only seven pitching numbers for each pitcher, so that the eighty-column card will carry the data for over five players. The cards will be read in as a continuous array, however, so the second pitching data card will begin where the first left off. Because a pitcher is referenced by the same player number for both batting and pitching, as mentioned before, it is necessary that the pitchers be assigned the lowest numbers (cf. sample roster sheet in Table 2). Therefore, if numbers one through twenty are assigned to the pitchers, 280 card columns will be used

SAMPLE DATA FOR FORTRAN PROGRAM TO COMPUTE PITCHING DATA

```
0000560900001493000055600000148100005557000014750000555900001461
5481000013930000559070000140100005425000013310000542500001342
536500001309000053110000148800005307000014360000524200001414
523300001379000051890000135700005290000013660000534200001343
521300001265000052880000148800005317000014320000538400001426
536900001414000052820000137700005284000013600000529400001321
510900001237000052870000136000005265000014130000537900001397
0000521200001346000052980000132600005207000012400000509100001205
2804705.49136054160212118
2104073.60105055060608105
5904893.99124071160309133
4403953.20081044000008090
7110833.81270178400820255
3604502.86103068000001107
6206464.88146091210120144
5707442.54134216261113184
7812892.84272232411921314
4802523.13049066000004072
1701264.76033021000005034
9808384.45184108280410186
5711143.19257176391440299
7708063.68188109370723213
6909882.90243160370722258
02306114.88172059190626144
```

Table 3. Listing of Sample Input for Program to Compute Pitching Data.



W	-5	PC	-7	MOB	13	SO	-3
WP	5	PHR	-1	SPC	5		
W	-6	PC	0	MOB	-0	SO	1
WP	4	PHR	-3	SPC	47		
W	5	PC	-5	MOB	3	SO	2
WP	15	PHR	-3	SPC	8		
W	4	PC	-7	MOB	-3	SO	-3
WP	14	PHR	-2	SPC	0		
W	-4	PC	-4	MOB	2	SO	6
WP	5	PHR	-2	SPC	11		
W	-1	PC	-1	MOB	-5	SO	3
WP	9	PHR	-7	SPC	0		
W	1	PC	-15	MOB	9	SO	2
WP	11	PHR	3	SPC	10		
W	-2	PC	-9	MOB	-7	SO	27
WP	8	PHR	-3	SPC	14		
W	-5	PC	-5	MOB	-5	SO	8
WP	5	PHR	-3	SPC	14		
W	16	PC	-11	MOB	-3	SO	22
WP	26	PHR	-4	SPC	0		
W	7	PC	-8	MOB	8	SO	6
WP	17	PHR	3	SPC	0		
W	5	PC	-14	MOR	6	SO	-0
WP	15	PHR	-2	SPC	11		
W	-6	PC	-3	MOB	-3	SO	4
WP	4	PHR	2	SPC	13		
W	1	PC	-7	MOB	1	SO	1
WP	11	PHR	-0	SPC	11		
W	-3	PC	3	MOB	-5	SO	5
WP	7	PHR	-2	SPC	11		

STOP

Table 4. Sample Output for Fortran Program to Compute Pitching Data.

for pitching data cards. Three and a half 80-column cards will then be necessary. The last forty columns of the last card would be left blank.

#### Preparation of Name Data Cards

Name data cards must also be prepared. These make it possible for the computer to type the names of the players you desire to play. A maximum of ten characters are allowed for each name. The tenth character must always be a record mark. The same card format is used to punch the name data cards. Eight ten-character names should be punched on each eighty-column card and the names and cards are put in the order corresponding to player numbers as before.

#### Order of Data Cards

After compiling all the data cards for the baseball program, they should be put in the following order and placed in the appropriate part of the object deck (see operating instructions):

1. Batting data cards
2. pitching data cards
3. name data cards

#### FLOW CHARTS

The following pages contain flow charts for the baseball game program and its subroutines. The Sacrifice and

Steal subroutines are open subroutines, and all the rest are closed. The following is a legend for the flow charts.

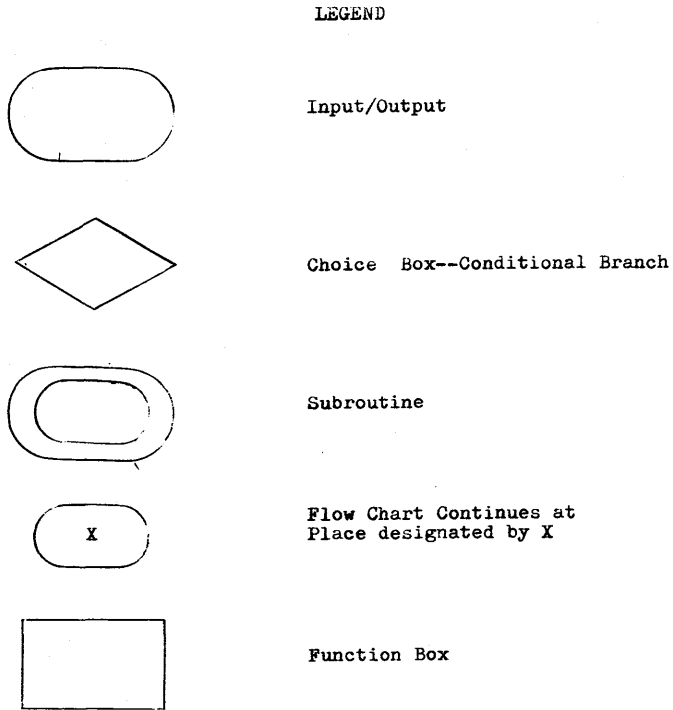


Figure 1. Legend for Flow Charts

MAIN PROGRAM

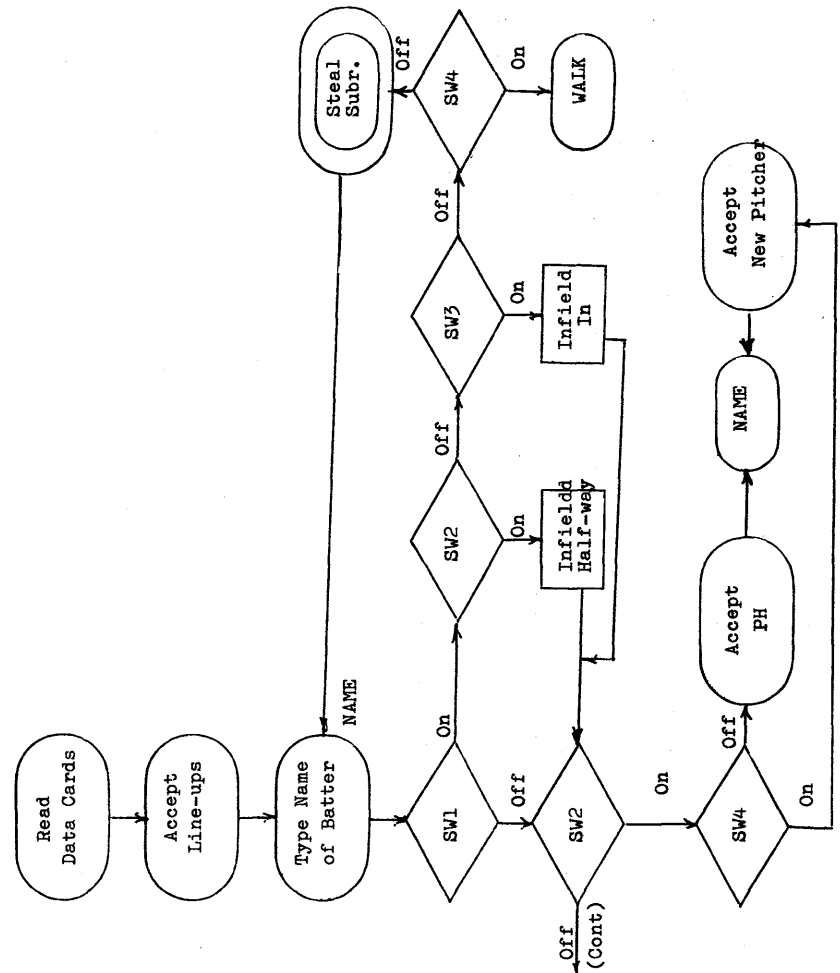
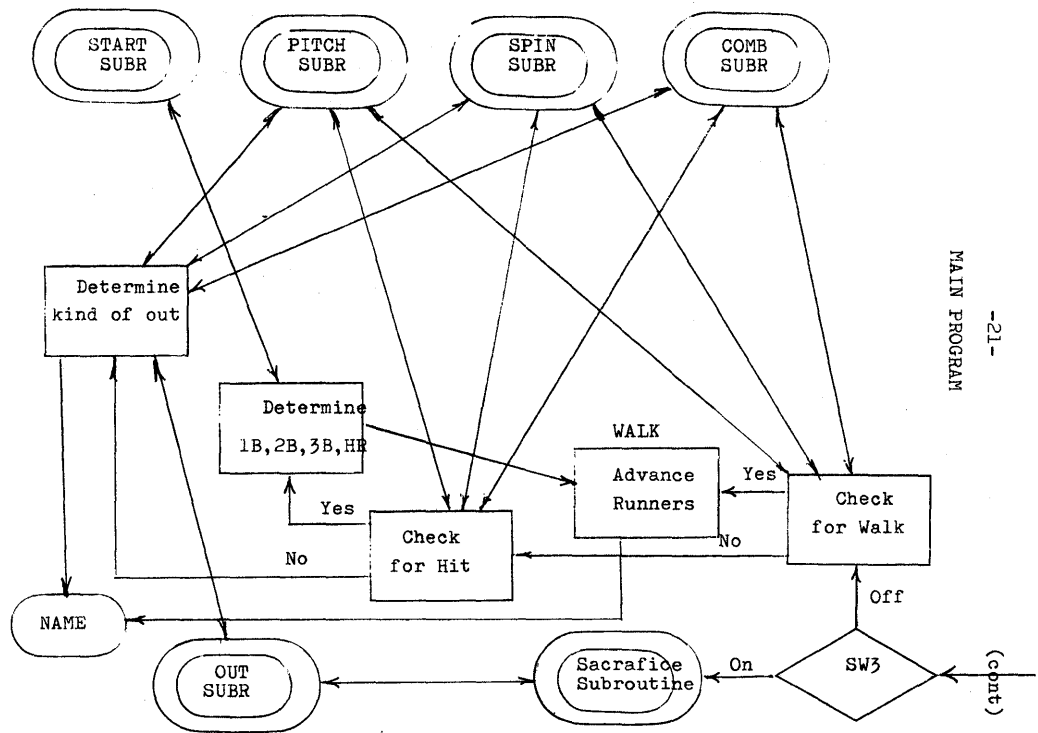


Figure 2. Flow-Chart of Main Program

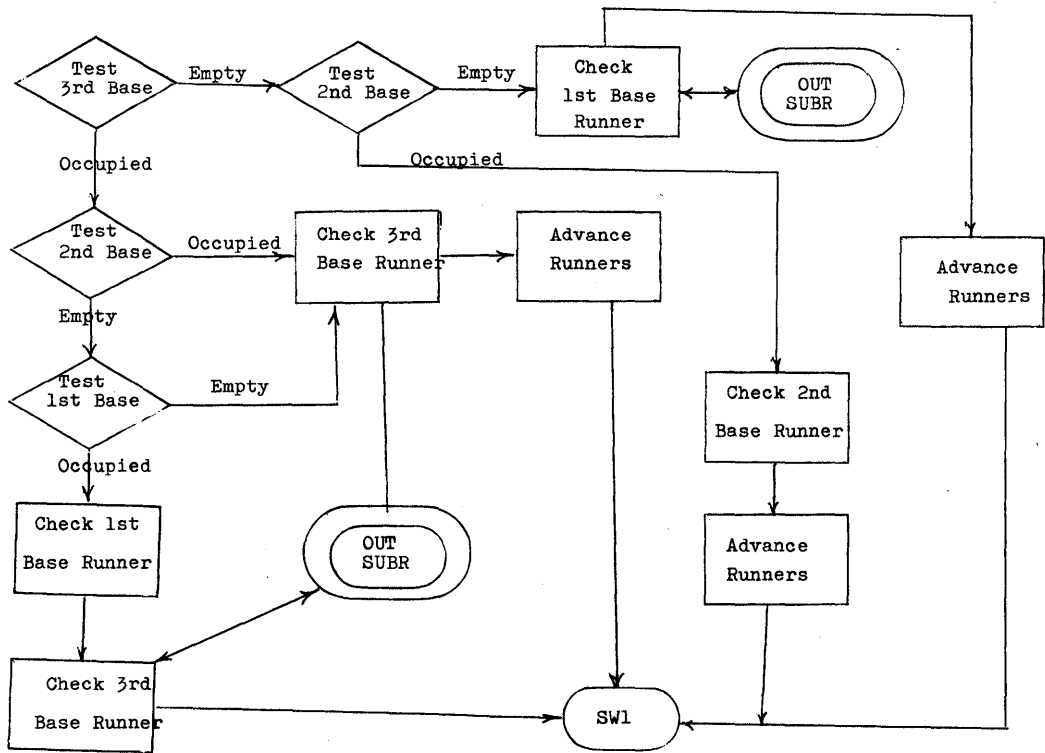
Figure 2 (cont).



MAIN PROGRAM

(cont)

Figure 3. Flow-Chart of Steal Subroutine



STEAL SUBROUTINE

SACRAFICE SUBROUTINE

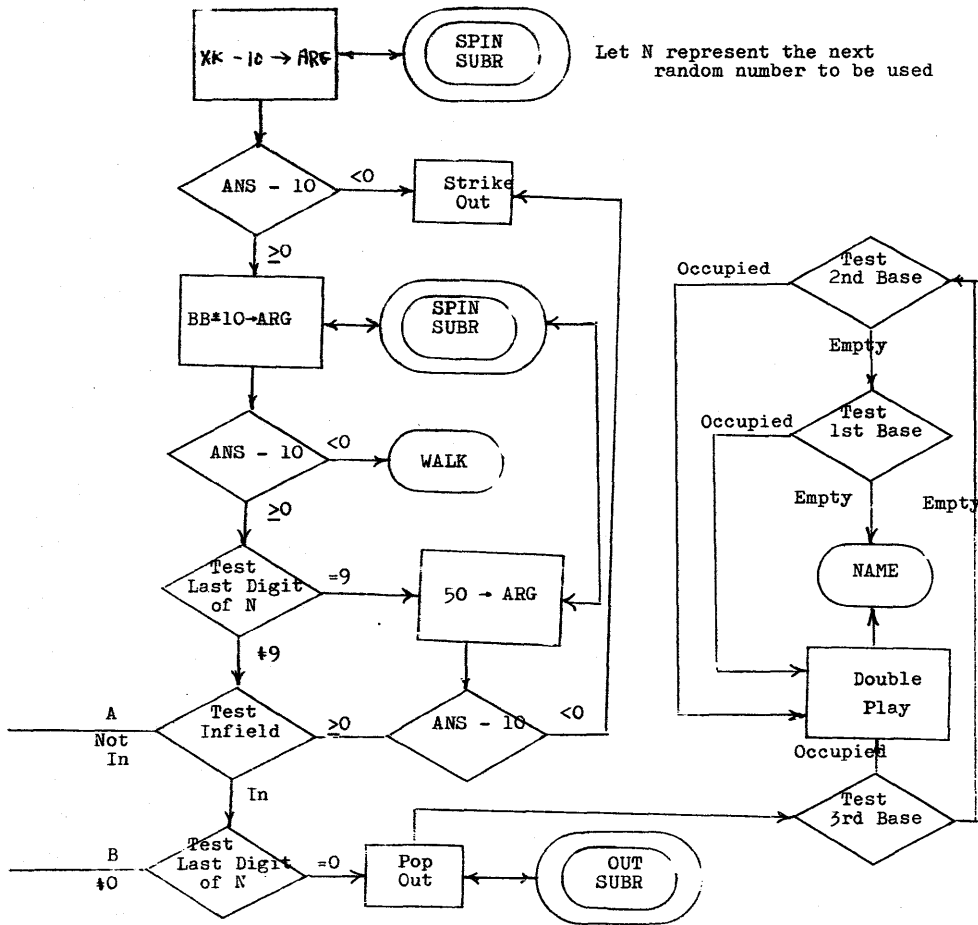


Figure 4. Flow-Chart of Sacrifice Subroutine

SACRAFICE SUBROUTINE

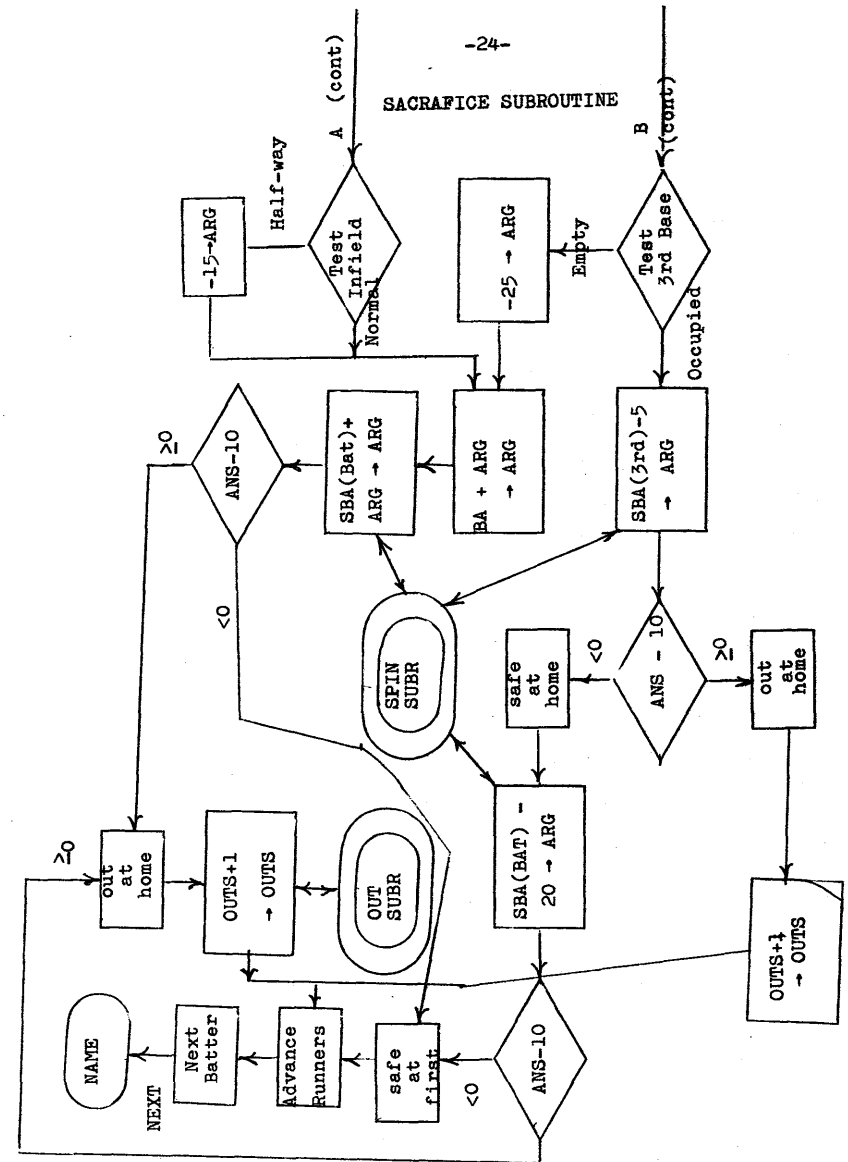


Figure 4 (cont)

SPIN SUBROUTINE

Let  $N_i$  be the  $i$ th random number in the random number table; the address of  $N_i$  is stored in  $H+30$ .

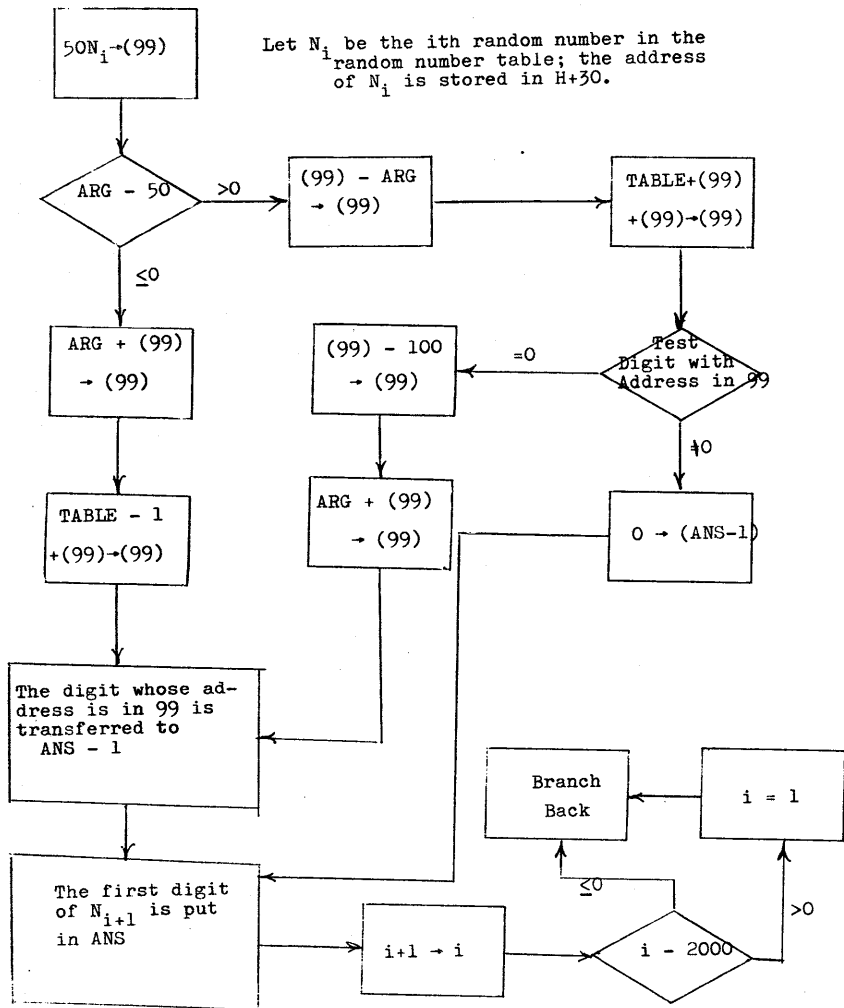


Figure 5. Flow-Chart of SPIN Subroutine

OUT SUBROUTINE

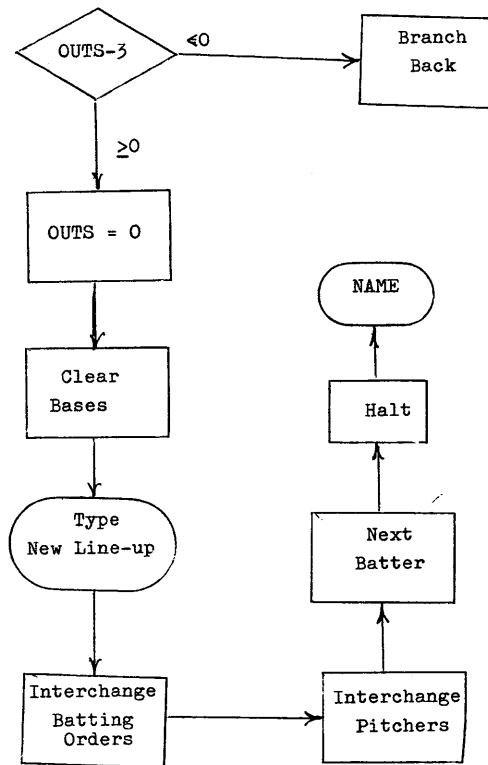
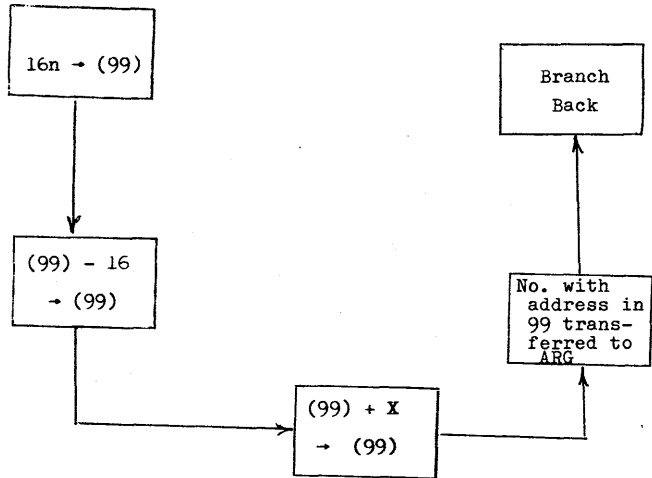


Figure 6. Flow-Chart of OUT Subroutine

COMB SUBROUTINE

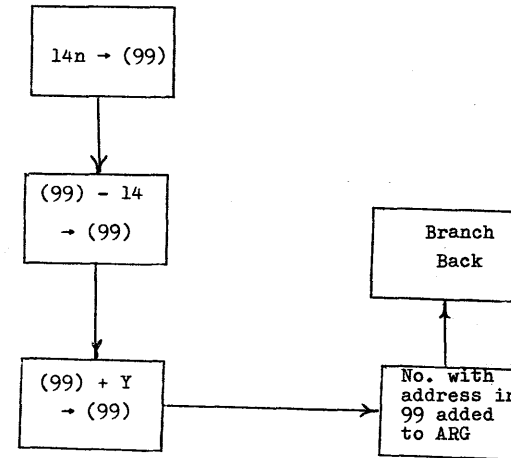


Let n represent the player number of the current batter

Let X represent the symbol of the data to be obtained, which was put in the Q-field of the BTM instruction

Figure 7. Flow-Chart of COMB Subroutine

PITCH SUBROUTINE

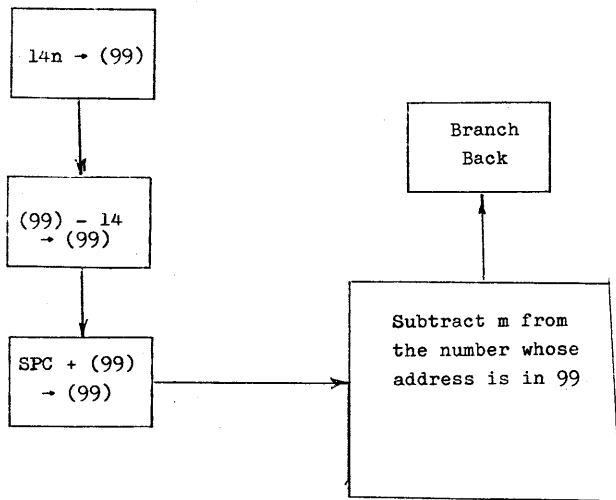


Let n represent the player number of the current pitcher

Let Y represent the symbol of the pitching data to be obtained, which was put in the Q-field of the BTM instruction

Figure 8. Flow-Chart of PITCH Subroutine

START SUBROUTINE

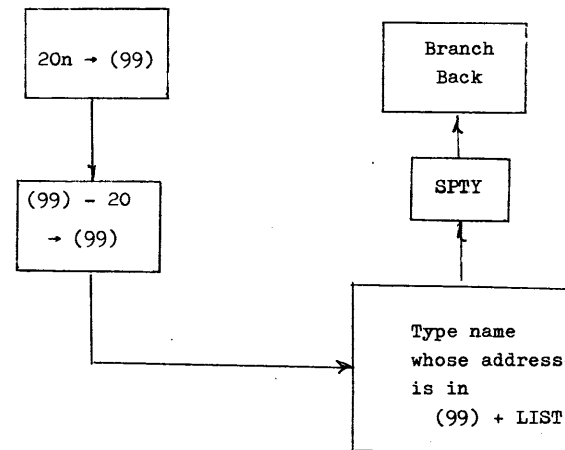


Let n represent the player number of the current pitcher

Let m represent the reduction factor in the Q-field of the BTM instruction

Figure 9. Flow-Chart of START Subroutine

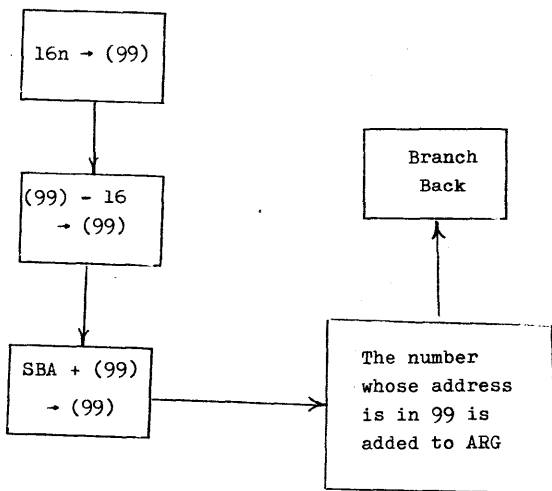
NAME SUBROUTINE



Let n represent the player number of the player whose name is to be printed; the address of n is in NAME - 1

Figure 10. Flow-Chart of NAME Subroutine

STEAL SUBROUTINE



Let n represent the number of the player whose SBA is desired. The address of n is in STEAL - 1

Figure 11. Flow-Chart of STEAL Subroutine

DETAILED CODING INFORMATION

Important Addresses

A symbol table may be found in Appendix B and a map of storage in Table 5, but the following addresses may be of special significance to the operator.

The 100 x 50 matrix TABLE is stored in locations 00404 to 05403. The random number table is in locations 05438 to 07437.

The number of the current pitcher is in 00403 and 00402. The batting order is in positions 09682 to 09699. The counter for the number of outs is at 09709. The player number of the runner on first base may be found in 10422 and 10423; the runner on second base in 10432 and 10433; and the runner on third base in 10470 and 10471.

Reentry

Setting switches two and three will start a new game, but if for some reason a manual entry into the program is desired, either of two certain points would be most likely. To enter new line-ups branch to 18172; you may desire to transfer zeroes to the outs counter and/or the addresses mentioned above for the first-, second-, and third-base runners before branching. To bring up the next batter, branch to 10964.



Number of Pitcher	00402-00403
	00404-05403
Matrix Table	
Tempprary Storage, Work Area	05404-05437
	05438-07437
Random-number Table	
	07438-10411
Data Storage	
	10412-11047
Main Program	
	11048-12139
Steal Subroutine	
	12140-12739
Main Program	
	12740-13963
Sacrafice Subroutine	
	14064-15095
Closed Subroutines	
	15196-18195
Main Program	
	18196-19666
Not Used	
	19667-19687
Defensive Line-up Storage	
	19688-19999
Not used	

Figure 12. Storage Layout of Baseball Game Program

OPERATING INSTRUCTIONS

Execution of the object program will consist of the following main steps: (1) preparation of the object deck; (2) clearing core to zeroes; (3) loading object deck; (4) typing in line-ups; and (5) controlling console switches for the desired strategy. Each of these steps will be explained separately.

Preparation of Object Deck

The object deck should consist of the following in the designated order:

1. SPS object program
2. 5000-digit table
3. Random number table
4. Player data cards.

The object program and the 5000-digit table are part of the standard package for the program (see the Program Description for an explanation of the significance of this 5000-digit table). To vary the outcome of the games, a new set of random numbers should be used for each game (shuffling the deck may also serve adequately). There should be twenty-five cards of random numberw with eighty numbers per card and a flag at every odd card position (two sets of random-number cards are provided as part of the standard package for the program). Preparation of data cards is explained in the section on Input/Output Specifications (data cards for the 1963 edition of the Dodgers

and Yankees are provided--these were used to test the original program and the sample game which will follow is based on these data cards).

Clear Core to Zeroes

1. Press INSERT key on console.
2. Type "160001000000" on the console typewriter.
3. Press RELEASE key on console.
4. Press START key on console.
5. Press INSTANT STOP key on console.
6. Press RESET key on console.

Load Object Program

This task is performed by placing the object deck in the card hopper of the card reader and pressing the LOAD key on the card reader. After a portion of the object deck has been read into the computer, the READER NO FEED light will go off on the console. At this point, press the START key on the console. The remainder of the deck will then be read into core.

Type in Line-ups

After the object deck has been loaded, the console typewriter will the message "ENTER DEF LINEUP." The console typewriter will then be released, and will be ready to accept the home team line-up. When the data cards are prepared, each player is assigned a number. Type the

line-up as a sequence of two-digit numbers corresponding to the appropriate players in the order in which they are to bat.

Example: Line-up sheets for the 1963 Dodger and Yankee teams are in Table 7. Typing in the following would give the line-up listed below:

272429282330252202.

- |                     |      |
|---------------------|------|
| 1. Maury Wills, ss  | (27) |
| 2. Jim Gilliam, 2b  | (24) |
| 3. Willie Davis, cf | (29) |
| 4. Tom Davis, lf    | (28) |
| 5. Ron Fairly, lb   | (23) |
| 6. Frank Howard, rf | (30) |
| 7. Ken McMullen, 3b | (25) |
| 8. John Roseboro, c | (22) |
| 9. Sandy Koufax, p  | (02) |

After typing in the defensive line-up hit the R-S (RELEASE AND START) key on the console typewriter. The typewriter will then type the message "ENTER BAT ORDER." Type in the visiting team's lineup in the same manner as explained above.

Controlling Console Switches for Strategy

Table 6 gives a listing of switch settings for the program. Only the indicated switches for each setting should be on--all others must be off.

The general sequence of events in the playing of the game can be illustrated by the following diagram:

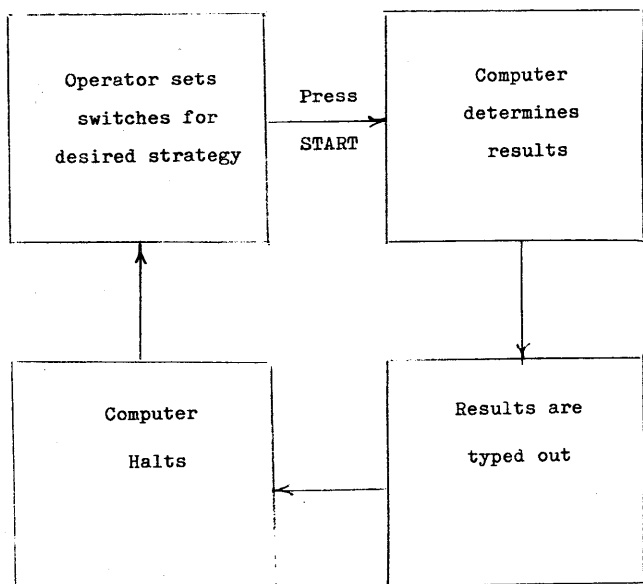


Figure 13. General Sequence of Events in Execution of Program

Switch Setting	Function
1	Steal. Calls for attempted steal.
2	Pinch-Hitter. Computer will type message to enter ph. Type the two-digit player number of the desired pinch-hitter and hit R-S.
2,4	New Pitcher. Computer will type message to enter pitcher. Type the two-digit player number of the pitcher and hit R-S.
1,2	Sets infield half-way. Increases batter's chances of a hit and decreases chances of a successful bunt.
1,3	Sets infield in. Has same effect as above, but in greater magnitude.
1,4	The batter is intentionally walked.
3	Sacrafice. Batter attempts a bunt. His chances are dependent upon his speed and the depth of the infield.
2,3	New Game. Computer asks for new line-ups.
4	Runner takes two bases on a single and three bases on a double at risk of being thrown out; pick-off attempt by pitcher is initiated; runner on third will attempt to score on any fly ball--otherwise he would only try to score on a deep fly.
3,4	At the end of each inning, the batting order of the new team is typed out by the console type-writer. If this line-up is incorrect or unsatisfactory for any reason, switches 3 and 4 may be put on to enter the correct line-up.

Table 5. Switch Settings for Strategy

SAMPLE ROSTER

SAMPLE GAME

The following pages show sample input and output for the program. Table 6 is the sample roster used for the game, and Tables 8 through 11 are listings of the decks used for input.

The sample game which follows was double-spaced so that helpful comments could be inserted.

New York	Los Angeles
10 Bouton	01 Drysdale
11 Daley	02 Koufax
12 Ford	03 Miller
13 Sheldon	04 Ferranoski
14 Stafford	05 Podres
15 Terry	06 Sherry
16 Williams	07 Calmus
17 Arroyo	08 Rowe
18 Bridges	09 Richert
19 Downing	21 Camilli
20 Reniff	22 Roseboro
37 Berra	23 Fairly
38 Blanchard	24 Gilliam
39 E. Howard	25 McMullen
40 Boyer	26 Skowron
41 Linz	27 Wills
42 Kubek	28 T. Davis
43 Long	29 W. Davis
44 Pepitone	30 F. Howard
45 Richardson	31 Moon
46 Lopez	32 Walls
47 Mantle	33 Breeding
48 Maris	34 Tracewski
49 Reed	35 Ferrara
50 Tresh	36 Nen

Table 6. Sample Roster



2156737475475535307212841852520914168695  
 3332719562708005578577350202323134755123

7008309199945788424295691328905636504893  
 9349120235306755232527832530397748239417

5437024007172372781531376021703802937565  
 1062780108282874698094187383700251298907

7575705416501992343375818216860974454487  
 3020908828390226823368926485138922190337

2469729612390946167252874271455526870627  
 1523966273076163447056364095565296694043

4825522313367413475101682740424367395090  
 9385531882869833165085036270935246959796

2086836510129730812550908590010995676133  
 1206051522072275817748797008693001817154

Table 8. Listing of Random-Number Cards (Each two lines represent one card)

SAMPLE BATTING DATA CARDS

0407164661614630010512000000563001011400  
 0000503002041110101030250308140000002630

0103160017342230020515151515352802051010  
 1010352802052020202035280205202020203528

0212161717171830021515252525323501051505  
 0707252501010400000038300102121717174230

0204141111336430011701000000202501171000  
 0000223002051515151535280205101515153528

0210282020362330021025162330206302132711  
 1626173206132715151708640510221515303035

0107271216332830050629061012117904043411  
 1425146604052810152716760306291721423132

0210241516221740020826171717263803072416  
 1720163403052315161720450305161010253335

0208201515302044010822151534103002102312  
 1234163001052716193421320407271515262536

0407282121231742030631070714153801112616  
 1626144201102715153020450205301820230451

0208272021272130032332121236307201122522  
 2243173203103015222933340310281416271638

SAMPLE PITCHING DATA CARDS

0505050805031402090727080314011509021103  
 1001010503090704040402060602110407030314

020402020200802060201010508000406040610  
 200510050503021503080600001040347030305

0507021105071303050105010701011100110603  
 0304040213051406001502110708080617030416

1103222604040804061820041203030308100004  
 00

Table 9. Listing of Sample Batting and Pitching Data Cards

SAMPLE OUTPUT

-45-

NAME DATA CARDS

DRYSDALE	KOUFAX	MILLER	PERANOSKI
PODRES	SHERRY	CALMUS	ROWE
RICHERT	BOUTON	DALEY	FORD
SHELDON	STAFFORD	TERRY	WILLIAMS
ARROYS	BRIDGES	DOWNING	RENIFF
CAMILLI	ROSEBORO	FAIRLY	GILLIAM
MCMULLEN	SKOWRON	WILLS	T. DAVIS
W. DAVIS	F. HOWARD	MOON	WALLS
BREEDING	TRACEWSKI	FERRARA	NEN
BERRA	BLANCHARDE,	HOWARD	BOYER
LINZ	KUBEK	LONG	PEPITONE
RICHRDSON	LOPEZ	MANTLE	MARIS
REED	TRESH		

Table 10. Listing of Sample Name Data Cards

ENTER DEF LINEUP  
272429282330342205RS  
(Home team line-up was typed in)  
ENTER BAT ORDER424547483944374015RS  
(Visiting team line-up entered)  
KUBEK WALK  
RICHRDSON GROUND BALL 3  
(Ground ball to first--Kubek out to complete double-play)  
KUBEK OUT AT 2ND  
MANTLE STRIKEOUT  
THREE OUTS  
27242928233034220547  
(At the end of each inning the typewriter will print  
the batting order of the next team to bat; turn switches  
3 and 4 on if you want to change that line-up)  
WILLS STRIKEOUT  
GILLIAM SINGLE  
W. DAVIS STRIKEOUT  
T. DAVIS  
(Switch 1 was on, so that Gilliam stole second base)  
GILLIAM SAFE AT 2ND  
T. DAVIS FLY BALL 9  
(Fly ball to right field)  
THREE OUTS  
48394437401542454748  
MARIS SINGLE  
E. HOWARD SINGLE  
Switch 4 was on, so Maris went to third)  
MARIS SAFE AT 3RD  
PEPITONE STRIKEOUT  
BERRA STRIKEOUT  
BOYER GROUND BALL 2  
THREE OUTS  
23303422052724292823

FAIRLY SINGLE  
F. HOWARD FLY BALL 7  
TRACEWSKI FLY BALL 7  
ROSEBORO STRIKEOUT  
THREE OUTS  
15424547483944374015

TERRY STRIKEOUT  
KUBEK FLY BALL 8  
RICHARDSON GROUND BALL 5  
THREE OUTS  
05272429282330342205

PODRES FLY BALL 9  
WILLS STRIKEOUT  
GILLIAM WALK  
W. DAVIS SINGLE  
T. DAVIS FLY BALL 7  
THREE OUTS  
47433944374015424547

MANTLE FLY BALL 9  
MARIS STRIKEOUT  
E. HOWARD SINGLE  
PEPITONE FLY BALL 9  
THREE OUTS  
23303422052724292823

FAIRLY SINGLE  
F. HOWARD STRIKEOUT  
TRACEWSKI GROUND BALL 2  
FAIRLY OUT AT 2ND  
THREE OUTS  
37401542454748394437

BERRA GROUND BALL 2  
BOYER FLY BALL 8  
TERRY GROUND BALL 6  
THREE OUTS  
22052724292823303422

ROSEBORO  
(Switch 3 was on to call for bunt)  
OUT AT 1ST  
PODRES WALK  
WILLS INFIELD HALF-WAY, SET SW, PUSH START  
(Switches 1 and 2 brought the infield half-way)  
GROUND BALL 4  
PODRES OUT AT 2ND  
THREE OUTS  
42454748394437401542

KUBEK GROUND BALL 6  
RICHARDSON GROUND BALL 3  
MANTLE SINGLE  
MARIS  
(Switch 1 was on to call for steal)  
MANTLE SAFE AT 2ND  
MARIS STRIKEOUT  
THREE OUTS  
24292823303422052724



GILLIAM WALK

W. DAVIS SINGLE

T. DAVIS

(Switch 1 called for double steal--note that only the  
GILLIAM SAFE AT 3RD outcome of the lead runner is given)

(Switch 4 was on, so runner went home on fly ball)  
T. DAVIS FLY BALL 9 SAFE AT HOME

FAIRLY GROUND BALL 4 RUNNERS ADVANCE

F. HOWARD GROUND BALL 4

THREE OUTS

39443740154245474839

E. HOWARD WALK

PEPITONE DOUBLE

(Switch 4 was on, so Howard scored on double from first)  
E. HOWARD SAFE AT HOME

BERRA GROUND BALL 4 RUNNERS ADVANCE

BOYER SINGLE

TERRY SINGLE

BOYER SAFE AT 3RD

(Switches 2 and 4 were on to change pitchers--Perranoski entered)  
KUBEK ENTER PITCHER SET SW4RS

KUBEK GROUND BALL 5 RUNNERS ADVANCE

RICHARDSON GROUND BALL 5

THREE OUTS

34220427242928233034

(Switch 2 was on to bring up pinch-hitter--Walls entered)  
TRACEWSKI ENTER PH SET SW32RS

WALLS WILD PITCH

WALLS STRIKEOUT

ROSEBORO FLY BALL 9

PERANOSKI ENTER PH SET SW31

MOON WALK

WILLS INFIELD HALF-WAY, SET SW, PUSH START

OUT AT 1ST

THREE OUTS

47483944374015424547

(A new pitcher was asked for, although switches 2 and 4 were  
off, since there had been a ph for the pitcher--Koufax entered)  
MANTLE ENTER PITCHER SET SW2RS

MANTLE WALK

MARIS STRIKEOUT

E. HOWARD

MANTLE SAFE AT 2ND

E. HOWARD GROUND BALL 4 RUNNERS ADVANCE

PEPITONE HOME RUN

BERRA STRIKEOUT

THREE OUTS

24292823303222022724

GILLIAM SINGLE

W. DAVIS STRIKEOUT

T. DAVIS STRIKEOUT

FAIRLY WALK

F. HOWARD GROUND BALL 4

THREE OUTS

40154245474839443740

BOYER SINGLE

TERRY STRIKEOUT

KUBEK FLY BALL 8

RICHARDSON GROUND BALL 6

THREE OUTS

32220227242928233032

WALLS FLY BALL 7

ROSEBORO SINGLE

KOUFAX ENTER PH SET SW21RS

CAMILLI STRIKEOUT

WILLS INFIELD HALF-WAY, SET SW, PUSH START  
(Wills was safe on an error by the second baseman)  
ERROR 4

GILLIAM

OUT AT 1ST

THREE OUTS

47483944374015424547

MANTLE ENTER PITCHER SET SW02RS  
(Switches 2 and 3 are used to start new game)  
MANTLE ENTER DEF LINEUP

Line Score of Game

Yankees	000	000	320-	5
Dodgers	000	001	000-	1

Table 11. Sample Game Played on Computer

APPENDIX

BASEBALL PROGRAM

1001PITCHRDS 2...NUMBER OF PITCHER  
1002TABLE DSS 5000..5000-DIGIT TABLE  
1003TEMP DC 2.00  
1004TEMP1 DC 2.00  
1005TEMP2 DSS 30  
1006RANDOMDSS 2000  
1007LIST DAS 560  
1008XF DS 2  
1009BB DS 2  
1010BA DS 2  
1011K2B DS 2  
1012K3B DS 2  
1013HR DS 2  
1014XK DS 2  
1015SBA DS 2  
1016 DSS 784  
1017XW DS 2  
1018PC DS 2  
1019MOB DS 2  
1020KC DS 2  
1021WP DS 2  
1022PHR DS 2  
1023SPC DS 2  
1024 DSS 306  
1025ARG DS 2  
1026ANS DC 2.00  
1027ORDER DSS 20  
1028 DC 1.  
1029 DSS 5  
1030OUTS DC 2.00  
1031 DC 1.,19687  
2001M1 DAC 16. ENTER BAT ORDER!  
2002M2P DAC 17. ENTER DEF LINEUP!  
2003M2 DAC 14. ENTER PITCHER!  
2004M3 DAC 13. SAFE AT HOME!  
2005M4 DAC 12. OUT AT HOME!  
2006M5 DAC 12. SAFE AT 3RD!  
2007M6 DAC 11. OUT AT 3RD!  
2008M7 DAC 12. SAFE AT 2ND!  
2009M8 DAC 11. OUT AT 2ND!  
2010M9 DAC 9. SET SW!  
2011M10 DAC 9. ENTER PH!  
2012M11 DAC 8. POP OUT!  
2013M12 DAC 11. OUT AT 1ST!  
2014M13 DAC 7. SINGLE!  
2015M14 DAC 11. WILD PITCH!  
2016M15 DAC 5. WALK!  
2017M16 DAC 9. PICK-OFF!  
2018M17 DAC 10. ERROR 0!  
2019M18 DAC 7. DOUBLE!  
2020M19 DAC 7. TRIPLE!  
2021M20 DAC 9. HOME RUN!  
2022M21 DAC 10. STRIKEOUT!  
2023M22 DAC 11. FLY BALL 0!  
2024M23 DAC 14. GROUND BALL 0!  
2025M24 DAC 17. RUNNERS ADVANCE!  
2026M25 DAC 11. THREE OUTS!

APPENDIX A

SPS SOURCE PROGRAM LISTING

2027M26 DAC 31,INFIELD IN. SET SW, PUSH START  
 2028M27 DAC 37,INFIELD HALF-WAY. SET SW, PUSH START  
 3001READ RNCD TABLE,500,210, FIRST = READ + 11  
 3002 CM READ + 6,80,810, SECOND = READ + 21  
 3003 AM READ + 6,TABLE + 5000,8  
 3004 BN READ  
 3005RD RN RANDOB,500,1010, THIRD = RD + 11  
 3007 CM RD + 6,RANDOM + 2000,7,TEST FOR LAST CARD  
 3008 BN RD  
 3009RD1 RN XF - 1,500,210  
 3010 AM RD1 + 6,80,10  
 3011 AM RD1 + 11,1,10  
 3012 CM RD1 + 11,14,10  
 3013 BNE RD1  
 3014 RACD LIST  
 3015 RACD LIST + 160  
 3016 RACD LIST + 320  
 3017 RACD LIST + 480  
 3018 RACD LIST + 640  
 3019 RACD LIST + 800  
 3020 RACD LIST + 960  
 3021 WATY M2P  
 3022 RCTY  
 3023 RNTY 19667  
 3024 SF 19667  
 3025 SF 19669  
 3026 SF 19671  
 3027 SF 19673  
 3028 SF 19675  
 3029 SF 19677  
 3030 SF 19679  
 3031 SF 19681  
 3032 SF 19683  
 3033 TF PITCHR,19684  
 3034 RCTY  
 3035ENTER WATY M1  
 3036 RNTY ORDER  
 3037 SF ORDER  
 3038 SF ORDER + 2  
 3039 SF ORDER + 4  
 3040 SF ORDER + 6  
 3041 SF ORDER + 8  
 3042 SF ORDER + 10  
 3043 SF ORDER + 12  
 3044 SF ORDER + 14  
 3045 SF ORDER + 16  
 3046 TF TEMP,ORDER + 17  
 4001SW1 BTM NAME,ORDER + 1,7,WRITE NAME OF BATTER  
 4002 CM PITCHR,20,10,TEST FOR PROPER NUMBER IN PITCHR  
 4003 BP S,,,BRANCH IF NO PITCHER  
 4004 BNC1 A  
 4005 BC2 B  
 4006 BC3 C  
 4007 BC4 D  
 5001 CM RD + 11,0,10, BEGIN STEAL ROUTINE  
 5002 BE E  
 5003 CM READ + 21,0,10  
 5004 BNE F  
 5005 CM READ + 11,0,10  
 5006 BE F  
 5007 TFM ARG,2,10

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5008 BTM NAME,READ + 11,7,TYPE NAME OF FIRST BASE RUNNER  
 5009 BTM STEAL,READ + 11,7  
 5010 BTM SPIN,0,10  
 5011 CM ANS,10,10  
 5012 BN G  
 5013 AM OUTS,1,10  
 5014 TFM READ + 11,,10  
 5015 WATY M8  
 5016 WATY M9  
 5017 H  
 5018 BTM OUT,0,10  
 5019A2 TFM ARG,13,1011  
 5020 BTM STEAL,RD+11,7  
 5021 BTM SPIN,,10  
 5022 BTM NAME,RD + 11,7,TYPE NAME OF THIRD-BASE RUNNER  
 5023 CM ANS,10,10  
 5024 BN H  
 5025 AM OUTS,1,10  
 5026 WATY M4  
 5027 WATY M9  
 5028 H  
 5029F1 TFM RD + 11,0,10  
 5030 BTM OUT,0,10  
 5031 B SW1  
 5032G TF READ + 21,READ + 11  
 5033 TFM READ + 11,0,10  
 5034 WATY M7  
 5035 RCTY  
 5036 B A2  
 5037H WATY M3  
 5038 WATY M9  
 5039 H RANDOM + 1,2,2, COUNTER IN H+30  
 5040 B F1  
 5041F TFM ARG,25,1011  
 5042 BTM STEAL,RD+11,7  
 5043 BTM SPIN,0,10  
 5044 BTM NAME,RD + 11,7,TYPE NAME OF THIRD-BASE RUNNER  
 5045 CM ANS,10,10  
 5046 BN I  
 5047 WATY M4  
 5048 H  
 5049 AM OUTS,1,10  
 5050 BTM OUT,0,10  
 5051I1 TF RD+11,READ + 21  
 5052 B K1  
 5053I WATY M3  
 5054 H  
 5055 B I1  
 5056E CM READ + 21,0,10  
 5057 BE J  
 5058 TFM ARG,8,1011  
 5059 BTM STEAL,READ + 21,7  
 5060 BTM SPIN,0,10  
 5061 BTM NAME,READ + 21,7,TYPE NAME OF 2ND-BASE RUNNER  
 5062 CM ANS,10,10  
 5063 BN K  
 5064 WATY M6  
 5065 H  
 5066 AM OUTS,1,10  
 5067 BTM OUT,0,10  
 5068K1 TF READ + 21,READ + 11

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5069 TFM READ + 11.0.10  
 5070 B SW1  
 5071K WATY M5  
 5072 TF RD + 11.0.10  
 5073 H  
 5074 B K1  
 5075J TFM ARG.2.10  
 5076 BTM STEAL,READ + 11.7  
 5077 BTM SPIN.0.10  
 5078 BTM NAME,READ + 11.7  
 5079 CM ANS.10.10  
 5080 BN L  
 5081 TFM READ + 11.0.10  
 5082 WATY M8  
 5083 H  
 5084 AM OUTS.1.10  
 5085 BTM OUT.10 .10  
 5086 B SW1  
 5087L TF READ + 21.0.10  
 5088 TFM READ + 11.0.10  
 5089 WATY M7  
 5090 H  
 5091 B SW1... END STEAL ROUTINE  
 6001B TFM SPC + 305.3.10. INF = SPC + 305  
 6002 WATY M27...MESSAGE--INFIELD PLAYING IN  
 6003 H  
 6004 RCTY  
 6005 B A + 12  
 6006C TFM SPC + 305.6.10  
 6007 WATY M26...MESSAGE--INFIELD PLAYING HALF-WAY  
 6008 B B + 24  
 6009A TFM SPC + 305.0.10  
 6010 BNC2 R  
 6011 BC3 RPR  
 6012 BC4 S  
 6013 WATY M10  
 6014 WATY M9  
 6015 C ORDER+1.ORDER+3..TEST FOR PH FOR PITCHER  
 6016 BP NP...BRANCH IF NOT PITCHER  
 6017 C ORDER + 1.ORDER + 5  
 6018 BP NP  
 6019 C ORDER + 1.ORDER + 7  
 6020 BP NP  
 6021 C ORDER + 1.ORDER + 9  
 6022 BP NP  
 6023 C ORDER + 1.ORDER + 11  
 6024 BP NP  
 6025 C ORDER + 1.ORDER + 13  
 6026 BP NP  
 6027 C ORDER + 1.ORDER + 15  
 6028 BP NP  
 6029 C ORDER + 1.ORDER + 17  
 6030 BP NP  
 6031 RNTY ORDER...ACCEPT PINCH-HITTER  
 6032 SF ORDER  
 6033 TF TEMP.ORDER+1..REPLACE PITCHER WITH PH  
 6034 B SW1  
 6035NP RNTY ORDER...ACCEPT PINCH-HITTER  
 6036 SF ORDER  
 6037 B SW1  
 6038S WATY M2

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6039 WATY M9  
 6040 TFM ZZZ+6.1966B.7.INITIALIZE ADDRESS  
 6041ZZZ C 0.PITCHR..FIND BATTING POSITION OF CURRENT PITCHER  
 6042 BE ZZA...BRANCH WHEN FOUND  
 6043 AM ZZZ+6.2.10.MODIFY ADDRESS  
 6044 B ZZZ...BRANCH FOR LOOP  
 6045ZZA RNTY PITCHR-1...ACCEPT NEW PITCHER  
 6046 SF PITCHR = 1  
 6047 TF ZZB+6.ZZZ+6...MODIFY ADDRESS  
 6048ZZB TF 0.PITCHR..PUT NEW PITCHER IN BATTING ORDER  
 6049 B SW1  
 6050R BNC3 ZC  
 7001 TFM ARG.10.1011. SAC ROUTINE  
 7002 BTM COMB.KK.7  
 7003 CM ARG.0.10  
 7004 BNP T  
 7005 BTM SPIN.0.10  
 7006 CM ANS.10.10  
 7007 BN KS  
 7008T TFM ARG.10.1011  
 7009 BTM COMB.BB.7  
 7010 CM ARG.0.10  
 7011 BNP U - 12  
 7012 BTM SPIN.0.10  
 7013 CM ANS.10.10  
 7014 BN D  
 7015 TF U + 11. H + 30  
 7016U TF SPC + 303  
 7017 SM SPC + 303.9.10  
 7018 BD V. SPC + 303  
 7019 TFM ARG.50.10  
 7020 BTM SPIN.0.10  
 7021 CM ANS.10.10  
 7022 BN KS  
 7023V CM SPC + 305.6.10  
 7024 BN W  
 7025 TF V + 47.H + 30  
 7026 TF SPC + 303  
 7027 BD X.SPC + 303  
 7028 WATY M11  
 7029 RCTY  
 7030 AM OUTS.1.10  
 7031 BTM OUT.0.10  
 7032 CM RD + 11.0.10  
 7033 BE Y  
 7034 TFM RD + 11.0.10  
 7035 WATY M6  
 7036 H  
 7037 AM OUTS.1.10  
 7038 BTM OUT.0.10  
 7039 B NEXT  
 7040Y CM READ + 21.0.10  
 7041 BE Z  
 7042 TFM READ + 21.0.10  
 7043 WATY M8  
 7044 B Y - 48  
 7045Z CM READ + 11.0.10  
 7046 BE NEXT - 12  
 7047 TFM READ + 11.0.10  
 7048 WATY M12  
 7049 B Z - 12

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7050 H  
 7051NEXT TF ORDER + 19,ORDER + 1  
 7052 TR ORDER,ORDER + 2  
 7053 B SW1  
 7054X CM RD + 11,0.10  
 7055 BE Z2 + 24  
 7056 TFM ARG,5.10  
 7057 BTM STEAL,RD + 11.7  
 7058 BTM SPIN,0.10  
 7059 BTM NAME,RD + 11.7  
 7060 TFM RD + 11,0.10  
 7061 BD Z1,ANS - 1  
 7062 WATY M4  
 7063 AM OUTS,1.10  
 7064 BTM OUT,0.10  
 7065 TF RD + 11,READ + 21  
 7066 TF READ + 21,READ + 11  
 7067 TF READ + 11,ORDER + 1  
 7068 B NEXT - 12  
 7069Z1 TFM ARG,20.10  
 7070 BTM STEAL,ORDER + 1.7  
 7071 BTM SPIN,0.10  
 7072 BD Z2,ANS - 1  
 7073 WATY M3  
 7074 RCTY  
 7075 WATY M12  
 7076 TF RD + 11,READ + 21  
 7077 TF READ + 21,READ + 11  
 7078 TFM READ + 11,0.10  
 7079 AM OUTS,1.10  
 7080 BTM OUT,0.10  
 7081 B NEXT - 12  
 7082Z2 WATY M13  
 7083 B Z1 - 48  
 7084 TFM ARG,25,1011  
 7085 BTM COMB,BA.7  
 7086 MM ARG,1.10  
 7087 TF 40.99  
 7088 TFM ARG,0.10  
 7089 BTM STEAL,ORDER + 1.7  
 7090 A 40,ARG  
 7091 MM 40,5.10  
 7092 SF 97  
 7093 TF ARG,98  
 7094 BTM SPIN,0.10  
 7095 BD Z1+60,ANS - 1  
 7096 B Z2  
 7097W CM SPC + 305,3.10  
 7098 BN W + 48  
 7099 TFM ARG,15,1011  
 7100 B Z2 + 36  
 7101 TFM ARG,0.10  
 7102 B Z2 + 36... END SAC ROUTINE  
 8001 DSS 100  
 8002SPIN TF SPIN + 18,H + 30  
 8003 MM 0,50,9  
 8004 CM ARG,50,10  
 8005 BP M  
 8006 A 99,ARG  
 8007 AM 99,TABLE - 1.7  
 8008 TF N + 11,99

8009N TD ANS - 1  
 8010 SF ANS - 1  
 8011 AM H + 30,1.10  
 8012 TFM 0 + 11,H + 30.7  
 80130 TD ANS  
 8014 CF ANS  
 8015 AM H + 30,1.10  
 8016 CM H + 30,RANDOM + 1999.7  
 8017 BP P  
 8018 BB  
 8019M S 99,ARG  
 8020 AM 99,TABLE + 99.7  
 8021 TF Q + 11,99  
 8022Q BD Q + 48  
 8023 SM 99,100.9  
 8024 A 99,ARG  
 8025 B N - 12  
 8026 TDM ANS - 1  
 8027 B N + 12  
 8028P TFM H + 30,RANDOM+ 1.7  
 8029 BB  
 9001OUT CM OUTS,3.10  
 9002 BI NEW,1300  
 9003 BB  
 9004NEW TFM OUTS,0.10  
 9005 TFM READ + 11,0.10  
 9006 TFM READ + 21,0.10  
 9007 TFM RD + 11,0.10  
 9008 TF ORDER + 19,ORDER + 1  
 9009 TR ORDER,ORDER + 2  
 9010 RCTY  
 9011 WATY M25  
 9012 RCTY  
 9013 WNTY 19667  
 9014 TF ORDER + 19,ORDER + 1  
 9015 RCTY  
 9016 TR TEMP2 , ORDER  
 9017 TR ORDER , 19667  
 9018 TR 19667, TEMP2  
 9019 TF TEMP1,PITCHR  
 9020 TF PITCHR,TEMP  
 9021 TF TEMP,TEMP1  
 9022 H  
 9023 BNC3 SW1  
 9024 BNC4 SW1  
 9025 TFM SW1 - 11,41.10  
 9026 B ENTER  
 10001COMB TF ZA + 11,COMB - 1  
 10002 MM ORDER + 1,16.9  
 10003 SM 99,16.10  
 10004ZA AM 99  
 10005 B AQZ - 12  
 11001PITCH TF ZB + 11,PITCH - 1  
 11002 MM PITCHR,14.9  
 11003 SM 99,14.10  
 11004ZB AM 99  
 11005 B AQZ - 12  
 12001START MM PITCHR,14.9  
 12002 SM 99,14.10  
 12003 AM 99,SPC,7  
 12004 TF AA + 6,99

12005AA S 0,START = 1  
 12006 BB  
 13001NAME TFM NAM+6,LIST,7,INITIALIZE ADDRESS  
 13002 TF MM+6,NAME=1,,INITIALIZE ADDRESS  
 13003 RCTY  
 13004MM MM 0,20,9,MODIFY ADDRESS  
 13005 SM 99,20,10,ADDRESS = 20N = 20  
 13006 A NAM+6,99,,ADDRESS OF PLAYER NAME IN NAM+6  
 13007NAM WATY,100,,TYPE NAME  
 13008 SPTY,,SPACE TYPEWRITER  
 13009 BB  
 14001STEAL TF A1 + 6,STEAL - 1  
 14002A1 MM 0,16,9  
 14003 SM 99,16,10  
 14004 AM 99,SBA,7  
 14005 TF AQZ + 11,99  
 14006AQZ A ARG  
 14007 BB  
 14008 DSS 100  
 15001ZC TFM ARG,0,10, CHECK FOR WALK  
 15002 BTM COMB,BB,7  
 15003 BTM SPIN,0,10  
 15004 BD ZD,ANS - 1  
 15005 BNC4 ZE  
 15006 BD ZE,ANS  
 15007 TFM ARG,2,10  
 15008 BTM SPIN,0,10  
 15009 WATY M16  
 15010 BD ZF ,ANS - 1  
 15011 TDM M17 + 16,1  
 15012 WATY M17  
 15013ZG TF RD + 11,READ + 21  
 15014 TF READ + 21,READ + 11  
 15015 TFM READ + 11,0,10  
 15016 H  
 15017 B SW1  
 15018ZF AM OUTS,1,10  
 15019 BTM OUT,0,10  
 15020 CM RD + 11,0,10  
 15021 BE ZH  
 15022 TFM RD + 11,0,10  
 15023 B ZF - 24  
 15024ZH CM READ + 21,0,10  
 15025 BE ZJ  
 15026 TFM READ + 21,0,10  
 15027 B ZF - 24  
 15028ZJ TFM READ + 11,0,10  
 15029 B ZF - 24  
 15030ZE TFM ARG,0,10  
 15031 BTM PITCH,WP,7  
 15032 BTM SPIN,0,10  
 15033 BD D,ANS - 1  
 15034 WATY M14  
 15035 B ZG  
 15036D WATY M15  
 15037 BTM START,1,10  
 15038 CM READ + 11,0,10  
 15039 BE Z1 - 24  
 15040 CM READ + 21,0,10  
 15041 BE Z1 - 36  
 15042 B Z1 - 48

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16001ZD TF ARG,SPC + 305,  
 16002 CM RD + 11,0,10  
 16003 BE QA  
 16004 BTM PITCH,MOB,7  
 16005 B QB  
 16006QA CM READ + 21,0,10  
 16007 BNE ZD + 36  
 16008 CM READ + 11,0,10  
 16009 BNE ZD + 36  
 16010 BTM PITCH,PC,7  
 16011QB TF 50,ARG  
 16012 TFM ARG,0,10  
 16013 BTM PITCH,SPC,7  
 16014 TF ANS,ARG  
 16015 TF ARG,50  
 16016 CM ANS,0,10  
 16017 BI QC,1300  
 16018 S ARG,ANS  
 16019QC BTM COMB,BA,7  
 16020 CM ARG,0,10  
 16021 BNP ZK  
 16022 BTM SPIN,0,10  
 16023 BD ZK,ANS - 1  
 16024 TFM ARG,0,10  
 16025 BTM COMB,K2B,7  
 16026 TF H1 + 11,H + 30  
 16027H1 C ARG  
 16028 BN ZL  
 16029 BTM START,3,10  
 16030 WATY M18  
 16031 TFM ARG,2,10  
 16032 BTM SPIN,0,10  
 16033 BD ZM,ANS - 1  
 16034 TDM M17 + 16,9  
 16035 WATY M17  
 16036ZN TFM READ + 11,0,10  
 16037 TFM READ + 21,0,10  
 16038 TF RD + 11,ORDER + 1  
 16039 B NEXT - 12  
 16040ZM TFM RD + 11,0,10  
 16041 TF READ + 21,ORDER + 1  
 16042 BNC4 ZP  
 16043 CM READ + 11,0,10  
 16044 BE NEXT - 12  
 16045 TFM ARG,25,10  
 16046 BTM STEAL,READ + 11,7  
 16047 BTM NAME,READ+11,7  
 16048 TFM READ + 11,0,10  
 16049 BI ZQ - 24,1400  
 16050 BTM SPIN,0,10  
 16051 BD ZQ,ANS - 1  
 16052 WATY M3  
 16053 B NEXT - 12  
 16054ZQ WATY M4  
 16055 AM OUTS,1,10  
 16056 BTM OUT,0,10  
 16057 B NEXT - 12  
 16058ZP TF RD + 11,READ + 11  
 16059 TFM READ + 11,0,10  
 16060 B NEXT - 12  
 16061ZL TFM ARG,0,10

CHECK FOR HIT

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16062 BTM COMB. K3B.7  
 16063 TF H2 + 11.H + 30  
 16064H2 C ARG  
 16065 BN ZR  
 16066 WATY M19  
 16067 BTM START.4.10  
 16068 TFM ARG.2.10  
 16069 BTM SPIN.0.10  
 16070 BD ZN.ANS - 1  
 16071 TDM M17 + 16.8  
 16072 WATY M17  
 16073 TFM RD + 11.0.10  
 16074 TFM READ + 11.0.10  
 16075 TFM READ + 21.0.10  
 16076 B NEXT - 12  
 16077ZR TFM ARG.0.10  
 16078 BTM PITCH.PHR.7  
 16079 BTM COMB.HR.7  
 16080 TF H3 + 11.H + 30  
 16081H3 C ARG  
 16082 BN ZS  
 16083 WATY M20  
 16084 BTM START.5.10  
 16085 B ZR - 48  
 16086ZS WATY M13  
 16087 BTM START.2.10  
 16088 TFM ARG.2.10  
 16089 BTM SPIN.0.10  
 16090 BD ZT.ANS - 1  
 16091 TDM M17 + 16.7  
 16092 WATY M17  
 16093 B ZM  
 16094ZT BNC4 Z1 - 48  
 16095 CM READ + 11.0.10  
 16096 BE ZV  
 16097 TFM ARG.38.10  
 16098 BTM STEAL.READ + 11.7  
 16099 BI ZW.1400  
 16100 BTM SPIN.0.10  
 16101 BD ZX.ANS - 1  
 16102ZW BTM NAME.READ + 11.7  
 16103 WATY M5  
 16104 TF RD + 11.READ + 11  
 16105 TF READ + 11.ORDER + 1  
 16106 TFM READ + 21.0.10  
 16107 B NEXT - 12  
 16108ZX BTM NAME.READ + 11.7  
 16109 WATY M6  
 16110 AM OUTS.1.10  
 16111 BTM OUT .1.10  
 16112 TFM RD + 11.0.10  
 16113 B ZX - 36  
 16114ZV CM READ + 21.0.10  
 16115 BE ZV - 24  
 16116 TFM ARG.48.10  
 16117 BTM STEAL.READ + 21  
 16118 BI ZZ.1400  
 16119 BTM SPIN.0.10  
 16120 BD ZZ + 36.ANS - 1  
 16121ZZ BTM NAME.READ + 21.7  
 16122 WATY M3

16123 B ZV - 24  
 16124 BTM NAME.READ + 21.7  
 16125 WATY M4  
 16126 AM OUTS.1.10  
 16127 BTM OUT.0.10  
 16128 B ZV = 24...  
 17001ZK TFM ARG.0.10  
 17002 BTM PITCH.KC.7  
 17003 BTM COMB.XK.7  
 17004 BTM SPIN.0.10  
 17005 BD ZY.ANS - 1  
 17006KS WATY M21  
 17007 AM OUTS. 1.10  
 17008 BTM OUT.0.10  
 17009 B NEXT - 12  
 17010ZY CM ANS.70.10  
 17011 BN QH  
 17012 CF ANS - 1  
 17013 TD M22 + 18.ANS - 1  
 17014 WATY M22  
 17015 AM OUTS.1.10  
 17016 BTM OUT.0.10  
 17017 TD SPIN - 1.ANS  
 17018 TDM SPIN - 2.0.11  
 17019 CM RD + 11.0.10  
 17020 BE NEXT - 12  
 17021 BNC4 QE  
 17022 CM SPIN - 1.4.10  
 17023 BI QE.1300  
 17024 TFM ARG.10.10  
 17025 BTM STEAL.RD + 11.7  
 17026QG BI QG + 48.1400  
 17027 BTM SPIN.0.10  
 17028 BTM NAME.RD + 11.7  
 17029 BD QF.ANS - 1  
 17030 WATY M3  
 17031 TFM RD + 11.0.10  
 17032 B NEXT - 12  
 17033QF WATY M4  
 17034 TFM RD + 11.0.10  
 17035 B ZK + 72  
 17036QE CM SPIN - 1.7.10  
 17037 BI QE + 48.1300  
 17038 TFM ARG.30.10  
 17039 B QG - 12  
 17040 TFM ARG.40.10  
 17041 B QG - 12  
 17042QH TD SPIN - 1.ANS - 1  
 17043 CF ANS - 1  
 17044 TD M17 + 16.ANS - 1  
 17045 TD M23 + 24.ANS - 1  
 17046 TD ARG.ANS - 1  
 17047 TDM ARG - 1.0.11  
 17048 BTM SPIN.0.10  
 17049 BD QL.ANS - 1  
 17050 WATY M17  
 17051 B Z1 = 48  
 17052QL WATY M23  
 17053 TD SPIN - 1.ANS  
 17054 TDM SPIN - 2.0.11  
 17055 AM OUTS.1.10

END HIT ROUTINE



17056 BTM OUT.1.10  
17057 CM SPIN - 1.4.10  
17058 BP QJ  
17059 CM READ + 11.0.10  
17060 BE QJ  
17061 BTM NAME,READ + 11.7  
17062 WATY MB  
17063 AM OUTS.1.10  
17064 BTM OUT.0.10  
17065 TF RD + 11,READ + 21  
17066 TFM READ + 21.0.10  
17067 TFM READ + 11.0.10  
17068 B NEXT - 12  
17069QJ CM READ + 11.0.10  
17070 BNE QJ1  
17071 CM READ + 21.0.10  
17072 BNE QJ1  
17073 CM RD + 11.0.10  
17074 BE QJ1 + 12  
17075QJ1 WATY M24  
17076 TF ORDER + 19,ORDER + 1  
17077 TR ORDER,ORDER + 2  
17078 B ZG  
17079RPR TFM SW1 - 11.26.10,RESET INSTRUCTION FOR NEW GAME  
17080 B RD1 + 144...START NEW GAME

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APPENDIX B

SYMBOL TABLE

END OF PASS 11

00403	*PITCHR	00404	TABLE	05405	TEMP
05407	TEMP1	05408	TEMP2		
05438	*RANDOM	07439	LIST	08559	XF
08561	BB	08563	BA		
08565	K2B	08567	K3B	08569	HR
08571	XK	08573	SBA		
09359	XW	09361	PC	09363	MOB
09365	KC	09367	WP		
09369	PHR	09371	SPC	09679	ARG
09681	ANS	09682	ORDER		
09709	OUTS	09711	M1	09743	M2P
09777	M2	09805	M3		
09831	M4	09855	M5	09879	M6
09901	M7	09925	M8		
09947	M9	09965	M10	09983	M11
09999	M12	10021	M13		
10035	M14	10057	M15	10067	M16
10085	M17	10105	M18		
10119	M19	10133	M20	10151	M21
10171	M22	10193	M23		
10221	M24	10255	M25	10277	M26
10339	M27	10412	READ		
10460	RD	10508	RD1	10820	ENTE
R 10964	SW1	11264	A2		
11384	F1	11420	G	11480	H
11528	F	11648	I1		
11672	I	11708	E	11852	K1
11888	K	11936	J		

2080	L	12140	B	12200	C
12235	A	12548	NP		
12584	S	12520	ZZZ	12668	ZZA
12704	ZZB	12728	R		
12824	T	12920	U	13004	V
13208	Y	13268	Z		
13340	NEXT	13376	X	13556	Z1
13712	Z2	13892	W		
14064	SPIN	14148	N	14196	Q
14268	M	14304	Q		
14376	P	14400	OUT	14436	NEW
14712	COMB	14748	ZA		
14772	PITCH	14808	ZB	14832	STAR
T 14880	AA	14904	NAME		
14940	MM	14976	NAM	15012	STEA
L 15024	A1	15072	AQZ		
15196	ZC	15340	ZG	15400	ZF
15472	ZH	15520	ZJ		
15544	ZE	15516	D	15700	ZD
15760	QA	15820	QB		
15916	QC	16012	H1	16120	ZN
16168	ZM	16336	ZQ		
16384	ZP	16420	ZL	16456	H2
16612	ZR	16660	H3		
16720	ZS	16816	ZT	16912	ZW
16984	ZX	17056	ZV		
17140	ZZ	17236	ZK	17296	KS

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17344	ZY	17535	QG		
17520	QF	17556	QE	17728	QH
348	QL	18915	QJ		17
13124	QJ1	18172	RPR		

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APPENDIX C

SPS OBJECT PROGRAM LISTING



APPENDIX D

FORTRAN SOURCE PROGRAM TO COMPUTE BATTING DATA

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M0000000000049J04120P90JKLMMNPQZ L10038800019M90000000000M900003600000 00

DO 250 I = 1,25
READ 1,AB,HITS,DBLE,TRPL,HR,SB,CS,AVE,BB,SO,PC
AP = AB + BB
BB = 100. \* BB/AP
KBB = BB
BA = 100. \* AVE
KBA = BA
K2B = 100. \* DBLE/HITS
K3B = 100. \* TRPL/HITS
KHR = 100. \* HR/HITS
OUTS = AB - HITS
K = 100. \* SO/OUTS
IF (SB - 9.) 100,110,110
100 KSBA = 30. + 2. \* SB
GO TO 200
110 IF (SB - 17.) 120,130,130
120 KSBA = 25. + (100. \* SB)/(2.\* (SB + CS))
GO TO 200
130 IF (SB - 25.) 140,150,150
140 ASB = SB + CS
KSBA = 30. + (100. \* SB)/(2.\* (SB + ASB))
GO TO 200
150 ASB = SB + CS
KSBA = 35. + (100. \* SB)/(2.\* ASB)
200 KF = 100. \* PCT
KF = 100 - KF
K3B = K2B + K3B
KHR = K3B + KHR
TYPE 2,KF,KBB,KBA,K2B
TYPE 3,K3B,KHR,K,KSBA
250 CONTINUE
STOP
1 FORMAT (9X,F3.0,F3.0,F2.0,F2.0,F2.0,F3.0,F3.0,F3.0,F3.0,F)
2 FORMAT (1HF,3X,I3,3X,2HBB,3X,I3,3X,2HBA,3X,I3,3X,2H2B,3X,I3)
3 FORMAT (2H3B,3X,I3,3X,2HR,3X,I3,3X,1HK,3X,I3,3X,3HSBA,3X,I3,/)
END

FORTRAN OBJECT PROGRAM TO COMPUTE BATTING DATA

```

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123456789123456789-23456789-J3456789-JK456789-JKLZ 31003000000324900000
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440102003019330301900000490106800000020000000000
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```

APPENDIX E

FORTRAN OBJECT PROGRAM TO COMPUTE BATTING DATA



FORTRAN SOURCE PROGRAM TO COMPUTE PITCHING DATA

```

DIMENSION T(32), H(32)
DO 100 I = 1,8
100 READ 1,T(I),H(I),T(I+8),H(I+8),T(I+16),H(I+16),T(I+24),H(I+24)
1 FORMAT (F8.0,F8.0,F8.0,F8.0,F8.0,F8.0,F8.0,F8.0)
SUM = 0.0
Q = 0.0
DO 110 I = 1,32
SUM = SUM + T(I)
110 Q = Q + H(I)
TAV = Q/SUM
KAV = 100. * (TAV + .005)
DO 300 I = 1,15
READ 2,BB,AB,ERA,HITS,SO,GS,CG,HR,IP
2 FORMAT (F3.0,F4.0,F4.2,F3.0,F3.0,F2.0,F2.0,F2.0,F2.0,I3)
KW = -6
TEST = BB/(AB + BB)
X = .054
50 IF (TEST - X) 120,120,130
130 KW = KW + 1
X = X + .005
GO TO 50
120 Y = HITS/AB + .005
KY = 100. * Y
KSUM = 2 * (KY - KAV)
MOB = -8
X = 2.45
60 IF (ERA - X) 140,140,150
150 X = X + .15
MOB = MOB + 1
GO TO 60
140 KPC = KSUM - MOB
K = -9
TEST = SO/AB
Z = .080
70 IF (TEST - Z) 200,200,210
210 K = K + 1
Z = Z + .006
GO TO 70
200 IF (GS) 201,212,201
212 KSPC = 0
GO TO 80
201 IF (GS - 20.) 205,206,206
205 KSPC = 4.7 * CG/GS * 10.
GO TO 80
206 KSPC = 10. + 0.95 * CG/GS * 10.
80 XIP = IP
TEST = HR/XIP
KPHR = -7
X = .030
90 IF (TEST = X) 113,113,114
114 KPHR = KPHR + 1
X = X + .012
GO TO 90
113 KWP = KW + 10
TYPE 3,KW,KPC,MOB,K
3 FORMAT (1HW,4X,13,4X,2HPC,4X,13,4X,3HMOB,4X,13,4X,2H50,4X,13)
300 TYPE 4,KWP,KPHR,KSPC
4 FORMAT (2HWP,4X,13,4X,3HPR,4X,13,4X,3HSPC,4X,13,/)
STOP

```

APPENDIX F

FORTRAN SOURCE PROGRAM TO COMPUTE PITCHING DATA



END

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APPENDIX G

FORTRAN OBJECT PROGRAM TO COMPUTE PITCHING DATA

```

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41000000000360007200500360014400500360021600500410000000000310000000072 0005
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490000001100023000-12600134002792600127002842500011000003100000002142600 0007
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