LRU

THE UNIVERSITY OF LANCASTER LIBRARY RESEARCH UNIT

SIMULATION KIT NO. 1

A LIBRARY MANAGEMENT GAME

(LOAN AND DUPLICATION POLICIES)

GAME EDITOR'S MANUAL

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LIBRARY RESEARCH UNIT

With the Compliments of the Director

CONTENTS

PREFACE

This manual has been prepared in an attempt to explain how the Loan and Duplication Policy Game should be edited, and to clarify the rôle of the Game Editor. Users of the Game may well find that they prefer to use it in other ways, perhaps without the use of a Game Editor. These notes merely serve to bring together our experience of administering this aspect of the Game, and are not meant to represent a definitive guide to its use.

INTRODUCTION: THE RÔLE OF THE GAME EDITOR

Although the duties of the Game Editor will very much depend upon the actual circumstances in which the Game is being played, this manual will attempt to give guidance in general terms on the types of problem which are liable to occur in virtually any situation.

The basic rôle of the Game Editor is to translate the policy decisions of the participants, which are written in natural language, into machine-readable form; he may also be responsible for ensuring that certain rules, such as budgetary limits, are not violated. In some circumstances the Game Editor might also be required to edit the results which are printed out by the computer, perhaps in an attempt to limit the amount of information given to the participant. It is therefore very important that the Game Editor should be conversant with the mechanics of the Game and the way in which it is being presented, so as to be able to deal with any problems which may arise. In brief, his rôle is to act as the channel of communication between the participant and the computer.

These notes will serve to amplify the rôle of the Game Editor, and an example of how he can deal with each of a number of different types of policy decision will be given. Reference will be made to tables in the Market Research Ltd. data which will also be found in this kit.

I. THE LIBRARY IDENTIFICATION NUMBER

Each group of participants will have been assigned a "library number" at the start of the exercise. They should be encouraged to use this number in all communications with the game editor, as this practice will avert any possibility of the policies of two libraries being inadvertently transposed. The participant's input form (a copy of which, marked "A", is enclosed) contains space for the library number at the top, and the Game Editor's input form (a smaller form, marked "B") contains a similar space. In normal circumstances the Game Editor should copy the library number directly from the participants input form to his own form. However, should the participant wish to start taking his policy decisions again from the beginning (perhaps because his present policies do not produce the expected results) and should this practice be permitted by the rules of the game as it is being played (for instance it would not be permitted if the participants were taking year to year decisions as librarians, and not merely planning their policies) then the Game Editor must act differently. He can return any library to "year 0" (before the new policies are run) simply by inputting the negative of the library number. Thus, library 3 is "returned to year 0" by inputting the library number as "-3".

II. THE LOAN POLICIES

We now come to the core of the problem. How is the Game Editor to deal with the myriad different ways of defining loan policies? Such policies can be pursued in terms of the number of books subject to each policy, the type of book, the type of borrower, the demand for the book, and in many other ways. Yet the computer program will accept only six integers. First of all, the significance of these integers must be explained. A typical set would be:

168 168 168 168 168 168

Each of these integers represents a loan period. They are, in fact, the length of the loan period expressed in hours (a conversion table, marked "C", will be found enclosed). It will be seen that each integer represents a loan period of exactly one week (a 24 hour day is assumed by the computer). Any figure between zero and the largest integer which the computer is capable of accepting can be input as a loan period, although for most purposes a range of 1 to 8760 (i.e. 1 year) is quite adequate.

If table MRI of the Market Research data is consulted it will be seen that the libraries have been defined in terms of the number of issues which each of their books received during the previous year. This is the basis of the method used by the Game Editor to input loan periods to the computer. In earlier work which was carried out by the Library Research Unit[1,2]*, the ten categories of table MRI were reduced to six, and this number has proved to be the best for maximum flexibility without undue cumbrousness. The six categories are obtained by converting table MRI into a slightly different form, as reproduced below in Fig. G1:

No.of issues during the year	5 or more	4	3	2	1	0
Proportion of books	0.03	0.06	0.10	0.17	0.24	0.40
Category	A	B	C	D	E	F

Fig. G1

As the library grows, the number of books in each category changes, but the proportion of the total number of titles held remains the same. Throughout the rest of these notes the categories will be referred to as A, B, C, D, E or F as shown in the above table.

* References will be found in the bibliography which is enclosed separately.

The significance of the six loan periods used by the computer program is now apparent. Each input loan period is the loan period for the category of book specified, the first being the loan period for category A, the second for category B, and so on. We must now explain the methods which the Game Editor employs to deal with each of the possible ways in which the participant might define his loan policies. A complex example is given last, in which the loan policies have been defined in more than one way.

(a) Loan policies defined by the category of book

From the Game Editor's point of view, this is the simplest method of defining loan policies. Let us assume that he received the policies in the following form:

	LIBRARY NUMBER: 3
LOAN PERIODS	1 week for titles issued 5 or more times last year
	5 weeks for titles issued 3 or 4 times last year
	10 weeks for the remainder

Referring to his table (table G1 above) the Game Editor can see immediately that these policies fit into the categories as they have been defined above. He can therefore write out the loan policies for this library in machine-readable form in the following way:

168 840 840 1680 1680 1680

When another library defines its policies in terms of the percentage of stock subject to each policy he can write out the policies in exactly the same way. For instance:

	LIBRARY NUMBER: 2
LOAN PERIODS	1 week for the most popular 3% of titles held
	5 weeks for the next most popular 16% of titles held
	10 weeks for the remainder

will be translated as:

168 840 840 1680 1680 1680

In these examples it has been assumed that the policies have been defined in terms of the number of titles held, rather than the number of volumes. In the first year we can assume that the number of titles and the number of volumes is approximately equal (remember that

serials are not considered in this Game). However, if the participant decides to buy duplicate copies of titles which the library already holds, it becomes increasingly important for both he and the Game Editor to distinguish clearly between titles and "books" when defining policies. In some instances it may be necessary for the Game Editor to seek clarification of the stated policies from the participant, but this is to be avoided if at all possible, as it tends to direct the thinking of the student.

(b) Loan policies defined by the proportion of stock

In section (a) above, the simplest case of loan policies defined in terms of the proportion of stock has been dealt with. However it is perfectly possible for a participant to define his policies in terms of a proportion of stock which does not coincide with the categories used by the Game program. An example will show how the Game Editor can deal with this eventuality should it occur. It is assumed that the Game Editor receives a set of policies which state:

	LIBRARY NUMBER: 6
LOAN PERIODS	4 hours for the most popular 1% of titles held
	3 days for the next most popular 3% of titles held
	2 weeks for the next most popular 20% of titles held
	10 weeks for the remainder

Such a complex set of loan policies will, of course, occur only rarely and will almost certainly attract severe cost penalties. Let us consider the problem diagrammatically (fig.G.2.):

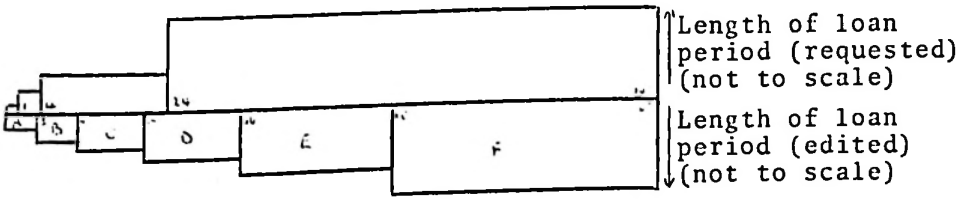

Fig. G.2.

A method has to be found for translating the four loan periods requested (the upper portion of the diagram) into the six loan periods which the computer demands (the lower part of the diagram). Consider category A (the 3% most popular titles). One third (the most popular third) of these titles are to be subject to a loan period of four hours. The remaining two thirds are to be subject to a loan period of 3 days (72 hours). We can therefore say that the average loan period for a book in category A will be approximately:

$\frac{1}{3} \times 4 + \frac{2}{3} \times 72$

$= \frac{4 + 144}{3} = \frac{148}{3} = \underline{\underline{49}}$ hours (to the nearest integer)

Similarly, category B (containing the next most popular 6% of the titles) is subject to a loan period of three days for the most popular sixth, and 2 weeks for the remaining five sixths. We therefore calculate the weighted average as:

$\frac{1}{6} \times 72 + \frac{5}{6} \times 336$

$= \frac{72 + 1680}{6} = \frac{1752}{6} = \underline{\underline{292}}$ hours

The titles of category C, as can be seen from fig. G.2, are subject to only one loan period, namely two weeks, and we can therefore define the loan policy for this category as 336 without further calculation. Category D however, is again subject to two loan policies. In this case, the most popular $\frac{5}{17}$ ths of the titles are subject to the two week loan period, and the remaining $\frac{12}{17}$ ths are subject to a loan period of 10 weeks. We therefore calculate the weighted average as:

$$\frac{5}{17} \times 336 + \frac{12}{17} \times 1680 = \frac{1680 + 20160}{17}$$

$$= \underline{\underline{1285}} \text{ hours (to the nearest integer)}$$

Categories E and F, it will be seen from the diagram, contain only one loan period (namely ten weeks). We can therefore write the loan policies in machine-readable form as:

49 292 336 1285 1680 1680

and the results obtained will be consistent with the policies specified by the participant.

(c) Loan policies defined by the number of titles

This method of defining loan policies is really a variation of the preceding method. The Game Editor needs to know the total number of titles held by the library. Market Research Ltd.'s Report MR1 states that at the beginning of the exercise the library holds 10,000 titles. Taking this figure as a starting-point the Game Editor must be able to calculate the number of titles held by the library in the year currently being run - usually a simple matter as this is an output parameter contained in the results handed to the participant (cf. the enclosed print-out, "D").

For the purposes of this example we have assumed that the run is for year 1 and that no books can therefore have been added to the collection. The Game Editor receives the following information.

	LIBRARY NUMBER: 5
LOAN PERIODS:	The most popular 300 titles to be on "Short loan" (4 hours)
	The next most popular 2000 titles to be on "popular loan" (1 week)
	The remainder on "long loan" (10 weeks)

The first operation must be to convert the number of titles subject to each loan policy into the equivalent proportion of stock. To do this, the Game Editor simply divides by 10,000. The policies can therefore be re-stated as:

Most popular ↑ ↓ Least popular

Proportion of stock	Loan policy
0.03	4 hours
0.20	168 hours
0.77	1680 hours

Fig. G.3.

The Game Editor can now proceed as in section (b) above.

The "Short Loan"(four hours) section coincides exactly with category A. There is hence no problem with this category. Category B (0.03 to 0.09) falls completely within the "Popular Loan" (168 hours) category, as does category C (0.09 to 0.19). Again no calculations are needed. Category D, however, overlaps the "Popular Loan" and "Long Loan" (1680 hours) categories. The equivalent loan period is therefore calculated:

$$\frac{4}{17} \times 168 + \frac{13}{17} \times 1680$$

$$= \frac{672 + 21840}{17} = \frac{22512}{17} = \underline{\underline{1324}} \text{ hours (to the nearest integer)}$$

Category E falls completely within the "Long Loan" category, as does category F. The Game Editor is therefore able to specify the loan policies as:

4 168 168 1324 1680 1680

(d) Loan policies defined by the status of the borrower

In this section we will consider the problem of providing for loan policies which differentiate between different types of user. It is useful here to refer to the Market Research Ltd. report on this subject (Report MR6) which is enclosed. Table MR V, contained in this report, shows the distribution of issues with respect to each type of user in each of our six categories (the data for category F are not made explicit as there are zero issues in this category, and this must

obviously hold for all types of user). The table must be examined in detail to determine what differences, if any, exist between the borrowing habits of undergraduates, postgraduates, staff and other library users. In order to determine whether, for instance, undergraduates tend to borrow more-popular books whilst staff borrow less-popular books we rearrange the table in the form shown in Table G.4.

Category	A	B	C	D	E	F	
Undergraduates	0.10	0.20	0.25	0.25	0.20	0.00	)Proportion of
Postgraduates	0.10	0.20	0.25	0.25	0.20	0.00	)total issues
Academic Staff	0.10	0.20	0.25	0.25	0.20	0.00	)to this type
Other Users	0.00	0.00	0.00	0.00	0.00	0.00	)of borrower in each category

TABLE G.4.

The first important finding is that all borrowers are either undergraduates, postgraduates or academic staff. No other library users borrow books so that if any loan period is specified for them it can safely be ignored. We are concerned solely with the other three types of user.

The second all-important finding is that there are no differences between the borrowing habits of the three types of borrower. A member of any given borrower-type is as likely to borrow a book from any given category as is a member of any other borrower-type. The only reason that undergraduates borrow more books of any one type is simply that there are more undergraduates. The Game Editor does not, therefore, have to concern himself with differences between categories - he merely needs to know the proportion of loans which are generated by each type of user. Consider table MRV of the Market Research Ltd. data. Any category could be taken, but in this case we have chosen category A (5+ issues per annum). Undergraduates are responsible for $\frac{21}{25}$ths (or 84%) of the total issues of books in this category, postgraduates for $\frac{1}{25}$ths (or 8%) and academic staff for $\frac{1}{25}$ths (8% again). The significance of these findings will again be shown by a worked example. Let us suppose that the Game Editor receives a policy statement of the form:

	LIBRARY NUMBER: 1
LOAN PERIODS:	1 week for undergraduates
	2 weeks for postgraduates
	10 weeks for academic staff

The equivalent loan policy for category A will be calculated (in hours) as:

$$\left(168 \times \frac{21}{25}\right) + \left(336 \times \frac{2}{25}\right) + \left(1680 \times \frac{2}{25}\right)$$

$$= \frac{3528 + 672 + 3360}{25} = \frac{7560}{25} = \underline{302} \text{ (to the nearest integer)}$$

Hence the loan period for books in category A is equivalent to 302 hours. However we know (from Table MRV) that the proportion of borrowings by each type of borrower in each category is equal. Hence the loan policy in every category is 302 hours, and the Game Editor is able to translate these policies as:

302 302 302 302 302 302

(e) Loan policies defined in more than one way

The Game Editor has to be capable of dealing with the most complex ways of defining loan policies. For instance, in some cases participants will state their policies in terms, not only of the type or number of books to be subject to the policy, but also in terms of the type of borrower. An example should clarify this:

Suppose that the Game Editor receives the following statement of loan policies:

LIBRARY NUMBER: 4

LOAN PERIODS (a) 200 most popular titles on a "short loan" collection. Undergraduates and postgraduates may borrow these books for four hours, academic staff for 1 day. Other users may not borrow Short Loan books.

(b) The next most popular 3000 titles to be on "popular loan". Undergraduates and postgraduates may borrow these books for 1 week, academic staff for 10 weeks. Other users are also limited to 1 week loans.

(c) The remainder of the collection is to be on "Long Loan". All users may borrow these books for 10 weeks.

The first step is to calculate the average loan period in each of the three categories. In section (d) above the proportion of borrowings due to each type of user was calculated, and it will be remembered that there are no significant differences between the borrowing habits of the different types. Consider first of all the "Short Loan" collection. It is known that 8% of the borrowings from this collection will be due to academic staff, the remainder to undergraduates and postgraduates. The loan policies for "other users" are, of course, a red

herring - this type of user is known not to borrow books. The average loan period for "Short Loan" books is therefore:

$$\frac{2}{25} \times 24 + \frac{23}{25} \times 4 = \frac{48}{25} + \frac{92}{25} = \frac{140}{25}$$

$$= \underline{\underline{6 \text{ hours}}} \text{ (to the nearest integer)}$$

Therefore the 200 most popular titles will be subject to an average loan period of 6 hours.

The next category is termed "Popular Loan" and can be dealt with similarly. Thus, the average loan period for "Popular Loan" books will be:

$$\frac{2}{25} \times 1680 + \frac{23}{25} \times 168 = \frac{43}{25} \times 168$$

$$= \underline{\underline{289 \text{ hours}}} \text{ (to the nearest integer)}$$

(Again note that the loan policy for "other users" should be ignored).

The "Long Loan" category presents no problem - all issues are for a period of <u>1680 hours</u>

The situation at this stage has therefore been reduced to a simple problem of the form illustrated in Section (c) above. It is recommended that those interested complete the calculation and obtain the loan policies in machine readable form. (The correct solution is contained in Appendix II to this manual). Assume that the library holds 10,000 titles.

III. THE DUPLICATION POLICIES

In many ways the problems posed by the different ways of defining duplication policies are similar to the problems already discussed with regard to loan policies (Section II above). However, the number of different ways of defining duplication policies is rather more limited - for instance, it makes little sense to duplicate books on the basis of borrower type. Nearly all participants define their duplication policies either in terms of the number of books to be duplicated or in terms of the threshold of issues above which duplication will occur.

As in the case of loan policies, the computer is programmed to accept six integers for duplication policies, and again these six integers correspond to the categories of Fig. G.1. Each integer represents the <u>number</u> of <u>extra</u> duplicates to be purchased in its category, starting with category A and continuing to category F. A typical set might be:

1000 1000 1000 1000 1000 1000

This input tells the computer to "purchase" 1000 extra duplicates in each loan category for this library (i.e. 6000 extra duplicates in all). Assuming that no duplicates have been bought by this library up to this point (e.g. it might be

year 1), the average number of copies per title in each category (i.e. the duplication level) can be calculated (fig. G.4.).

Category	A	B	C	D	E	F
No. of titles held	300	600	1000	1700	2400	4000
No. of 'books' held	1300	1600	2000	2700	3400	5000
Duplication Level	4.3	2.7	2.0	1.6	1.4	1.25

Fig. G.4.

The methods of translating the natural language duplication policy decisions into machine-readable form will now be illustrated.

(a) Duplication policies defined by the category of book

This method of defining duplication policies is, of course, the simplest from the point of view of the Game Editor. For example, the following policies would be very simple to translate.

LIBRARY NUMBER: 3

DUPLICATION: 300 extra copies of books issued 5 or more times last year.
600 extra copies of books issued 4 or more times last year.

Referring to table G.1., the Game Editor can write the duplication policies for library number 3 in machine-readable form as:

300 600 0 0 0 0

Exactly the same duplication policies would be implied by the following statement (year 1):

LIBRARY NUMBER: 2

DUPLICATION: 1 extra copy of every title issued 4 or more times last year.

What would the Game Editor write down if in place of "4 or more" the "librarian" of Library 2 had written "2 or more"? (The solution will be found in Appendix II).

(b) Duplication policies defined by the proportion of stock

As in the case of loan policies, it is possible for the participant to define his duplication policies in such a way that they do not fall neatly into the six categories used by the Game Editor. The method used by the Game Editor in these circumstances is similar to that used in similar circumstances with loan policies, and an example will serve to illustrate it. The following statement is received:

LIBRARY NUMBER: 6	
DUPLICATION:	3 extra copies of the most popular 1% of titles held.
	2 extra copies of the next most popular 3% of titles held.
	1 extra copy of the next most popular 6% of titles held.

It will be assumed, in this example, that year 1 is being run and that therefore 10,000 titles are held. The problem is shown diagrammatically in Fig. G.5.

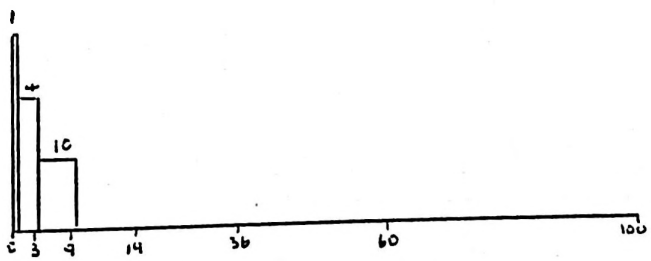

Fig. G.5.

Consider category A (containing the most popular 3% of the titles). The participant has requested 3 extra copies of one third of these, and 2 extra copies of the remainder. Category A contains 0.03 x 10000 = 300 titles. Hence 3 extra copies of the most popular 100 titles, and 2 extra copies of the remaining 200 titles are required. Hence (3 x 100) + (2 x 200) = 700 extra copies must be bought in this category.

Category B contains 600 titles, (6% of the stock). The most popular one sixth (i.e. 1% of the total stock) must be duplicated twice. The remainder (i.e. 5% of the total stock) must be duplicated once only. Hence, the number of duplicates to be bought in this category is: (100 x 2) + (500 x 1) = 700 extra copies. The remaining duplicates will be placed in category C. 1% of the total stock remains to be duplicated, so 100 copies of titles in category C are purchased.

The duplication policies for this library are therefore written as:

700 700 100 0 0 0

(c) Duplication policies defined by the number of titles

This method of defining duplication policies is of course a variation of the method outlined in section (b) above, and a worked example will not be given. However, those interested may like to consider the following problem, the solution to which will be found in the AppendixII.(Assume it is for year 1):

LIBRARY NUMBER: 1	
DUPLICATION:	2 extra copies of the most popular 200 titles.
	1 extra copy of the next most popular 3150 titles.

IV. THE ACQUISITION OF NEW TITLES

The final policy decision which the participant must take is the number of new titles which he wishes to purchase. New titles are distributed throughout the loan categories by the computer program and not by the Game Editor. Hence only one integer is input, representing the total number of new titles which the participant wishes to purchase. For example, the Game Editor receives the following statement:

LIBRARY NUMBER: 8	
PURCHASE OF NEW TITLES:	Purchase 300 new titles

This is transferred directly to the Game Editor's input form as:

300

The Game Editor must of course be aware of the way in which the computer program distributes these titles across the six loan categories, as future policy statements may demand that loan or duplication policies are defined in terms of the number of titles subject to the policy. In fact, the distribution follows the distribution of Fig. G.1, so that 3% of the titles are placed in category A, 6% in category B, and so on.

The new numbers of titles in each category can therefore be found by multiplying the total number of titles held by the proportion of titles in the category, as stated in Fig.G.1. For example, adding 300 titles to the library would result in a library with the characteristics of Fig. G.6.

Category	A	B	C	D	E	F
Number of titles	309	618	1030	1751	2472	4120

Fig. G.6.

V. A COMPLETE WORKED EXAMPLE

This section of this manual contains a complete worked example of a fairly complex set of policies. The calculations will be given in full.

The Game Editor has received the following statement of policies:

Return to Year 0 please

UNIVERSITY OF LANCASTER LIBRARY RESEARCH UNIT

LIBRARY MANAGEMENT GAME

Describe your policies in detail on this form and hand it to the Game Editor. He will translate it into machine readable form and will return your results to you.

LIBRARY NUMBER: 6

LOAN PERIODS The most popular 200 titles to be on 4 hour loan (all users)

The next most popular 600 titles to be on 1 week loan (all users)

The remainder on 10 week loan (all users)

DUPLICATION 1 extra copy of all titles issued 6 or more times last year

PURCHASE OF NEW TITLES 1100 extra titles

The first point to strike the notice of the Game Editor is the request to "return to year 0". The validity of such a request must be checked in order to determine whether or not the participant is allowed to do this in the context of the Game as it is being played. It is assumed in this example that such a request is valid, and the Game Editor can therefore begin to complete his input form:

LIBRARY NUMBER -6

LOAN PERIODS ____ ____ ____ ____ ____ ____

DUPLICATES ____ ____ ____ ____ ____ ____

TITLES ____

This form is not to be used by participants

Next, the Game Editor must consider the loan policies of the library. These are seen to be of the form discussed in section II (c) above. As it is known that the policies are to be implemented in year 1, the number of titles held by the library must be 10,000. The policies can now be restated as shown in Fig. G.7.

Proportion of Stock	Loan Policy
0.02	4 hours
0.06	1 week
0.92	10 weeks

Fig. G.7.

The Game Editor now continues in the normal way. Of the titles in category A, two thirds are to be on 4 hour loan, and the remaining one third on 1 week loan. The average loan period will therefore be:

$$\left(\frac{2}{3} \times 4\right) + \left(\frac{1}{3} \times 168\right) = \frac{8 + 168}{3} = \frac{176}{3} = \underline{59 \text{ hours}}$$

Similarly, five-sixths of the books in category B will be on 1 week loan and the remainder on 10 week loan. The average loan period will therefore be:

$$\left(\frac{5}{6} \times 168\right) + \left(\frac{1}{6} \times 1680\right) = \frac{15 \times 168}{6} = \underline{\underline{420 \text{ hours}}}$$

The remaining books are to be subject to a loan period of 10 weeks, and the Game Editor therefore completes the second part of his input form in the following way:

LIBRARY NUMBER -6

LOAN PERIODS	59	420	1680	1680	1680	1680
DUPLICATES						
TITLES						

This form is not to be used by participants

Duplication policies must be considered next. The participant has stated that he wishes to purchase one extra copy of all titles issued 6 or more times during the previous year. The information contained in Fig.G.1. is insufficient to deal with this request, and Table MRI must be consulted to find the proportion of books in category A which are issued 6 or more times. This proportion is seen to be 0.5. Hence the participant wishes to duplicate half of the titles in category A, and it is known that this category contains 300 titles. Hence 150 duplicates will be purchased, and the Game Editor is able to complete the third part of his input form in the following way:

LIBRARY NUMBER -6

LOAN PERIODS	59	420	1680	1680	1680	1680
DUPLICATES	150	0	0	0	0	0
TITLES						

This form is not to be used by participants.

Finally, it can be seen that the participant wishes to purchase 1100 new titles. This number is therefore transferred directly to the input form, which is then complete. It can be handed to the computer operator for input to the computer.

LIBRARY NUMBER -6

LOAN PERIODS	59	420	1680	1680	1680	1680
DUPLICATES	150	0	0	0	0	0
TITLES	1100					

This form is not to be used by participants

VI. OTHER TASKS OF THE GAME EDITOR

Although the Game Editor's main task is to translate the policies of the Game participants into machine readable form, he must also be ready to ensure that the rules of the Game are enforced. These rules will, of course, depend upon the actual situation in which the Game is being played, but one example, which has already been mentioned, is the ability of the Game Editor to allow or not to allow the individual libraries to "return to year 0". In the short courses run by the Library Research Unit, this facility was permitted only whilst the participants were familiarising themselves with the characteristics of their libraries, and not during the actual play of the Game. Similarly, the Game Editor was required, in these courses, to enforce an "economic squeeze" which limited the book fund at critical times, and thereby reduced the number of books which a library could buy. Many more examples could be cited, but those required in any particular situation will depend on the individuals concerned with the organisation of the courses.

APPENDIX I

This Appendix contains a number of exercises in the form of input to the Game Editor, which should be translated into machine-readable form. The correct solutions will be found in Appendix II.

It should be assumed that the policies are for year 1 and that all requests are valid, except where otherwise stated.

1. Return to Jew C

UNIVERSITY OF LANCASTER LIBRARY RESEARCH UNIT

LIBRARY MANAGEMENT GAME

Describe your policies in detail on this form and hand it to the Game Editor. He will translate it into machine readable form and will return your results to you.

LIBRARY NUMBER: 3

LOAN PERIODS 10 weeks for all books

DUPLICATION None

PURCHASE OF NEW TITLES None

2.

UNIVERSITY OF LANCASTER LIBRARY RESEARCH UNIT

LIBRARY MANAGEMENT GAME

Describe your policies in detail on this form and hand it to the Game Editor. He will translate it into machine readable form and will return your results to you.

LIBRARY NUMBER: 6

LOAN PERIODS 1 week for undergraduates
5 weeks for all other users

DUPLICATION 1 extra copy of every title issued 5 or more times last year

PURCHASE OF NEW TITLES 1000

3. Year 2

UNIVERSITY OF LANCASTER LIBRARY RESEARCH UNIT
LIBRARY MANAGEMENT GAME

Describe your policies in detail on this form and hand it to the Game Editor. He will translate it into machine readable form and will return your results to you.

LIBRARY NUMBER: 6

LOAN PERIODS 4 hours for the most popular 300 titles
1 week for the next most popular 600 titles
10 weeks for the remainder.

DUPLICATION None

PURCHASE OF NEW TITLES None

4.

UNIVERSITY OF LANCASTER LIBRARY RESEARCH UNIT
LIBRARY MANAGEMENT GAME

Describe your policies in detail on this form and hand it to the Game Editor. He will translate it into machine readable form and will return your results to you.

LIBRARY NUMBER: 5

LOAN PERIODS 1 week for the most popular 3% of stock.
6 weeks for the remainder

DUPLICATION None

PURCHASE OF NEW TITLES None

5.

UNIVERSITY OF LANCASTER LIBRARY RESEARCH UNIT
LIBRARY MANAGEMENT GAME

Describe your policies in detail on this form and hand it to the Game Editor. He will translate it into machine readable form and will return your results to you.

LIBRARY NUMBER 10

LOAN PERIODS 10 weeks for all books and all users.

DUPLICATION 2 extra copies of the 3% most popular titles.
1 extra copy of the next 6% most popular titles.

PURCHASE OF NEW TITLES None

6.

UNIVERSITY OF LANCASTER LIBRARY RESEARCH UNIT
LIBRARY MANAGEMENT GAME

Describe your policies in detail on this form and hand it to the Game Editor. He will translate it into machine readable form and will return your results to you.

LIBRARY NUMBER: 4

LOAN PERIODS

Undergraduates:	4 hours for the 300 most popular titles. 1 week for the 2100 next most popular titles 5 weeks for the remainder
Postgraduates:	1 day for the 300 most popular titles. 2 weeks for the 2100 next most popular titles. 10 weeks for the remainder.
Academic Staff:	10 weeks for all books.
Other users	2 weeks for all books, except the most popular 300 titles, which they are not allowed to borrow

DUPLICATION

3 extra copies of books issued 9 or more times.
2 extra copies of books issued 6, 7, or 8 times.
1 extra copy of books issued 5 times

PURCHASE OF NEW TITLES NONE

APPENDIX II

Solutions to exercises in the text

(1) Section II(e) page 11. The loan policies of Library 4 are equivalent to:

100 289 289 616 1680 1680

(2) Section III(a) page 12. The duplication policies of Library 2 are equivalent to:

300 600 1000 1700 0 0

(3) Section III(c) page 14. The duplication policies of Library 1 are equivalent to:

500 600 1000 1450 0 0

Solutions to exercises in Appendix I

(1)

LIBRARY NUMBER	-3					
LOAN PERIODS	1680	1680	1680	1680	1680	1680
DUPLICATES	0	0	0	0	0	0
TITLES	0					

This form is not to be used by participants

(2)

LIBRARY NUMBER	6					
LOAN PERIODS	275	275	275	275	275	275
DUPLICATES	300	0	0	0	0	0
TITLES	1000					

This form is not to be used by participants

(3)

LIBRARY NUMBER 6

LOAN PERIODS	19	374	1680	1680	1680	1680
DUPLICATES	0	0	0	0	0	0

TITLES 0

This form is not to be used by participants

Did you remember that 1000 titles were bought in year 1?

(4)

LIBRARY NUMBER 5

LOAN PERIODS	168	1008	1008	1008	1008	1008
DUPLICATES	0	0	0	0	0	0

TITLES 0

This form is not to be used by participants

(5)

LIBRARY NUMBER 10

LOAN PERIODS	1680	1680	1680	1680	1680	1680
DUPLICATES	600	600	0	0	0	0

TITLES 0

This form is not to be used by participants

(6)

LIBRARY NUMBER 4

LOAN PERIODS	140	302	302	777	975	975
DUPLICATES	470	0	0	0	0	0

TITLES 0

This form is not to be used by participants