U.S. Department of Transportation

Urban Mass Transportation Administration

CIRCULAR

UMTA C 2710.4A

July 22, 1988

Subject: REVENUE BASED SAMPLING PROCEDURES FOR OBTAINING FIXED ROUTE BUS OPERATING DATA REQUIRED UNDER THE SECTION 15 REPORTING SYSTEM

1. PURPOSE. This circular describes a suggested alternative revenue based procedure for use in collecting fixed route operating data required under the Section 15 Uniform System of Accounts and Records and Reporting System. The procedure is suited to any fixed route mode with on-board data collection.

2. CANCELLATION. This circular cancels UMTA Circular 2710.4, "Revenue Based Sampling Procedures for Obtaining Fixed Route Bus Operating Data Required Under the Section 15 Reporting System," dated 5-10-85.

3. REFERENCES.

   a. Urban Mass Transportation Act of 1964, as amended.

   b. Uniform System of Accounts and Records and Reporting System; Clarification of Procedures for Addressing Noncompliance with Reporting Requirements; Final Rule (52 FR 36182) (49 CFR 630), dated 9-25-87.

   c. Urban Mass Transportation Industry Uniform System of Accounts and Records and Reporting System: Volume I - General Description, dated 1-77; Volume II - Uniform System of Accounts and Records, dated 1-77; and Reporting Manual and Sample Forms (All Reporting Levels), dated 2-88.

   d. UMTA Circular 2710.1A, "Sampling Procedures for Obtaining Fixed Route Bus Operating Data Required Under the Section 15 Reporting System," dated 7-18-88.

   e. UMTA Circular 2710.2A, "Sampling Procedures for Obtaining Demand Responsive Bus System Operating Data Required Under the Section 15 Reporting System," dated 7-22-88.

   f. UMTA Circular 9030.1A, "Section 9 Formula Grant Application Instructions," dated 9-18-87.

4. BACKGROUND. UMTA Circular 2710.1A, "Sampling Procedures for obtaining Fixed Route Bus Operating Data Required Under the Section 15 Reporting System," suggests one sampling procedure for obtaining fixed route bus operating data required under the Section 15 Reporting System. Its procedures require sample sizes between 549 and 915 vehicle trips per year.

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The sampling procedures described in this circular require a significantly smaller sample size to obtain estimates of annual passenger trips and passenger miles by mode at the required levels of precision and confidence.

The total required sample size has been reduced to 208 bus trips a year. This represents a reduction of between 62 and 77 percent from the number of trips that need to be sampled using the procedures described in UMTA Circular 2710.1A.

The sampling procedures contained in the circular meet the statistical standards of 95 percent confidence and 10 percent precision for each transit service mode. Transit agencies can use these procedures to estimate bus "service consumed" (passenger miles) to be reported to UMTA for use in allocating Section 9 funds authorized by the Surface Transportation Assistance Act of 1982. (See Section 9(a)(3) of the UMT Act.)

A transit agency may use a technique other than the UMTA recommended techniques as long as it meets the prescribed precision and confidence levels. If a different technique is used, it is recommended that the technique be submitted to UMTA for approval. Implementation of a sampling procedure that has not been confirmed in writing by UMTA as meeting the prescribed statistical requirements may result in adjustments to future Section 9 formula apportionments if the data are found not to be reliable.

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CHAPTER I

INTRODUCTION

1. PURPOSE. This circular suggests an approach for the collection of the following operating data required for the Section 15 Reporting System:

   a. Total annual unlinked passenger trips (passengers).

   b. Total annual passenger miles.

   The "revenue based" sampling approach developed for this circular satisfies the specified confidence and precision levels (95% and ± 10%, respectively).

   Due to the manner in which the estimates of annual unlinked passenger trips and annual passenger miles are estimated, the approach described in this circular is suitable only to fixed route modes with on-board fare collection. This limitation primarily affects rail modes for which fare collection is not on-board.

   Because the sample size required for the sampling procedures described in this circular is much smaller than that required for the procedures described in Circular 2710.1A, use of these revenue-based procedures significantly reduces the burden on transit operators of meeting the Section 15 Data Reporting System requirements. However, for acceptable accuracy of estimates derived from revenue-based procedures to be maintained, it is vital that the revenue collection on individual bus trips be accurately measured. Registering fareboxes offer the easiest way to meet this requirement. One feasible alternative is to empty the farebox at the beginning and end of each sample trip and count the revenue collected on that trip. (This might be done by providing an assigned checker with a portable farebox that is used only to collect the fares on the randomly selected trips.) The procedures and supporting forms contained in this circular require an accurate count of the farebox revenue received on each sampled trip.

   The revenue-based sampling method is offered as one of many possible approaches that meet the statistical precision and confidence standards established for Section 15 reporting.

   It may be used to estimate passenger miles for use in allocating Section 9 funds authorized by the Surface Transportation Act of 1982. No operator is required to follow either the procedures described herein or any other specific set of procedures. An operator may elect to use any other

procedures so long as the ones chosen satisfy the minimum statistical requirements. If a different technique is used, it should be submitted to UMTA for approval. Implementation of a sampling procedure that has not been confirmed in writing by UMTA as meeting the prescribed statistical requirements may result in adjustments to future Section 9 formula apportionments if the data are found not to be reliable.

2. OVERVIEW OF PROCEDURE. The procedure described in this circular enables any transit agency to estimate annual unlinked passenger trips and annual passenger miles based on data from a small sample of randomly selected bus trips. In summary, the method consists of counting boarding and alighting passengers, measuring distances between stops, and counting farebox revenue on four randomly selected bus trips each week throughout the fiscal year. Consequently, 208 bus trips are sampled, enabling estimates to be made of two ratios:

   a. Farebox revenue per unlinked passenger trip
   b. Farebox revenue per passenger mile.

   The sample size is sufficient to meet the 95% confidence and ± 10% precision limits on estimates of total annual passenger miles as required for the Section 15 Reporting System.

   Total annual system-wide passenger trips and passenger miles are estimated by dividing each of these ratios separately into the total annual system (mode) farebox revenues for all routes. For example, total annual unlinked passenger trips are estimated as follows:

$$\text{TOTAL ANNUAL UNLINKED PASSENGER TRIPS} = \frac{\text{System-wide Annual Farebox Revenue}}{\text{Estimated Farebox Revenue Per Unlinked Passenger Trip}}$$

   where the "farebox revenue per unlinked passenger trip" is estimated from the sample of trips.

   Farebox revenue includes all passenger revenue actually collected on board. However, it is important that it include only revenue collected on board. It excludes revenue from sales of passes, tokens, and other prepayment instruments. It also excludes all non-transportation revenue. Finally, it excludes all revenue collected on trips not eligible to be sampled.

   Since all bus trips sampled are randomly selected, all types of services, day of the week, levels of fare, types of fare payment, periods of the day, etc., are represented on the average, in proportion to their occurrence in the pool of total annual trips. Likewise, since all riders are counted on

the selected trips (including cash fares, passholders, elderly, handicapped, and students), the ratios of "farebox revenue per passenger" and "farebox revenue per passenger mile" based on the sampled trips yield total passenger and passenger mile estimates when applied to system-wide farebox revenues for the fiscal year.

The sampling procedure is based on relationships between farebox revenue and unlinked passenger trips and between farebox revenue and passenger miles. Consequently, the procedure requires an unchanged fare structure. If changes are made in fare structure or policy during the course of the fiscal year, passengers and passenger miles must be estimated independently for each separate period of fare structure. This means that the year may have to be divided into two or more periods that are defined by when fare changes are introduced. Revenues collected during each period and cumulative passengers and passenger miles for each period's sampled trips should be kept and tallied separately. Once system-wide passengers and passenger miles are estimated separately for each period, they can be assumed to arrive at estimates of total annual passengers and passenger miles. A change in fare structure would necessitate a slight increase in the total sample size.

CHAPTER II

DEFINITIONS, SAMPLE SIZE AND COMPOSITION

1. DEFINITIONS. The following are definitions of key terms used in this circular:

   a. Bus Trip. A bus trip is defined as a one-way trip by a bus while in revenue service, starting at one end of a route and ending at another end of a route. A round trip, therefore, is counted as two separate bus trips. In the case where a route is a pure loop involving entirely different streets and pickup points, and where there is no logical way to identify route end points, then the traversing of the loop can be regarded as a single bus trip. If a bus is interlined (i.e., if a bus changes routes during revenue service) then the point of interlining (or route change) is considered to represent the end of one one-way trip and the beginning of another.

   b. Farebox Revenue. Farebox revenue is the cash collected in fares on bus trips. Transfers, tokens, passes, and other non-currency forms of payment should not be counted as farebox revenue. It is critical to the method's validity that the counting of cash fares be done in the same way for all sampled trips. In addition, it is imperative that accurate system-wide farebox revenue totals be available for the entire year and any separate sampling periods within the year (as defined below in this chapter).

   c. Weekly Bus Trip Lists. These are lists of weekly trips from which the sample of trips will be drawn. The lists are simply tallies of bus trips scheduled during each week, including trippers. In some cases, a "day-of-week" digit may be included in the numbering scheme of the tally. The lists of each week must include all revenue bus trips, except school bus, charter, and demand response trips.

   d. Sampling Period. If, during the fiscal year, there is a change in fare policy, then annual passengers and passenger miles must be computed separately for the periods before and after the fare change(s). The year is thus divided into sampling periods for which separate tabulations of revenues, passengers and passenger miles from sampled trips are kept, and separate ratios of "revenue per unlinked passenger trip" and "revenue per passenger mile" are calculated. If there are no fare changes during a fiscal year, then the year is considered to be a single sampling period.

e. Time Period. Each weekday is divided into time periods as defined in Appendix A. The periods include: A.M. Peak, Midday, P.M. Peak, and Night. Saturdays, Sundays, and Holidays do not have designated time periods. The time at which a sampled trip begins determines the time period in which it is classified.

f. Random Sample. For a sample to be random, each element in the population of all elements must have a known chance of appearing in the sample. The odds of drawing each element must either be the same, or, in the cases where the odds differ, elements must be grouped so that those within each group have an equal chance of being drawn.

2. SAMPLE SIZE AND COMPOSITION. Table II-1 outlines the annual sample from which estimates of "farebox revenue per passenger trip" and "farebox revenue per passenger mile" are to be made. The sample of trips is obtained by randomly selecting four trips from each week's trip list. (For twelve weeks following a fare change, the weekly sample is increased from four to five trips.) Over a full year, the number of trips on which revenue and ridership data are collected is 208.

Different weekly trip lists should be developed corresponding to changes in the scheduled services made during the course of the year. Typically, a separate weekly trip list would be required for each timetable. Each week's four-trip sample should be separately selected at a time close to the sample week, but still allowing adequate lead time for scheduling of survey/data collection personnel and any supporting equipment.

There is, however, one exception to this general sample size rule of four bus trips per week. Transit agencies introducing a fare policy change should increase the weekly sample size to five bus trips for twelve weeks following the change in fare policy. The purpose of this sample size increase is to compensate statistically for the greater variability and instability in riding habits that typically follow fare changes. If the designated twelve-week period extends into a new fiscal year, five trips a week should be sampled in the final weeks of the ending fiscal year, and five per week should be sampled in the initial weeks of the beginning fiscal year so that a total of twelve consecutive weeks are sampled at a rate of five trips a week. Thereafter, the sampling reverts to a rate of four trips per week.

Table II-1

SAMPLE CHARACTERISTICS

Number of Weeks per Year	X	Number of Sampled Trips per Week*	=	Number of Sampled Trips per Year
(52)	X	(4)	=	(208)

*As noted above, the sample size should be increased to 5 trips per week for 12 weeks after a fare policy change is implemented.

CHAPTER III

SELECTION OF THE SAMPLE

1. OUTLINE OF THE APPROACH. Success of the procedure described in this circular requires that the four (or five) weekly bus trips are selected randomly from all trips operated during the respective week. This chapter provides two approaches to randomly selecting bus trips.

   For each of these approaches, the first step is to identify the population of weekly trips from which the sampled trips will be chosen and to assign a serial number to each trip. This step is referred to as the construction of a weekly bus trip list. The second step is to randomly choose the serial numbers of the trips to be surveyed. The third step is to determine which trips correspond to the selected serial numbers. To allow subsequent determination of which trips have been chosen by the random sampling process, the list must be constructed in a way which allows unique identification of each trip operated during the week.

   In addition to the two random selection approaches explained in this circular, there are many other methods that are both feasible and valid. It is essential only that the list be developed in a way that each and every trip operated during a week is included and that each trip has the same chance of being selected.

   Each of the methods described has both advantages and disadvantages relating to its ease of use. Preference of one method over another will vary among transit agencies, depending on such factors as uniformity of schedules across days of the week, the total number of daily bus trips, the number of routes in the system, and the frequency of changes in fare policy or in the number of scheduled trips.

   In general, the following two-step sequence assures that the four trips in each week's sample are selected randomly:

   a. Construct a list of all scheduled one-way revenue bus trips, including trippers, for the week to be sampled, including trips made on all weekdays, weekend days and holidays, and assign a unique number to each trip on the list. Charter, school bus (bus used exclusively for carrying school children), and demand response (dial-a-ride) operations should be excluded.

b. Randomly select the trips for which data are to be collected.

The remainder of this chapter describes in detail both of these steps for the two techniques. Copies of the worksheets to aid in constructing weekly bus trip lists for each method are provided in Appendix B.

The same weekly list is used week after week as long as the schedule is unchanged. A separate selection of trips is made for each week. The listing and selection process for the trips of a given week need to be accomplished only far enough in advance to allow scheduling of surveyors. It is possible to do the selection on a weekly basis, each week only drawing the four trips necessary for the following week. Alternatively, it is also possible to do a full year's worth of selections all at one time. In general, the selection should be done far enough ahead to schedule surveyors, but not so far ahead that the week's final schedule of trips has not been determined. Thus, for example, if schedules are adjusted quarterly, not more than one quarter's worth of selection would be accomplished at one time.

2. LISTING OF WEEKLY TRIPS. The two methods explained below can be described as follows:

a. Method 1. Continuous numbering across all days of the week.

b. Method 2. Separate numbering according to day of the week.

While the two methods have much in common, each is relatively better suited to some situations than to others. Before presenting the methods themselves, some of their differences will be considered.

The first of these methods has the advantage that a single range of valid identification numbers is developed. This means that when using a random number table to select trips from the list, any number within the single range is known to correspond to an actual bus trip. The disadvantage is that even a minor schedule adjustment can require changes to the entire list. The approach is probably more attractive to agencies with stable schedules.

The second method sets a separate range of valid identification numbers for each day of the week. It thus leaves gaps of invalid numbers between the valid range for one day and the valid range for the following day. This makes it somewhat more complicated to know whether a number from a random number table corresponds to an actual bus trip or to one of the gaps

between the valid ranges for individual days. On the other hand, a minor schedule adjustment affects the identification number of trips only on the days for which schedule has been changed. To an agency making frequent, minor schedule changes, this method might be more attractive than the first.

3. METHOD 1: CONTINUOUS NUMBERING WEEKLY TRIP LIST. Assume for the purpose of illustration that a transit system has three routes and that the same bus schedules are followed on Monday through Friday, with fewer trips on Saturday and Sunday. Using bus schedules, timetables, or daily driver run sheets, the operator can then select any day (say, Monday) and number one-way bus trips to be made on that day, beginning with one route and proceeding to the next route until all scheduled trips for the day on all routes have been numbered consecutively (no numbers skipped). The numbering would then be picked up, in sequence, for the following days until all trips scheduled over the seven days of the week have been numbered and recorded. A simplified example of a listing of trips using this method is shown in Table III-1. An important point to remember is that every revenue trip is considered to be a scheduled one-way trip, and that all trips should be included except those that are specifically excluded (e.g., school bus).

It is not necessary to write down each trip number to derive the trip number range for each day. Rather, the trips for any given day can simply be counted on the schedules in some logical, reproducible sequence. The number ranges for the days enable the user to determine on which day a randomly selected numbered trip, generated by the procedure described subsequently, will fall.

Following the sample in Table III-1, selection of random four-digit number, 2047, indicates that a bus trip would be sampled on Friday of the week in question, a day that has a bus trip number range of 1661-2075. Further, it can be determined from the data that the trip to be sampled will be on Route 3, if, as is shown, the numbering of daily trips is done so that each route's bus trips have identifiable Trip Serial Number ranges. Then, the trips can be counted, in order, from the beginning of the appropriate route's printed schedule for the appropriate day until the randomly selected trip number is reached. Once the selected trip is determined by counting through the schedule, its time, location of departure, and direction can be determined.

Any schedule change that alters the number of trips on any given day means that the weekly trip list must be changed accordingly, and new ranges of numbers by day or route must be established. Consequently, the continuous numbering approach for trip lists may not be as practical as some other

Table III-1

EXAMPLE OF CONTINUOUS NUMBERING METHOD FOR WEEKLY ONE-WAY TRIPS

Day of Week	Trip Serial Numbers by Route Number			Trip Serial Number Range
	1	2	3	
Monday	0001-0124	0125-0304	0305-0415	0001-0415
Tuesday	0416-0539	0540-0719	0720-0830	0416-0830
Wednesday	0831-0954	0955-1134	1135-1245	0831-1245
Thursday	1245-1369	1370-1549	1550-1660	1246-1660
Friday	1661-1781	1785-1964	1965-2075	1661-2075
Saturday	2076-2136	2137-2171	2172-2212	2076-2212
Sunday	2213-2233	2234-2249	2250-2261	2213-2261
Total Range of Weekly Trips				0001-2261 (Valid Number Range).

approaches for large transit agencies with frequent schedule changes since re-numbering of trips would be an often repeated process. An example worksheet for listing weekly trips by day of the week and by route is given in Appendix B. Note that each Trip Serial Number must have the same number of digits, that number being the number of digits in the total number of trips counted a week. Thus, for example, a trip occurring 215th in a list of 2261 weekly trips would be designated by the four-digit number "0215".

4. METHOD 2: NUMBERING TRIPS BY DAY OF THE WEEK. An alternative method to developing a weekly one-way bus trip list of sample selection is to code trips according to the day of the week on which they are scheduled. This coding consists of a day-of-the-week digit (ranging from 1 to 7) at the beginning of the trip numbers for each day, followed by the number of a trip for that day's schedules for all routes.

Table III-2 contains a listing of weekly trips for a three-route system using this numbering method. According to the table, Route 2 accounts for trips 116 through 290 on Monday through Friday. So, when a four-digit random number 2277 is selected, it tells the user that the sample trip is to be the 277th trip on Tuesday (the 2nd day of the week, based on the first digit). Further, it is known that "277" falls in the range of valid numbered trips for Route 2.

Using this method of deriving a weekly trip list, changes in schedules for particular days can be accommodated without the necessity of changing all subsequent trip numbers on other days of the week. In addition, the first digit of the selected random number immediately indicates the day of the week on which the trip would be sampled. However, all randomly selected trip serial numbers from the Table of Random Numbers beginning with the numbers 0, 8, or 9 are invalid because there are no days of the week with which they are associated. Four-digit numbers beginning with 0, 8, and 9 are thus disregarded.

5. SELECTING THE SAMPLE. The sample of four trips for a given week is selected from the weekly list of one-way bus trips using a random selection process. The concept of random numbers is very important to the statistical theory on which confidence and precision standards are based. Replacement of a proper random selection process by an informal arbitrary process or by a formal attempt to achieve a representative sample will invalidate the results and thus prevent the data from meeting the statistical standards.

Table III-2

EXAMPLE OF DAY-OF-WEEK NUMBERING METHOD FOR WEEKLY ONE-DAY TRIPS

Day of Week	Trip Serial Numbers by Route Number			Number of Scheduled One-Way Trips	Trip Serial Number Range
	1	2	3		
Monday	001-115	116-290	291-415	415	1001-1415
Tuesday	001-115	116-290	291-415	415	2001-2415
Wednesday	001-115	116-290	291-415	415	3001-3415
Thursday	001-115	116-290	291-415	415	4001-4415
Friday	001-115	116-290	291-415	415	5001-5415
Saturday	001-085	086-154	155-250	250	6001-6250
Sunday	001-080	081-141	142-208	208	7001-7208
Total Range of Weekly Trips					1001-7208 (Valid Number Range)

Random numbers tables are developed through use of specialized computer programs which guarantee that the sequence with which individual digits appear is random. This ensures that blocks of sequential 2, 3, 4, or more digit numbers are also random. In reading the table, leading blanks in the four digit groupings of the table should be read as zeros. Thus a number appearing as (56) should be read as (0056).

The first step in using a random numbers table is to decide on the appropriate number of digits in the random numbers drawn. To illustrate, the third line of Table III-3 can be used to generate a series of two-digit random numbers. In order to make the most of the table, it is best to read numbers in an overlapping fashion. To do this for two-digit numbers, a two-digit long "window" is moved along the line in one-digit steps. The resulting series of two-digit numbers on line three is:

33 34 40 06 63 38 81 15 52 29 93 33 34 42 23 31.

Similarly, the set of three-digit numbers from the same line is:

834 340 406 063 638 381 815 152 529 293 933 334 342.

The same process can be used to produce a series of numbers with any required number of digits.

The technique for selecting four "valid" random numbers (i.e., numbers of trips appearing in the ranges established by the weekly trip list) is virtually the same for both of the trip listing methods described above. However, because the trip numbering methods differ for the two lists, the valid numbers selected from the random numbers tables will also be different.

The number of digits in the trip numbers to be randomly selected will vary among transit agencies. If trips are listed continuously across all days of the week (Method 1), then the number of digits in the random number may range up to five (or even six) digits (e.g., if there are a total of 80,000 (or 100,000) weekly one-way bus trips).

The number of random number digits needed if trips are listed by day (Method 2) will be governed by the maximum number of one-way trips on any day of the week. Thus, if a system operates a maximum of 5,600 daily one-way trips on five days (Monday through Friday), then the number of digits in all random numbers will be five, since an extra "day of the week" digit is added at the beginning of a four-digit trip number.

c. METHOD 1: SELECTING THE SAMPLE FROM CONTINUOUS NUMBERED WEEKLY TRIPS. Using the data presented in Table III-1 for continuous numbering of a 3-route system, the procedure for selecting the sample of four trips from the weekly list of Trip Serial Numbers is as follows:

a. Choose any line of digits in the random number table (Table III-3); line 1, for example.

b. Since the Trip Serial Numbers in the listing of weekly trips (Table III-1) contain four digits, only use sets of four consecutive digits in the random numbers table. (If serial numbers from the trip list had five digits, then sets of five consecutive digits would be selected from Table III-3).

Table III-3

EXAMPLE RANDOM NUMBERS TABLE

3554	4224	3880	8191	7393	9150	6665	1894	2309	5730
9567	2421	5037	9828	2348	7773	9018	5836	2898	3081
8340	6381	5293	3423	1843	2848	8400	2794	7928	9437
6149	5561	1879	9745	469	1045	8725	1111	2984	2056
5960	8196	2942	4521	1658	2548	4026	1544	4773	9130
1977	1512	5685	9033	8195	6118	6283	9884	1748	383
124	1657	3451	3076	4480	7893	6947	2099	7302	552
2955	5730	3423	969	4106	6817	5513	4687	9047	3281
6614	4108	5726	4546	2288	9223	5033	9751	1669	2894
7222	9855	7982	3433	4782	1986	310	1444	6677	660

c. Read along line 1, from left to right, in "overlapping" sets of four digits until four valid four-digit numbers have been obtained; i.e., each of the four numbers should be within their range of numbers in the list of weekly trips shown in Table III-1. (Each four-digit number overlaps the preceding one, in that the second digit in the initial four-digit number set becomes the first digit in the second four-digit number set, and so forth.)

d. Reading from Table III-3 (the random numbers table), the first set of four digits is 3554. The second set is 5544 (the first number, 3, is dropped and the number 4 in the next "unused" column is added). Continuing along line 1 the series becomes:

3554 5544 5442 4422 4224 2243 2433 . . .

Referring to the Trip Serial Number listing in Table III-1, the first valid random number (i.e., a number lying in the range of 001-2261) is 2243. The next three valid numbers encountered, in order, are:

(1) 0819
(2) 1917
(3) 1739.

Each of these four-digit numbers is circled in line 1 of Table III-3.

NOTE: Leading zeros in the fields of a random number table are often left as blanks. These blanks should be read as zeros.

e. The four trips to be surveyed during the week in the example occur on the following days and routes:

(1) 2243 : Sunday, Route 2
(2) 0819 : Tuesday, Route 3
(3) 1917 : Friday, Route 2
(4) 1739 : Friday, Route 1

By numbering trips in a sequence of days and route numbers, the burden of having to count to determine the specific trip to be surveyed is reduced.

f. Keep track of the lines and the columns that are used and the first digit of the last valid number identified for the week's sample just selected. For the next week's four-trip sample, begin listing four-digit numbers as described above, but this time, beginning with the next four-digit number following ("overlapping") the four-digit number of the last trip selected for the previous week. Thus, the next week's sample would be drawn from a series of numbers that begins with the following:

7393 3939 9391 3915 9150 1506 5066 . . .

When all of the random number pages in Appendix G have been used, reverse the process starting from the right side of the lines, or use some other technique (e.g., going from the top down by column) that does not retrace the set of numbers previously selected. Under no circumstances should the trip numbers selected for one week, or year, be automatically transferred to the next. If necessary, additional random number tables should be procured to ensure no duplication among weeks and among years.

7. ADDITIONAL COMMENTS.

a. The Daily List.

(1) Normally, a new summary table of Trip Serial Numbers will not have to be developed every week. As long as the schedules remain the same, the scheduled Trip Serial Numbers will remain the same.

(2) In general, any process that assigns a unique number to a bus trip is acceptable. If the serial numbers have a large number of digits, it becomes more difficult to find them in the table of random numbers.

b. Sample Selection Process.

(1) A sample selection process that appears to provide "more representative" trips must not be substituted. Doing so may inadvertently introduce biases that cannot be evaluated by standard statistical methods. If another trip selection process is used, be sure that it can be demonstrated to be a random process and that it yields estimates within the prescribed limits specified in Chapter I of this circular.

(2) The random selection process automatically distributes trips according to time period, so that there is adequate representation in peak periods. This is another reason for strict adherence to the random sampling process.

(3) If for some reason a trip selected for the sample is eliminated from the schedule or terminated due to breakdown, an additional trip should be sampled during the next week. (Sometimes the scheduling of surveyors may require a lapse of two or three weeks before the missed trip can be replaced.)

(4) For surveyor scheduling purposes, the samples may need to be chosen well in advance of the days on which the surveys are to be taken. This is acceptable if the scheduled daily trips are reasonably constant. If major scheduling changes occur, however, the sample should be redrawn.

(5) When constructing the week's trip list, replace "normal" day's trips with the holiday trip schedule when appropriate. For example, if Christmas were to fall on a Sunday, and workers have Monday off, then two consecutive weeks' samples should have revised (holiday) schedules on one of their days:

In one week, the Sunday (day 7) would run on a holiday trip schedule; and in the new week, Monday (day 1) would have a holiday schedule.

(6) Sampling theory assures that the sampling procedures apply to any size agency.

(7) The random selection of the trips assures equal likelihood of inclusion of any trip operating on the same route (e.g., zonal, express or short-turns).

8. METHOD 2: SELECTING THE SAMPLE FROM WEEKLY TRIPS NUMBERED BY DAY. The same procedures and guidelines set forth for sample selecting using continuous numbering of weekly trips apply to weekly trips lists derived based on days of the week. For example, using another random number listing (Table III-4) and the trip list in Table III-2 to demonstrate, we begin on line 1, listing four-digit numbers in sequence.

2078 0784 7845 8459 4596 5964 . . .

Only those four-digit numbers are valid whose remaining three digits are less than or equal to the maximum numbers of trips on the day indicated by the first digit. Thus, the first number derived from line 1 in Table III-4, 2078, is valid since it lies in the valid range of numbers (2001-2415) for Tuesday, as indicated in Table III-2. The next three valid numbers on line 1 of Table III-4 are:

a. 4008
b. 5161
c. 6114

The four valid numbers are circled on Table III-4.

According to the trip list in Table III-2, the four trips to be surveyed are:

a. 2078 Tuesday, Route 1
b. 4003 Thursday, Route 1
c. 5161 Friday, Route 2
d. 6114 Saturday, Route 1.

To determine which trips (i.e., routes, times of departure and directions) are to be surveyed each week, the trips from the schedules have to be counted in the same order as when the original ranges of trip serial numbers were established for the weekly trips lists. As the randomly selected trip numbers are each reached on the schedules for the appropriate routes and days, they are noted and scheduled for survey. Thus, using the above example, the 78th trip on Route 1 on Tuesday would be sampled; the 3th trip on Route 1 on Thursday would be sampled; the 161st trip on Route 2 on Friday would be sampled; and the 114th trip on Route 1 on Saturday would be sampled.

Table III-4

EXAMPLE RANDOM NUMBERS TABLES

2078	4596	4008	5161	1403	6012	5024	4936	3762	4204
1078	251	3561	9329	4264	9334	7335	8494	1545	3095
7090	4795	6197	2081	5987	5831	1112	349	5677	8033
7709	5727	4544	2241	8361	8120	797	4962	9690	2839
6165	263	9493	8399	6535	5366	292	8755	242	3540
9343	4973	3014	5306	7715	1977	6905	9629	3654	5722
6190	8562	853	4487	2529	3097	2734	9902	676	9189
4996	217	7264	7198	373	3788	8477	226	323	7573
7543	7096	9902	1562	8051	1450	3230	6029	9542	4677
3212	3193	8666	8710	455	6785	6450	4879	7533	3341

CHAPTER IV

COLLECTING THE DATA

1. DATA ITEMS TO BE COLLECTED. The data collected from sampled trips are sufficient to enable a transit agency to derive annual estimates of the following required Section 15 report items:

   a. Unlinked Passenger Trips
   b. Passenger Miles
   c. Passengers Boarded
   d. Trips in Sample
   e. Total Number of Bus Trips
   f. Unlinked Passengers per Trip
   g. Passenger Miles per Trip.

2. GENERAL PROCEDURE. The procedure for collecting unlinked passenger trip and passenger mile data requires that surveyors ride the buses on the four trips selected in the weekly sample, and that they record the number of passengers that board and alight the bus at each bus stop. Note that in the survey process, the passengers are not contacted in any way. The surveyor is positioned on the bus so that all boarding and alighting passengers can be observed and accurately counted. During peak hours and on crowded runs, two surveyors may be needed. Distances between consecutive stops are determined either directly from the bus odometer readings, by retracing the trip by automobile and recording the odometer readings, or by any other means that gives accurate measurements. To ensure that the total passenger mile estimate is valid, it is absolutely necessary that the distance between stops be accurately known. The sampling of on-off counts, farebox revenue and distances between stops provides the survey information needed to estimate annual passenger trips and passenger miles for the whole system.

3. THE SURVEY TRIP SHEET. A form, the "Survey Trip Sheet," that may be used to collect the data is contained in Appendix C. It is suggested that this form be studied carefully before reading the following instructions. A completed example Survey Trip Sheet is also provided in Appendix C to demonstrate the steps described below.

4. PRE-SURVEY PROCEDURES. A separate Survey Trip Sheet should be used for each bus trip sampled. If the trip involves more stops than can be recorded on a single page, additional pages should be used, and the

page numbers should be written in the upper right-hand corner (Page _ of _). Each surveyor should carry several extra sheets in the event that additional pages are required. Before the survey trip begins, the surveyor should fill in the following items on the Survey Trip Sheet:

a. Date - The date the survey is taken.

b. Day of Week - The day of the week that the survey is taken. If the day is a holiday, place a check (X) in the "holiday" blank, in addition to noting the day of the week.

c. Trip Serial Number - The number given to each trip on the weekly trip list (see Chapter III).

d. Direction of Travel - Inbound, outbound, westbound, or other such designation.

e. Time Period - The period during which the sampled trip begins:

(1) A.M. Peak
(2) Midday
(3) P.M. Peak
(4) Night
(5) Saturday
(6) Sunday

f. Route Number - The officially designated route number.

g. Farebox Reading - The reading on the farebox before the first passenger boards at the start of the trip. (This is written down only if registering fareboxes are used.)

h. Number of Passengers - The number of passengers who boarded the vehicle at the originating stop should be recorded in column (11). Include any passengers who might have stayed on board from the previous trip.

i. At subsequent points where the bus stops to let passengers on or off during the trip, record the following information:

(1) The stop number in column (8).

(2) The stop name or description in column (9).

(3) The odometer reading in column (10). If the bus has no odometer, or if the driver is too busy to call out the readings, then column (10) should be left blank and filled in later based on a field check or a review of detailed schedule sheets.

(4) The number of passengers boarded in column (11).

(5) The number of passengers alighting in column (12).

j. Between stops, count the number of passengers onboard and enter it in column (13). This recording should agree with the following calculation:

(1) passengers on-board between previous two stops

(2) plus passengers who boarded at last stop

(3) minus passengers who alighted at last stop.

For example, in the Survey Trip Sheet in Appendix C, there were 25 passengers on-board between stops #3 and #4. At stop #4, 14 boarded and 2 alighted; therefore, the number on-board between stops #4 and #5 should be:

$$25 + 14 - 2 = 37$$

This number should check with an actual head count after stop #4. It is important to check the number on board whenever possible, because this is the key number in estimating passenger miles.

k. At the last stop, indicate on the worksheet that this is where the survey trip ended (as shown in the Survey Trip Sheet example) and record the ending farebox reading (if a registering farebox is used) in item (16). Record the total revenue collected on the trip in item (17). This amount is calculated by subtracting the beginning farebox reading from the ending farebox reading if a recording farebox is used on the trip. Otherwise, another method must be used to determine the revenues collected on the trip (e.g., issuing the checker's portable substitute farebox that would be emptied and counted after each sampled trip).

5. POST-SURVEY PROCEDURES. The remaining columns and totals should be completed back at the office.

   a. If two surveyors are used, combine the results of the two Survey Trip Sheets into a single one. Usually, the only additional data that the rear-door surveyor will have is the rear-door alighting count, column (12). However, that surveyor should also be recording items (8), (9), and (13) so that these can be checked with the front-door surveyor.

   b. Determine the distance between stops, column (14), from the bus odometer readings. If the bus odometer readings cannot be obtained, determine the distance from system records, a map, or by retracing the route by automobile, or by a combination of all three. Map distances alone may not be accurate if the route involves a large proportion of curved streets typical of some suburban areas.

   c. For each between-stop distance, multiply the number of passengers on board, column (13), by the distance between stops, column (14), to get the passenger miles between two stops. Record the results in column (15) for each between-stop distance.

   d. Add the columns specified by the numbers in parentheses at the bottom of the trip sheet.

      (18) = column (11) sum = total passengers boarded.

      (19) = column (15) sum = total passenger miles for the trip.

      Items (18) and (19) are next recorded on the Weekly Record Sheet, as described in Chapter 6 and shown in Appendix D.

   e. If a selected trip is not operated or if an assigned surveyor misses a trip which does operate, a replacement trip should be added to the following week's four scheduled trips. The replacement must be randomly selected.

CHAPTER V

RECORDING AND ACCUMULATING SURVEY RESULTS

1. THE PURPOSE OF WEEKLY ACCUMULATION. The following procedures may be used to record and accumulate the survey results on a weekly basis. The procedures are designed so that, at the end of each year, the annual Section 15 passenger trips and passenger miles data can be prepared directly from the final (52nd) Weekly Record Sheet.

2. THE WEEKLY RECORD SHEET. The form for recording the survey results from a weekly sample of trips is called the "Weekly Record Sheet." A blank form and a partially completed form are provided in Appendix D.

3. RECORDING THE SURVEY RESULTS. The following discussion references the completed Survey Trip Sheet and Weekly Record Sheet in Appendix C and Appendix D, respectively.

   The Weekly Record Sheet records the totals on the Survey Trip Sheets--i.e., items (18) and (19)--for each of the four sampled weekly trips. On the Weekly Record Sheet shown, note that the circled number 49 under column (5) "Passengers Boarded" corresponds to 49 passengers boarded--item (18)--on the Survey Trip Sheet. Similarly, the circled number 304.4 under column (6) "Passenger Miles" on the Weekly Record Sheet corresponds to the total passenger miles--item (19)--on the Survey Trip Sheet, and so on. Note that the day Trip Serial Number for each of the sample trips are recorded. In addition, the Serial Number may indicate the day of week on which the sample was taken. Direction of travel may also be indicated if the trip numbering method is designed to do so by the operator (e.g., odd numbers inbound, even westbound).

   A notation for "Holiday" is recorded (checked) only for a trip sampled on a holiday. This item is not required, but it may be useful for internal agency purposes.

   The procedure requires the recording of the revenue, boarding and passenger mile totals from each of the four Survey Trip Sheets for a week on the Weekly Record Sheet. Data for the example Trip Sheet in Appendix C appear in the first row of the example Weekly Record Sheet. (A fifth line is provided in the Weekly Record Sheet for weeks when an additional sample trip is required because of a change in fare structure, policy, and/or missed runs.)

The other data in the example Weekly Record Sheet represent three other hypothetical surveys taken during one week. Note that one trip sampled in the example is shown to be on a holiday, but its data are treated just like data from all other sampled trips.

4. ACCUMULATING THE RESULTS. A week's sampling should be totaled and averaged on the Weekly Record Sheet. (Note that "totals" are appropriate for "passengers boarded," "passenger miles," "revenue collected," and "number of trips sampled," while "averages" are appropriate for "revenues per passenger" and "revenues per passenger mile.")

The process of weekly accumulation can save time at the end of the year when the UMTA Section 15 report is due. Keep a running total of the results. The estimates of annual passenger trips (boarding) and passenger miles are derived from UMTA Annual Reporting requirements from the last three columns on the final Weekly Record Sheet for the fiscal year. The steps in the derivations are given in the following chapter of this circular.

Finally, it is noted that data are accumulated from one week to the next only up to the point of a change in fare policy. The cumulative process should be started anew at the time that any fare change is introduced. In that way, passengers and passenger miles are calculated separately for each so-defined period during the year and then summed for all periods to arrive at annual totals and cumulative averages at the end of the fiscal year.

CHAPTER VI

COMPUTING ANNUAL PASSENGER TRIPS, PASSENGER MILES

1. USING WEEKLY RECORD SHEETS TO PRODUCE ANNUAL ESTIMATES. Cumulative information from the Weekly Record Sheets is used to estimate the number of passengers boarded and passenger miles for the year. If the fiscal year has more than one sampling period (i.e., if there is a fare change), then the estimates of total passenger trips and passenger miles must be done separately by sampling periods and then added to arrive at fiscal year totals.

2. ESTIMATING ANNUAL UNLINKED PASSENGER TRIPS. Passenger trips for each fiscal year are estimated by dividing the "total annual system-wide farebox revenues" derived from all trips eligible to be sampled (including trips actually sampled) by the final cumulative average "revenue per passenger" derived from the last Weekly Record Sheet of the fiscal year:

$$\text{ESTIMATED UNLINKED PASSENGER TRIPS} = \frac{\text{Total Annual System Farebox Revenue}}{\text{Cumulative Average Farebox Revenue Per Unlinked Passenger Trip}}$$

It should be emphasized that passenger revenue collected through passes, tokens, or other payment mechanisms for which there is no on-board fare collection are to be excluded from the annual total of system-wide farebox revenue. Revenue collected aboard trips which are not eligible to be sampled must likewise be excluded.

Note that the form shown in Figure VI-1 and Appendix E is designed to accommodate five separate sampling periods plus the annual totals and averages. Each of the data items appearing on the form should be filled out for all sampling periods as might exist in any given year (as determined by the occurrence of fare changes). Any extra periods on the form should be crossed out (X), and the spaces for data below them not used. If the number of periods in the year exceeds five, then additional forms should be added as required and numbered accordingly.

3. ESTIMATING ANNUAL PASSENGER MILES. An estimate of passenger miles for the fiscal year is obtained by dividing the total annual system farebox revenue by the final cumulative average "revenue per passenger mile" derived from the last Weekly Record Sheet of the fiscal year:

$$\text{ESTIMATED UNLINKED PASSENGER MILES} = \frac{\text{Total Annual System Farebox Revenue}}{\text{Cumulative Average Farebox Revenue Per Passenger Mile}}$$

If separate sampling periods are necessary, passenger miles should be calculated in the same way as was described above for passenger trips, i.e., by summing individual estimates across periods for the fiscal year.

4. ALLOCATION OF ANNUAL TOTALS TO TIME PERIODS. Once these annual totals for passenger trips and passenger miles are calculated, the allocation of each among time periods and/or days (according to the definitions of time periods in Appendix A and the UMTA Section 15 reporting forms 406 and 406A) can be done.

The allocation approach is to assign the year's total unlinked trips and passenger miles to the six time periods according to the proportions of sampled unlinked trips and passenger miles in each of the time periods. To distribute passenger boardings by time period (Y), for example, the following procedure is used:

$$\text{NUMBER OF PASSENGER TRIPS IN TIME PERIOD "Y"} = \text{Estimated Total Annual Passenger Trips} \times \frac{\text{Annual Sampled Boardings in Time Period "Y"}}{\text{Total Annual Sampled Boardings}}$$

Where "Estimated Total Annual Passenger Trips" is derived from the procedure described above, and the "Annual Sampled Boardings" and "Annual Sampled Boardings by Time Period 'Y'" can be determined from the Weekly Record Sheets.

Similarly, for estimating passenger miles by time period, the following relationship is used:

$$\text{NUMBER OF PASSENGER MILES IN TIME PERIOD "Y"} = \text{Estimated Total Annual Passenger Miles} \times \frac{\text{Annual Sampled Passenger Miles in Time Period "Y"}}{\text{Total Annual Sampled Passenger Miles}}$$

Note that passenger mile data are not required for Section 15 reporting by average weekday time periods but by average weekday, Saturday, and Sunday totals only.

APPENDIX A
DETERMINATION OF TIME PERIODS

A form for indicating your service periods appears on the next page. The following definitions apply to that form.

SERVICE TIMES

Time A.M. Service Begins - The earliest time in the morning when a bus begins its first trip after the break between night service and morning service. For 24-hour service, assume that service begins at 2400.

Time A.M. Peak Begins - The time in the morning when additional service is provided to handle higher passenger volumes.

Time Midday Begins - The time in the morning when normal scheduled (base) headways are resumed.

Time P.M. Peak Begins - The time in the afternoon or evening when service is again increased to handle higher passenger volumes.

Time Night Service Begins - The time in the evening when the P.M. peak ends and normal scheduled night headways are begun.

Time Night Service Ends - The time that the last bus ends its last trip. This may be in the early morning (e.g., 2:00 A.M.). For 24-hour service, assume that night service ends at 2400.

SERVICE PERIODS

A.M. Peak - The period between the time when A.M. Peak service begins and the time when Midday service begins.

Midday - The period between the time when Midday service begins and P.M. Peak service begins.

P.M. Peak - The period between the time when P.M. Peak service begins and Night service begins.

Night - The period between the time Night service begins and A.M. Peak service begins. Note that this includes part of the early morning service just before the A.M. peak.

CLASSIFICATION OF BUS TRIPS

A bus trip is classified into one of the four time periods listed above according to the time when the trip begins. All trips are classified into the time period when the trips begin even though they may be regarded as being in the "base schedule."

Form 401

TRANSIT SYSTEM SERVICE PERIOD SCHEDULE

Transit ID ☐☐☐☐ Level ☐

Fiscal Year End ☐☐ ☐☐ ☐☐ Mode ☐
Month Day Year

a Line No.	ITEM	b WEEKDAY	c SATURDAY	d SUNDAY
	LIMITS OF SERVICE PERIOD:			
01	Time Morning service begins			
02	Time AM *PEAK* service begins			
03	Time Midday service begins			
04	Time PM *PEAK* service begins			
05	Time Night service begins			
06	Time Night service ends			
	TOTAL HOURS			
07	Morning period			
08	AM Peak period			
09	Midday period			
10	PM Peak period			
11	Night period			
12	ENTIRE DAY -- TOTAL HOURS			

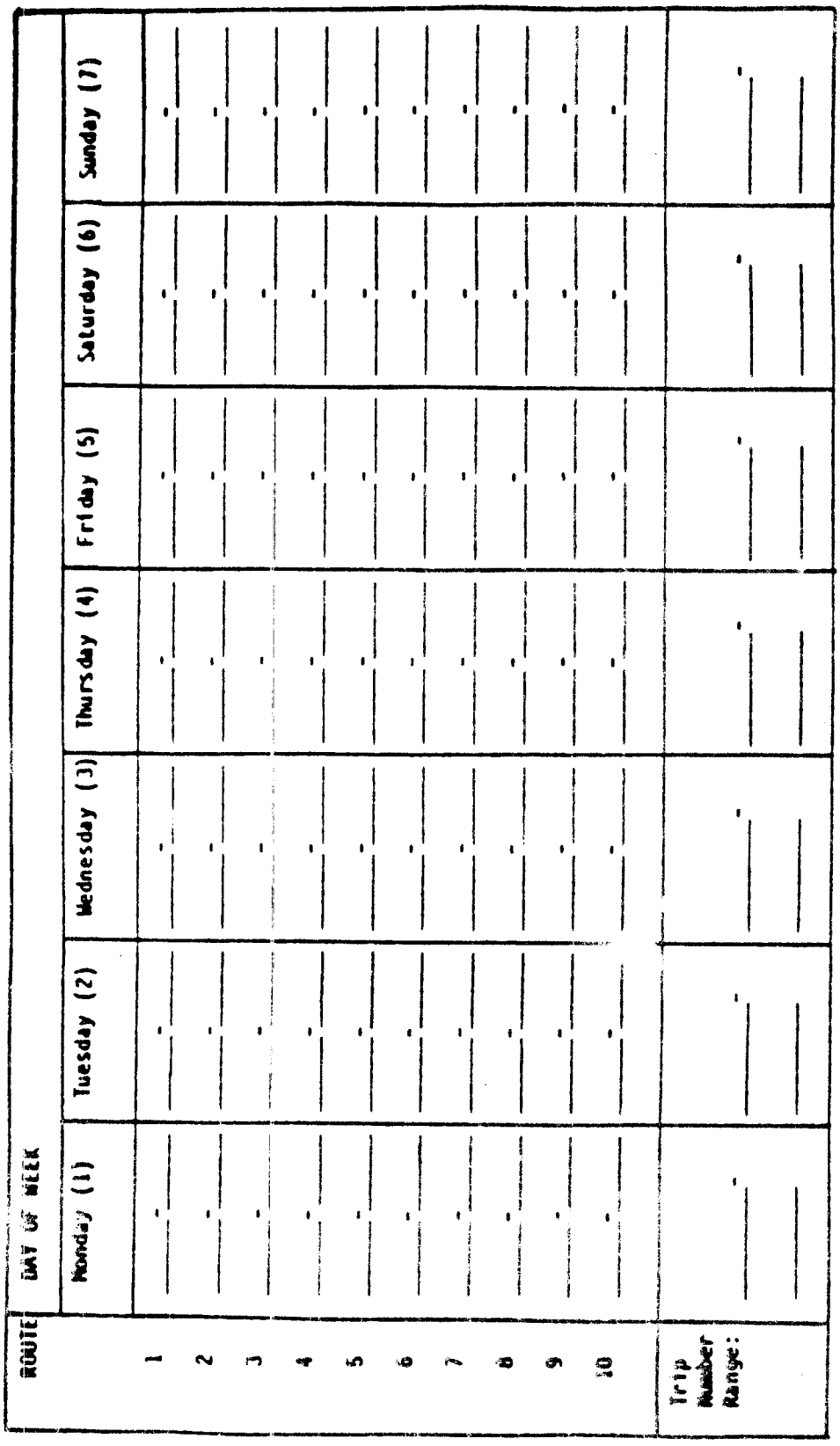
Date Prepared _____ Date Updated _____

APPENDIX B

WORKSHEETS FOR CONSTRUCTION OF WEEKLY BUS TRIP LISTS AND TRIP SERIAL NUMBERS

Method 1: Numbering Continuous Across All Days of the Week

Method 2: Numbering Separate by Day of the Week


ROUTE
DAY OF WEEK
Monday (1)
Tuesday (2)
Wednesday (3)
Thursday (4)
Friday (5)
Saturday (6)
Sunday (7)
1
2
3
4
5
6
7
8
9
10
Trip Number Range:
Weekly Valid Number Range: 1 - 7

ROUTE	DAY OF WEEK						
	Monday (1)	Tuesday (2)	Wednesday (3)	Thursday (4)	Friday (5)	Saturday (6)	Sunday (7)
1	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
2	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
3	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
4	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
5	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
6	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
7	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
8	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
9	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
10	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7
Trip Number Range:	1 -1	2 -2	3 -3	4 -4	5 -5	6 -6	7 -7

Weekly Valid Number Range: 1 - 7

APPENDIX C

SURVEY TRIP SHEETS

SURVEY TRIP SHEET

(1) DATE [illegible] (2) DAY OF WEEK Tuesday (3) TRIP SERIAL NUMBER 20[illegible] (4) DIRECTION Inbound

(5) TIME PERIOD* AM Peak (6) ROUTE NUMBER 2 N (7) BEGINNING FAREBOX READING $ 184.50

(8) STOP NO	(9) STOP DESCRIPTION	(10) ODOMETER READING	(11) PASSENGERS BOARDED	(12) PASSENGERS ALIGHTING	(13) PASSENGERS ON BOARD	(14) DISTANCE BETWEEN STOPS (MILES)	(15) PASSENGER MILES (13) X (14)
[illegible] 1	Silver Spring Pin	89.0	20		20	[illegible]	20.[illegible]
2	[illegible]	890.0	10	0	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	891.5	[illegible]	5	25	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	14	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* See Appendix A

TOTALS 49 (18) 304.4 (19)

(16) ENDING FARE BOX READING: $ 206.00

(17) REVENUE COLLECTED: (16) - (7) = $ 21.50

Checker

SURVEY TRIP SHEET

(1) DATE _____ (2) DAY OF WEEK _____ (3) TRIP SERIAL NUMBER _____ (4) DIRECTION _____

(5) TIME PERIOD* _____ (6) ROUTE NUMBER _____ (7) BEGINNING FAREBOX READING $ _____

(8) STOP NO	(9) STOP DESCRIPTION	(10) ODOMETER READING	(11) PASSENGERS BOARDED	(12) PASSENGERS ALIGHTING	(13) PASSENGERS ON BOARD	(14) DISTANCE BETWEEN STOPS (MILES)	(15) PASSENGER MILES (13) X (14)

* See Appendix A

TOTALS _____ (18) _____ (19)

(16) ENDING FARE BOX READING: $ _____

(17) REVENUE COLLECTED: (16) - (7) = $ _____

_____
Checker

APPENDIX D

WEEKLY RECORD SHEETS

(1) WEEK ENDING SUNDAY June (month) 17 (date), 19 84 (year)

SAMPLED TRIPS	(2) DAY OF WEEK	(3) TRIP SERIAL NUMBER	(4) HOLIDAY	(5) PASSENGERS BOARDED	(6) PASSENGER-MILES	(7) FAREBOX REVENUE COLLECTED	(8) TIME* PERIOD
1.	Tuesday	2023		47	304.4	21.50	AM Peak
2.	Tuesday	2510		83	425.7	39.80	AM Peak
3.	Wednesday	3091		120	501.7	51.75	PM Peak
4.	Friday	5221		24	147.0	12.00	Midday
5.							

TOTAL FOR THIS WEEK: (9) No. of Trips: 4 (5) 276 (6) 1378.8 (7) 125.05

PREVIOUS CUMULATIVE TOTAL: 92 5374 35,216.7 2414.10

CUMULATIVE TOTAL TO DATE: 96 5650 36,595.5 2,539.15

CUMULATIVE AVERAGE TO DATE:

FAREBOX REVENUE PER PASSENGER (10): ((7) divided by (5)) = $ .499 /passenger

FAREBOX REVENUE PER PASSENGER MILE (11): ((7) divided by (6)) = $ .095 /passenger-mile

* TIME PERIODS: AM PEAK; MIDDAY; PM PEAK; NIGHT; SATURDAY; SUNDAY.

(1) WEEK ENDING SUNDAY _____ (month) _____ (date). 19_____ (year)

SAMPLED TRIPS	(2) DAY OF WEEK	(3) TRIP SERIAL NUMBER	(4) HOLIDAY	(5) PASSENGERS BOARDED	(6) PASSENGER-MILES	(7) FAREBOX REVENUE COLLECTED	(8) TIME* PERIOD
1.							
2.							
3.							
4.							
5.							

TOTAL FOR THIS WEEK: (9) No. of Trips: _____ (5)_____ (6)_____ (7)_____

PREVIOUS CUMULATIVE TOTAL: _____ _____ _____ _____

CUMULATIVE TOTAL TO DATE: _____ _____ _____ _____

CUMULATIVE AVERAGE TO DATE:

FAREBOX REVENUE PER PASSENGER (10): ((7) divided by (5)) = $_____/passenger

FAREBOX REVENUE PER PASSENGER MILE (11): ((7) divided by (6)) = $_____/passenger-mile

* TIME PERIODS: AM PEAK; MIDDDAY; PM PEAK; NIGHT; SATURDAY; SUNDAY.

APPENDIX E

WORKSHEET FOR CALCULATING ANNUAL PASSENGER TRIPS AND PASSENGER MILES

YEAR: 19____ SAMPLING* PERIOD: Start Date: End Date:	_____ _____	_____ _____	_____ _____	_____ _____	ANNUAL TOTAL (SUM OF PERIODS)
(A) Farebox Revenue ($)	_____	_____	_____	_____	_____
(B) Cumulative Revenue per Passenger Trip ($/pass) for Period	_____	_____	_____	_____	
(C) Cumulative Revenue per Passenger-Mile ($/pass-mi) for Period	_____	_____	_____	_____	
(D) Estimated System Passenger Trips ((A) divided by (B))	_____	_____	_____	_____	_____
(E) Estimated System Passenger-Miles ((A) divided by (C))	_____	_____	_____	_____	_____

* Separate sampling periods should be used only if a change in fare level or fare structure, or a major service change has occurred during the year. Otherwise the year should be treated as a single period and only the first column should be used.

APPENDIX F

TABLE OF RANDOM NUMBERS

2078	4596	4008	5161	1403	5012	5024	4938	3762	4204
7990	4795	8197	2081	5807	6831	1112	349	8677	6033
8399	3151	1514	6367	5813	8946	4140	7726	3765	4488
747	5265	3962	7994	868	8825	6553	4891	8673	8456
7709	8727	4544	2241	8816	2120	797	4962	9690	2039
6125	263	9498	8399	6535	5366	292	8759	242	3540
9346	4973	6014	5806	7714	1977	6905	9629	3645	5733
6190	8142	888	4487	3529	3097	2734	9902	676	9189
4996	617	7264	7198	373	3782	8477	226	323	7573
7643	7098	9902	1562	8051	1450	3230	6029	9542	4677
6212	5198	6666	6710	458	6785	6450	4879	7533	3341
5065	7312	6028	7476	4054	3640	5034	9339	7546	1968
1018	959	4135	7362	236	8300	7082	3317	6109	8152
8777	3567	238	3207	6118	994	6978	4935	4888	5494
2758	112	2408	1270	2487	3122	9034	2281	6940	2379
275	3297	5691	5488	2589	8685	2112	3997	7161	1668
7656	4859	7188	386	4160	1951	5494	8144	4088	7271
501	3241	9869	7660	9866	7144	4779	9180	2321	3704
9008	7473	9523	8394	8861	8749	953	808	4249	2230
6166	8903	4876	1183	9930	9713	8871	5885	7068	3536
8694	0139	5029	6807	2337	3194	3502	5156	4010	1188
1609	8383	3604	6459	4480	3325	1248	9347	2259	8867
2303	1340	5806	4564	478	670	4736	616	7714	1730
4443	1183	750	7903	286	5271	5547	3688	8188	9469
1991	8201	2170	6682	2549	8439	662	5634	9777	6903
4596	3386	8908	4434	1619	5335	2076	9382	1922	4655
8486	8470	2556	3742	3650	2942	8167	8103	6847	5882
7624	9184	1241	2788	6857	8855	9117	9784	9916	4547
7575	2055	1166	278	3639	9385	2967	5037	6184	5098
4374	6280	3437	7359	7649	2507	3834	5651	844	5164
5539	6282	4339	6346	4970	1037	6098	5048	8034	4128
413	930	8978	6453	220	851	3011	8832	3045	9636
222	1311	7562	2832	9272	1914	7307	5416	984	4438
9766	6704	2875	1159	9691	7939	9103	2548	7899	5298
5482	2370	6656	7290	6503	2767	799	1799	917	180
8873	4235	511	9230	9530	4542	7147	7917	498	7045
7985	3730	7663	3364	2069	6550	3864	4887	2261	438
7848	7529	9092	2678	9473	7774	903	4679	4220	5210
6586	5597	1300	3079	8276	5781	905	4531	2671	3418
7407	8611	925	3968	6540	6177	8268	8258	8871	2255
5771	1340	9106	7561	7952	482	6023	8169	1112	6889
1080	8562	8607	2019	8003	9554	445	5603	4889	9813
3907	8731	9625	7974	9096	1610	8682	6565	8598	1851
3553	9249	3664	5462	2418	9100	600	8480	9791	5905
4274	9111	4251	4721	919	1147	8488	6186	9650	1853
7261	8291	1373	8435	53	9632	4992	9127	8452	5342
2122	2663	3579	9217	2671	6289	6097	3746	3030	6634
590	51	5735	8076	7385	1948	4816	9449	4087	4642
4295	6202	6309	8758	8034	1377	2917	6724	4311	8007
2296	7713	9859	5793	1448	9644	229	1179	6047	987

8688	9173	4564	1316	9043	7830	9214	3891	8843	8186
7963	5729	8208	8838	3187	890	8316	668	3774	1031
8953	3758	8716	3269	4783	6107	1485	4160	4477	768
9742	8203	8469	9590	4182	2051	8951	8233	3544	9890
7302	3246	108	9196	1338	8465	1192	289	3093	3684
9508	2973	2023	5890	8326	8998	1820	8235	6842	2832
4257	9268	6233	665	729	647	8242	6247	6415	7965
9260	3475	3243	5542	4330	4732	9060	2300	6490	7394
1694	2068	8332	1612	7827	7947	2796	9276	7849	6874
9503	669	9114	4402	6162	1534	1271	4366	1870	9536
8893	7516	324	5169	5474	515	8284	9968	2521	6078
7752	5570	1899	9728	9785	4651	1875	2477	7879	6869
1703	5285	277	622	9297	7417	1730	1860	5355	7041
6522	9190	8847	8697	5790	488	83	8478	3443	2466
8570	4048	6228	1084	4945	2837	4737	6630	5881	8045
3407	2934	4166	8297	8801	580	5757	3067	6727	887
7691	2226	9979	4123	1741	4330	9767	9417	9992	4493
5107	8745	9761	8977	5744	3014	6519	9836	5383	7935
4762	5234	3288	2019	7979	9302	3543	2874	149	9626
2521	4547	2444	745	6353	4887	44	8255	1456	8167
5257	8384	2407	4454	4349	2145	2708	3447	6761	1428
5250	6788	6636	6642	511	9062	7832	1759	1797	3977
4831	8884	8056	8464	3230	685	6081	3677	4726	5329
5136	8116	2766	4745	8301	4384	6295	3349	6102	7283
266	585	9189	7255	2826	6881	8142	9392	370	8894
9685	4499	2863	6144	9856	4953	3122	7399	5932	4328
4962	1422	159	6038	6389	2932	9576	2468	8261	902
7489	2331	6081	2543	3381	240	7859	2580	9323	8728
4191	3695	2158	9194	8010	227	2021	4516	4643	3507
9000	2315	8129	3420	961	4098	6953	7067	6847	1779
6612	1631	1008	9291	7707	4803	5337	3289	9462	2384
7279	3182	9847	8918	2993	6956	4738	3469	6229	5551
9769	8893	4709	4754	9808	9226	7051	9852	2234	6041
4555	4531	1417	880	3377	1753	3097	7133	3893	589
8568	952	5307	9253	9842	7086	4798	818	8219	1722
1740	4343	9930	707	8809	402	3782	7758	3019	6245
6963	3506	973	2078	6448	2509	3893	6200	4658	1567
9214	2966	9313	8961	6788	3834	8633	485	9009	7956
4325	4352	5387	5069	6011	3366	3381	9657	2038	8948
8532	1614	2825	7883	8199	4916	4179	8892	4431	2003
9249	2402	2794	7885	9033	3102	8177	4205	2631	1167
5888	9683	9633	4242	1584	9796	8346	8550	6831	4556
4765	3747	8339	9688	8456	2356	2160	2679	2790	920
9442	1425	8183	6203	7455	9465	8272	6081	4008	8041
199	952	4526	1457	1423	7790	2323	8482	6727	5207
3896	8778	387	4118	2253	9583	9447	4878	2611	4144
6161	7998	5958	9618	7226	1800	7346	8444	773	6622
6895	3405	1655	1422	2842	2874	7617	4910	7174	8975
394	9550	5640	7642	8409	3043	8190	5809	8340	8165
3138	7228	3876	8049	3587	4627	6598	290	7946	2214

1114	3127	3418	5973	4319	3858	598	9526	309	4940
1660	3168	9971	494	5659	4246	971	3541	1125	2715
9022	2332	7749	9182	8097	1414	1708	1722	4513	2067
7840	6708	1066	2957	2905	5125	8625	8112	5494	2122
3865	9602	9383	3765	3064	6499	8375	1250	3126	7
1921	9028	2256	6850	2089	9617	3972	9295	3643	4043
9348	2402	324	3179	3686	7373	1577	1447	5028	4103
5320	619	3178	6299	3519	7713	9160	8763	8630	7203
6280	2720	206	4037	5221	1274	2206	199	6836	3373
2813	3789	7562	885	9800	5864	3625	9639	5751	6527
1472	1548	8670	7984	3077	1171	4786	8572	6064	6320
1600	7982	9813	8578	462	151	9962	5831	9236	6591
4995	5174	6844	9093	9814	810	2734	7085	2491	7785
5573	1094	1604	8683	6719	71	2842	6628	8226	6545
4787	4221	2538	9853	5057	4242	5999	3921	9229	4261
1889	2343	6207	3487	9692	9727	4969	6484	667	4552
8841	4605	5016	5019	4774	2256	3203	5629	6209	1344
8208	8475	9541	3532	6777	9473	8298	6140	8955	6035
6471	3824	6452	8898	7682	4371	1638	7104	84	3233
220	1369	8189	7660	1883	7312	6034	7533	4463	6296
1365	6257	8428	7844	7744	1334	9725	3891	9774	465
296	1326	5845	5293	6792	5588	6086	1146	9293	4277
434	7395	3091	6028	2998	9276	7804	6125	6142	8296
9401	6598	952	4573	1910	4777	18	726	6870	544
3677	3176	9817	8765	2208	2956	4353	9638	7836	4401
5597	5942	9488	6326	6057	2413	2688	6544	8237	8748
1556	6841	9499	3955	2064	1761	6008	6038	177	820
3778	7261	8153	9997	6140	1463	1120	4617	8160	6161
7603	1989	9816	8432	8920	8397	974	9799	3630	1322
2469	1616	4439	3981	8820	8676	6247	5559	9402	5032
5254	6746	6095	2262	299	6419	6716	6674	8846	1598
4812	8162	1309	9029	7544	9723	8607	2995	4774	2850
9148	233	3614	301	2657	9043	4004	3962	9503	5968
2102	1805	5477	9648	9536	4158	3166	7697	7822	5792
2354	8734	8489	6537	3133	7905	707	9431	6630	822
9467	1622	9521	4665	8615	9516	8777	9871	4270	5903
2284	5256	5448	3043	4277	6685	9909	1949	1758	8852
4567	4350	9312	4376	948	71	7005	8269	7554	8813
9272	2395	2145	1560	1979	772	8243	3116	8673	2825
1412	3481	9498	7956	2098	2074	8290	1034	3089	5026
3033	4673	885	2022	8095	392	1524	5441	6307	7035
2665	766	1020	1049	4973	3503	706	9475	7097	4096
3519	2779	9806	8567	504	866	6052	8865	7353	1886
5032	3172	5902	9710	9539	2625	7780	2163	7131	7215
3876	8386	6948	9828	4564	8931	5197	3677	6839	6458
3605	4592	5793	3125	6405	5924	9115	3050	2829	25
4508	4447	1774	6560	1228	8283	2120	4114	8145	8589
2259	7850	2001	3768	7639	2178	797	3508	8141	3700
8468	2173	21	5890	8277	5767	738	3205	3575	5840
8480	8802	5999	9941	9429	5752	1828	4475	9047	8586

3483	9461	7588	8749	9247	3827	3881	7471	7681	9032
3284	7015	8044	3057	9484	9108	4722	4817	7120	8268
4633	9699	1146	8989	1223	7518	4515	9384	970	8032
6060	4807	6554	5354	8477	8920	7259	9582	4329	3726
9025	7102	5379	6211	7826	2472	3038	4774	1296	3552
3105	2241	4775	1727	7881	8624	9103	1338	3509	1721
9468	1693	9823	6893	3340	1069	7188	8192	1808	9269
7478	3057	3601	9579	5764	8144	7342	9805	4501	9888
6338	6175	3280	8417	2169	1264	8409	9472	4479	2990
7911	4346	5671	8047	8697	8783	397	9391	3986	8071
1047	3633	268	1825	1603	441	4320	2168	3645	2330
2160	3325	9257	9429	2859	2064	7170	89	1626	4013
9479	4462	7643	4869	7609	4371	3472	3429	7486	9122
4075	2694	5044	3086	4748	325	4531	7179	8908	5595
3246	2590	4737	2610	7663	1372	2134	7045	7088	4747
255	3866	2291	6249	5203	8785	7769	3049	6267	6424
7569	9077	1537	8427	5950	7806	1817	3002	4585	901
3366	3626	2105	390	1267	2905	7372	1078	6477	7812
6185	6547	848	4793	6720	7368	8670	2484	3087	8771
528	6002	6814	8089	829	3069	7447	7737	1187	8435
4671	5830	1311	9342	5636	2803	7110	1015	2401	8638
6335	7407	5675	1567	3787	8694	8271	9349	6698	3242
4955	8490	1030	9035	4590	5004	5292	7808	5778	2587
1402	9346	8397	306	3138	3716	8708	4166	3954	5382
4972	5156	7236	3465	3729	647	3278	6812	4155	6240
8523	9229	9216	1429	1877	3040	3469	8686	139	4222
8738	1830	9836	2597	72	5783	6019	5612	5640	6083
9817	6093	5510	2753	9785	9009	5463	9394	7360	8728
3282	4601	3958	4564	6169	9072	6499	8170	9227	8015
9465	4281	6175	4767	2688	9191	4712	7331	5506	1786
207	7422	9043	4873	2640	4567	9663	2455	2957	8183
7896	4367	6269	3513	8384	6018	563	8173	7655	7222
843	7883	7743	347	9890	224	4987	4271	8033	3835
4527	6881	5635	4319	2307	5087	3194	4749	7634	7608
5237	2152	579	1991	5435	4567	9780	3610	1601	5747
7432	631	499	9202	9522	5168	3636	7151	590	7122
6455	6498	3589	3435	4608	173	6609	1743	2205	8467
9534	3695	8284	1203	4930	9205	8802	7874	8687	13
2942	9079	7247	5476	3581	8896	9430	1888	3123	4026
2183	1167	7103	1836	779	1873	9249	5651	8278	1488
2910	1904	6283	5212	8031	9	4298	2755	84	2058
8231	848	2693	5718	9842	5474	8676	9908	2174	4037
6009	9152	1277	3973	7802	8683	1739	514	1155	8685
7873	2609	6749	2261	3875	2226	5366	9003	5840	8525
8739	4260	4114	4628	3419	8476	3290	982	7576	1194
2539	5540	1909	396	8215	7268	7083	9686	9771	5565
1360	4470	876	3035	3365	7751	3335	76	6129	9387
622	1542	9869	136	4612	2758	2134	2435	989	9001
5275	7726	5387	708	2390	6192	2165	8830	4178	1009
5635	1128	339	5470	8710	337	693	7604	963	9520

9112	9514	7321	5347	448	764	8515	6036	7468	3770
989	5641	1666	5636	4709	6184	4093	6323	913	1038
7946	9508	6420	6492	4409	1791	7672	1938	7581	7358
4037	6411	3175	1457	5190	5468	4893	2293	896	8618
1268	7212	416	3858	8172	9267	8361	1932	286	4547
8310	9419	6433	8856	7721	5799	4961	4618	2148	6030
6586	5106	6399	6337	3380	8366	9138	7228	3814	7432
8976	3943	5028	1704	1346	843	4766	6589	6719	2461
6629	4766	1937	199	3569	697	7734	9918	8817	215
6727	1881	637	9336	7422	817	2605	8617	1050	56
4310	1700	9250	9994	8674	6879	1984	9364	8291	8813
5836	8039	4473	3742	8592	2371	3909	9807	346	8278
4129	4146	225	3580	178	2267	8199	5316	8176	8854
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4292	4665	9348	6829	4623	5498	5401	6565	811	1979
4519	5700	4004	7541	5288	4357	1387	4632	2401	8191
1875	3983	2938	9793	4461	9779	6265	1173	5095	6622
8835	2791	7017	388	8459	4881	7337	1325	9820	5054
5037	4023	4298	2196	6501	5093	8391	6581	6022	5683
6277	688	9939	2190	3325	8747	4339	4707	8590	8224
7489	9281	5598	3937	9417	5739	1962	6139	2327	9782
9630	1750	6782	3762	8802	3970	9632	7083	9836	1763
1727	3184	8658	6946	3053	6882	2492	2856	6239	997
3979	4849	9004	8801	2913	9099	8147	3992	6223	2435
8797	6688	7942	2208	3525	38	2230	1413	8361	8278
3752	554	1729	3417	942	3992	6360	3796	8965	4743
3282	4249	421	7987	9333	3649	3077	9749	866	1935
5187	3492	5245	5133	195	3622	1325	2699	3859	1109
4607	8329	8059	2747	4986	1178	7120	1745	9452	892
2597	3673	1790	6074	5982	7967	121	2024	7210	1498
4734	9873	375	6925	9861	5469	8157	4826	4327	2624
8043	4834	7243	1574	4662	7273	6164	9779	3751	3015
6379	8405	4568	5551	1288	4101	8804	5508	4966	1941
5263	4100	9415	1626	890	8239	[illegible]	5316	9922	6296
4910	1696	4216	9751	2091	7134	9059	2206	5621	1050
9975	3502	5639	8838	7389	2923	4505	1975	7111	1721
9418	1148	6016	1449	4075	4530	3410	828	3027	9559
9913	148	3652	2819	6889	8416	1931	8900	726	4759
9432	5312	7511	1796	187	6958	4895	4975	7374	9357
9203	8106	983	7167	7075	1577	8887	9437	2192	5979
4983	347	8881	138	9337	9909	5650	8775	6492	5524
2940	1287	9368	1486	654	9378	7429	9799	2252	7535
9030	1920	3457	6556	9118	7283	4875	6660	4722	714
9072	2869	1882	7096	3908	1665	8953	7900	5168	4166
2459	427	2798	7285	2903	6887	6280	623	9225	8459
5955	3069	1810	1358	8331	9351	5233	8551	4879	3013
3158	8242	3463	8564	9059	6488	8398	1766	7689	2742
5187	3315	3469	1795	1227	7388	3216	7424	3840	2791
1887	9102	3824	687	1256	5376	2358	9168	2891	7787
578	1092	6474	7421	2357	8023	1304	2471	8090	9119

9674	2084	8980	7694	2426	1898	8301	5635	8815	7259
2207	581	637	1836	2428	8376	3054	1127	4914	854
6668	2829	1583	5085	1274	5604	4182	1703	2471	2136
9569	2278	3553	8577	6941	4988	6344	8744	8827	9659
5917	7680	8874	6719	5342	5430	739	1639	7912	8144
3622	2605	5502	9880	1243	5406	2984	4692	2307	5757
9882	4881	1760	5567	1670	7512	3367	5860	4406	7560
5436	5350	7605	2284	2700	9905	1533	7702	8692	4366
6343	4270	4124	4485	1724	5120	8094	2934	6983	6474
150	9650	2735	6090	2524	2973	6618	1852	3064	4331
6714	8852	676	5450	7585	9596	6322	3318	5112	8166
3857	4396	7539	5474	6266	5807	1412	8940	4099	7481
2328	6234	4136	5507	1660	8911	7593	3154	1692	8072
8412	2312	2021	396	3425	4340	2766	9160	7454	5530
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891	6164	9372	9605	1737	7232	8886	8042	8258	1535
8888	502	2812	5554	8229	3424	3517	9567	7728	8097
7766	5221	8061	82	9298	908	6628	3572	10	799
7715	7180	8915	9637	3484	3902	1923	1668	8592	4219
7378	8294	8495	7588	3504	5333	5712	802	5203	6972
9625	1950	8854	8794	6582	962	5053	6490	8375	1984
459	4907	8372	9047	1170	5513	5862	786	1293	3274
404	2175	1642	2028	9223	1530	4727	9014	1959	4245
3461	8485	8315	1014	2254	7174	5388	4513	413	1308
2747	4770	9029	1027	4542	9732	3764	4332	9203	3730
7215	8890	8511	2855	5772	6341	9098	2461	7148	9939
677	8294	6000	2694	6531	8960	6309	9082	3081	3749
450	783	6559	6009	6114	895	6098	8597	3507	147
3779	4099	6510	2618	3429	8842	2692	5854	1227	5907
8390	6216	2403	8631	6232	6540	9586	2347	3817	9804
9592	8325	3441	6275	6706	191	4062	6330	1941	9144
7914	530	7440	1147	5450	5827	2004	4363	3530	6205
3791	2782	3026	717	1501	7080	3274	5722	5368	624
2029	4690	6180	4538	865	5179	159	2116	7175	8838
8999	9018	5201	6566	5617	2019	9764	7152	7409	5284
7616	4045	53	9391	2586	1081	6164	4605	1943	4293
4347	6132	2648	3160	5433	5324	7402	904	3969	7095
1707	9691	4229	1	4289	2856	1315	1752	4631	2493
9145	9111	2483	7042	8350	7430	5548	9713	8413	1310
2762	4863	9568	4103	1827	5696	1266	260	939	2876
5265	749	5865	9925	2615	8020	4802	9517	5121	3273
4685	5017	3042	4992	3868	3881	2101	3988	7348	3781
4097	6440	1956	8556	6656	2658	181	8346	8923	5564
2564	6536	1251	9110	9810	343	8172	3138	7065	2183
5198	7398	4011	5154	1257	3714	5711	4258	9801	1540
373	5222	2894	8380	1452	5013	3813	2811	2971	7426
4974	4093	6568	3341	9214	8601	5655	1513	3741	9563
2109	2001	7288	2835	6149	602	2276	7706	135	8891
5023	7958	3962	736	8307	46	8883	2389	1821	8484

9836	4604	131	6202	8741	2148	4966	911	4967	6875
4581	3917	4646	8832	9166	8358	6416	5196	1545	5531
6690	8612	8874	3413	2307	7672	9048	8671	503	8241
9836	2326	7356	5395	53	5647	5135	171	3320	8924
6229	9103	6199	2194	6565	1788	3757	5843	4701	5440
6854	2537	4013	6703	6700	9415	6632	928	3482	1615
9078	407	7101	827	749	6805	9321	5071	7678	9984
7885	9238	5253	1571	4370	4405	4804	9896	8857	1165
228	3139	5693	8443	2091	9819	5904	3546	7862	9958
3039	1418	8200	6553	519	1347	489	1200	9761	7604
2008	9985	9636	6735	6419	6004	5064	521	8616	3117
5774	9806	3695	1793	5553	699	8165	4164	7498	883
1372	1640	2101	1	7472	4700	188	4372	9002	709
2026	2512	4468	1883	7128	4184	3637	1751	6579	1993
5456	4729	896	715	4755	9664	7750	9893	5178	4455
5077	9391	6991	5115	6382	5925	9701	8882	6284	778
668	7230	5597	5204	2103	907	6493	2247	153	5338
9541	1952	982	1025	5685	1214	15	9782	7430	9754
1778	3927	4811	9928	9000	1792	2921	4393	897	9150
9059	1830	1818	2425	8786	7232	2661	5797	1440	9476
8745	555	6905	5170	9057	1313	6684	4015	3033	9941
3568	7152	2314	4330	5450	6240	6134	8345	87	7246
274	1570	8845	9186	739	7720	8730	4285	4594	8811
3259	2311	1625	8459	3954	8061	1746	5917	5515	7220
4322	2702	89[illegible]	298	6839	5930	8322	4964	1581	1712
7578	2970	241	224	6051	4894	7668	4310	1395	6193
7056	5723	816	5087	457	7372	2299	8679	9315	6177
8875	4322	1346	5391	253	7743	1109	7507	7332	5629
2983	9099	6417	6686	6437	7210	1165	1393	4798	3153
1575	6929	9906	5821	556	27	6357	2882	9877	6717
237	4448	8541	4205	8524	100	7888	6379	6585	6359
8964	653	2432	7976	8957	160	7666	2640	4753	1510
6273	4973	2893	4605	3704	1911	6502	7245	9898	7842
956	3510	1165	4101	1368	1143	7228	3685	6158	9439
428	8298	2279	5347	6478	1080	8880	1798	5959	4644
7458	8466	8192	261	7800	1473	9714	311	254	4746
1103	2371	6132	2034	7037	9523	9289	4801	5781	7771
3178	7495	5503	7651	8919	7910	6117	3412	1195	6643
6546	9366	4	5871	8606	9272	7574	3927	9904	859
992	8425	9448	3854	2327	6904	974	6116	9315	235
9462	8745	886	261	381	7263	3100	9433	6806	2240
2259	6384	7859	8966	3189	7726	7518	2029	2322	2501
6943	6906	5472	2068	3865	6941	2792	4379	3978	298
3536	7890	502	7761	5063	6593	9332	8492	1620	3896
8451	7097	9677	9348	1532	1620	7893	8422	6887	8317
979	1869	4206	5318	8031	7352	2735	3549	7108	2356
5836	9503	9118	3604	8084	749	5300	4484	2331	1214
3852	8173	5412	9781	2504	501	2404	1519	5071	2741
623	7689	1308	848	5768	6478	581	3844	3625	2857
1181	368	4139	2178	8307	8603	8345	8367	5535	1070

9938	1399	538	341	111	2977	2982	5374	8187	7505
8366	6034	6183	958	8010	6137	8113	7698	4152	9061
6811	1576	5491	5494	7653	9165	323	4094	2860	6256
1045	4044	4296	1851	1103	4752	9931	492	6647	4150
5401	50	5468	3399	7329	8323	9996	1808	8128	8061
2402	2493	4860	6268	1167	4956	380	9903	9909	7816
7422	6323	7658	8501	3562	3095	1882	1468	7423	8021
4633	5798	2146	6498	1329	817	5000	9559	870	6732
3052	2219	5880	3356	6063	7977	8180	2358	9046	1580
9642	6919	8140	8416	646	6090	6739	8141	2925	718
4037	2412	3180	1492	5411	8800	2713	7116	3321	5291
9885	6578	8639	1942	3430	8735	1596	2585	5934	4710
8741	9697	8028	8826	7614	5541	5059	2052	4032	9018
9370	8243	8177	5679	2356	1579	6892	9427	1969	4011
869	8412	2397	3658	6646	5015	1978	4405	4588	5737
2661	3180	5262	3110	9540	7641	7900	7978	2273	3269
5850	6768	1430	5095	5198	4600	6056	5539	1984	1362
4015	8107	476	4081	3898	6924	1834	8238	6529	4334
121	2846	5421	3065	5107	4432	8648	5672	506	3266
9993	8263	3803	1449	4397	7734	7408	722	2004	1990
9787	8104	5351	902	220	9721	1500	1968	2164	2427
162	929	5231	9089	103	3803	3476	9630	9367	3109
6394	6212	3250	7198	5708	7136	8642	8014	4071	353
1753	8695	3106	3670	9055	8784	1462	5022	3657	1025
8804	2415	4038	9946	8906	9409	1421	8981	4276	8228
5375	8036	5978	8017	9407	1876	3592	8918	9615	3177
1401	4571	683	2554	8445	591	4781	3030	769	1938
142	2967	6124	7049	7394	7695	2089	8515	2921	6314
113	3265	9808	6425	9126	630	8131	5742	3647	2901
7840	5857	3566	9216	8003	9607	6014	9913	8764	9809
8993	4690	2056	3310	1695	4193	8546	634	7674	883
6975	7668	2299	1294	5450	2141	8157	8044	1499	3881
1325	6206	8924	4079	7689	4897	6748	5042	1726	1198
8815	8182	1432	9764	1831	4208	6294	7724	9889	5773
509	751	4783	9043	848	2387	2661	6939	2847	4998
8797	3019	248	6969	3549	1257	3843	6986	3783	3177
7197	2526	5329	97	7835	5912	3227	4458	3899	7538
7893	473	7395	2126	6375	585	6476	128	9368	483
421	2626	3719	1521	2238	4342	7476	6197	5056	5621
9801	7478	9745	489	1262	396	2407	4152	1330	9495
1693	9544	3110	2483	7087	8778	606	6577	605	1621
1078	251	5561	9329	4264	9394	7335	8494	1545	3095
2310	5707	9323	548	2391	196	2172	5811	3804	7766
2556	1397	60	5668	5167	9947	252	4247	5163	5443
5357	7481	875	1728	5399	771	2763	9286	3776	608
1673	1538	3537	6914	699	4133	3862	5273	6179	9962
5135	2304	4649	9881	2590	3852	3771	1395	9670	1833
6557	9750	3359	1841	9424	8212	8321	9890	3873	1484
7998	2882	8856	6503	3626	3675	8104	9119	8884	7860
3986	3362	3964	5579	6679	7307	8072	8052	8806	5750

3554	4224	3380	81[illegible]1	9353	9150	6005	5894	2309	8730
9567	2421	5039	9828	2346	7757	5016	5836	2898	3081
8340	6381	5295	3423	1845	2640	8400	1796	7928	9437
6149	5561	1876	5745	469	1045	4725	1111	2584	2056
5960	8196	2942	4521	1628	3540	4026	1544	4773	9130
1977	1512	5685	9033	8190	6116	6283	8884	1740	183
124	1657	3451	3076	4480	7695	6567	2099	7302	552
2955	5[illegible]30	3423	969	6106	6817	5513	4685	9047	3281
6614	4108	5726	4546	2206	9825	8083	9751	1669	2894
7222	9855	7992	3433	4702	1866	310	3444	6677	660
9669	186	139	6712	3672	6921	7410	1060	5351	6992
6147	6659	2911	2614	3385	8267	8479	8608	4095	5752
5137	7571	7278	3467	2708	5202	8353	3349	4653	2807
1723	7053	7444	8115	5044	7560	9508	6061	2906	7515
2499	7100	8513	7618	3359	3129	2292	4698	4669	9234
5618	5112	2685	3744	1060	6892	8411	5312	7829	8486
9120	4036	2383	2617	9329	7831	5138	5603	7562	8541
6351	4964	864	4539	3782	4365	6985	778	3144	1996
1345	3542	1798	9391	9018	5385	8435	9719	6295	9972
2328	8986	1649	6827	7035	9700	1093	5219	4840	2931
8293	9653	9203	702	6929	1725	4069	7363	2140	7325
9739	4254	9073	4360	6771	8513	7044	606	9962	4453
5463	3300	6420	1702	6507	2514	2455	1697	5800	3852
5521	6401	5986	9829	8627	943	9756	1978	5881	9355
6506	1176	9101	1602	8496	4906	6644	3768	1588	1661
6905	7514	2515	7301	129	8753	4289	4072	3477	2971
2778	3496	5504	7637	8757	6641	2486	8814	984	9487
253	5341	7092	7376	6459	103	339	4793	9464	4813
1527	4942	1225	8737	6631	7872	2592	2523	1819	6117
3187	8931	9639	3106	66	3027	8543	9805	4350	8359
4833	9346	2626	2589	235	7612	547	2158	8398	19
5236	1868	7769	983	9607	1475	4[illegible]3	8797	3759	7662
2648	6907	2867	5996	8273	2820	1444	3725	1130	8174
3491	538	8098	7538	2908	631	3600	211	2098	5702
4554	2978	5918	4720	8267	4460	3411	2594	861	1753
993	6088	6055	8338	2005	1598	5847	8500	8816	5681
6102	9744	4883	5224	184	833	5459	1267	6182	140
6852	5007	8763	2451	5420	2923	3726	4188	8718	2477
6824	8308	2470	6981	8047	5948	8291	4188	4806	1348
8320	9490	6891	1649	4209	809	2954	9294	9092	8560
8301	9008	2549	279	9059	3610	9605	5793	7796	3121
4307	5032	2549	9920	5480	6788	862	8917	7817	3230
1874	7991	3047	694	753	183	2838	4199	1027	5275
7071	8840	1600	5044	434	7741	6556	2019	6291	2416
6877	8358	1661	7644	4904	7937	6766	9222	3062	63
4079	9203	53	437	3041	9479	8771	714	7867	816
1482	4419	7118	704	9080	3196	4955	9632	2443	3633
5247	1640	5215	1135	967	1271	8538	3598	2523	5261
9539	3846	9577	3605	6622	6065	5207	828	585c	7847

5057	3819	1750	2026	6501	4357	1040	1452	8517	8869
5759	5857	4589	9464	9900	2392	6409	4286	2615	9001
4636	1315	7248	9600	4779	7790	8427	9507	4377	6093
1495	2628	9891	3213	9843	8107	4985	7156	6935	450
1114	9894	1068	3332	6603	2726	2175	3599	1613	6153
1201	8174	1698	2634	3873	2868	1452	6819	1880	8323
6221	4134	5791	4574	917	4818	5241	1961	8582	6771
3168	2384	4644	6831	2190	1120	6434	6323	2379	9705
7565	3011	988	4600	1279	7793	5946	4632	7658	760
6145	2451	876	7473	2829	1466	3923	2571	7630	2023
9464	4066	404	8765	6758	7935	394	5567	5805	8872
3585	4089	1153	9304	4202	9409	9026	5036	4689	994
2698	2125	3780	4681	2289	5857	1345	7002	6399	8925
9276	9616	4258	2166	5197	7824	8308	7474	7027	3406
8392	8752	7708	8268	9971	2993	647	1622	42	9872
7650	9694	5679	4441	2422	3193	1364	3801	3907	4021
2539	4850	5021	8958	4041	6463	3590	4311	3353	5734
3513	1765	9825	4111	5468	1903	2314	5555	7704	8150
8882	5077	8705	113	3509	2251	4785	1559	5957	584
6911	4502	2240	9828	2287	7153	4346	4617	7514	9700
9152	9016	1356	8160	7686	2860	6429	2792	7179	1982
335	3794	9554	692	8058	3275	1299	1114	8661	8740
876	250	582	9566	1101	1861	1074	4200	5157	6551
6586	2082	6168	9635	2138	497	1511	2676	8979	2876
4269	781	1077	1246	5519	4023	2242	1841	2365	7604
6920	9089	7885	1609	8971	9472	427	7463	3958	2986
911	4453	1753	6190	8069	5924	7518	7075	2788	1004
334	8236	3988	3975	48	1091	9692	9642	4117	117
8223	9310	7511	2349	5697	8239	9960	3622	7222	1666
6095	9288	500	2780	5291	3399	1722	2230	9234	6501
4959	5052	6539	9093	7444	7105	4942	1800	4440	9387
2874	4045	8596	4838	3462	3653	9981	8479	5255	558
4197	8016	5220	1777	7268	8251	801	1724	7202	8916
9101	8095	3418	1794	2466	9810	6448	9223	1032	9739
1583	2362	4028	1211	1408	3809	2876	3526	3359	8439
394	7962	9765	8577	1643	2010	9012	9853	3216	5819
7784	2362	9014	1087	5515	7970	1815	8889	3513	2901
1168	9161	2397	4936	9424	840	2786	6859	8936	7882
5406	6990	4741	2658	8039	3925	8256	4439	7983	8838
8794	6980	9946	496	944	5416	550	87	7115	8974
1858	4223	5781	2213	7607	742	7236	3798	7060	5641
9905	8028	2649	5771	1490	610	8840	3154	526	6404
884	8723	5122	3143	3371	5123	6942	1334	9777	4415
9723	6849	5402	2793	2876	8930	7394	682	1968	2592
6763	2822	9121	659	8568	9187	7660	6920	7689	3874
6499	8137	8871	5291	1116	8886	944	7275	9136	9481
6403	6992	9824	3438	8768	1726	8040	7239	1391	2922
4442	1370	2634	2086	5001	7863	3598	9407	4102	5836
5812	2210	6801	2758	7555	6595	7020	5427	8753	1857
9732	891	5590	3620	6431	38	7284	7656	4438	2957