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random number tables and random number generators in using calculators. Random generation of numbers is important in almost all studies in vegetation science. If you've never used random number generation, or are a little rusty, go through this section carefully. You will apply the techniques you learn here in your class projects. Some of the examples may only make sense after reading the course section on Simple Random Sampling. In fact, simple random sampling and random selection of numbers are so intertwined that you may need to go back and forth between the two sections. How to use a typical random number generator in a calculator An easy way to use a random number table Three more examples How to use a typical random number generator in a Calculator calculator with the ability to generate random numbers almost always give a random uniform number between 0 and 1. To use these numbers, you need to convert them to a range that matches your study. An example of selecting individuals at random Consider an example of sampling by individuals. Imagine you have completed the design phase of your field studio. It now wants to take action from a subset of six canopy trees out of the 24 in its statistical population. Trees have already been numbered from 1 to 24. The calculator gives you a random real number between 0 and 1. To convert this number to a random integer between 1 and 24, multiply the calculator number by 24 and drag to the next integer. (Here's a technique: jump if the calculator gives 0.0000 exactly.) For example, if the calculator gives 0.5481, it multiplies 0.5481 by 24 to get 13.15. Round to 14. This answer means that tree number 14 is in your sample. An easy way to use a random number table A random number table is a series of digits (0 to 9) randomly arranged across rows and columns. If you don't have access to a random number table, you can use one that I generated for this class. Click here to view the table or to print it. (You must have Acrobat Reader to read this file.) Choose an arbitrary starting point (using darts, putting the table with your eyes closed, whatever; every part of the table is random, just avoid starting same place at a time). Read the columns from the arbitrary starting point, accepting integers in your range. The same example of random individuals selection in the tree example of the simple random sampling section, the range is from 01 to 24, corresponding to trees number 1 to a If the table number is out of range, skip it and try the following. Let's say your arbitrary starting point is row 11 and column 2 in the random number table of the course. As for columns 2 and 3, the first entry is 10. So tree number 10 is on the sample. The next entry is 02, so tree number 2 is in the sample. But the next number is 86, which is out of the range from 1 to 24, so you skip it. Three examples of selecting random locations Consider another example, choosing random grid locations for the coordinate system. Imagine you have completed the design phase of your field studio and want to take measurements of eight squares of 1-m2 within a study area of 12 m by 15 m. First get the coordinate of 12 m. Use the calculator to get a random number between 0 and 1. Multiply this number by 12 to get the position of the square along this axis. Get another random number for the 15m coordinate and multiply it by 15 to get the square position along this axis. For example, the calculator gives you 0.3280, which is multiplied by 12 to get 3.94. The second number of the calculator is 0.7002, which is multiplied by 15 to get 10.50. This means that the square located at the coordinate position of 3.94 m and 10.50 m is part of its sample set. Repeat these steps for the remaining seven squares. It is important to use many digits in your random number, for example, 0.3280 vs. 0.3. If you've just used 0.3, your locations couldn't be closer than 1.2m away! See why? 0.3 times 12 gives 3.6 m and 0.4 times 12 gives 4.8 m. If you use a 0.5 m by 0.5 m square, then most of your study can never be selected for sampling. That's not good! Now we consider a second case, locating squares with the coordinate system. First you have to decide how carefully you want to locate your sample (like every meter, every 10 cm, or every cm). Sometimes a resolution of 1m is adequate, but the tapes are usually marked in centimeters, so maintaining a resolution of 0.01 m provides a more satisfactory randomization without additional work either before or in the field. To locate a square along a 12m axis, you will see two columns, for numbers from 00 to 12. If you want a resolution of 0.01 m, you will see four columns (for a range of 0000 to 1200), and put a decimal point between the third and fourth digits. For example, an entry in the table of random numbers of 0542 means that the coordinate is 5.42 m. If the next entry is out of range (such as 6780), skip it and try another entry. The third example is the use of the grid system with the random number generator in a calculator. Imagine you have completed the design of your field studio. You want to take measurements within eight squares of 1 m 2 within a study area of 12 m by 15 m. In this case, there are 180 possible sections of 1 m2 within the study area. So so Random selection process is simply collecting integers from 1 to 180. To do this, multiply the random number (which is between 0 and 1) by 180 and round to the next integer. A technique In this class, and in most of the science of vegetation, sampling is done without substitution. That is, once selected, a data point (tree, square location, whatever) is removed from more likely to be selected. If the procedures described here generate the same data point (tree, square location, you name it), simply skip that random number and try another one. If you can't wait to jump through all these methods of using random numbers, go to Assignments on Blackboard and select the questionnaire called Using Random Numbers. Otherwise, you can wait until the end of the simple random sampling in the field chapter. © 2007 Mark V. Wilson and Oregon State University The concept of randomness implies that each item being considered has the same probability of being selected as part of the sample. A set of samples is a small selection of topics from a larger population. When statistical research is done, this set of samples should look, as closely as possible, to the larger group. The goal of using a randomly selected set of samples is to finally generalize the sample results back to the larger population. But how do researchers determine a set of samples that will be truly representative of the larger population? The answer to obtaining a representative sample may be the use of a table of random numbers to select each member of the sample set. By using a random number table, all members of the population will have an equal and independent probability of being selected for the sample group. (Independent selection means that an individual has no effect on the selection of other individuals in the population.) A random number table is a series of digits (0 to 9) randomly arranged in rows and columns as below screenshot shown. The table usually contains 5-digit numbers, arranged in rows and columns, for easy reading. Typically, a full table can be extended to four or more pages. You'll find random number tables in most statistical textbooks. Random number tables exist since 1927 and are generated by a variety of methods. How to use a table of random numbers: Note: This method is one of a variety of methods of reading numbers from random numbers tables. 1. Let's say you have the test scores for a population of 200 students. Each student has been assigned a number from 1 to 200. We want to randomly test only 5 of the students for this 2. Since the population size is a three-digit number, we will use the first three digits of the numbers listed in the table. 3. Without looking, point to a starting point in the table. Suppose we land at 75636 (3rd column, 2nd inning). 4. This location gives the first three digits 756. This is too large (> 200), so we choose the next number in this column. Keep in mind that we are looking for numbers during the first three digits are from 001 to 200 (representing students). 5. The second option gives the first three digits to be 407, also too large. Continue through the column until you find 5 of the numbers during the first three digits are less than or equal to 200. 6. From this table we reached 070 (07015), 038 (03811), 045 (04594), 055 (05542) and 194 (19428). 7. RESULT: Students 38, 45, 55, 70 and 194 years old will be used for our random sample. Our set of student samples has been selected at random where each student was equally likely to be selected and a student's selection did not influence the selection of other students. Note: In today's world, random number tables have been almost replaced by computational random number generators. Like random number tables, these generators use several different methods to generate random data. Most calculators cannot truly generate random numbers. They use a formula with a number seed to generate the numbers, which means the list could be potentially repeated (making the list not truly random). These lists of pseudo-random numbers, however, will be enough for your research at algebra level 2. Level.

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How to use random number table in sampling