EXPLORATIONS

Chapter 6

Randomization in Sampling and Experiments

Topic 14 covers random sampling and randomization for experiments.

## Topic 14—Random Sampling and Randomization for Experiments

Simple Random Samples

Example: Each class member is given a number from 1 to 24 as shown in the table on the next page. Select a student at random to make a contribution to the class discussion. Also select a simple random sample of five students from the class so these students can represent the class at an upcoming meeting.

1. From the Home screen, press CATALOG and then press **R**.

2. Use the cursor keys to select **RandSeed** and press ENTER. (RandSeed sets the first value used to generate a pseudo random number, which is used in turn to generate the next number.)

3. To be able to get the same answers as in this book, type **123** and press ENTER to display **Done** (screen 1). (To generate another sample, use a different RandSeed, or skip step 1 if there is no need to repeat your results.)
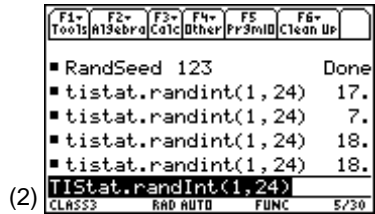
4. Press CATALOG, and then press F3 **Flash Apps**.

Note: You can work in folder **ASTAT** *or* **MAIN***, or, if you are using your own class data, you can work in the* **CLASS3** *folder.*

Note: **RandSeed** *is pasted to the input line. The bottom status line displays* **EXPR***, indicating you must enter an expression.*

(1)
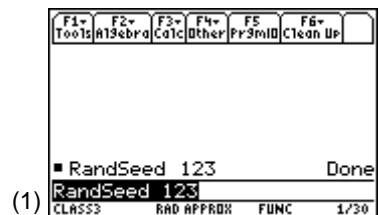
5. Press **R**, select **randInt(…tistat**, and press ENTER.

*Note: See **RandSamp** below for sampling without repeats or without replacement.*

6. Type **1,24)**, including the comma and right parenthesis, and then press ENTER for the second line on screen 2. The 17th student in the list (**Flora**) is asked to answer a question or contribute to the class discussion.

7. Press ENTER ENTER ENTER for **7**, **18**, and **18** (or **Martin**, **Bee**, and **Bee** again). These students are the next volunteers. (See screen 2.)

8. Press ENTER ENTER for **12** and **11** (or **Ann** and **Lawrence**).

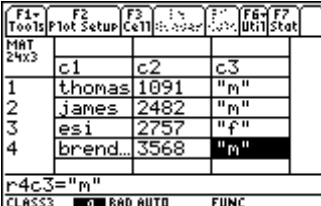|	class3	id3	gender		class3	id3	gender
1	Thomas	1091	M	13	Floyd	5180	M
2	James	2482	M	14	Ivan	5187	M
3	Esi	2757	F	15	Katherine	5521	F
4	Brendan	3568	M	16	Bernadette	6475	F
5	Kojo	3768	M	17	Flora	7039	F
6	Juan	3850	M	18	Bee	7151	F
7	Martin	3880	M	19	Ming	7192	F
8	Christopher	3984	M	20	Nicodemus	7219	M
9	Cheyenne	4456	F	21	Marge	8477	F
10	Shaine	4628	F	22	Jose	8506	M
11	Lawrence	4696	M	23	Frank	9802	M
12	Ann	4946	F	24	Miles	9965	M

Sampling from a List or Matrix (Optional)

1. Type the students' names, as listed, in a list named
   class3 (screen 3) and/or in a matrix named **clas3mat**
   with all the data including **id** and **gender** (screen 4).

(3)

(4)

2. From the Home screen, paste **RandSeed 123** from the
   top of the stack to the input line and press ENTER. This
   enables you to repeat the previous result (screen 5).

3. Type **class3[**, and then paste **tistat.randint(1,24)** from
   the stack and type **]** to close the bracket (or do the
   same with **clas3mat[**) (screen 6).

4. Press ENTER ENTER for **Flora** and **Martin** as before and in
   screen 5 or screen 6. The matrix could be extended to
   include phone numbers, addresses, and so forth.

(5)

(6)

To generate more than one number at a time:

5. From the Home screen, type **RandSeed123** and then
   press ENTER.

6. Enter **tistat.randint(1,24,5)**, and then press ENTER ENTER (screen 7).

The first five random numbers, without repeats, are **17**, **7**, **18**, **12**, and **11** (or **Flora**, **Martin**, **Bee**, **Ann**, and **Lawrence**) to be the class representatives.
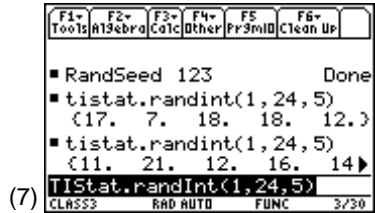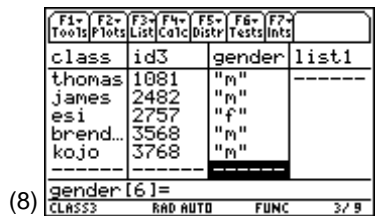

(7)

Note: This is three females and two males. **tistat.randint(1,24,10)** would have given the same results as above, but you would have to scroll to the right to see all the values.

Stratified Random Sample

Example: Select a random sample of five students from the class in proportion to the number of males and females in the class.

From the Stats/List Editor:

1. Enter the identification numbers in list **id3** and gender (**m** or **f**) in list **gender**, as found in the table and shown in screen 8.

**Note:** There are 10 females and 14 males in the class, so two females and three males will be selected from the strata: female and male.

(8)

2. With the cursor rectangle anywhere in list **gender**, press F3 **List**, **2:Ops**, and then **2:Sort List**, **Adjust All**, with Key List: **gender** and Sort Order: **Ascending** (screen 9).

(9)

Note: You could return to the original order of names, if necessary, since **id3** numbers are in order.

3. Press ENTER to display the first three lists (screen 10).

4. In a list named **num**, type **seq(x,x,1,24)** and press ENTER (fourth list in screen 10) as you did in Topic 1.
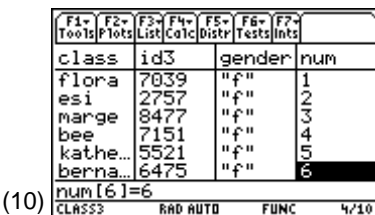
(10)

From the Home screen, obtain screen 11 with the following:

1. Set **RandSeed 4321** so you can repeat these results.

2. Press CATALOG, and then press F3 **Flash Apps**.

3. Select **randInt(…tistat** and then press ENTER.

4. Type **1,10,5)** and press ENTER for a result of **{6 4 8 6 2}**. The two females are **6** and **4** (or **Bernadette** and **Bee**).

5. Enter **tistat.randint(11,24,5)** and press ENTER for a result of **{24 24 14 20 18}**. The three males are **24**, **14**, and **20** (or **Thomas**, **Miles**, and **Brendan**). (See screen 11.)
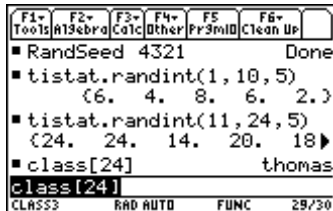
(11)

Note: These come from the list as sorted in screen 10, with the 10 females (1 to 10) followed by the 14 males (11 to 24).

Randomization in Experimental Designs

Randomization is an important component of conducting an experiment.

Example: Divide the class of 24 students randomly into two groups of 12 each to test two different worksheets. These worksheets are being used to teach a new skill to see which one is the most effective.

1. Set **RandSeed 678** so you can repeat these results.

2. Enter **tistat.randint(1,24,5)**, five at a time so you can read the first ten student names and another five student names after pressing ENTER.

   The results are **12**, **8**, **20**, **4**, **14**, **7**, **16**, **11**, **13**, **10**, **19**, **15** after ignoring repeats of **14** and **7**. From the original table these are **Ann**, **Christopher**, **Nicodemus**, **Brendan**, **Ivan**, **Martin**, **Bernadette**, **Lawrence**, **Floyd**, **Shaine**, **Ming**, and **Katherine** assigned to use worksheet A, and the remaining 12 students assigned to use worksheet B.
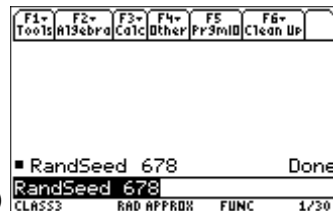
RandSamp – Sampling Without Repetitions (without replacements)

From the Home screen:

1. Set **RandSeed 678** (screen 12).

2. Press CATALOG, and then press F3 **Flash Apps**.

3. Select **randSamp** and press ENTER.

The instructions ask for **list, choose [, norep=1]**.

4. Enter list name **num**, which contains the values from 1 to 24.

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5. Enter **tistat.randsamp(num,12,1)** to choose 12 values, with **1** for NO REPEATS, and press ENTER (screen 13). The first five values displayed are **1**, **16**, **10**, **12**, and **2**.

    If you try to choose 25 values from 24 with no repeats, you will get a Domain Error. If you remove the last "**1**" from the **randsamp** instruction, it will pick 25 values with replacement, and the values will be the same as in screen 11.

6. Highlight the output list of numbers and use ⊙ for the remaining **22**, **4**, **20**, **9**, **7**, **19**, and **15** with no repeats.

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Note: This cannot be done five at a time if you want to be sure there are no repeats.

Sampling Using Non-Consecutive Integers

You could also sample from student ID numbers (under **id3** in screens 8 or 10), or invoice numbers, or any other unique number in the data base. The following is done with the data sorted as in screen 10 with the 10 females first, followed by the 14 males.

Screen 14 shows that the first three **ids** in your sample are **7039**, **4696**, and **7192**. From the original table, these are **Flora**, **Lawrence**, and **Ming**.

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