

Chapter 2

Random Number Generator

Suppose that a local school superintendent asked you to take a random sample of 5 of an elementary school's 32 teachers using Excel so that you could interview these five teachers about their job satisfaction at their school.

To do that, you need to define a "sampling frame." A sampling frame is a list of people from which you want to select a random sample. This frame starts with the identification code (ID) of the number 1 that is assigned to the name of the first teacher in your list of 32 teachers in this school. The second teacher has a code number of 2, the third a code number of 3, and so forth until the last teacher has a code number of 32.

Since this school has 32 teachers, your sampling frame would go from 1 to 32 with each teacher having a unique ID number.

We will first create the frame numbers as follows in a new Excel worksheet.

2.1 Creating Frame Numbers for Generating Random Numbers

Objective: To create the frame numbers for generating random numbers

A3: FRAME NO.

A4: 1

Now, create the frame numbers in column A with the Home/Fill commands that were explained in the first chapter of this book (see Sect. 1.4.1) so that the frame numbers go from 1 to 32, with the number 32 in cell A35. If you need to be reminded about how to do that, here are the steps:

Click on cell A4 to select this cell

Home

Fill (then click on the “down arrow” next to this command and select) Series (see Fig. 2.1)

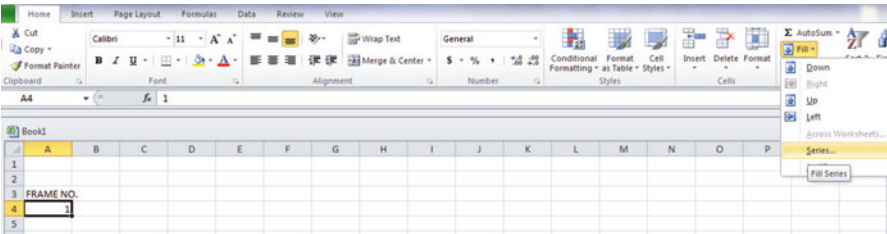


Fig. 2.1 Dialog Box for Fill/Series Commands

Columns

Step value: 1

Stop value: 32 (see Fig. 2.2)

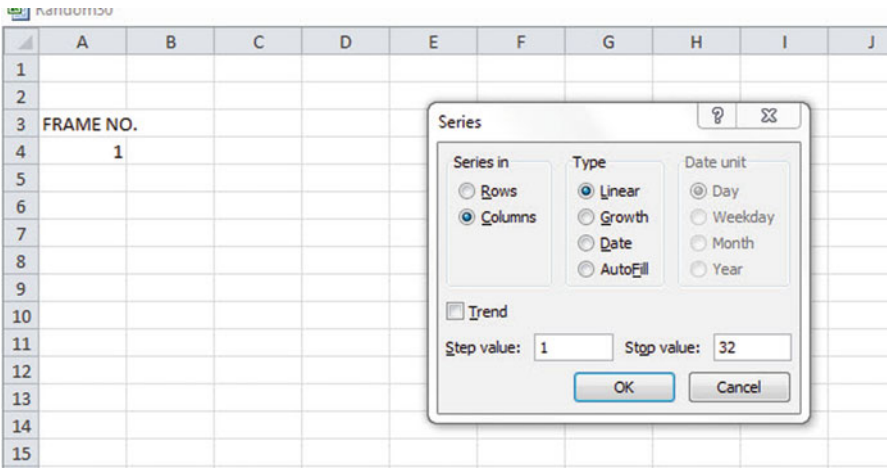


Fig. 2.2 Dialog Box for Fill/Series/Columns/Step value/Stop value Commands

OK

Then, save this file as: Random29. You should obtain the result in Fig. 2.3.

FRAME NO.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32

Fig. 2.3 Frame Numbers from 1 to 32

Now, create a column next to these frame numbers in this manner:

- B3: DUPLICATE FRAME NO.
- B4: 1

Next, use the Home/Fill command again, so that the 32 frame numbers begin in cell B4 and end in cell B35. Be sure to widen the columns A and B so that all the information in these columns fits inside the column width. Then, center the information inside both Column A and Column B on your spreadsheet. You should obtain the information given in Fig. 2.4.

Fig. 2.4 Duplicate Frame
Numbers from 1 to 32

FRAME NO.	DUPLICATE FRAME NO.
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25
26	26
27	27
28	28
29	29
30	30
31	31
32	32

Save this file as: Random30

You are probably wondering why you created the same information in both Column A and Column B of your spreadsheet. This is to make sure that before you sort the frame numbers that you have exactly 32 of them when you finish sorting them into a random sequence of 32 numbers.

Now, let's add a random number to each of the duplicate frame numbers as follows.

2.2 Creating Random Numbers in an Excel Worksheet

- C3: RANDOM NO.
(then widen columns A, B, C so that their labels fit inside the columns;
then center the information in A3:C35)
- C4: =RAND()

Next, hit the Enter key to add a random number to cell C4.

Note that you need *both* an open parenthesis *and* a closed parenthesis after =*RAND* (). The RAND command “looks to the left of the cell with the RAND() COMMAND in it” and assigns a random number to that cell.

Now, put the pointer using your mouse in cell C4 and then move the pointer to the bottom right corner of that cell until you see a “plus sign” in that cell. Then, click and drag the pointer down to cell C35 to add a random number to all 32 ID frame numbers (see Fig. 2.5).

FRAME NO.	DUPLICATE FRAME NO.	RANDOM NO.
1	1	0.003582027
2	2	0.782788863
3	3	0.579542097
4	4	0.194826007
5	5	0.180624088
6	6	0.11111051
7	7	0.841557731
8	8	0.43839362
9	9	0.039665164
10	10	0.950687104
11	11	0.701382569
12	12	0.340485937
13	13	0.622362199
14	14	0.823691903
15	15	0.196989157
16	16	0.644490495
17	17	0.818952316
18	18	0.198204913
19	19	0.703849331
20	20	0.412769208
21	21	0.356822645
22	22	0.906835718
23	23	0.770448533
24	24	0.22095226
25	25	0.141239005
26	26	0.035501923
27	27	0.11336016
28	28	0.055916598
29	29	0.368006445
30	30	0.133117174
31	31	0.736884083
32	32	0.702218141

Fig. 2.5 Example of Random Numbers Assigned to the Duplicate Frame Numbers

Then, click on any empty cell to deselect C4:C35 to remove the dark color highlighting these cells.

Save this file as: Random31

Now, let’s sort these duplicate frame numbers into a random sequence.

2.3 **Sorting Frame Numbers into a Random Sequence**

Objective: To sort the duplicate frame numbers into a random sequence

Highlight cells B3:C35 (include the labels at the top of columns B and C)
Data (top of screen)
Sort (click on this word at the top center of your screen; see Fig. 2.6)

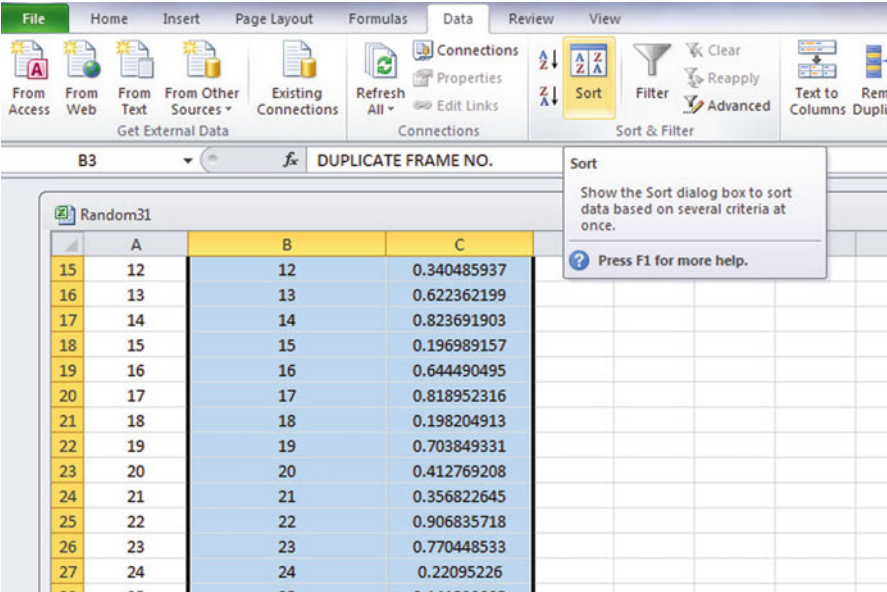


Fig. 2.6 Dialog Box for Data/Sort Commands

Sort by: RANDOM NO. (click on the down arrow)
Smallest to Largest (see Fig. 2.7)

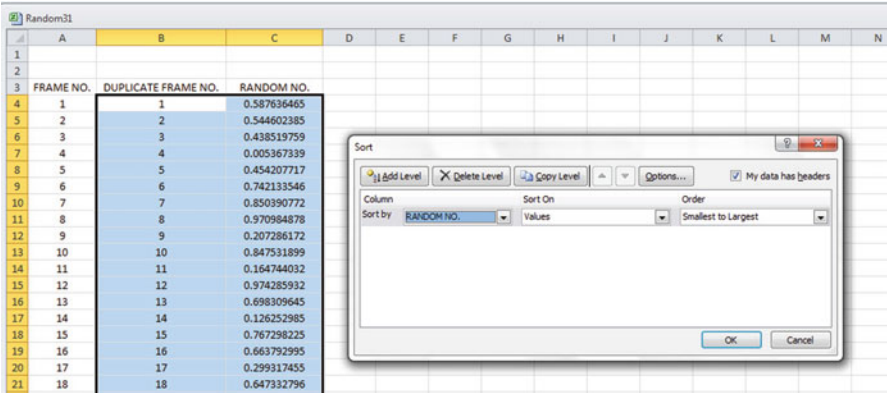


Fig. 2.7 Dialog Box for Data/Sort/RANDOM NO./Smallest to Largest Commands

OK

Click on any empty cell to deselect B3:C35.

Save this file as: Random32

Print this file now.

These steps will produce Fig. 2.8 with the DUPLICATE FRAME NUMBERS sorted into a random order.

Fig. 2.8 Duplicate Frame Numbers Sorted by Random Number

FRAME NO.	DUPLICATE FRAME NO.	RANDOM NO.
1	4	0.048919918
2	32	0.715166245
3	19	0.734859307
4	31	0.457996527
5	14	0.837332575
6	25	0.509257077
7	11	0.71473365
8	20	0.297513233
9	29	0.455511676
10	9	0.398344533
11	28	0.074506919
12	17	0.822659637
13	26	0.680326909
14	30	0.586949154
15	3	0.685958841
16	5	0.801702294
17	24	0.042432294
18	27	0.913192281
19	2	0.911877184
20	1	0.000107945
21	22	0.660085877
22	18	0.782601369
23	16	0.222790879
24	13	0.735556843
25	6	0.849257376
26	15	0.232958712
27	10	0.506254928
28	7	0.092256678
29	23	0.990635679
30	21	0.767847232
31	8	0.004497343
32	12	0.748968302

Important note: *Because Excel randomly assigns these random numbers, your Excel commands will produce a different sequence of random numbers from everyone else who reads this book!*

Because your objective at the beginning of this chapter was to select randomly five of this school’s 32 teachers for a personal interview, you now can do that by selecting the *first five ID numbers* in DUPLICATE FRAME NO. column after the sort.

Although your first five random numbers will be different from those we have selected in the random sort that we did in this chapter, we would select these five IDs of teachers to interview using Fig. 2.9.

Fig. 2.9 First Five Teachers
Selected Randomly

FRAME NO.	DUPLICATE FRAME NO.	RANDOM NO.
1	4	0.048919918
2	32	0.715166245
3	19	0.734859307
4	31	0.457996527
5	14	0.837332575
6	25	0.509257077
7	11	0.71473365
8	20	0.297513233
9	29	0.455511676
10	9	0.398344533
11	28	0.074506919
12	17	0.822659637
13	26	0.680326909
14	30	0.586949154
15	3	0.685958841
16	5	0.801702294
17	24	0.042432294
18	27	0.913192281
19	2	0.911877184
20	1	0.000107945
21	22	0.660085877
22	18	0.782601369
23	16	0.222790879
24	13	0.735556843
25	6	0.849257376
26	15	0.232958712
27	10	0.506254928
28	7	0.092256678
29	23	0.990635679
30	21	0.767847232
31	8	0.004497343
32	12	0.748968302

4, 32, 19, 31, 14
Save this file as: Random33

Remember, your five ID numbers selected after your random sort will be different from the five ID numbers in Fig. 2.9 because Excel assigns a different random number *each time the =RAND() command is given*.

Before we leave this chapter, you need to learn how to print a file so that all the information on that file fits onto a single page without “dribbling over” onto a second or third page.

2.4 Printing an Excel File so That All the Information Fits onto One Page

Objective: To print a files so that all the information fits onto one page

Note that the three practice problems at the end of this chapter require you to sort random numbers when the files contain 63 teachers, 114 counties of the state of Missouri, and 76 key accounts, respectively. These files will be “too big” to fit onto one page when you print them unless you format these files so that they fit onto a single page when you print them.

Let’s create a situation where the file does not fit onto one printed page unless you format it first to do that.

Go back to the file you just created, Random 33, and enter the name: *Jennifer* into cell: A52.

If you printed this file now, the name, *Jennifer*, would be printed onto a second page because it “dribbles over” outside of the page range for this file in its current format.

So, you would need to change the page format so that all the information, including the name, Jennifer, fits onto just one page when you print this file by using the following steps.

Page Layout (top left of the computer screen).

(Notice the “Scale to Fit” section in the center of your screen; see Fig. 2.10.)

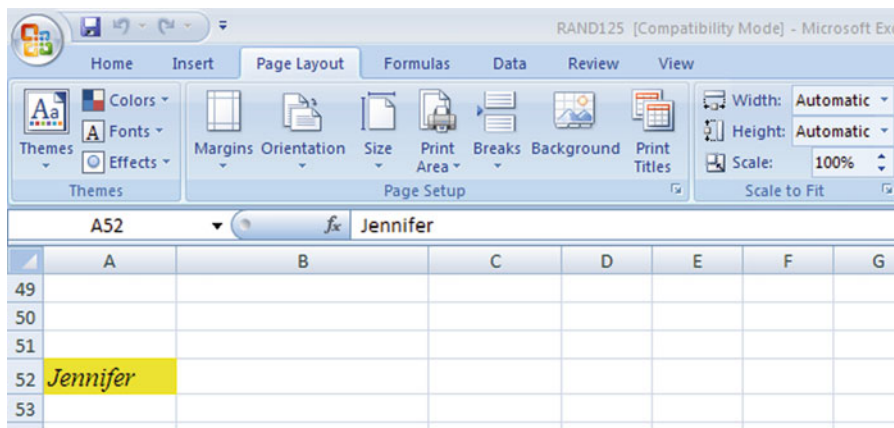


Fig. 2.10 Dialog Box for Page Layout/Scale to Fit Commands

Hit the down arrow to the right of 100% *once* to reduce the size of the page to 95%.

Now, note that the name, Jennifer, is still on a second page on your screen because her name is below the horizontal dotted line on your screen in Fig. 2.11 (the dotted lines tell you outline dimensions of the file if you printed it now).

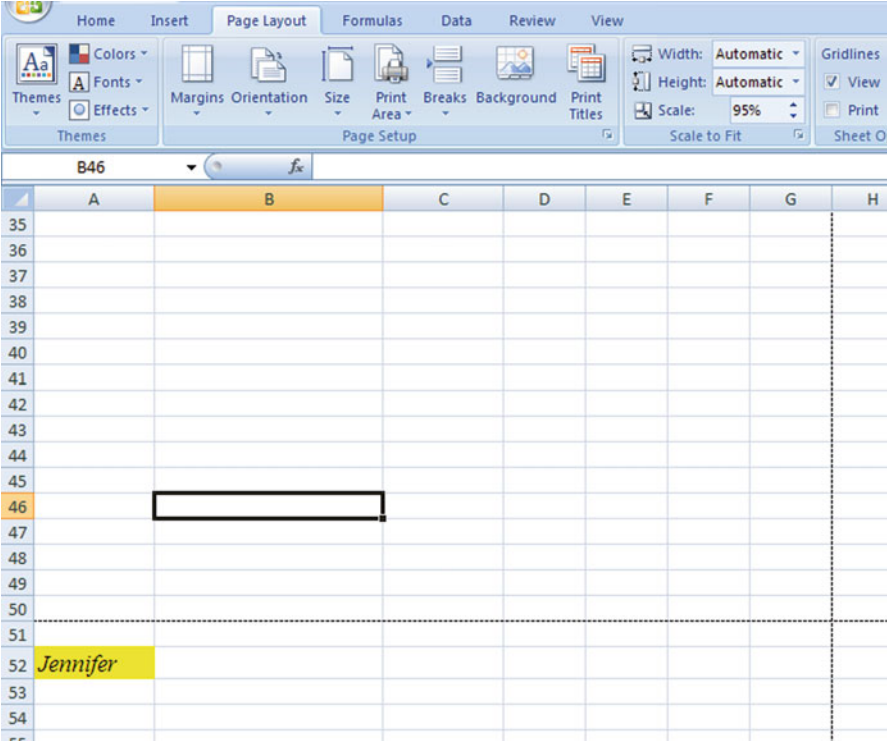


Fig. 2.11 Example of Scale Reduced to 95 % with “Jennifer” to be Printed on a Second Page

So, you need to repeat the “scale change steps” by hitting the down arrow on the right once more to reduce the size of the worksheet to 90% of its normal size.

Notice that the “dotted lines” on your computer screen in Fig. 2.12 are now below Jennifer’s name to indicate that all the information, including her name, is now formatted to fit onto just one page when you print this file.

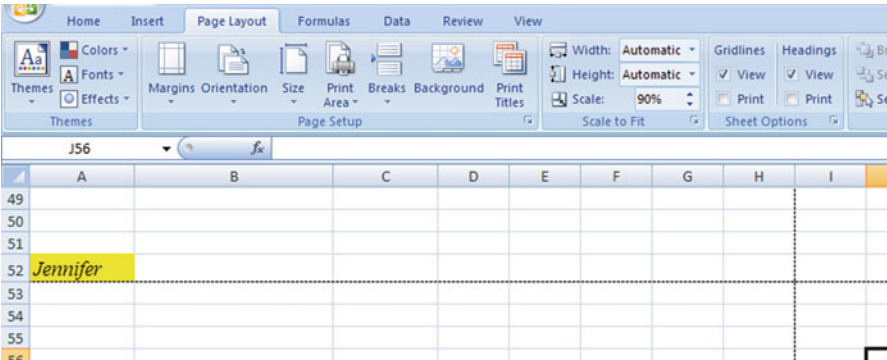


Fig. 2.12 Example of Scale Reduced to 90 % with “Jennifer” to be Printed on the First Page (note the dotted line below Jennifer on your screen)

2.5 End-of-Chapter Practice Problems

1. Suppose that you wanted to do a “customer satisfaction phone survey” of 15 of 63 teachers at a secondary school in St. Louis, Missouri.
 - (a) Set up a spreadsheet of frame numbers for these teachers with the heading: FRAME NUMBERS using the Home/Fill commands.
 - (b) Then, create a separate column to the right of these frame numbers which duplicates these frame numbers with the title: Duplicate frame numbers.
 - (c) Then, create a separate column to the right of these duplicate frame numbers and use the =RAND() function to assign random numbers to all the frame numbers in the duplicate frame numbers column, and change this column format so that three decimal places appear for each random number.
 - (d) Sort the duplicate frame numbers and random numbers into a random order.
 - (e) Print the result so that the spreadsheet fits onto one page.
 - (f) Circle on your printout the ID number of the first 15 teachers that you would call in your phone survey.
 - (g) Save the file as: RAND9

Important note: *Note that everyone who does this problem will generate a different random order of teacher ID numbers since Excel assigns a different random number each time the RAND() command is used. For this reason, the answer to this problem given in this Excel Guide will have a completely different sequence of random numbers from the random sequence that you generate. This is normal and what is to be expected.*

2. Suppose that you wanted to do a random sample of 10 of the 114 counties in the state of Missouri as requested by a political pollster who wants to select registered voters by county in Missouri for a phone survey of their voting preferences in the next election. You know that there are 114 counties in Missouri because you have accessed the Web site for the US census (U.S. Census Bureau 2000). For your information, the United States has a total of 3,140 counties in its 50 states (U.S. Census Bureau 2000).
 - (a) Set up a spreadsheet of frame numbers for these counties with the heading: FRAME NO.
 - (b) Then, create a separate column to the right of these frame numbers which duplicates these frame numbers with the title: Duplicate frame no.
 - (c) Then, create a separate column to the right of these duplicate frame numbers entitled “Random number” and use the =RAND() function to assign random numbers to all the frame numbers in the duplicate frame numbers column. Then, change this column format so that three decimal places appear for each random number.
 - (d) Sort the duplicate frame numbers and random numbers into a random order.
 - (e) Print the result so that the spreadsheet fits onto one page.

- (f) Circle on your printout the ID number of the first 10 counties that the pollster would call in his phone survey.
 - (g) Save the file as: **RANDOM6**
3. Suppose that a Sales department at a company wants to do a “customer satisfaction survey” of 20 of this company’s 76 “key accounts.” Suppose, further, that the Sales Vice-President has defined a key account as a customer who purchased at least \$30,000 worth of merchandise from this company in the past 90 days.
- (a) Set up a spreadsheet of frame numbers for these customers with the heading: **FRAME NUMBERS**.
 - (b) Then, create a separate column to the right of these frame numbers which duplicates these frame numbers with the title: **Duplicate frame numbers**.
 - (c) Then, create a separate column to the right of these duplicate frame numbers entitled “Random number” and use the **=RAND()** function to assign random numbers to all the frame numbers in the duplicate frame numbers column. Then, change this column format so that three decimal places appear for each random number.
 - (d) Sort the duplicate frame numbers and random numbers into a random order.
 - (e) Print the result so that the spreadsheet fits onto one page.
 - (f) Circle on your printout the ID number of the first 20 customers that the Sales Vice-President would call for his phone survey.
 - (g) Save the file as: **RAND5**

Reference

U.S. Census Bureau. (2000). Census 2000 PHC-T-4. Ranking tables for counties 1990 and 2000. Retrieved January 20, 2011 from <http://www.census.gov/population/www/cen2000/briefs/phc-t4/tables/tab01.pdf>

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