

Chapter 2

Random Number Generator

Suppose that you wanted to take a random sample of 5 of your company's 32 salespeople using Excel so that you could interview these 5 salespeople about their job satisfaction at your company.

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 salesperson in your list of 32 salespeople in your company. The second salesperson has a code number of 2, the third a code number of 3, and so forth until the last salesperson has a code number of 32.

Since your company has 32 salespeople, your sampling frame would go from 1 to 32 with each salesperson 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)

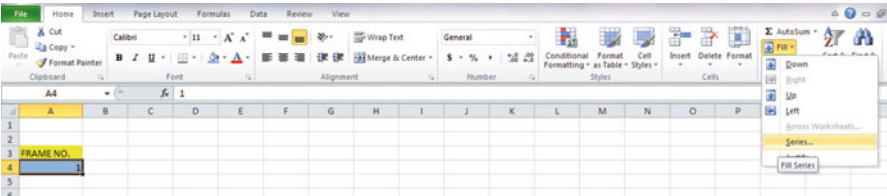


Fig. 2.1 Dialog Box for Fill/Series Commands

Columns
Step value: 1
Stop value: 32 (see Fig. 2.2)

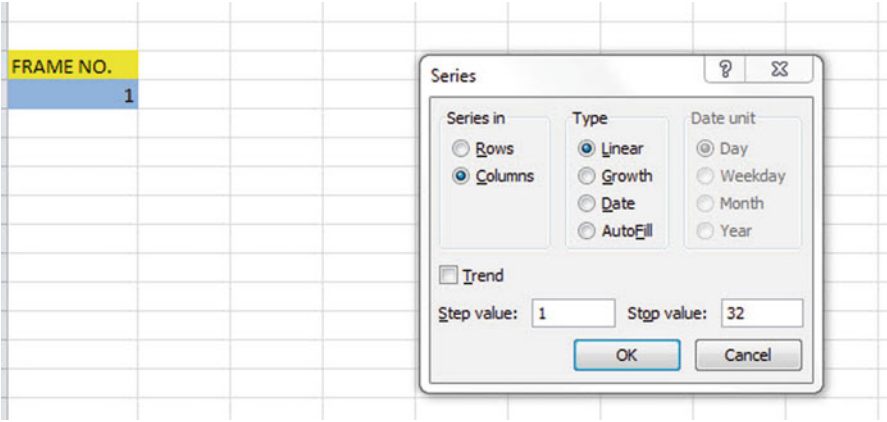


Fig. 2.2 Dialog Box for Fill/Series/Columns/Step value/Stop value Commands

OK

Then, save this file as: Random2. 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 of 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.

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			

Fig. 2.4 Duplicate Frame Numbers from 1 to 32

Save this file as: Random3

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	0.690332931		
2	2	0.022334603		
3	3	0.89452184		
4	4	0.981573849		
5	5	0.698381228		
6	6	0.611413628		
7	7	0.013551391		
8	8	0.036862479		
9	9	0.412932328		
10	10	0.460808373		
11	11	0.533416136		
12	12	0.988470378		
13	13	0.097821358		
14	14	0.881481661		
15	15	0.352287507		
16	16	0.344014139		
17	17	0.084570168		
18	18	0.467909507		
19	19	0.904917153		
20	20	0.252482436		
21	21	0.788783634		
22	22	0.592964999		
23	23	0.946665187		
24	24	0.214249616		
25	25	0.509340791		
26	26	0.439105519		
27	27	0.086378662		
28	28	0.975489923		
29	29	0.120077924		
30	30	0.216062043		
31	31	0.353995884		
32	32	0.558171248		

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: Random3A

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)

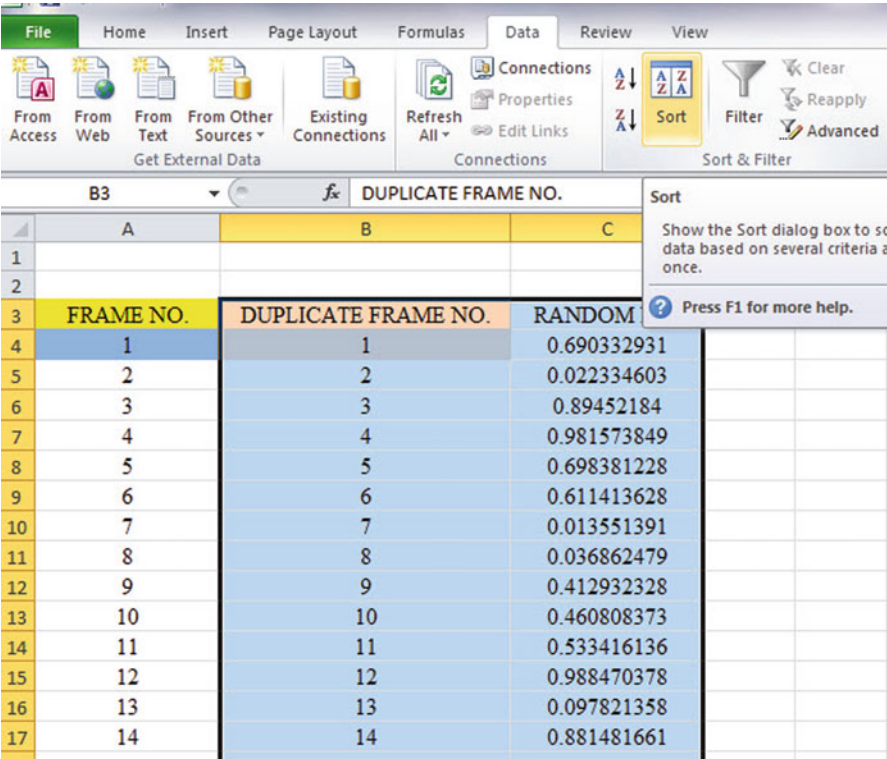


Fig. 2.6 Dialog Box for Data/Sort Commands

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

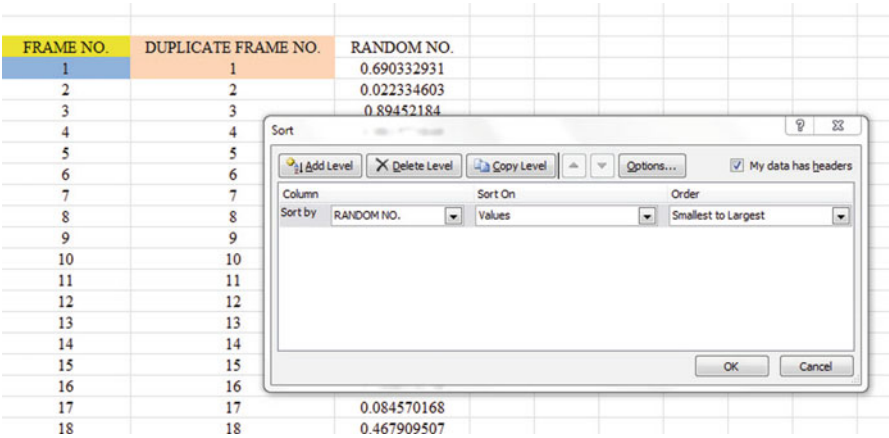


Fig. 2.7 Dialog Box for Data/Sort/RANDOM NO./Smallest to Largest Commands

OK
Click on any empty cell to deselect B3:C35.
Save this files as: Random4
Print this file now.

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

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!*

FRAME NO.	DUPLICATE FRAME NO.	RANDOM NO.		
1	7	0.343261283		
2	2	0.929607291		
3	8	0.914304212		
4	17	0.903618324		
5	27	0.257228182		
6	13	0.456204036		
7	29	0.390622986		
8	24	0.222210116		
9	30	0.432155483		
10	20	0.219982266		
11	16	0.842461398		
12	15	0.3781508		
13	31	0.694049089		
14	9	0.939764564		
15	26	0.075689667		
16	10	0.302227714		
17	18	0.468687794		
18	25	0.148502036		
19	11	0.49462371		
20	32	0.87719372		
21	22	0.413151766		
22	6	0.094310793		
23	1	0.962115342		
24	5	0.528964967		
25	21	0.401140496		
26	14	0.403327013		
27	3	0.865025638		
28	19	0.517332393		
29	23	0.968085821		
30	28	0.647609375		
31	4	0.670143403		
32	12	0.09483352		

Fig. 2.8 Duplicate Frame Numbers Sorted by Random Number

Because your objective at the beginning of this chapter was to select randomly 5 of your company's 32 salespeople 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 salespeople to interview using Fig. 2.9.

7, 2, 8, 17, 27

FRAME NO.	DUPLICATE FRAME NO.	RANDOM NO.		
1	7	0.343261283		
2	2	0.929607291		
3	8	0.914304212		
4	17	0.903618324		
5	27	0.257228182		
6	13	0.456204036		
7	29	0.390622986		
8	24	0.222210116		
9	30	0.432155483		
10	20	0.219982266		
11	16	0.842461398		
12	15	0.3781508		
13	31	0.694049089		
14	9	0.939764564		
15	26	0.075689667		
16	10	0.302227714		
17	18	0.468687794		
18	25	0.148502036		
19	11	0.49462371		
20	32	0.87719372		
21	22	0.413151766		
22	6	0.094310793		
23	1	0.962115342		
24	5	0.528964967		
25	21	0.401140496		
26	14	0.403327013		
27	3	0.865025638		
28	19	0.517332393		
29	23	0.968085821		
30	28	0.647609375		
31	4	0.670143403		
32	12	0.09483352		

Fig. 2.9 First Five Salespeople Selected Randomly

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 of 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 of the Information Fits onto One Page

Objective: To print a file so that all of 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 customers, 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 4, 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 of 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)

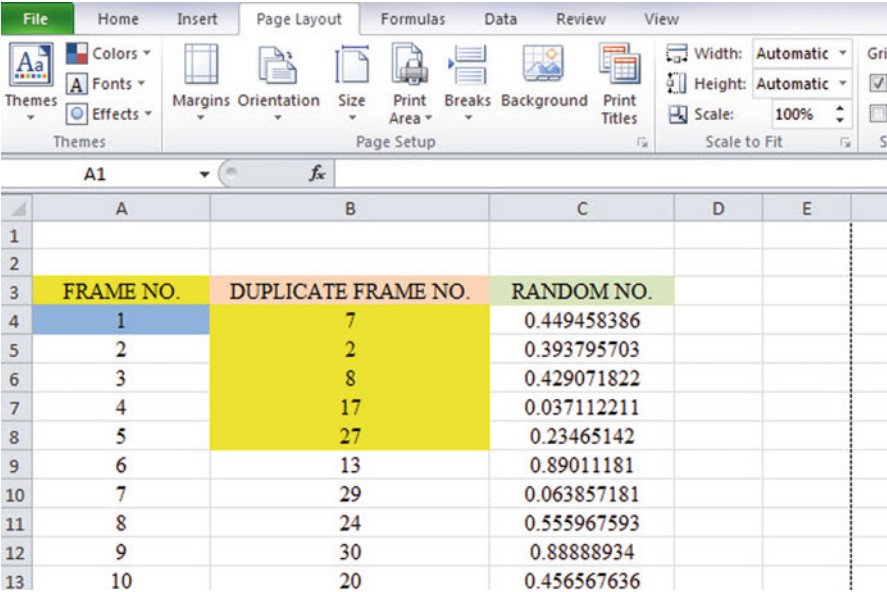


Fig. 2.10 Dialog Box for Page Layout/Scale to Fit Commands

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 the 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).

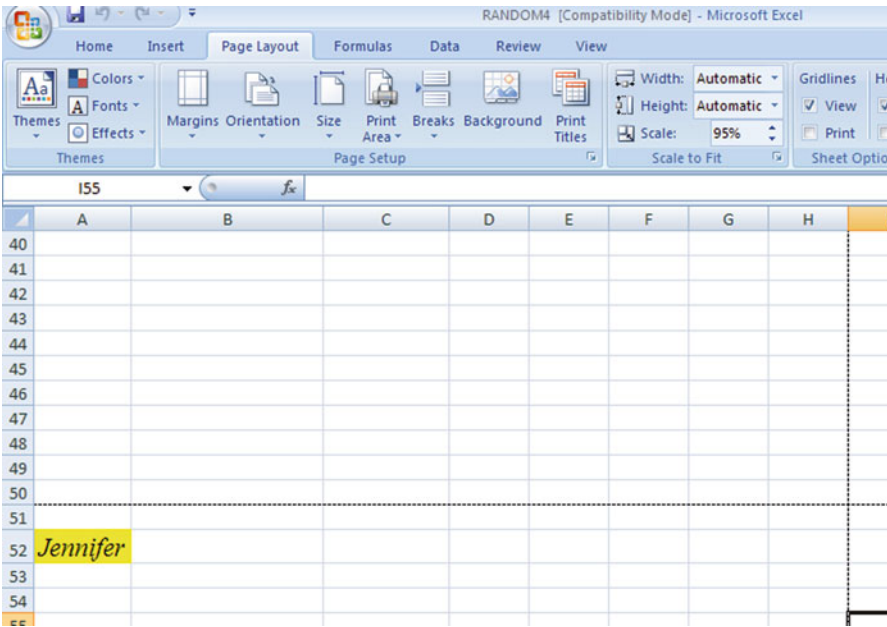


Fig. 2.11 Example of Scale Reduced to 95% with “Jennifer” to be Printed on a Second Page

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 of the information, including her name, is now formatted to fit onto just one page when you print this file.

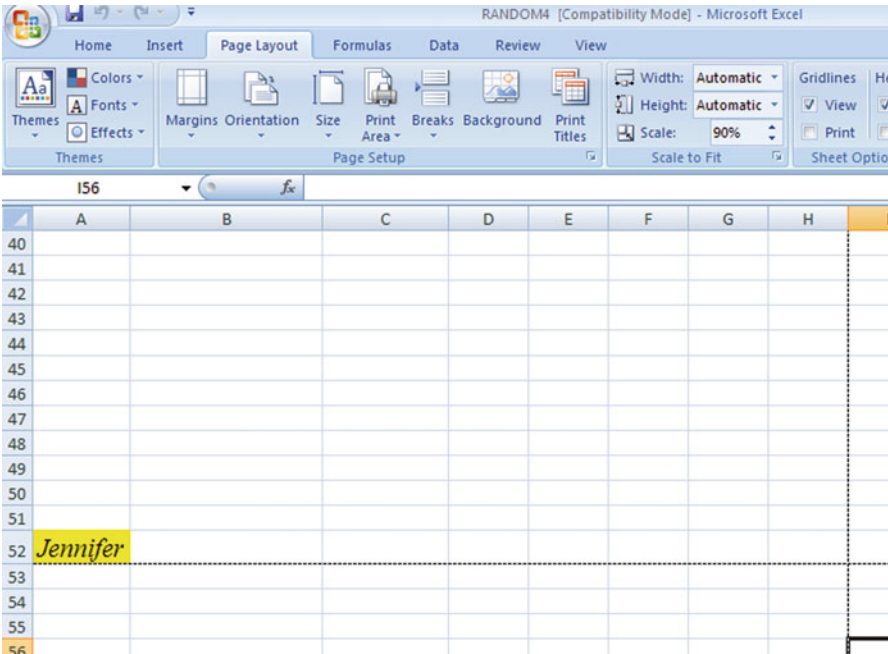


Fig. 2.12 Example of Scale Reduced to 90% with “Jennifer” to be printed on the first page (note the dotted line below Jennifer on your screen)

Save the file as: Random4A
Print the file. Does it all fit onto one page? It should (see Fig. 2.13).

2.5 End-of-Chapter Practice Problems

1. Suppose that you wanted to do a “customer satisfaction phone survey” of 15 of 63 customers who purchased at least \$1,000 worth of merchandise from your company during the last 60 days.
 - (a) Set up a spreadsheet of frame numbers for these customers 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 of 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 customers 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 customer 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 of 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 your Sales department at your company wants to do a “customer satisfaction survey” of 20 of your company’s 76 “key accounts.” Suppose, further, that your Sales Vice-President has defined a key account as a customer who purchased at least \$30,000 worth of merchandise from your 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 of 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 your Sales Vice-President would call for his phone survey.
 - (g) Save the file as: **RAND5**

Reference

U.S. Census Bureau 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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