

Chapter 889

Design Generator

Introduction

This program generates factorial, repeated measures, and split-plots designs with up to ten factors. The design can be placed in the current spreadsheet.

An introduction to experimental design is presented in Chapter 881 on Two-Level Factorial Designs and will not be repeated here.

Crossed Factors

Two factors are *crossed* if all levels of one factor occur with each level of the second factor. No distinction needs to be made as to whether a factor is random or fixed. Factorial and randomized block designs are examples of designs that contain crossed factors.

Nested Factors

In the repeated measures and split-plot designs, at least one of the factors is nested in another factor. A factor is *nested* when all levels of this factor do not occur with each level of another factor. For example, suppose a study is being made to compare the heart rate of males and females. Five males and five females are selected. One factor in the study would be gender with two levels: male and female. Another factor would be individual with ten levels: P1, P2, ..., and P10. Since five of the ten individuals are in the males group and the other five individuals are in the females group, individuals are nested within gender.

The basic structure of *repeated measures* and *split-plot* designs is identical. The difference between the two is in the way the factor levels are assigned within the individual factor. Consider an exercise study in which heart rate readings are to be made on an individual at five different points in time. If the amounts of exercise is assigned at random before each reading, the design is a split plot. If the amounts of exercise follow the same pattern for each individual, the design is a repeated measures.

Procedure Options

This section describes the options available in this procedure.

Design Tab

This panel specifies the parameters that will be used to create the design values.

Experimental Setup

Factor (1 to 12) Values

The values used to represent the rows are specified here. These values may be letters, digits, words, or numbers. The list is delimited by blanks or commas. The number of levels of a factor corresponds to the number of values that are listed here.

To specify a nested factor, use the word Nested followed by the number of levels within a group. For example, entering 'Nested 4' signifies a design in which four individuals are placed in each group. The number of groups is found by crossing the factors before the nested factor.

An easy way to replicate a design is to specify a nested factor as the last factor with the number of replicates specified as the number of levels.

Data Storage to Spreadsheet

Store Data on Spreadsheet

Check this box to generate the design data on the spreadsheet. The spreadsheet data will be identical to the design data generated on the output window.

Store First Factor In

The first factor is stored in this column. Each additional factor that is specified is stored in the columns immediately to the right of this column. A factor is specified when values are entered into its Factor Values box.

Warning: The program fills these variables with data, so any previous data will be replaced.

Example 1 – Three-by-Four Factorial Design with Three Replicates

This section presents an example of how to degenerate a three-by-four factorial design with three replicates per treatment combination. To run this example, take the following steps. **CAUTION: since the purpose of this routine is to generate data, you should always begin with an empty output spreadsheet.**

Setup

This section presents the values of each of the parameters needed to run this example. First, from the PASS Home window, load the **Design Generator** procedure window by expanding **Design of Experiments**, then clicking on **Experimental Design**, and then clicking on **Design Generator**. You may then make the appropriate entries as listed below, or open **Example 1** by going to the **File** menu and choosing **Open Example Template**.

1 Specify the design parameters.

- Enter **1 2 3** in the **Factor 1 Values (A)** box.
- Enter **1 2 3 4** in the **Factor 2 Values (B)** box.
- Enter **Nested 3** in the **Factor 3 Values (C)** box.
- Check the **Store Data on Spreadsheet** box.
- Enter **1** in the **First Factor Column** box.

2 Run the procedure.

- From the Run menu, select **Start Calculation**. Alternatively, just click the Calculate button.

Three-by-Four Design with Three Replicates

Experimental Design

Row	Factor 1	Factor 2	Factor 3
1	1	1	1
2	1	1	2
3	1	1	3
4	1	2	4
5	1	2	5
6	1	2	6
7	1	3	7
8	1	3	8
9	1	3	9
10	1	4	10
11	1	4	11
12	1	4	12
13	2	1	13
14	2	1	14
15	2	1	15
16	2	2	16
17	2	2	17
18	2	2	18
19	2	3	19
20	2	3	20
21	2	3	21
22	2	4	22
23	2	4	23
24	2	4	24
25	3	1	25
26	3	1	26
27	3	1	27
28	3	2	28
29	3	2	29
30	3	2	30
31	3	3	31
32	3	3	32
33	3	3	33
34	3	4	34
35	3	4	35
36	3	4	36

The values were also produced on the spreadsheet.

These values are also generated on the spreadsheet.

Example 2 – Randomized Block Design

This section presents an example of how to degenerate a randomized block design with three blocks and four treatments. To run this example, take the following steps. **CAUTION: since the purpose of this routine is to generate data, you should always begin with an empty output spreadsheet.**

Setup

This section presents the values of each of the parameters needed to run this example. First, from the PASS Home window, load the **Design Generator** procedure window by expanding **Design of Experiments**, then clicking on **Experimental Design**, and then clicking on **Design Generator**. You may then make the appropriate entries as listed below, or open **Example 2** by going to the **File** menu and choosing **Open Example Template**.

1 Specify the design parameters.

- Enter **1 2 3** in the **Factor 1 Values (A)** box.
- Enter **A B C D** in the **Factor 2 Values (B)** box.
- Make sure that the **Factor 3 Values (C)** box is blank.

2 Run the procedure.

- From the Run menu, select **Start Calculation**. Alternatively, just click the Calculate button.

Randomized Block Design

Experimental Design		
Row	Factor 1	Factor 2
1	1	A
2	1	B
3	1	C
4	1	D
5	2	A
6	2	B
7	2	C
8	2	D
9	3	A
10	3	B
11	3	C
12	3	D

It is important to remember that when you use this design, you must randomly assign treatments to the four letters and randomly assign the physical blocks to the three block numbers.

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Example 3 – Repeated Measures Design

This section presents an example of how to degenerate a repeated measures design with three groups, two individuals per group, and two treatments which we will label 'Pre' and 'Post.' To run this example, take the following steps. **CAUTION: since the purpose of this routine is to generate data, you should always begin with an empty output spreadsheet.**

Setup

This section presents the values of each of the parameters needed to run this example. First, from the PASS Home window, load the **Design Generator** procedure window by expanding **Design of Experiments**, then clicking on **Experimental Design**, and then clicking on **Design Generator**. You may then make the appropriate entries as listed below, or open **Example 3** by going to the **File** menu and choosing **Open Example Template**.

1 Specify the design parameters.

- Enter **1 2 3** in the **Factor 1 Values (A)** box.
- Enter **Nested 2** in the **Factor 2 Values (B)** box.
- Enter **Pre Post** in the **Factor 3 Values (C)** box.

2 Run the procedure.

- From the Run menu, select **Start Calculation**. Alternatively, just click the Calculate button.

Repeated Measures Design

Experimental Design			
Row	Factor 1	Factor 2	Factor 3
1	1	1	Pre
2	1	1	Post
3	1	2	Pre
4	1	2	Post
5	2	3	Pre
6	2	3	Post
7	2	4	Pre
8	2	4	Post
9	3	5	Pre
10	3	5	Post
11	3	6	Pre
12	3	6	Post