**Question 12.2**

*To determine the value of 10 different yes/no features to the market value of a house (large yard, solar roof, etc.), a real estate agent plans to survey 50 potential buyers, showing a fictitious house with different combinations of features. To reduce the survey size, the agent wants to show just 16 fictitious houses. Use R’s FrF2 function (in the FrF2 package) to find a fractional factorial design for this experiment: what set of features should each of the 16 fictitious houses have? Note: the output of FrF2 is “1” (include) or “-1” (don’t include) for each feature.*

Here’s one possible solution. The file solution 12.2.R shows how to find a fractional factorial design using the FrF2 function in R. The design is shown in the table below.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Features** | | | | | | | | | |
| **House number** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **J** | **K** |
| **1** | -1 | 1 | -1 | -1 | -1 | 1 | -1 | 1 | 1 | -1 |
| **2** | -1 | -1 | 1 | 1 | 1 | -1 | -1 | -1 | -1 | 1 |
| **3** | 1 | -1 | -1 | 1 | -1 | -1 | 1 | 1 | 1 | 1 |
| **4** | -1 | 1 | -1 | 1 | -1 | 1 | -1 | -1 | -1 | 1 |
| **5** | 1 | -1 | -1 | -1 | -1 | -1 | 1 | -1 | -1 | -1 |
| **6** | 1 | 1 | 1 | -1 | 1 | 1 | 1 | -1 | -1 | -1 |
| **7** | -1 | -1 | 1 | -1 | 1 | -1 | -1 | 1 | 1 | -1 |
| **8** | -1 | 1 | 1 | 1 | -1 | -1 | 1 | -1 | 1 | -1 |
| **9** | 1 | -1 | 1 | -1 | -1 | 1 | -1 | -1 | 1 | 1 |
| **10** | -1 | -1 | -1 | 1 | 1 | 1 | 1 | -1 | 1 | -1 |
| **11** | 1 | 1 | -1 | -1 | 1 | -1 | -1 | -1 | 1 | 1 |
| **12** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **13** | -1 | 1 | 1 | -1 | -1 | -1 | 1 | 1 | -1 | 1 |
| **14** | -1 | -1 | -1 | -1 | 1 | 1 | 1 | 1 | -1 | 1 |
| **15** | 1 | -1 | 1 | 1 | -1 | 1 | -1 | 1 | -1 | -1 |
| **16** | 1 | 1 | -1 | 1 | 1 | -1 | -1 | 1 | -1 | -1 |

Note that due to differences in the random number generator, you might get slightly different results. On a different machine, here’s another solution I got:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Features** | | | | | | | | | |
| **House number** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **J** | **K** |
| **1** | -1 | -1 | 1 | -1 | 1 | -1 | -1 | 1 | 1 | -1 |
| **2** | 1 | -1 | 1 | -1 | -1 | 1 | -1 | -1 | 1 | 1 |
| **3** | -1 | -1 | -1 | 1 | 1 | 1 | 1 | -1 | 1 | -1 |
| **4** | 1 | 1 | -1 | 1 | 1 | -1 | -1 | 1 | -1 | -1 |
| **5** | -1 | 1 | -1 | -1 | -1 | 1 | -1 | 1 | 1 | -1 |
| **6** | 1 | -1 | -1 | 1 | -1 | -1 | 1 | 1 | 1 | 1 |
| **7** | -1 | 1 | -1 | 1 | -1 | 1 | -1 | -1 | -1 | 1 |
| **8** | -1 | 1 | 1 | 1 | -1 | -1 | 1 | -1 | 1 | -1 |
| **9** | 1 | -1 | 1 | 1 | -1 | 1 | -1 | 1 | -1 | -1 |
| **10** | -1 | -1 | -1 | -1 | 1 | 1 | 1 | 1 | -1 | 1 |
| **11** | 1 | -1 | -1 | -1 | -1 | -1 | 1 | -1 | -1 | -1 |
| **12** | -1 | 1 | 1 | -1 | -1 | -1 | 1 | 1 | -1 | 1 |
| **13** | -1 | -1 | 1 | 1 | 1 | -1 | -1 | -1 | -1 | 1 |
| **14** | 1 | 1 | 1 | -1 | 1 | 1 | 1 | -1 | -1 | -1 |
| **15** | 1 | 1 | -1 | -1 | 1 | -1 | -1 | -1 | 1 | 1 |
| **16** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |