

HW9

12.1

I work for a major grocer and we could use DOE to evaluate different store layouts. An important question that we try to answer is - how should we organize our store layout so that our sales is maximized. For example, should we keep all green produce right near the entrance, where should snacks and soda be placed. We can easily use DOE to try different layouts over a period of time and see which one garners the best response.

12.2

For this purpose, I created 10 factors as shown below: 1) Elementary school rating over 8 2) Middle school rating over 8 3) High school rating over 8 4) Rated as safe neighborhood 5) Large yard 6) Solar 7) Public transportation in less 5 miles 8) Original owner 9) Swimming pool 10) Two car parking garages The idea is to come up with 16 fictitious houses that would include factors from the above list.

To clarify, a 1 in the results mean that the factor that has a “Yes” for that factor should be included and a -1 means a factor that has a “No” for that factor will be included. So, all the 16 fictitious houses will indeed include all 10 factors, however one fictitious house might include a “Yes” and another one might include a “No” for the same feature.

Also, we can observe that: $AG=BF=CE=DK=HJ$, $BD=CJ=EH=FK$, $BH=CK=DE=FJ$, $BJ=CD=EK=FH$, $BK=CH=DF=EJ$

13.1

- 1) Binomial: Phase three trial of a Covid vaccine which has a “Success” or “Failure” answer. Will the San Francisco 49ers win the Superbowl this year: answer is “Yes” or “No”?
- 2) Geometric: An expensive retail store would want to find out, how many customers visit their store before making a purchase each day.
- 3) Poisson: No. of customers buying food from McDonalds each day. No. of cars getting car washed each day
- 4) Exponential: The time between failures of a drilling machine. The time between two earthquakes in California
- 5) Weibull: How long do I have until my iPhone battery runs out. How long before my sofa recliner fails to work.

13.2

Please refer to the attached Arena model and related reports. To summarize, we need 4 document checkers and 4 security lines to keep the total waiting time to less than 15 minutes. The waiting time is also displayed on the screen for easier reference.

```
library(FrF2)
```

```
## Loading required package: DoE.base
```

```
## Loading required package: grid
```

```
## Loading required package: conf.design
```

```
## Registered S3 method overwritten by 'DoE.base':
```

```
##   method          from
```

```
##   factorize.factor conf.design
```

```
##
```

```
## Attaching package: 'DoE.base'
```

```
## The following objects are masked from 'package:stats':
```

```
##
```

```
##   aov, lm
```

```
## The following object is masked from 'package:graphics':
```

```
##
```

```
##   plot.design
```

```
## The following object is masked from 'package:base':
```

```
##
```

```
##   lengths
```

```
mod = FrF2(16, 10, factor.names = c("Elementary school rating over 8", "Middle school rating over 8", "High school rating over 8", "Rated as safe neighborhood", "Large yard", "Solar panel", "Fence", "Garden", "Patio", "Deck"))
```

```
print(mod)
```

```
##   Elementary.school.rating.over.8 Middle.school.rating.over.8
```

```
## 1                                -1                             1
```

```
## 2                                 1                             1
```

```
## 3                                -1                             1
```

```
## 4                                 1                             -1
```

```
## 5                                 1                             1
```

```
## 6                                -1                             -1
```

```
## 7                                -1                             -1
```

```
## 8                                 1                             -1
```

```
## 9                                 1                             -1
```

```
## 10                               -1                             -1
```

```
## 11                               -1                             -1
```

```
## 12                               -1                             1
```

```
## 13                               -1                             1
```

```
## 14                                 1                             1
```

```
## 15                                 1                             -1
```

```
## 16                                 1                             1
```

```
##   High.school.rating.over.8 Rated.as.safe.neighborhood Large.yard Solar
```

```
## 1                            -1                             -1         -1         1
```

```

## 2          1          -1          1          1
## 3          1          -1          -1         -1
## 4          1          1          -1          1
## 5         -1          1          1         -1
## 6          1          -1          1         -1
## 7         -1          -1          1          1
## 8         -1          1          -1         -1
## 9         -1          -1          -1         -1
## 10         -1          1          1          1
## 11          1          1          1         -1
## 12          1          1          -1         -1
## 13         -1          1          -1          1
## 14         -1          -1          1         -1
## 15          1          -1          -1          1
## 16          1          1          1          1
##   Public.transportation.in.less.5.miles Original.owner Swimming.pool
## 1          -1          1          1
## 2           1          -1          -1
## 3           1          1          -1
## 4          -1          1          -1
## 5          -1          1          -1
## 6          -1          1          1
## 7           1          1          -1
## 8           1          1          1
## 9           1          -1          -1
## 10          1          -1          1
## 11         -1          -1          -1
## 12           1          -1          1
## 13         -1          -1          -1
## 14         -1          -1          1
## 15         -1          -1          1
## 16           1          1          1
##   Two.car.parking.garage
## 1          -1
## 2          -1
## 3           1
## 4          -1
## 5          -1
## 6          -1
## 7           1
## 8           1
## 9          -1
## 10         -1
## 11          1
## 12         -1
## 13          1
## 14          1
## 15          1
## 16          1
## class=design, type= FrF2

```

```
aliasprint(mod)
```

```
## $legend
```

```

## [1] A=Elementary.school.rating.over.8
## [2] B=Middle.school.rating.over.8
## [3] C=High.school.rating.over.8
## [4] D=Rated.as.safe.neighborhood
## [5] E=Large.yard
## [6] F=Solar
## [7] G=Public.transportation.in.less.5.miles
## [8] H=Original.owner
## [9] J=Swimming.pool
## [10] K=Two.car.parking.garage
##
## $main
## [1] A=BE=CF=DH=JK B=AE=CG C=AF=BG D=AH=GJ E=AB=FG
## [6] F=AC=EG G=BC=DJ=EF=HK H=AD=GK J=AK=DG K=AJ=GH
##
## $fi2
## [1] AG=BF=CE=DK=HJ BD=CJ=EH=FK BH=CK=DE=FJ BJ=CD=EK=EH BK=CH=DF=EJ

```