Solutions to exercises

Listed below are the solutions to the exercises.

All solutions are computed using RStudio, though **you should only do the exercises in RStudio if stated in the list of exercises.** This may result in slight differences in numerical answers, which is due to rounding errors.

The solutions may often be computed in different ways and when two solutions are given it does not necessarily mean that more solutions does not exist. However, when two solutions are given we encourage you to think about why these two solutions are equivalent.

```
library(mosaic)
```

Module 1.2

4.3:

a)

```
a <- 210/885
a
```

```
## [1] 0.2372881
```

b.i)

```
b <- 50/210
b
```

```
## [1] 0.2380952
```

b.ii)

```
95/675
```

```
## [1] 0.1407407
```

c.i)

```
50/885
```

```
## [1] 0.05649718
```

c.ii)

```
a * b
```

```
## [1] 0.05649718
```

d)

```r
yes <- 50/885
no <- 580/885
yes + no
```

```
## [1] 0.7118644
```

4.5:

a)

The probability distribution is not uniform (all events have the same probability of orcurring). Moreover, the events does not occur with equal probability.

b)

```r
0*0.85 + 1*0.13 + 2*0.01 + 3*0.01
```

```
## [1] 0.18
```

4.11:

Define vector of percentages

```r
pct <- c(0.50, 0.90, 0.95, 0.99)
```

Option 1:

```r
cnorm(pct)[, 2]
```

```
## [1] 0.6744898 1.6448536 1.9599640 2.5758293
```

Option 2:

```r
qnorm(1 - (1 - pct)/2)
```

```
## [1] 0.6744898 1.6448536 1.9599640 2.5758293
```

4.15:

a)

```r
a <-  1 - pnorm(2.1)
a
```

```
## [1] 0.01786442
```

b)
Option 1:

```
b <- a
b
```

[1] 0.01786442

Option 2:

```
b <- pnorm(-2.1)
b
```

[1] 0.01786442

c)

```
1 - (a + b)
```

[1] 0.9642712

4.33:

a)
Option 1:

```
pnorm(95, mean = 100, sd = 15)
```

[1] 0.3694413

Option 2:

```
pnorm((95 - 100) / 15)
```

[1] 0.3694413

b)
By CLT, approximately normal with mean 100 and standard deviation 15/sqrt(36).
Option 1:

```
pnorm(95, mean = 100, sd = 15 / sqrt(36))
```

[1] 0.02275013

Option 2:

```
pnorm((95 - 100) / (15 / sqrt(36)))
```

[1] 0.02275013

c)

Yes, kind of. The probability of this event is 0.023, meaning that it happens in only 2.3% of all cases in repeated trails.

d) Population distribution (black) and distribution of sample mean (red):

```r
gf_dist("norm", mean = 100, sd = 15) %>%
  gf_dist("norm", mean = 100, sd = 15/sqrt(36), color = "red")
```