

Homework 1

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Problem 1

a

```
a <- seq(4751, 4835, 7)
```

a

```
## [1] 4751 4758 4765 4772 4779 4786 4793 4800 4807 4814 4821 4828 4835
```

b

```
b <- rep("Night", 5)
```

b

```
## [1] "Night" "Night" "Night" "Night" "Night"
```

c

```
c <- seq(89, 101, 1)
```

c

```
## [1] 89 90 91 92 93 94 95 96 97 98 99 100 101
```

d

```
d <- rep(seq(21, 18, -1), rep(3, 4))
```

d

```
## [1] 21 21 21 20 20 20 19 19 19 18 18 18
```

e

```
e <- seq(75, 57, -3)
```

e

```
## [1] 75 72 69 66 63 60 57
```

f

```
f <- c(seq(25, 75, 10), seq(70, 50, -5))
```

f

```
## [1] 25 35 45 55 65 75 70 65 60 55 50
```

g

```
g <- rep(seq(400, 500, 25), seq(5, 1, -1))
```

g

```
## [1] 400 400 400 400 400 425 425 425 425 450 450 450 475 475 500
```

h

```
h <- rep(seq(3, 1, -1), 5)
```

h

```
## [1] 3 2 1 3 2 1 3 2 1 3 2 1 3 2 1
```

i

```
i <- c(seq(124, 68, -8), seq(63, 38, -5))
```

i

```
## [1] 124 116 108 100 92 84 76 68 63 58 53 48 43 38
```

j

```
j <- rep(c("Morning", "Afternoon", "Night"), 2)
```

j

```
## [1] "Morning" "Afternoon" "Night" "Morning" "Afternoon" "Night"
```

Problem 2

a

```
pnorm(26.24, mean = 63, sd = 11)
```

```
## [1] 0.0004161578
```

The probability that a runner runs this 10k faster than 26.24 minutes is approximately 0.0004%.

b

```
qnorm(0.05, mean = 63, sd = 11)
```

```
## [1] 44.90661
```

The runner should have a goal time of about 42 minutes and 30 seconds.

c

```
29000*(1-pnorm(90, mean = 63, sd = 11))
```

```
## [1] 204.5411
```

I would expect about 205 runners to have their races disrupted.

Problem 3

a

```
1-pbinom(0, size = 12, prob = 0.2)
```

```
## [1] 0.9312805
```

The probability that the lie detector indicates that at least one of the applicants is lying is 93.1%.

b

```
input <- 0:11
```

```
results <- round(1-pbinom(input, size = 12, prob = 0.2), 3)
```

```
results
```

```
## [1] 0.931 0.725 0.442 0.205 0.073 0.019 0.004 0.001 0.000 0.000 0.000
```

```
## [12] 0.000
```

c

```
desc <- 1:12
desc_results <- rbind(desc, results)
desc_results

##           [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11]
## desc      1.000 2.000 3.000 4.000 5.000 6.000 7.000 8.000    9    10    11
## results 0.931 0.725 0.442 0.205 0.073 0.019 0.004 0.001    0    0    0
##           [,12]
## desc          12
## results        0
```

The descriptor values also show 3 decimal places.

d

```
names(results) <- desc
results

##      1      2      3      4      5      6      7      8      9     10     11     12
## 0.931 0.725 0.442 0.205 0.073 0.019 0.004 0.001 0.000 0.000 0.000 0.000
```

e

The labeled vector is easier to read because the label numbers stay in a sensible format.

f

```
results_df <- data.frame(desc=desc, prob=results)
results_df

##   desc prob
## 1     1 0.931
## 2     2 0.725
## 3     3 0.442
## 4     4 0.205
## 5     5 0.073
## 6     6 0.019
## 7     7 0.004
## 8     8 0.001
## 9     9 0.000
## 10    10 0.000
## 11    11 0.000
## 12    12 0.000
```

g

```
results_df2 <- data.frame(prob=results)
results_df2
```

```
##      prob
## 1  0.931
## 2  0.725
## 3  0.442
## 4  0.205
## 5  0.073
## 6  0.019
## 7  0.004
## 8  0.001
## 9  0.000
## 10 0.000
## 11 0.000
## 12 0.000
```

h

The second one, because the data.frame already has row labels, which are essentially what the descriptors vector contains.

Problem 4

```
name <- "Gretchen Martinet"
dep <- "Statistics"
courses <- c("STAT 2559", "STAT 3080")
names(courses) <- c("Course1", "Course2")
act <- c(FALSE, TRUE)
names(act) <- c("Course1", "Course2")
enr <- list(Course1 = 5, Course2 = c(75, 90, 90))
days <- list(
  Course1 = c("Tuesday", "Thursday"),
  Course2 = cbind(c("Monday", "Tuesday", "Tuesday"),
                  c("Wednesday", "Thursday", "Thursday"))
)

mylist <- list(Name = name, Department = dep, Courses = courses,
              ActiveTeach = act, Enr = enr, Days = days)
mylist
```

```

## $Name
## [1] "Gretchen Martinet"
##
## $Department
## [1] "Statistics"
##
## $Courses
##      Course1      Course2
## "STAT 2559" "STAT 3080"
##
## $ActiveTeach
## Course1 Course2
##  FALSE    TRUE
##
## $Enr
## $Enr$Course1
## [1] 5
##
## $Enr$Course2
## [1] 75 90 90
##
##
## $Days
## $Days$Course1
## [1] "Tuesday" "Thursday"
##
## $Days$Course2
##      [,1]      [,2]
## [1,] "Monday" "Wednesday"
## [2,] "Tuesday" "Thursday"
## [3,] "Tuesday" "Thursday"

```