R Modifyng Values

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deck

```
# getwd()
deck <- read.csv("../data/cards.csv",
                 stringsAsFactors = FALSE)
deck2 <- deck
```

Changing Values in Place

```
vec <- rep(0, 6)
vec[1]
```

```
## [1] 0
```

```
vec[1] <- 1000
vec
```

```
## [1] 1000    0    0    0    0    0
```

```
vec[c(1, 3, 5)] <- c(1, 1, 1)
vec
```

```
## [1] 1 0 1 0 1 0
```

```
vec[c(1, 3, 5)] <- 2
vec
```

```
## [1] 2 0 2 0 2 0
```

```
vec[4:6] <- vec[4:6] + 1
vec
```

```
## [1] 2 0 2 1 3 1
```

```
vec[7] <- 0
vec
```

```
## [1] 2 0 2 1 3 1 0
```

```
vec[9] <- 0

vec
```

```
## [1]  2  0  2  1  3  1  0 NA  0
```

```
# vec[9] <- NULL
vec <- vec[-9]
vec
```

```
## [1]  2  0  2  1  3  1  0 NA
```

```
head(deck2,
     n = 10)
```

```
##     face   suit value
## 1   king spades    13
## 2  queen spades    12
## 3   jack spades    11
## 4    ten spades    10
## 5   nine spades     9
## 6  eight spades     8
## 7  seven spades     7
## 8    six spades     6
## 9   five spades     5
## 10  four spades     4
```

```
head(deck2)
```

```
##    face   suit value
## 1  king spades    13
## 2 queen spades    12
## 3  jack spades    11
## 4   ten spades    10
## 5  nine spades     9
## 6 eight spades     8
```

```
head(deck2,
     n = -1)
```

```
##     face     suit value
## 1   king   spades    13
## 2  queen   spades    12
## 3   jack   spades    11
## 4    ten   spades    10
## 5   nine   spades     9
## 6  eight   spades     8
## 7  seven   spades     7
## 8    six   spades     6
## 9   five   spades     5
## 10  four   spades     4
## 11 three   spades     3
## 12   two   spades     2
## 13   ace   spades     1
## 14  king    clubs    13
## 15 queen    clubs    12
## 16  jack    clubs    11
## 17   ten    clubs    10
## 18  nine    clubs     9
## 19 eight    clubs     8
## 20 seven    clubs     7
## 21   six    clubs     6
## 22  five    clubs     5
## 23  four    clubs     4
## 24 three    clubs     3
## 25   two    clubs     2
## 26   ace    clubs     1
## 27  king diamonds    13
## 28 queen diamonds    12
## 29  jack diamonds    11
## 30   ten diamonds    10
## 31  nine diamonds     9
## 32 eight diamonds     8
## 33 seven diamonds     7
## 34   six diamonds     6
## 35  five diamonds     5
## 36  four diamonds     4
## 37 three diamonds     3
## 38   two diamonds     2
## 39   ace diamonds     1
## 40  king   hearts    13
## 41 queen   hearts    12
## 42  jack   hearts    11
## 43   ten   hearts    10
## 44  nine   hearts     9
## 45 eight   hearts     8
## 46 seven   hearts     7
## 47   six   hearts     6
## 48  five   hearts     5
## 49  four   hearts     4
## 50 three   hearts     3
## 51   two   hearts     2
```

```
tail(deck2,
     n = -2)
```

```
##     face     suit value
## 3   jack   spades    11
## 4    ten   spades    10
## 5   nine   spades     9
## 6  eight   spades     8
## 7  seven   spades     7
## 8    six   spades     6
## 9   five   spades     5
## 10  four   spades     4
## 11 three   spades     3
## 12   two   spades     2
## 13   ace   spades     1
## 14  king    clubs    13
## 15 queen    clubs    12
## 16  jack    clubs    11
## 17   ten    clubs    10
## 18  nine    clubs     9
## 19 eight    clubs     8
## 20 seven    clubs     7
## 21   six    clubs     6
## 22  five    clubs     5
## 23  four    clubs     4
## 24 three    clubs     3
## 25   two    clubs     2
## 26   ace    clubs     1
## 27  king diamonds    13
## 28 queen diamonds    12
## 29  jack diamonds    11
## 30   ten diamonds    10
## 31  nine diamonds     9
## 32 eight diamonds     8
## 33 seven diamonds     7
## 34   six diamonds     6
## 35  five diamonds     5
## 36  four diamonds     4
## 37 three diamonds     3
## 38   two diamonds     2
## 39   ace diamonds     1
## 40  king   hearts    13
## 41 queen   hearts    12
## 42  jack   hearts    11
## 43   ten   hearts    10
## 44  nine   hearts     9
## 45 eight   hearts     8
## 46 seven   hearts     7
## 47   six   hearts     6
## 48  five   hearts     5
## 49  four   hearts     4
## 50 three   hearts     3
## 51   two   hearts     2
## 52   ace   hearts     1
```

```
str(deck2)
```

```
## 'data.frame':    52 obs. of  3 variables:
##  $ face : chr  "king" "queen" "jack" "ten" ...
##  $ suit : chr  "spades" "spades" "spades" "spades" ...
##  $ value: int  13 12 11 10 9 8 7 6 5 4 ...
```

```
deck2$new <- 1:52
nrow(deck2)
```

```
## [1] 52
```

```
N <- nrow(deck2)
deck2$new2 <- 1:N
head(deck2)
```

```
##    face   suit value new new2
## 1  king spades    13   1    1
## 2 queen spades    12   2    2
## 3  jack spades    11   3    3
## 4   ten spades    10   4    4
## 5  nine spades     9   5    5
## 6 eight spades     8   6    6
```

```
deck2$new <- NULL
head(deck2)
```

```
##    face   suit value new2
## 1  king spades    13    1
## 2 queen spades    12    2
## 3  jack spades    11    3
## 4   ten spades    10    4
## 5  nine spades     9    5
## 6 eight spades     8    6
```

```
deck2[1, ]
```

```
##   face   suit value new2
## 1 king spades    13    1
```

```
str(deck2[1, ])
```

```
## 'data.frame':    1 obs. of  4 variables:
##  $ face : chr "king"
##  $ suit : chr "spades"
##  $ value: int 13
##  $ new2 : int 1
```

```
deck2[, 1]
```

```
##  [1] "king"  "queen" "jack"  "ten"   "nine"  "eight" "seven" "six"   "five"
## [10] "four"  "three" "two"   "ace"   "king"  "queen" "jack"  "ten"   "nine"
## [19] "eight" "seven" "six"   "five"  "four"  "three" "two"   "ace"   "king"
## [28] "queen" "jack"  "ten"   "nine"  "eight" "seven" "six"   "five"  "four"
## [37] "three" "two"   "ace"   "king"  "queen" "jack"  "ten"   "nine"  "eight"
## [46] "seven" "six"   "five"  "four"  "three" "two"   "ace"
```

```
deck2[, 1, drop = FALSE]
```

```
##     face
## 1   king
## 2  queen
## 3   jack
## 4    ten
## 5   nine
## 6  eight
## 7  seven
## 8    six
## 9   five
## 10  four
## 11 three
## 12   two
## 13   ace
## 14  king
## 15 queen
## 16  jack
## 17   ten
## 18  nine
## 19 eight
## 20 seven
## 21   six
## 22  five
## 23  four
## 24 three
## 25   two
## 26   ace
## 27  king
## 28 queen
## 29  jack
## 30   ten
## 31  nine
## 32 eight
## 33 seven
## 34   six
## 35  five
## 36  four
## 37 three
## 38   two
## 39   ace
## 40  king
## 41 queen
## 42  jack
## 43   ten
## 44  nine
## 45 eight
## 46 seven
## 47   six
## 48  five
## 49  four
## 50 three
## 51   two
## 52   ace
```

```
str(deck2[, 1])
```

```
##  chr [1:52] "king" "queen" "jack" "ten" "nine" "eight" "seven" "six" "five" ...
```

```
str(deck2[, 1, drop = FALSE])
```

```
## 'data.frame':    52 obs. of  1 variable:
##  $ face: chr  "king" "queen" "jack" "ten" ...
```

```
deck2[1]
```

```
##     face
## 1   king
## 2  queen
## 3   jack
## 4    ten
## 5   nine
## 6  eight
## 7  seven
## 8    six
## 9   five
## 10  four
## 11 three
## 12   two
## 13   ace
## 14  king
## 15 queen
## 16  jack
## 17   ten
## 18  nine
## 19 eight
## 20 seven
## 21   six
## 22  five
## 23  four
## 24 three
## 25   two
## 26   ace
## 27  king
## 28 queen
## 29  jack
## 30   ten
## 31  nine
## 32 eight
## 33 seven
## 34   six
## 35  five
## 36  four
## 37 three
## 38   two
## 39   ace
## 40  king
## 41 queen
## 42  jack
## 43   ten
## 44  nine
## 45 eight
## 46 seven
## 47   six
## 48  five
## 49  four
## 50 three
## 51   two
## 52   ace
```

```
str(deck2[1])
```

```
## 'data.frame':    52 obs. of  1 variable:
##  $ face: chr  "king" "queen" "jack" "ten" ...
```

```
deck2[1]$face
```

```
##  [1] "king"  "queen" "jack"  "ten"   "nine"  "eight" "seven" "six"   "five"
## [10] "four"  "three" "two"   "ace"   "king"  "queen" "jack"  "ten"   "nine"
## [19] "eight" "seven" "six"   "five"  "four"  "three" "two"   "ace"   "king"
## [28] "queen" "jack"  "ten"   "nine"  "eight" "seven" "six"   "five"  "four"
## [37] "three" "two"   "ace"   "king"  "queen" "jack"  "ten"   "nine"  "eight"
## [46] "seven" "six"   "five"  "four"  "three" "two"   "ace"
```

```
deck2[[1]]
```

```
##  [1] "king"  "queen" "jack"  "ten"   "nine"  "eight" "seven" "six"   "five"
## [10] "four"  "three" "two"   "ace"   "king"  "queen" "jack"  "ten"   "nine"
## [19] "eight" "seven" "six"   "five"  "four"  "three" "two"   "ace"   "king"
## [28] "queen" "jack"  "ten"   "nine"  "eight" "seven" "six"   "five"  "four"
## [37] "three" "two"   "ace"   "king"  "queen" "jack"  "ten"   "nine"  "eight"
## [46] "seven" "six"   "five"  "four"  "three" "two"   "ace"
```

```
deck2$face
```

```
##  [1] "king"  "queen" "jack"  "ten"   "nine"  "eight" "seven" "six"   "five"
## [10] "four"  "three" "two"   "ace"   "king"  "queen" "jack"  "ten"   "nine"
## [19] "eight" "seven" "six"   "five"  "four"  "three" "two"   "ace"   "king"
## [28] "queen" "jack"  "ten"   "nine"  "eight" "seven" "six"   "five"  "four"
## [37] "three" "two"   "ace"   "king"  "queen" "jack"  "ten"   "nine"  "eight"
## [46] "seven" "six"   "five"  "four"  "three" "two"   "ace"
```

```
seq(from = 13, to = 52, by = 13)
```

```
## [1] 13 26 39 52
```

```
c(13, 26, 39, 52)
```

```
## [1] 13 26 39 52
```

```
deck2[seq(13, 52, by = 13), ]
```

```
##    face     suit value new2
## 13  ace   spades     1   13
## 26  ace    clubs     1   26
## 39  ace diamonds     1   39
## 52  ace   hearts     1   52
```

```
str(deck2[seq(13, 52, by = 13), ])
```

```
## 'data.frame':    4 obs. of  4 variables:
##  $ face : chr  "ace" "ace" "ace" "ace"
##  $ suit : chr  "spades" "clubs" "diamonds" "hearts"
##  $ value: int  1 1 1 1
##  $ new2 : int  13 26 39 52
```

```
deck2[seq(13, 52, by = 13), 1]
```

```
## [1] "ace" "ace" "ace" "ace"
```

```
str(deck2[seq(13, 52, by = 13), 1])
```

```
##  chr [1:4] "ace" "ace" "ace" "ace"
```

```
deck2[seq(13, 52, by = 13), 1,
      drop = FALSE]
```

```
##    face
## 13  ace
## 26  ace
## 39  ace
## 52  ace
```

```
str(deck2[seq(13, 52, by = 13), 1,
          drop = FALSE])
```

```
## 'data.frame':    4 obs. of  1 variable:
##  $ face: chr  "ace" "ace" "ace" "ace"
```

```
deck2[seq(13, 52, by = 13), "face"]
```

```
## [1] "ace" "ace" "ace" "ace"
```

```
deck2[seq(13, 52, by = 13), c(TRUE, FALSE, FALSE, FALSE)]
```

```
## [1] "ace" "ace" "ace" "ace"
```

```
deck2$face[c(13, 26, 39, 52)]
```

```
## [1] "ace" "ace" "ace" "ace"
```

```
deck2$value
```

```
##  [1] 13 12 11 10  9  8  7  6  5  4  3  2  1 13 12 11 10  9  8  7  6  5  4  3  2
## [26]  1 13 12 11 10  9  8  7  6  5  4  3  2  1 13 12 11 10  9  8  7  6  5  4  3
## [51]  2  1
```

```
deck2$value[seq(13, 52, by = 13)]
```

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

```
deck2[seq(13, 52, by = 13), "value"]
```

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

```
deck2[seq(13, 52, by = 13), 3]
```

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

```
deck2[seq(13, 52, by = 13), c(FALSE, FALSE, TRUE, FALSE)]
```

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

```
deck2$value[seq(13, 52, by = 13)] <- 14
head(deck2, n = 13)
```

```
##     face   suit value new2
## 1   king spades    13    1
## 2  queen spades    12    2
## 3   jack spades    11    3
## 4    ten spades    10    4
## 5   nine spades     9    5
## 6  eight spades     8    6
## 7  seven spades     7    7
## 8    six spades     6    8
## 9   five spades     5    9
## 10  four spades     4   10
## 11 three spades     3   11
## 12   two spades     2   12
## 13   ace spades    14   13
```

```
source("./shuffle.R", echo = TRUE)
```

```
##
## > deal <- function(cards) {
## +     cards[1, ]
## + }
##
## > shuffle <- function(cards) {
## +     random <- sample(1:52, size = 52)
## +     cards[random, ]
## + }
```

```
deck3 <- shuffle(deck)
head(deck3)
```

```
##     face     suit value
## 26   ace    clubs     1
## 8    six   spades     6
## 5   nine   spades     9
## 15 queen    clubs    12
## 14  king    clubs    13
## 27  king diamonds    13
```

```
tail(deck3)
```

```
##     face     suit value
## 25   two    clubs     2
## 41 queen   hearts    12
## 37 three diamonds     3
## 19 eight    clubs     8
## 52   ace   hearts     1
## 22  five    clubs     5
```

Logical Subsetting

```
vec <- vec[1:7]
vec
```

```
## [1] 2 0 2 1 3 1 0
```

```
vec[c(FALSE, FALSE, FALSE, FALSE, TRUE, FALSE, FALSE)]
```

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

```
l <- c(FALSE, FALSE, FALSE, FALSE, TRUE, FALSE, FALSE)
l
```

```
## [1] FALSE FALSE FALSE FALSE  TRUE FALSE FALSE
```

```
which(l)
```

```
## [1] 5
```

```
w <- which(l)
vec[which(l)]
```

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

```
vec[w]
```

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

```
vec[9] <- 1
vec
```

```
## [1]  2  0  2  1  3  1  0 NA  1
```

```
is.na(vec)
```

```
## [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE  TRUE FALSE
```

```
which(is.na(vec))
```

```
## [1] 8
```

```
which(!is.na(vec))
```

```
## [1] 1 2 3 4 5 6 7 9
```

Logical Tests

```
1 > 2
```

```
## [1] FALSE
```

```
1 > c(0, 1, 2)
```

```
## [1]  TRUE FALSE FALSE
```

```
c(1, 2, 3) == c(3, 2, 1)
```

```
## [1] FALSE  TRUE FALSE
```

```
1 %in% c(3, 4, 5)
```

```
## [1] FALSE
```

```
c(1, 2) %in% c(3, 4, 5)
```

```
## [1] FALSE FALSE
```

```
c(1, 2, 3) %in% c(3, 4, 5)
```

```
## [1] FALSE FALSE  TRUE
```

```
which(c(1, 2, 3, 4) %in% c(3, 4, 5))
```

```
## [1] 3 4
```

```
deck2$face == "ace"
```

```
##  [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13]  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE  TRUE
```

```
which(deck2$face == "ace")
```

```
## [1] 13 26 39 52
```

```
sum(deck2$face == "ace")
```

```
## [1] 4
```

```
ace <- deck2$face == "ace"
ace
```

```
##  [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13]  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE  TRUE
```

```
deck2$value[ace]
```

```
## [1] 14 14 14 14
```

```
deck2[ace, "value"]
```

```
## [1] 14 14 14 14
```

```
deck2$value[deck2$face == "ace"]
```

```
## [1] 14 14 14 14
```

```
deck3[1:15, ]
```

```
##     face     suit value
## 26   ace    clubs     1
## 8    six   spades     6
## 5   nine   spades     9
## 15 queen    clubs    12
## 14  king    clubs    13
## 27  king diamonds    13
## 10  four   spades     4
## 42  jack   hearts    11
## 6  eight   spades     8
## 40  king   hearts    13
## 16  jack    clubs    11
## 30   ten diamonds    10
## 2  queen   spades    12
## 28 queen diamonds    12
## 33 seven diamonds     7
```

```
ace3 <- deck3$face == "ace"
which(ace3)
```

```
## [1]  1 25 41 51
```

```
deck3$value[ace3]
```

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

```
deck3[ace3, "value"]
```

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

```
deck3$value[ace3] <- 14
deck3$value[deck3$face == "ace"] <- 14
head(deck3, n = 20)
```

```
##     face     suit value
## 26   ace    clubs    14
## 8    six   spades     6
## 5   nine   spades     9
## 15 queen    clubs    12
## 14  king    clubs    13
## 27  king diamonds    13
## 10  four   spades     4
## 42  jack   hearts    11
## 6  eight   spades     8
## 40  king   hearts    13
## 16  jack    clubs    11
## 30   ten diamonds    10
## 2  queen   spades    12
## 28 queen diamonds    12
## 33 seven diamonds     7
## 49  four   hearts     4
## 44  nine   hearts     9
## 51   two   hearts     2
## 31  nine diamonds     9
## 24 three    clubs     3
```

```
deck4 <- deck
deck4$value <- 0
head(deck4, n = 20)
```

```
##     face   suit value
## 1   king spades     0
## 2  queen spades     0
## 3   jack spades     0
## 4    ten spades     0
## 5   nine spades     0
## 6  eight spades     0
## 7  seven spades     0
## 8    six spades     0
## 9   five spades     0
## 10  four spades     0
## 11 three spades     0
## 12   two spades     0
## 13   ace spades     0
## 14  king  clubs     0
## 15 queen  clubs     0
## 16  jack  clubs     0
## 17   ten  clubs     0
## 18  nine  clubs     0
## 19 eight  clubs     0
## 20 seven  clubs     0
```

```
deck4[, "value"] <- 10
head(deck4, n = 13)
```

```
##     face   suit value
## 1   king spades    10
## 2  queen spades    10
## 3   jack spades    10
## 4    ten spades    10
## 5   nine spades    10
## 6  eight spades    10
## 7  seven spades    10
## 8    six spades    10
## 9   five spades    10
## 10  four spades    10
## 11 three spades    10
## 12   two spades    10
## 13   ace spades    10
```

```
deck4[, 3] <- 0
deck4$suit == "hearts"
```

```
##  [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE
## [49]  TRUE  TRUE  TRUE  TRUE
```

```
h <-deck4$suit == "hearts"
h
```

```
##  [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE
## [49]  TRUE  TRUE  TRUE  TRUE
```

```
which(h)
```

```
##  [1] 40 41 42 43 44 45 46 47 48 49 50 51 52
```

```
which(deck4$suit == "hearts")
```

```
##  [1] 40 41 42 43 44 45 46 47 48 49 50 51 52
```

```
deck4$value[deck4$suit == "hearts"]
```

```
##  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0
```

```
deck4$value[h]
```

```
##  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0
```

```
deck4$value[deck4$suit == "hearts"] <- 1
deck4$value
```

```
##  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## [39] 0 1 1 1 1 1 1 1 1 1 1 1 1
```

```
deck4$value[h] <- 10
deck4$value
```

```
##  [1]  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## [26]  0  0  0  0  0  0  0  0  0  0  0  0  0 10 10 10 10 10 10 10 10 10 10
## [51] 10 10
```

```
deck4[h, "value"] <- 1
deck4$value
```

```
##  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## [39] 0 1 1 1 1 1 1 1 1 1 1 1 1
```

```
deck4$value[deck4$suit == "hearts"]
```

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

```
q <- deck4$face == "queen"
q
```

```
##  [1] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE FALSE
```

```
which(q)
```

```
## [1]  2 15 28 41
```

```
deck4[q, ]
```

```
##     face     suit value
## 2  queen   spades     0
## 15 queen    clubs     0
## 28 queen diamonds     0
## 41 queen   hearts     1
```

```
deck4[deck4$face == "queen", ]
```

```
##     face     suit value
## 2  queen   spades     0
## 15 queen    clubs     0
## 28 queen diamonds     0
## 41 queen   hearts     1
```

```
(s <- deck4$suit == "spades")
```

```
##  [1]  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE
## [13]  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE FALSE
```

```
deck4[s, ]
```

```
##     face   suit value
## 1   king spades     0
## 2  queen spades     0
## 3   jack spades     0
## 4    ten spades     0
## 5   nine spades     0
## 6  eight spades     0
## 7  seven spades     0
## 8    six spades     0
## 9   five spades     0
## 10  four spades     0
## 11 three spades     0
## 12   two spades     0
## 13   ace spades     0
```

```
deck4[deck4$suit == "spades", ]
```

```
##     face   suit value
## 1   king spades     0
## 2  queen spades     0
## 3   jack spades     0
## 4    ten spades     0
## 5   nine spades     0
## 6  eight spades     0
## 7  seven spades     0
## 8    six spades     0
## 9   five spades     0
## 10  four spades     0
## 11 three spades     0
## 12   two spades     0
## 13   ace spades     0
```

Boolean Operators

```
a <- c(1, 2, 3)
b <- c(1, 2, 3)
c <- c(1, 2, 4)
a == b
```

```
## [1] TRUE TRUE TRUE
```

```
b == c
```

```
## [1]  TRUE  TRUE FALSE
```

```
a == b & b == c
```

```
## [1]  TRUE  TRUE FALSE
```

```
deck4$face == "queen" & deck4$suit == "spades"
```

```
##  [1] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE FALSE
```

```
q & s
```

```
##  [1] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE FALSE
```

```
which(deck4$face == "queen" & deck4$suit == "spades")
```

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

```
which(q & s)
```

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

```
queen0fSpades <- deck4$face == "queen" & deck4$suit == "spades"
queen0fSpades
```

```
##  [1] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE FALSE
```

```
queen_spades <- q & s
queen_spades
```

```
##  [1] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE FALSE
```

```
which(queenOfSpades)
```

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

```
deck4[queenOfSpades, ]
```

```
##    face   suit value
## 2 queen spades     0
```

```
deck4$value[queenOfSpades]
```

```
## [1] 0
```

```
deck4[queen_spades, ]
```

```
##    face   suit value
## 2 queen spades     0
```

```
deck4[queen_spades, "value"]
```

```
## [1] 0
```

```
deck5 <- deck
head(deck5, n = 20)
```

```
##     face   suit value
## 1   king spades    13
## 2  queen spades    12
## 3   jack spades    11
## 4    ten spades    10
## 5   nine spades     9
## 6  eight spades     8
## 7  seven spades     7
## 8    six spades     6
## 9   five spades     5
## 10  four spades     4
## 11 three spades     3
## 12   two spades     2
## 13   ace spades     1
## 14  king  clubs    13
## 15 queen  clubs    12
## 16  jack  clubs    11
## 17   ten  clubs    10
## 18  nine  clubs     9
## 19 eight  clubs     8
## 20 seven  clubs     7
```

```
facecard <- deck5$face %in% c("king", "queen", "jack")
facecard
```

```
##  [1]  TRUE  TRUE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE  TRUE  TRUE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE  TRUE  TRUE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE  TRUE  TRUE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE FALSE
```

```
which(facecard)
```

```
##  [1]  1  2  3 14 15 16 27 28 29 40 41 42
```

```
deck5[facecard, ]
```

```
##     face     suit value
## 1   king   spades    13
## 2  queen   spades    12
## 3   jack   spades    11
## 14  king    clubs    13
## 15 queen    clubs    12
## 16  jack    clubs    11
## 27  king diamonds    13
## 28 queen diamonds    12
## 29  jack diamonds    11
## 40  king   hearts    13
## 41 queen   hearts    12
## 42  jack   hearts    11
```

```
deck5[facecard, "value"]
```

```
##  [1] 13 12 11 13 12 11 13 12 11 13 12 11
```

```
deck5$value[facecard] <- 10
head(deck5, 13)
```

```
##     face   suit value
## 1   king spades    10
## 2  queen spades    10
## 3   jack spades    10
## 4    ten spades    10
## 5   nine spades     9
## 6  eight spades     8
## 7  seven spades     7
## 8    six spades     6
## 9   five spades     5
## 10  four spades     4
## 11 three spades     3
## 12   two spades     2
## 13   ace spades     1
```

Missing Information

```
1 + NA
```

```
## [1] NA
```

```
NA == 1
```

```
## [1] NA
```

```
c(1, 2, NA) == c(1, 2, 3)
```

```
## [1] TRUE TRUE   NA
```

na.rm

```
c(NA, 1:50)
```

```
##  [1] NA  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
## [26] 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
## [51] 50
```

```
mean(c(NA, 1:50))
```

```
## [1] NA
```

```
mean(c(NA, 1:50), na.rm = TRUE)
```

```
## [1] 25.5
```

is.na

```
NA == NA
```

```
## [1] NA
```

```
c(1, 2, 3, NA) == NA
```

```
## [1] NA NA NA NA
```

```
vec <- c(1, 2, 3, NA)
is.na(vec)
```

```
## [1] FALSE FALSE FALSE  TRUE
```

```
which(is.na(vec))
```

```
## [1] 4
```

```
ace <- deck$face == "ace"
deck$value[ace] <- NA
head(deck, n = 20)
```

```
##     face   suit value
## 1   king spades    13
## 2  queen spades    12
## 3   jack spades    11
## 4    ten spades    10
## 5   nine spades     9
## 6  eight spades     8
## 7  seven spades     7
## 8    six spades     6
## 9   five spades     5
## 10  four spades     4
## 11 three spades     3
## 12   two spades     2
## 13   ace spades    NA
## 14  king  clubs    13
## 15 queen  clubs    12
## 16  jack  clubs    11
## 17   ten  clubs    10
## 18  nine  clubs     9
## 19 eight  clubs     8
## 20 seven  clubs     7
```

```
deck[ace, "value"] <- 14
head(deck, n = 20)
```

```
##     face   suit value
## 1   king spades    13
## 2  queen spades    12
## 3   jack spades    11
## 4    ten spades    10
## 5   nine spades     9
## 6  eight spades     8
## 7  seven spades     7
## 8    six spades     6
## 9   five spades     5
## 10  four spades     4
## 11 three spades     3
## 12   two spades     2
## 13   ace spades    14
## 14  king  clubs    13
## 15 queen  clubs    12
## 16  jack  clubs    11
## 17   ten  clubs    10
## 18  nine  clubs     9
## 19 eight  clubs     8
## 20 seven  clubs     7
```

```
deck3 <- deck
deck3 <- shuffle(deck)
head(deck3)
```

```
##     face   suit value
## 45 eight hearts     8
## 24 three  clubs     3
## 2  queen spades    12
## 44  nine hearts     9
## 41 queen hearts    12
## 6  eight spades     8
```

```
tail(deck3)
```

```
##     face     suit value
## 21   six    clubs     6
## 28 queen diamonds    12
## 27  king diamonds    13
## 19 eight    clubs     8
## 38   two diamonds     2
## 5   nine   spades     9
```

```
ace3 <- deck3$face == "ace"
ace3
```

```
##  [1] FALSE FALSE FALSE FALSE FALSE FALSE  TRUE  TRUE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49] FALSE FALSE FALSE FALSE
```

```
which(ace3)
```

```
## [1]  7  8 15 28
```

```
deck3[ace3, "face"]
```

```
## [1] "ace" "ace" "ace" "ace"
```

```
deck3$value[deck3$face == "ace"]
```

```
## [1] 14 14 14 14
```

```
deck3$value[ace3] <- NA
head(deck3, n = 20)
```

```
##     face     suit value
## 45 eight   hearts     8
## 24 three    clubs     3
## 2  queen   spades    12
## 44  nine   hearts     9
## 41 queen   hearts    12
## 6  eight   spades     8
## 26   ace    clubs    NA
## 39   ace diamonds    NA
## 25   two    clubs     2
## 17   ten    clubs    10
## 3   jack   spades    11
## 18  nine    clubs     9
## 7  seven   spades     7
## 48  five   hearts     5
## 52   ace   hearts    NA
## 46 seven   hearts     7
## 50 three   hearts     3
## 51   two   hearts     2
## 36  four diamonds     4
## 4    ten   spades    10
```

Save

```
ls()
```

```
##  [1] "a"             "ace"           "ace3"          "b"
##  [5] "c"             "deal"          "deck"          "deck2"
##  [9] "deck3"         "deck4"         "deck5"         "facecard"
## [13] "h"             "l"             "N"             "q"
## [17] "queen_spades"  "queenOfSpades" "s"             "shuffle"
## [21] "vec"           "w"
```

```
save.image(file = "./r_modifying_values.RData")
```