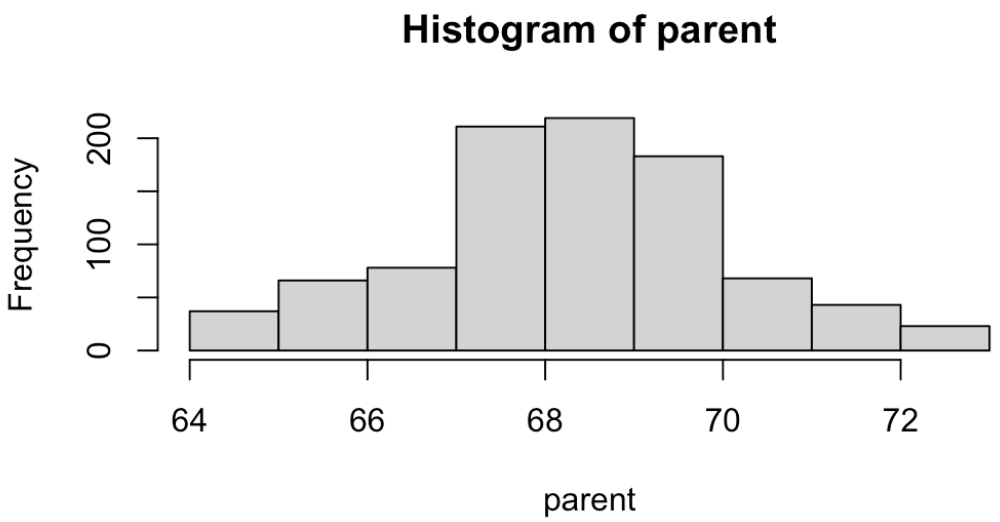
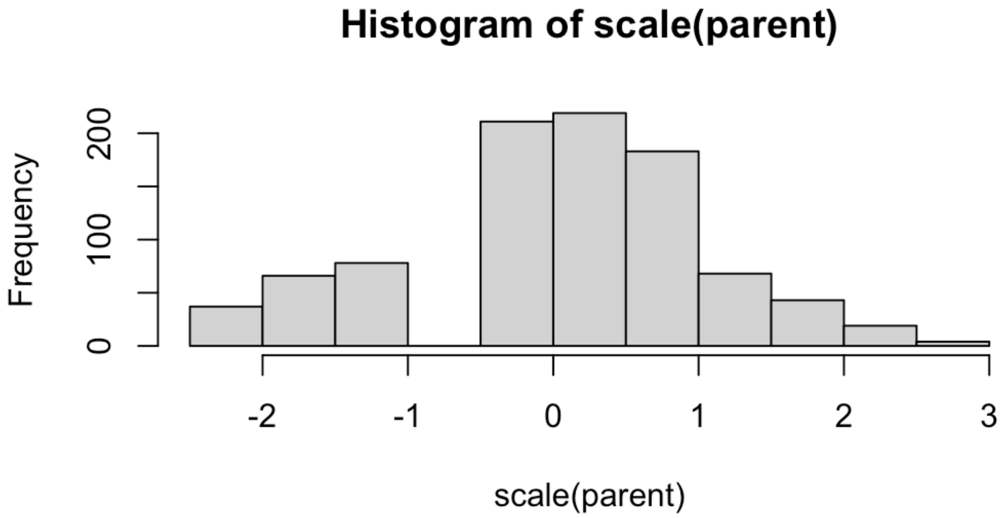
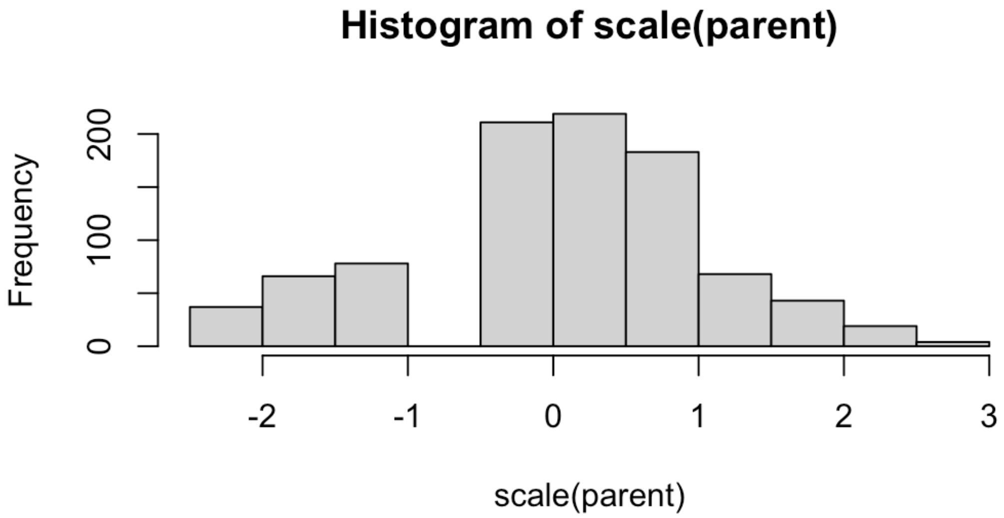
```
install.packages('HistData')

library(HistData)

attach(Galton)

head(parent)

[1] 70.5 68.5 65.5 64.5 64.0 67.5

mean(parent)

[1] 68.30819

sd(parent)

[1] 1.787333

scale(parent)

                 [,1]

  [1,]    1.2263019

  [2,]    0.1073165

  [3,] -1.5711616

hist(parent)
```



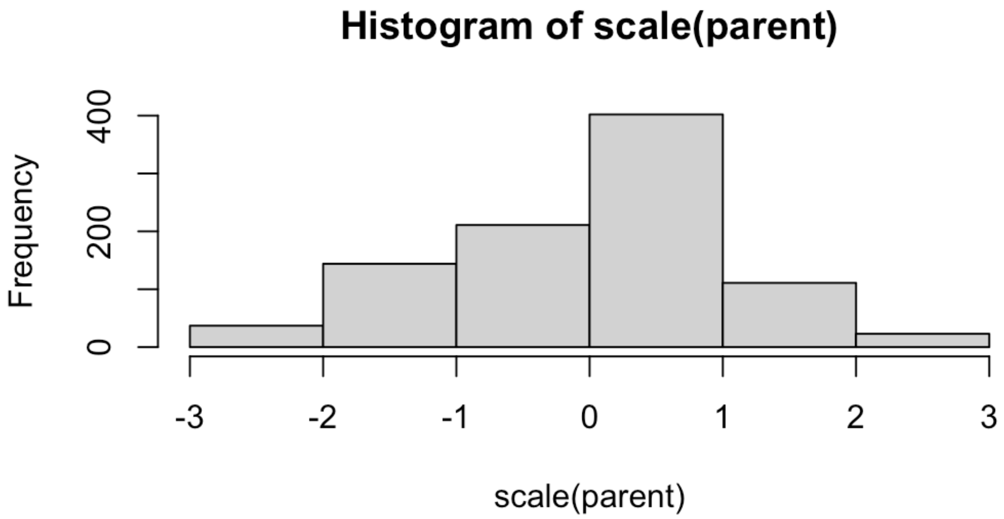
hist(scale(parent))




hist(scale(parent), breaks=15)

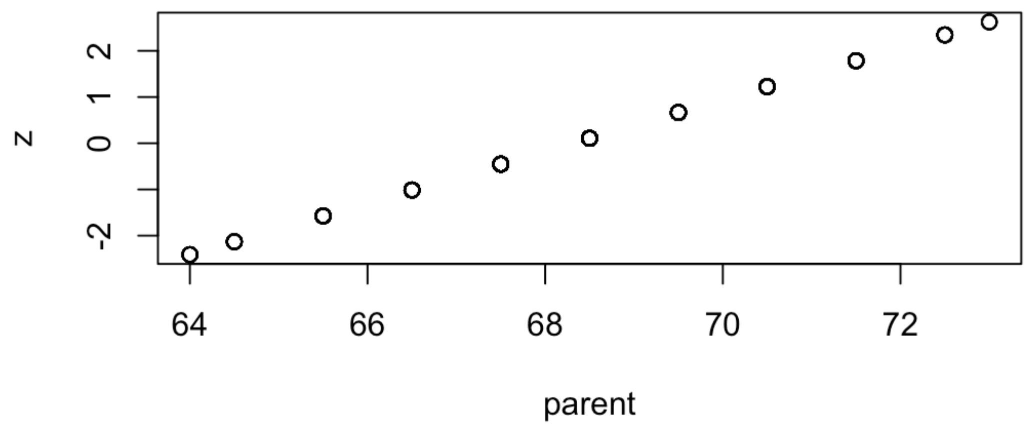



hist(scale(parent), breaks=5)




z=scale(parent)

plot(parent, z)




pnorm(0)

[1] 0.5

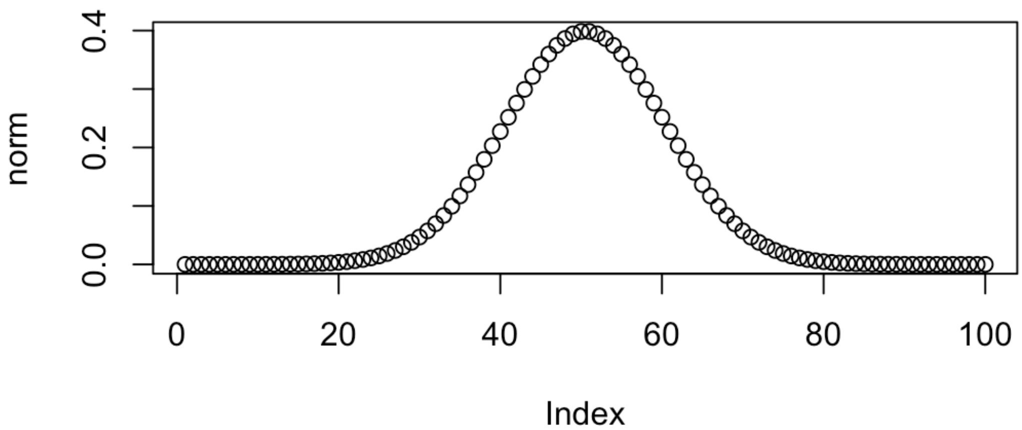
pnorm(3.74)

[1] 0.999908

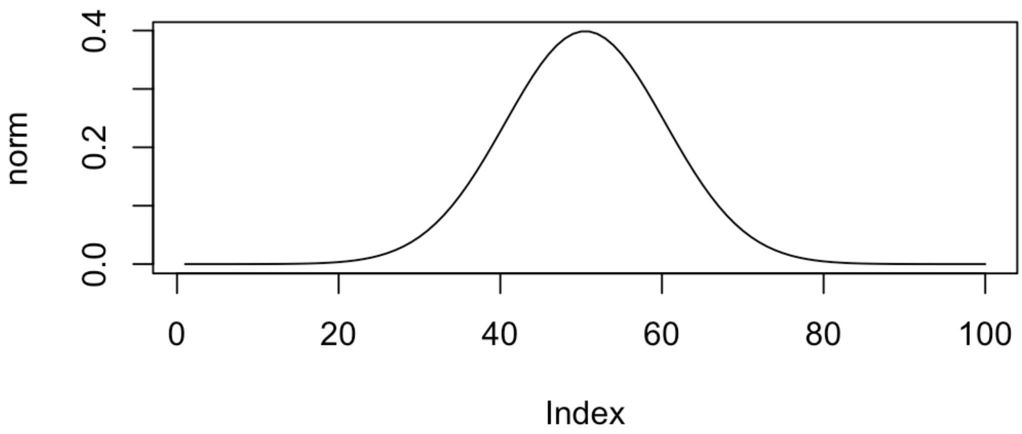
1-pnorm(3.74)

[1] 9.201013e-05

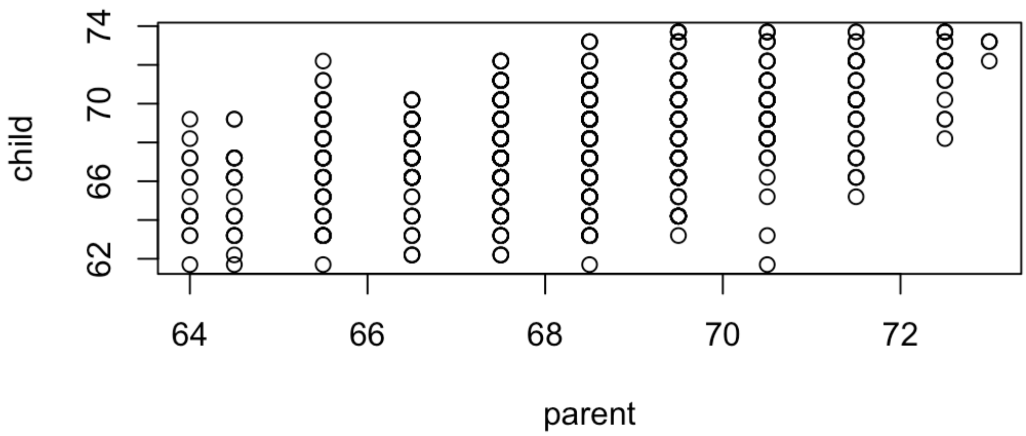
```
x <- seq(-5, 5, length = 100)

norm <- dnorm(x)

plot(norm)
```




```
x <- seq(-5, 5, length = 100)

norm <- dnorm(x)

plot(norm)
```




```
plot(parent, child)
```




cor(parent, child)

[1] 0.4587624

cor(parent, child, method = "pearson")

[1] 0.4587624

cor.test(parent, child, method = "pearson")

Pearson's product-moment correlation

data: parent and child

t = 15.711, df = 926, p-value < 2.2e-16

alternative hypothesis: true correlation is not equal to 0

95 percent confidence interval:

0.4064067 0.5081153

sample estimates:

cor

0.4587624

```
bill.fav <- c(10.0, 9.5, 8.4, 7.6, 2.1)

mary.fav <- c(9.7, 9.6, 9.0, 8.5, 7.6)

cor(bill.fav, mary.fav, method = "pearson")

[1] 0.9551578

cor(bill.fav, mary.fav, method = "spearman")

[1] 1

grade <- c(0, 0, 0, 0, 0, 1, 1, 1, 1, 1)

study.time <- c(30, 25, 59, 42, 31, 140, 90, 95, 170, 120)

grade.data <- data.frame(grade, study.time)

grade.data

   grade study.time

1      0         30

2      0         25

3      0         59

cor.test(grade, study.time)


    Pearson's product-moment correlation


data:  grade and study.time

t = 5.3515, df = 8, p-value = 0.0006846

alternative hypothesis: true correlation is not equal to 0

95 percent confidence interval:

 0.5740098 0.9724262

sample estimates:
```

```
      cor
0.8841088
iq = c(105, 98, 110, 105, 95)
t.test(iq, mu = 100)
    One Sample t-test
data:  iq
t = 0.96495, df = 4, p-value = 0.3892
alternative hypothesis: true mean is not equal to 100
95 percent confidence interval:
  95.11904 110.08096
sample estimates:
mean of x
    102.6
grade.0 <- c(30, 25, 59, 42, 31)
grade.1 <- c(140, 90, 95, 170, 120)
install.packages("lsr")
library(lsr)
cohensD(grade.0, grade.1)
[1] 3.384563
var.test(grade.0, grade.1)
    F test to compare two variances

data:  grade.0 and grade.1
F = 0.16831, num df = 4, denom df = 4, p-value = 0.1126
```

```
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
  0.01752408 1.61654325
sample estimates:
ratio of variances
         0.1683105
var(grade.0)
[1] 184.3
var(grade.1)
[1] 1095
t.test(grade.0, grade.1, var.equal = TRUE)


    Two Sample t-test


data:  grade.0 and grade.1
t = -5.3515, df = 8, p-value = 0.0006846
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
  -122.48598  -48.71402
sample estimates:
mean of x mean of y
     37.4     123.0
studytime <- c(30, 25, 59, 42, 31, 140, 90, 95, 170, 120)
grade <- c(0, 0, 0, 0, 0, 1, 1, 1, 1, 1)
```

t.test(studytime ~ grade)

Welch Two Sample t-test

data:  studytime by grade

t = -5.3515, df = 5.3094, p-value = 0.002549

alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0

95 percent confidence interval:

 -126.00773  -45.19227

sample estimates:

mean in group 0 mean in group 1

37.4  123.0

trial.1 <- c(10, 12.1, 9.2, 11.6, 8.3, 10.5)

trial.2 <- c(8.2, 11.2, 8.1, 10.5, 7.6, 9.5)

t.test(trial.1, trial.2, paired = TRUE)

Paired t-test

data:  trial.1 and trial.2

t = 7.2012, df = 5, p-value = 0.0008044

alternative hypothesis: true mean difference is not equal to 0

95 percent confidence interval:

 0.7073371 1.4926629

sample estimates:

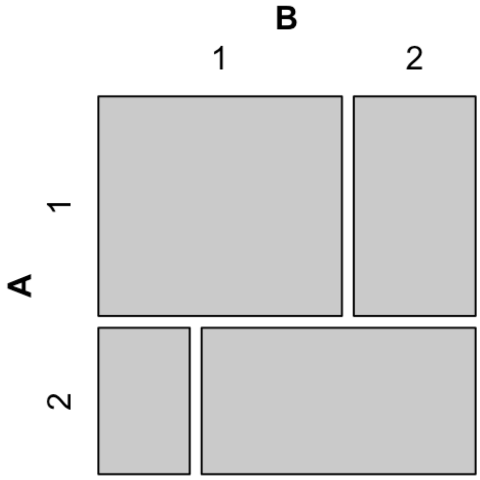
mean difference

1.1

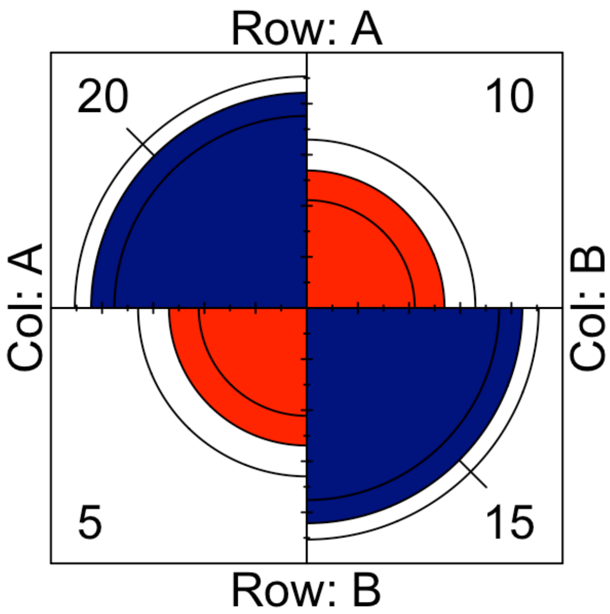
binom.test(2, 5, p = 0.5)

```
	Exact binomial test


data:  2 and 5
number of successes = 2, number of trials = 5, p-value = 1
alternative hypothesis: true probability of success is not equal to 0.5
95 percent confidence interval:
 0.05274495 0.85336720
sample estimates:
probability of success
                   0.4
binom.test(2, 5, p = 0.9)
	Exact binomial test
data:  2 and 5
number of successes = 2, number of trials = 5, p-value = 0.00856
alternative hypothesis: true probability of success is not equal to 0.9
95 percent confidence interval:
 0.05274495 0.85336720
sample estimates:
probability of success
                   0.4
diag.table <- matrix(c(20, 5, 10, 15), nrow = 2)
> diag.table
     [,1] [,2]
```

```
[1,]   20   10
[2,]    5   15
> chisq.test(diag.table, correct = F)

        Pearson's Chi-squared test

data:  diag.table
X-squared = 8.3333, df = 1, p-value = 0.003892
install.packages('psych')
library(psych)
phi(diag.table, digits = 3)
[1] 0.408
install.packages('vcd')
library(vcd)
assocstats(diag.table)
                    X^2 df  P(> X^2)
Likelihood Ratio 8.6305  1 0.0033059
Pearson          8.3333  1 0.0038924

Phi-Coefficient   : 0.408
Contingency Coeff.: 0.378
Cramer's V        : 0.408
mosaic(diag.table)
```

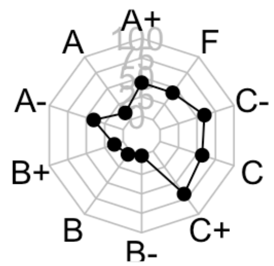



fourfold(diag.table)




```
install.packages("fmsb")

library(fmsb)

data = data.frame(matrix(sample(1:100, 10, replace = T), ncol = 10))

colnames (data) = c("A+", "A", "A-", "B+", "B", "B-", "C+", "C", "C-", "F")

data = rbind(rep(100, 10), rep(0, 10), data)

data

    A+    A   A-   B+    B   B-   C+    C   C-    F
```

```
1 100 100 100 100 100 100 100 100 100 100
2   0   0   0   0   0   0   0   0   0   0
3  43  11  40  12   5   1  68  57  60  43
radarchart(data, axistype=1,
           cglcol="grey", cglty=1, axislabcol="grey", caxislabels=seq(0,100,
25), cglwd=0.8)
```




```
intern.data <- matrix(c(20, 7, 7, 5, 8, 3, 3, 4, 5), 3, 3)
intern.data
     [,1] [,2] [,3]
[1,]   20    5    3
[2,]    7    8    4
[3,]    7    3    5
intern.data <- matrix(c(20, 7, 7, 5, 8, 3, 3, 4, 5), nrow=3, ncol=3)
Kappa.test(intern.data)
$Result
```

```
        Estimate Cohen's kappa statistics and test the null hypothesis that

        the extent of agreement is same as random (kappa=0)

data:    intern.data

Z = 2.583, p-value = 0.004898

95 percent confidence interval:

  0.05505846 0.45158606

sample estimates:

[1] 0.2533223

$Judgement

[1] "Fair agreement"


install.packages('pwr')

library(pwr)

pwr.t.test(n =, d = 0.5, sig.level = 0.05, power = 0.90, type = "two.sample")

          Two-sample t test power calculation


                  n = 85.03128

                  d = 0.5

        sig.level = 0.05

            power = 0.9

      alternative = two.sided


NOTE: n is number in *each* group
```

```
pwr.t.test(n =100, d = 0.5, sig.level = 0.05, power = , type = "two.sample")
Two-sample t test power calculation


              n = 100

              d = 0.5

      sig.level = 0.05

          power = 0.9404272

    alternative = two.sided

NOTE: n is number in *each* group

pwr.anova.test(k = 5, n =, f = 0.5, sig.level = 0.05, power = 0.90)

     Balanced one-way analysis of variance power calculation

              k = 5

              n = 13.31145

              f = 0.5

      sig.level = 0.05

          power = 0.9

NOTE: n is number in each group

pwr.r.test(n =, r = .10, sig.level = 0.05, power =0.90)


     approximate correlation power calculation (arctangh transformation)


              n = 1045.82

              r = 0.1

      sig.level = 0.05
```

power = 0.9

alternative = two.sided

pwr.r.test(n =, r = .90, sig.level = 0.05, power =0.90)

approximate correlation power calculation (arctangh transformation)

n = 7.440649

r = 0.9

sig.level = 0.05

power = 0.9

alternative = two.sided