Homework 10

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Exercise 24

```
a <- 15
b <- 10
c <- 5
d <- 10

n <- a + b + c + d
```

a) Measure of agreement

We calculate Cohen's Kappa.

```
p_e   <- (a+b)/n * (a+c)/n + (c+d)/n * (b+d)/n
p_a   <- (a+d)/n
kappa <- (p_a-p_e) / (1-p_e)
cat(sprintf("p_e: %.3f, p_a: %.3f, kappa: %.3f", p_e, p_a, kappa))
```

```
## p_e: 0.500, p_a: 0.625, kappa: 0.250
```

This means we have "fair agreement".

b) Statistically relevant difference

We use the exact McNemar test.

```
r <- min(b,c)
p <- 2 * sum(choose(b+c, 0:r) * 0.5^(b+c))

cat(sprintf("p-value: %.3f", p))
```

```
## p-value: 0.302
```

We can see that there is no significant difference.

Exercise 25

```
X <- c(10,8,3,4,1,5,9,2,6,6)
Y <- c(7,9,5,3,2,6,10,1,4,8)

n <- length(X)
```

a) Bravais-Pearson correlation coefficient

```
r <- cov(X,Y) / (sd(X) * sd(Y))
cat(sprintf("r: %.3f", r))
```

```
## r: 0.835
```

Test to verify statistical significance

b) Test for statistical signifance

Since we only want to know whether there is a significant correlation, we can use the "Exact Test for No Linear Correlation" test.

```
test_stat <- r * sqrt((n-2)/(1-r^2))
cat(sprintf("test statistic: %.3f, significant value: %.3f, ",
            test_stat, qt(0.975, n-2)))
```

```
## test statistic: 4.291, significant value: 2.306,
```

We can see that there is a significant difference from 0.

Does not have a name, maybe call it "t-test"

Exercise 26

We use the "Tests of Correlation Coefficients I" test. For this, we first perform a Fisher z-transformation.

```
n  <- 100
r1 <- 0.62
r2 <- 0.36

z1 <- 0.5 * log((1+r1) / (1-r1))
z2 <- 0.5 * log((1+r2) / (1-r2))

test_stat <- (z1 - z2) / sqrt(2/(n-3))

cat(sprintf("z1: %.3f, z2: %.3f, test statistic: %.3f, critical value: %.3f",
            z1, z2, test_stat, qnorm(0.975)))
```

```
## z1: 0.725, z2: 0.377, test statistic: 2.424, critical value: 1.960
```

This means that we can reject the null hypothesis.

maybe call it "t-test for correlation coefficients with Fisher z-transformation" or Fisher-Steiger test