exp_5.R

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eglab

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```
# Question 1:
# Student t-test
# Two independent samples of sizes 8 and 8 contained the following:
# Sample 1 = 19, 17, 15, 21, 16, 18, 16, 14
# Sample 2 = 15, 14, 15, 19, 15, 18, 16, 20
# Is the difference between the sample means significant?

sample1 = c(19, 17, 15, 21, 16, 18, 16, 14)
sample2 = c(15, 14, 15, 19, 15, 18, 16, 20)

n1 = length(sample1)
n2 = length(sample2)

mean1 = mean(sample1)
mean2 = mean(sample2)

var1 = var(sample1)
var2 = var(sample2)

sd = sqrt(((n1 * var1) + (n2 * var2)) / (n1 + n2 - 2))
cv = (mean1 - mean2) / (sd * sqrt((1 / n1) + (1 / n2)))
df = n1 + n2 - 2
tv = qt(0.9, df)

if (cv > tv) {
  conclusion = "the difference between the sample mean is satisfied"
} else {
  conclusion = "the difference between the sample mean is not satisfied"
}
print(conclusion)

## [1] "the difference between the sample mean is not satisfied"

t = t.test(sample1, sample2, var.equal = TRUE)
cv1 = t$statistic
tv1 = qt(0.975, df)

if (cv1 > tv1) {
```

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  cat("reject H0. the difference between the sample mean\n")
} else {
  cat("accept H0. the difference between the sample mean\n")
}
```

```
## accept H0. the difference between the sample mean
```

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# Question 2:
# The following data relate to the marks obtained by 10 students in two
tests,
# one held at the beginning of the year and the other at the end of the year
after intensive coaching.
# Do the data indicate that the students have benefited by coaching?

test1 = c(19, 17, 15, 21, 16, 18, 16, 14, 19, 20)
test2 = c(15, 14, 15, 19, 15, 18, 16, 20, 22, 19)

df = length(test1) - 1
alpha = 0.05

t = t.test(test1, test2, paired = TRUE)
cv = t$statistic
tv = qt(1 - alpha, df)

if (cv < tv) {
  print("accept H0")
} else {
  print("reject H0")
}
```

```
## [1] "accept H0"
```

```r
# Question 3:
# Two independent samples of sizes 8 and 8 contained the following:
# Sample 1 = 19, 17, 15, 21, 16, 18, 16, 14
# Sample 2 = 15, 14, 15, 19, 15, 18, 16, 20
# Test whether the variances of the two samples are equal (F-test)

sample1 = c(19, 17, 15, 21, 16, 18, 16, 14)
sample2 = c(15, 14, 15, 19, 15, 18, 16, 20)

alpha = 0.05

f = var.test(sample1, sample2)
cv = f$statistic
tv = qf(1 - alpha, df1 = length(sample1) - 1, df2 = length(sample2) - 1)

if (cv < tv) {
  print("reject H0")
} else {
```

```r
  print("accept H0")
}
```

```
## [1] "reject H0"
```

```r
# Question 4:
# Five coins are tossed 256 times.
# The number of heads observed by binomial distribution is given below.
# Examine if the coins are unbiased by employing chi-square goodness of fit
test.

n = 5
N = 256
p = 0.5
x = 0:5

obf = c(5, 35, 75, 84, 45, 12)
exf = dbinom(x, n, p) * N

cv = sum((obf - exf)^2 / exf)
tv = qchisq(1 - alpha, df = n - 1)

if (cv < tv) {
  print("accept H0 / fit is good")
} else {
  print("reject H0 / fit is not good")
}
```

```
## [1] "accept H0 / fit is good"
```

```r
# Question 5:
# From the following information, state whether the condition of the child
# is associated with the condition of the house:

#                       Condition of House
# Condition of Child    Clean     Dirty
# Clean                  69        51
# Fairly Clean           81        20
# Dirty                  35        44

data = matrix(c(69, 51, 81, 20, 35, 44), ncol = 2, byrow = TRUE)
df = 2
alpha = 0.05

chi_sq = chisq.test(data)
cv = chi_sq$statistic
tv = qchisq(1 - alpha, df)

if (cv < tv) {
  print("attributes are independent (associated)")
```

```
} else {
  print("attributes are not independent")
}
```

```
## [1] "attributes are not independent"
```