assignment_7_solution

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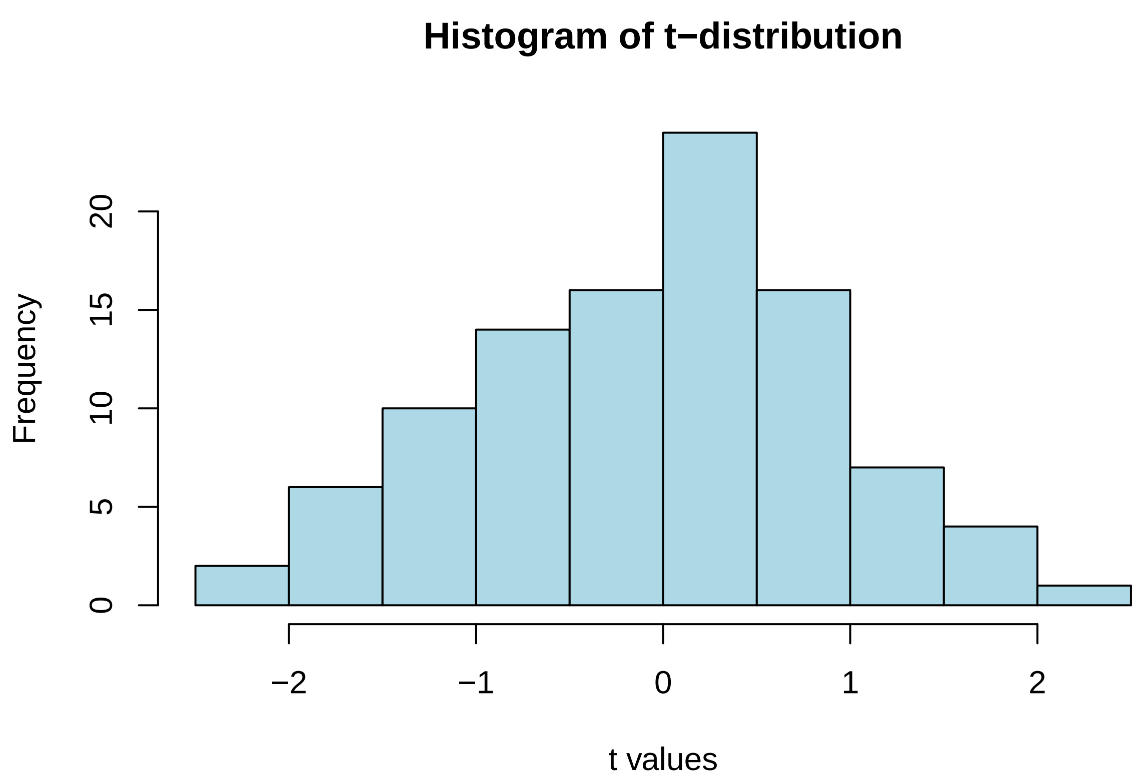
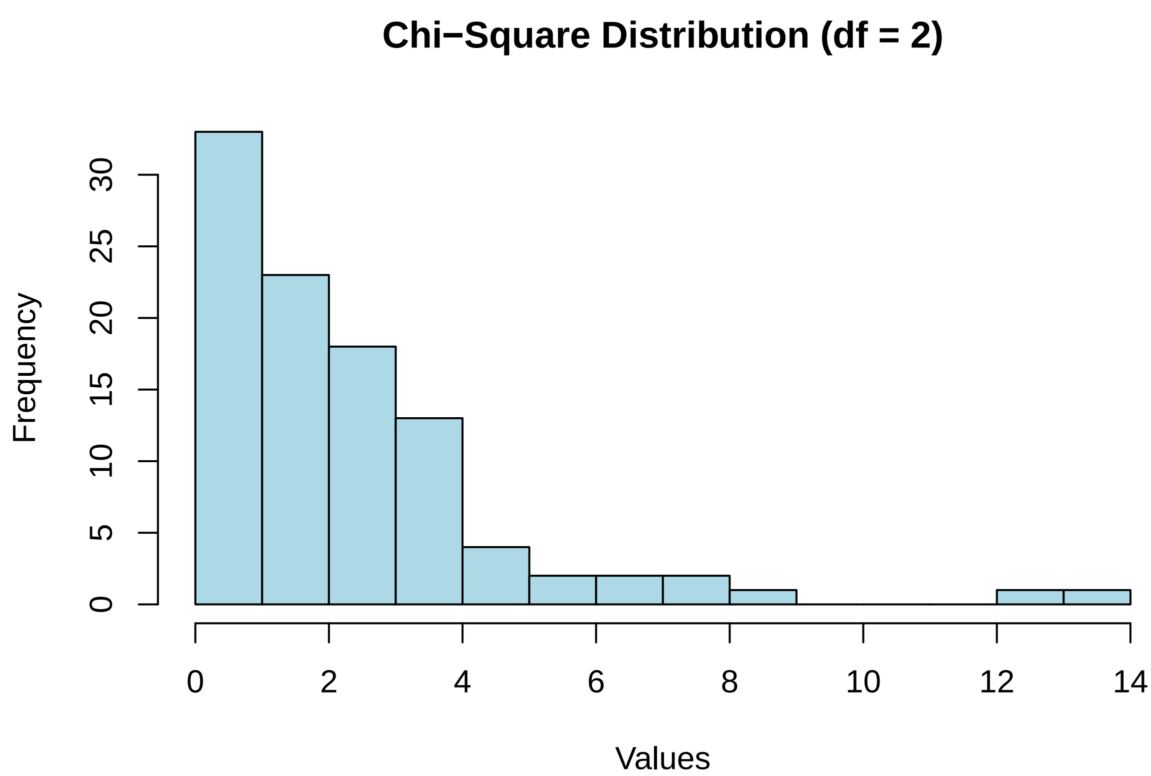
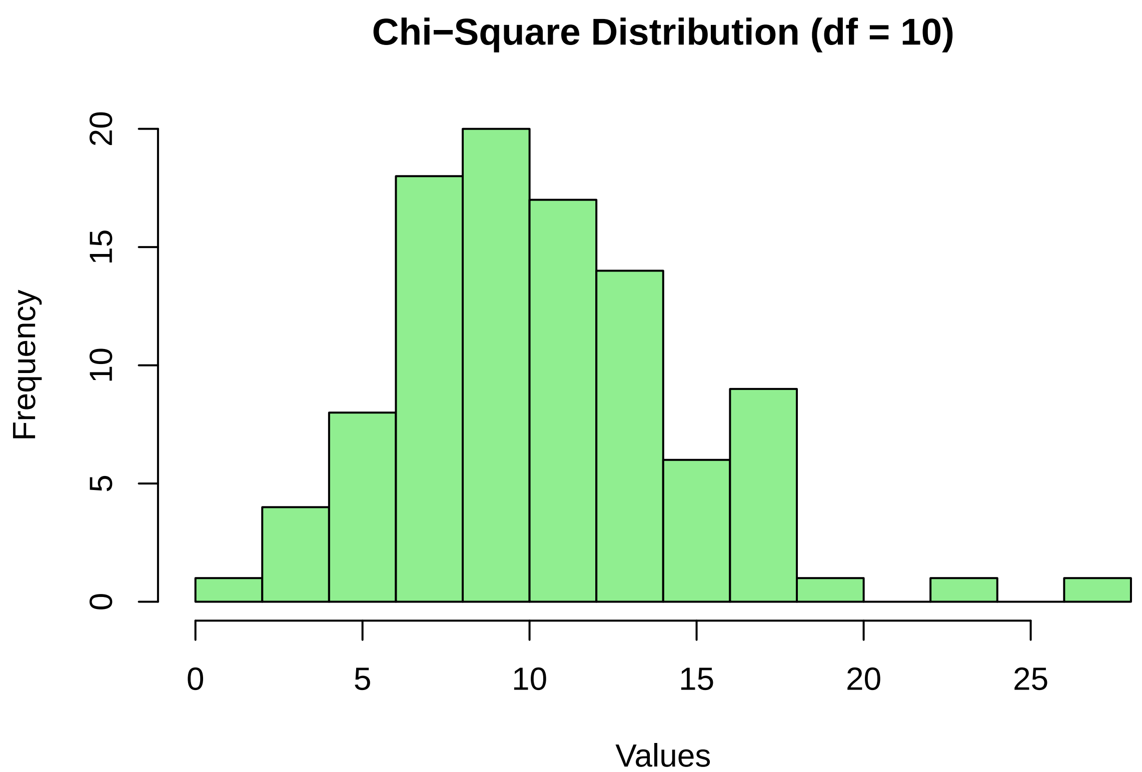
```r
# Q1.Use the rt(n, df ) function in r to investigate the t-distribution for n = 100
# and df = n-1 and plot the histogram for the same.
n <- 100
df <- n - 1
t_values <- rt(n, df)

hist(t_values,
     breaks = 15,              # Number of bins
     main = "Histogram of t-distribution",
     xlab = "t values",
     col = "lightblue",
     border = "black")
```



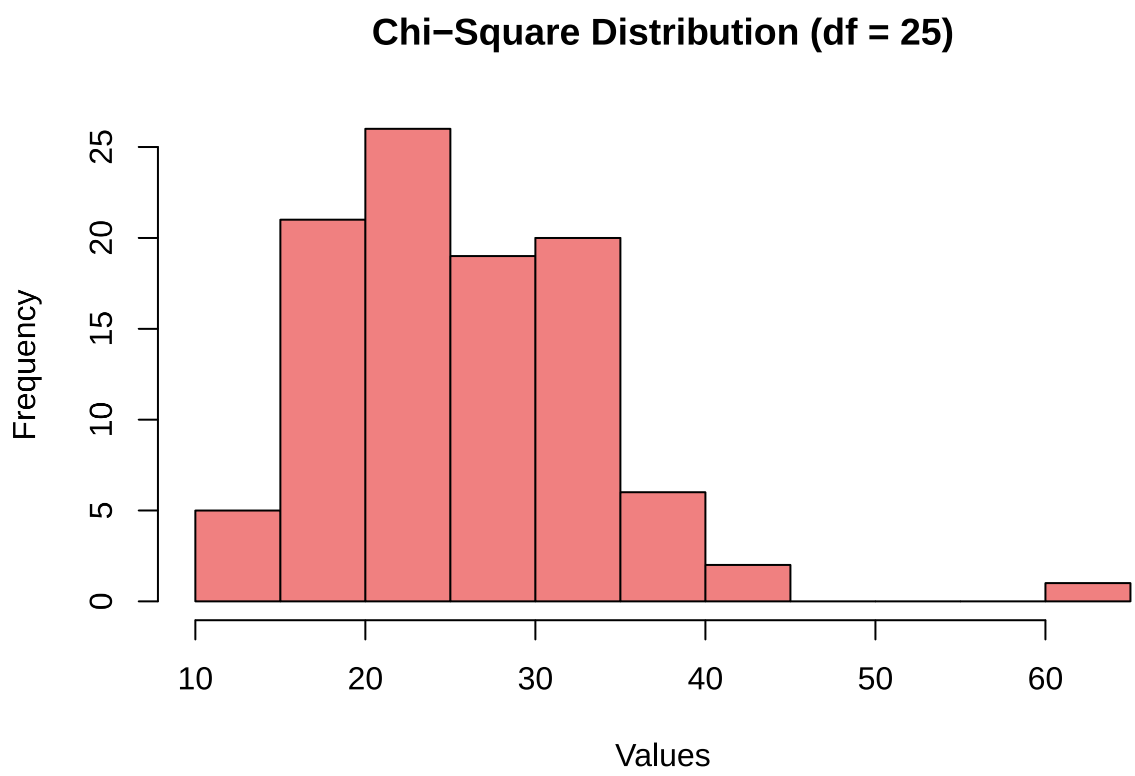
```
# Q2.Use the rchisq(n,df) function in r to investigate the chi-square distribution
# with n = 100 and df = 2, 10, 25.
n <- 100
chisq_df2 <- rchisq(n, df = 2)
chisq_df10 <- rchisq(n, df = 10)
chisq_df25 <- rchisq(n, df = 25)

# Histogram for df = 2
hist(chisq_df2,
     breaks = 15,
     main = "Chi-Square Distribution (df = 2)",
     xlab = "Values",
     col = "lightblue",
     border = "black")
```



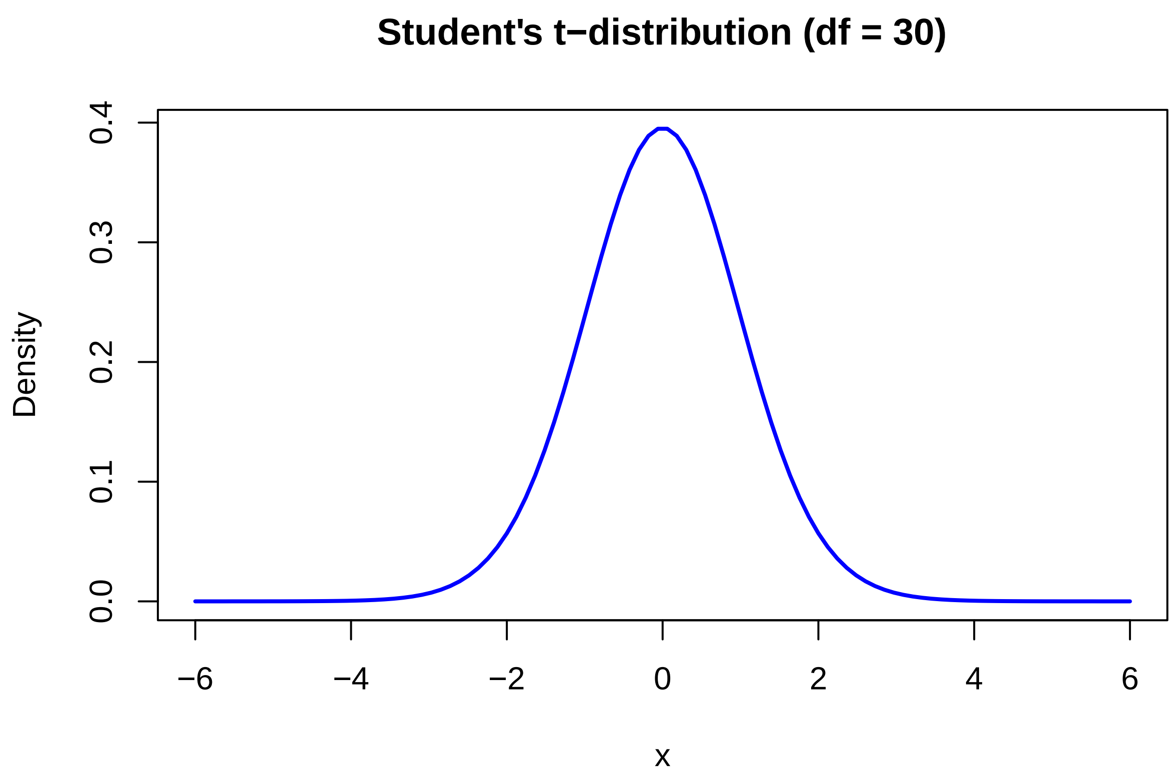

```
# Histogram for df = 10
hist(chisq_df10,
     breaks = 15,
     main = "Chi-Square Distribution (df = 10)",
     xlab = "Values",
     col = "lightgreen",
     border = "black")
```



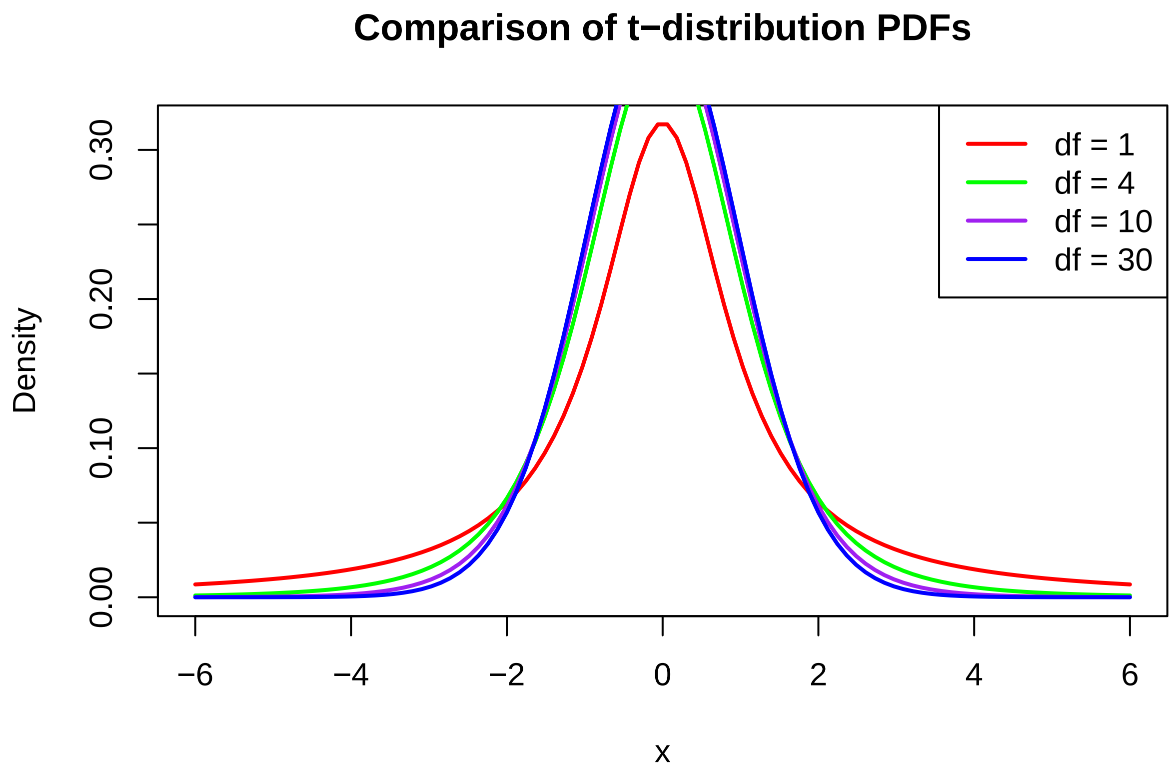

```r
# Histogram for df = 25
hist(chisq_df25,
     breaks = 15,
     main = "Chi-Square Distribution (df = 25)",
     xlab = "Values",
     col = "lightcoral",
     border = "black")
```




```r
# Q3.Generate a vector of 100 values between -6 and 6. Use the dt() function in
# r to find the values of a t-distribution given a random variable x and degrees
# of freedom 1,4,10,30. Using these values plot the density function for students
# t-distribution with degrees of freedom 30. Also shows a comparison of
# probability density functions having different degrees of freedom (1,4,10,30).
x <- seq(-6, 6, length.out = 100)
df_values <- c(1, 4, 10, 30)
colors <- c("red", "green", "purple", "blue")

# Plot the density function for degrees of freedom = 30
plot(x, dt(x, df = 30), type = "l",
     col = "blue",
     lwd = 2,
     main = "Student's t-distribution (df = 30)",
     xlab = "x",
     ylab = "Density")
```




```r
# Initialize the plot with the first distribution (df = 1)
plot(x, dt(x, df = df_values[1]), type = "l",
     col = colors[1], lwd = 2,
     ylim = c(0, max(dt(x, df = df_values[1]))),
     main = "Comparison of t-distribution PDFs",
     xlab = "x", ylab = "Density")

# Loop through the degrees of freedom and add lines for each
for (i in 2:length(df_values)) {
  lines(x, dt(x, df = df_values[i]), col = colors[i], lwd = 2)
}

# Add a legend for clarification
legend("topright",
       legend = paste("df =", df_values),
       col = colors,
       lwd = 2)
```




```r
# Q4.Write a r-code
# (i) To find the 95th percentile of the F-distribution with (10,20) degrees of freedom.
# (ii) To calculate the area under the curve for the interval [0, 1.5] and the
#      interval [1.5, +inf) of a F-curve with v1 = 10 and v2 = 20 (USE pf()).
# (iii) To calculate the quantile for a given area (= probability) under the
#       curve for a F-curve with v1 = 10 and v2 = 20 that corresponds to
#       q = 0.25, 0.5, 0.75 and 0.999. (use the qf ())
# (iv) To generate 1000 random values from the F-distribution with v1 = 10 and
#      v2 = 20 (use rf())and plot a histogram.
v1 <- 10
v2 <- 20
p <- 0.95
percentile_95 <- qf(p, df1 = v1, df2 = v2)
print(paste("95th percentile of F-distribution with (10,20) : ",percentile_95))
```

```
## [1] "95th percentile of F-distribution with (10,20) :  2.34787756699831"
```

```r
area_0_1.5 <- pf(1.5, df1 = v1, df2 = v2)
print(paste("Area under the curve for the interval [0, 1.5]: ",area_0_1.5))
```

```
## [1] "Area under the curve for the interval [0, 1.5]:  0.789053537481387"
```

```r
area_1.5_inf <- pf(1.5, df1 = v1, df2 = v2, lower.tail = FALSE)
print(paste("Area under the curve for the interval [1.5, +inf): ",area_1.5_inf))
```

```
## [1] "Area under the curve for the interval [1.5, +inf):  0.210946462518613"
```

```r
prob <- c(0.25, 0.5, 0.75, 0.999)
quantiles <- qf(prob, df1 = v1, df2 = v2)
print(paste("Quantiles for given area under the curve for a F-curve with p=",
            prob,"is",quantiles))
```

```
## [1] "Quantiles for given area under the curve for a F-curve with p= 0.25 is 0.656393632655341"
## [2] "Quantiles for given area under the curve for a F-curve with p= 0.5 is 0.966263888592917"
## [3] "Quantiles for given area under the curve for a F-curve with p= 0.75 is 1.3994874368231"
## [4] "Quantiles for given area under the curve for a F-curve with p= 0.999 is 5.0752462112097"
```

```r
random_values <- rf(1000, df1 = v1, df2 = v2)
hist(random_values, breaks = 30,
     main = "Histogram of 1000 Random F-distribution Values",
     xlab = "Values", col = "lightblue", border = "black")
```