Exercise set 4

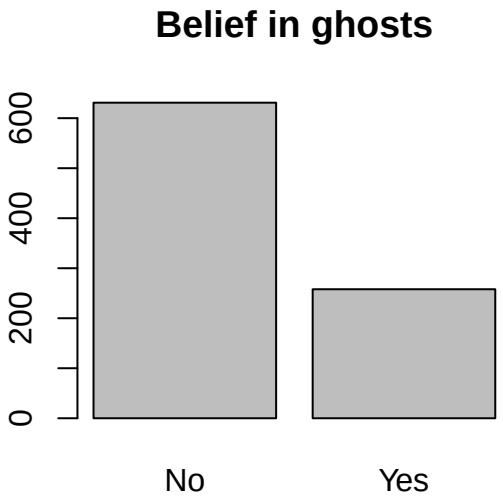
Stat 251

(1) *pvalues.* Use the given hypotheses, the *pvalue*, the significance level α (if not given use the assumed value) to determine if the null hypothesis should be rejected or not.
   (a) $H_0 : \pi = 0.25$, $H_a : \pi > 0.25$, $pvalue = 0.09$, $\alpha = 0.10$
   (b) $H_0 : \mu = 6$, $H_a : \mu < 6$, $pvalue = 0.00022$
   (c) $H_0 : \mu = 70$, $H_a : \mu \neq 70$, $pvalue =$`2.17e-03`
   (d) $H_0 : \pi = 0.2$, $H_a : \pi \neq 0.2$, $pvalue = 0.1298$
   (e) $H_0 : \mu = 3.5$, $H_a : \mu > 3.5$, $pvalue = 0.06$

(2) *Using Student's t distribution.* Find the degrees of freedom (df) and the value of $t^\star$ for the given sample size and confidence level or significance level (α) from statdistributions.com.
   (a) $n = 6$,$CL = 90\%$
   (b) $n = 21$,$CL = 98\%$
   (c) $n = 29$,$CL = 95\%$
   (d) $n = 12$,$CL = 99\%$
   (e) $n = 6$,$\alpha = 0.10$, left tail
   (f) $n = 40$,$\alpha = 0.05$, right tail

(3) *There is no Dana, there is only Zuul (Who you gonna call?)*
In November of 2005 the Harris Poll asked the question, "Do you believe in ghosts?" Out of the 889 randomly selected US adults, 29% said they did believe in ghosts.
   (a) Estimate π, the true proportion of people who believe in ghosts with 95% confidence; interpret
   (b) In a survey from 10 years ago, the proportion of people who believed in ghosts was 33%. Is there sufficient evidence that the proportion of people who believe in ghosts has changed? Conduct a hypothesis test; state the test statistic, *pvalue*, *df*, results, and conclusion in context
   (c) State the kind of error could have been made in context of the problem.

```
barplot(table(Zuul)); title('Belief in ghosts')
```



```
t.test(zuul,mu=.33)
```

```
    One Sample t-test

data:  zuul
t = -2.6123, df = 888, p-value = 0.009146
alternative hypothesis: true mean is not equal to 0.33
95 percent confidence interval:
 0.2603216 0.3201058
sample estimates:
mean of x
0.2902137
```

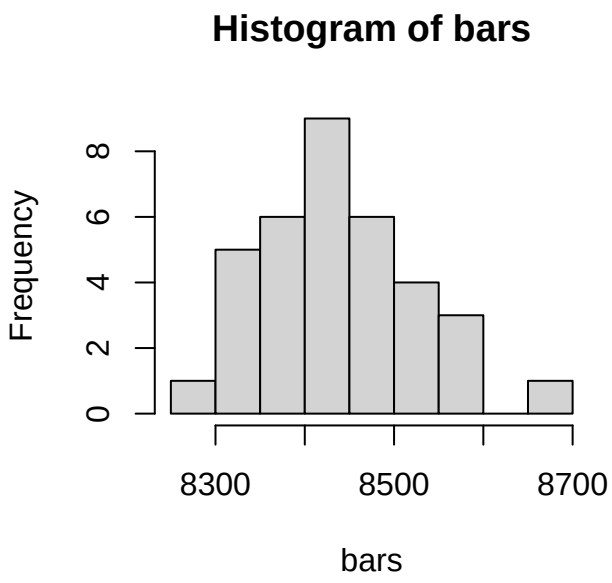
(4) *Steel-reinforcing Bars.* On the basis of extensive tests, the yield point of a particular type of mild steel-reinforcing bar is known to be normally distributed with historical standard deviation 100; a random sample of 35 bars was taken. Suppose that the specifications are that the yield point of a particular type of mild steel-reinforcing bar should be 8475 lbs.

(a) Estimate μ, the true mean yield point, with 98% confidence. Interpret.

(b) Is there sufficient evidence that the mean yield point is less than the specifications call for (the specs say 8475)? Conduct a hypothesis test; state the test statistic, *pvalue*, *df*, results, and conclusion in context. Let $\alpha = 0.02$

(c) State the kind of error could have been made in context of the problem.

```
hist(bars)
```




```
t.test(bars,mu=8475,conf.level=.98)
```

```
    One Sample t-test

data:  bars
t = -2.5408, df = 34, p-value = 0.01579
alternative hypothesis: true mean is not equal to 8475
98 percent confidence interval:
 8401.744 8473.535
sample estimates:
mean of x
```

```
  8437.64
```

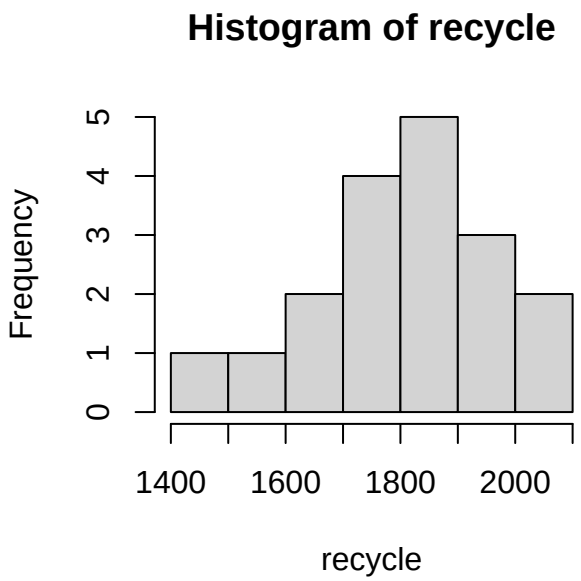
```
t.test(bars,mu=8475,alternative='l',conf.level=.98)
```

```
    One Sample t-test

data:  bars
t = -2.5408, df = 34, p-value = 0.007897
alternative hypothesis: true mean is less than 8475
98 percent confidence interval:
     -Inf 8469.042
sample estimates:
mean of x
  8437.64
```

(5) *It ain't easy bein' green.* A dealer in recycled paper places empty trailers at various sites. The trailers are gradually filled by individuals who bring in old newspapers and magazines, and are picked up on several schedules. One such schedule involves pickup every second week. This schedule is desirable if the average amount of recycled paper is more than 1600 cubic feet per 2-week period. The dealer's records for a random sample of eighteen 2-week periods was taken.
   (a) Estimate the true mean weight of recycled paper with 95% confidence. Interpret.
   (b) Is there sufficient evidence that the mean amount of recycled paper is more than 1600 cubic feet per 2 week period? Conduct a hypothesis test; state the test statistic, *pvalue*, *df*, results, and conclusion in context
   (c) State the kind of error could have been made in context of the problem.

```
hist(recycle)
```




```
t.test(recycle,mu=1600)
```

```
    One Sample t-test

data:  recycle
t = 5.4496, df = 17, p-value = 4.326e-05
alternative hypothesis: true mean is not equal to 1600
95 percent confidence interval:
```

```
 1721.685 1875.426
sample estimates:
mean of x
 1798.556
```

```
t.test(recycle,mu=1600,alternative='g')
```

```

    One Sample t-test

data:  recycle
t = 5.4496, df = 17, p-value = 2.163e-05
alternative hypothesis: true mean is greater than 1600
95 percent confidence interval:
 1735.173      Inf
sample estimates:
mean of x
 1798.556
```