# Prob and Stat Hmwk ch5

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5.1 Pg 335: 1,4,10;

4) Sample:50 Mean:654.1 Sd:311.7

a. Find a 95% confidence interval
   sigma = s/sqrt(n)
   sigma = 311.7/sqrt(50)

```
311.7/sqrt(50)
```

```
## [1] 44.08104
```

1-alpha =0.95
alpha = 0.05
alpha/2= 0.025
Z= 1.96
654.1+-1.96*(44.08)

```
1.96*44.08104
```

```
## [1] 86.39884
```

```
654.1+1.96*44.08104
```

```
## [1] 740.4988
```

```
654.1-1.96*44.08104
```

```
## [1] 567.7012
```

(567.7012,740.4988)

b. Find a 98% confidence interval
   1-alpha =0.98
   alpha = 0.02
   alpha/2= 0.01
   Z= 2.33
   654.1+-2.33*(44.08)

```
2.33*44.08104
```

```
## [1] 102.7088
```

```
654.1+2.33*44.08104
```

```
## [1] 756.8088
```

```
654.1-2.33*44.08104
```

```
## [1] 551.3912
```

(551.3912,756.8088)

c. A Traffic engineer states that the mean improvement is between 581.6 and 726.6 vehicles per hour. With what level of confidence can this statement be made?
   581.6 = 654.1+-Z*311.7/sqrt(50)*

*z=(654.1-581.6)/311.7*sqrt(50)
z= 1.64469 = 1.645

90%

10) Sample:60 Mean:85 Sd:2

a. Find a 95% confidence interval
sigma = s/sqrt(n)
sigma = 2/sqrt(60)

```r
2/sqrt(60)
```

```
## [1] 0.2581989
```

1-alpha =0.95
alpha = 0.05
alpha/2= 0.025
Z= 1.96
85+-1.96*(0.2581)

```r
85+1.96*(0.2581)
```

```
## [1] 85.50588
```

```r
85-1.96*(0.2581)
```

```
## [1] 84.49412
```

(84.49412,85.50588)

b. Find a 99.5% confidence interval
1-alpha =0.995
alpha = 0.005
alpha/2= 0.0025
Z= 2.81
85+-2.81*(0.2581)

```r
85+2.81*(0.2581)
```

```
## [1] 85.72526
```

```r
85-2.81*(0.2581)
```

```
## [1] 84.27474
```

(84.27474,85.72526)

c. What is the confidence level of the interval (84.63,85.37)?
85+-Z*(0.2581)*
*84.63=85-Z*(0.2581)

```r
(85-84.63)/(0.2581)
```

```
## [1] 1.433553
```

Z = 1.45
alpha/2 = 0.0735
alpha = 0.147
(1-alpha)=.853

85.3%

d. How many thermostats must be sampled so that a 95% confidence interval specifies the mean to within +- 0.35?
85+-0.35=(84.65,85.35)
0.35=z*(s/sqrt(n))*
*1-alpha =0.95*
*alpha = 0.05*
*alpha/2= 0.025*
*Z= 1.96*
*0.35 = 1.96*(2/sqrt(n)
sqrt(n)=1.96*2/0.35

```
(1.96*2/0.35)^2
```

```
## [1] 125.44
```

n = 126

e. How many thermostats must be sampled so that a 99.5% confidence interval specifies the mean to within +- 0.35?
85+-0.35=(84.65,85.35)
0.35=z*(s/sqrt(n))*
*1-alpha =0.995*
*alpha = 0.005*
*alpha/2= 0.0025*
*Z= 2.81*
*0.35 = 2.81*(2/sqrt(n))
sqrt(n)=2.81*2/0.35

```
(2.81*2/0.35)^2
```

```
## [1] 257.8318
```

n = 258

5.3 Pg 353: 1,2,14,16;
2) Find the value of t[n-1,a] needed to construct an upper or lower confidence bound in each of the situation in Exercise 1.
a. Level 90%, sample size 12.
t*s/sqrt(n)
t[11,0.05]=1.796

b. Level 90%, sample size 7.
t[6,0.1]=1.440

c. Level 99%, sample size 2.
t[1,0.01]=318.309

d. Level 95%, sample size 29.
t[28,0.05]=1.701

14) One sample T: X N:10 Mean:6.59635 Sd:0.11213 SeMean:0.03546 95% CI:(6.51613, 6.67656)

a. How many degrees of fredom does the Student's t distribution have?
n - 1 =dof
10 - 1 = 9

b. Use the information in the output, along with the t table, to compute a 99% confidence interval.
t[9,.01]=2.821
6.59635+-2.821*0.03546

```r
6.59635+2.821*0.03546
```

```
## [1] 6.696383
```

```r
6.59635-2.821*0.03546
```

```
## [1] 6.496317
```

(6.496317,6.696383)

16) The concentration of carbon monoxide (CO) in a gas sample is measured bny a spectophotometer and found to be 85 ppm. Through long experience with this instrument, it is believed that its measurements are unbiased and normally distributed, with an uncertainty (Sd): 8ppm. Find a 95% confidence interval for the concentration of CO in this sample.
    X+-Z[a/2]*sd*
    *z[0.025] = 1.96*
    *85+-1.96*8

```r
85+1.96*8
```

```
## [1] 100.68
```

```r
85-1.96*8
```

```
## [1] 69.32
```

(69.32,100.68)

5.2 Pg 341: 1,2,11,12,16;
2) During a reacent drought, a water utility in a certain town sampled 100 residential water bills and found that 73 of the residences has reduced their water consumption over that of the previous year.
a. Find a 95% confidence interval for the proportion of residences that reduced their water consumption.
P+-Z[alpha/2]*sqrt(P*(1-P)/m)
m=100+4=104
P=(X+2)/m
P=(73+2)/104=75/104=0.721
0.721+-1.96*sqrt(0.721*(1-.721)/104)

```r
0.721+1.96*sqrt(0.721*(1-.721)/104)
```

```
## [1] 0.8072004
```

```r
0.721-1.96*sqrt(0.721*(1-.721)/104)
```

```
## [1] 0.6347996
```

(0.6347996,0.8072004)

b. Find a 99% confidence interval for the proportion of residences that reduced their water consumption.
   0.721+-2.58*sqrt(0.721*(1-.721)/104)

```r
0.721+2.58*sqrt(0.721*(1-.721)/104)
```

```
## [1] 0.8344678
```

```r
0.721-2.58*sqrt(0.721*(1-.721)/104)
```

```
## [1] 0.6075322
```

(.6075322,0.8344678)

c. Find the sample size needed for a 95% confidence interval to specify the proportion to within +- 0.05
   0.721-.05 = 0.671
   0.671=0.721-Z[0.025]*sqrt(0.721(1-0.721)/m)*

*(.721*(1-0.721))/((0.721-0.671)/1.96)^2=m
m=309.109

n=310

d. Find the sample size needed for a 99% confidence interval to specify the proportion to within +- 0.05
0.721-.05 = 0.671
0.671=00.721-Z[0.025]*sqrt(00.721(1-00.721)/m)*
*(.721*(1-0.721))/((0.721-0.671)/2.58)^2
m=535.5979

n=536

e. Someone claims that more than 70% of residences reduced their water consumption with what level of confidence can this statement be made?
.7=.721-Z*sqrt(0.721*(1-.721)/104)

```r
z=(.721-.7)/(sqrt(0.721*(1-.721)/104))
z
```

```
## [1] 0.4774921
```

```r
z*2
```

```
## [1] 0.9549843
```

```r
1-z*2
```

```
## [1] 0.04501571
```

95% confidence

f. If 95% confidence intervals are computed for 200 towns, what is the probability that more than 192 of the confidence intervals cover the true proportions?

```r
1-pbinom(192,200,0.95)
```

```
## [1] 0.2133047
```

16) A stock market analyst notices that in a certain year, the price of IBM stock increased on 131 out of 252 trading days. Can these data be used to find a 95% confidence interval for the proportion of days that IBM stock increases? Explain.
P+-Z[alpha/2]*sqrt(P*(1-P)/m)
m=252+4=256
P=(X+2)/m
P=(131+2)/256=133/256=0.519
0.519+-1.96*sqrt(0.519*(1-0.519)/256)

```r
0.519+1.96*sqrt(0.519*(1-0.519)/256)
```

```
## [1] 0.5802058
```

```r
0.519-1.96*sqrt(0.519*(1-0.519)/256)
```

```
## [1] 0.4577942
```

(0.4577,0.5819)

I would probably shy away from his conclusion. The probably is already low and the interval is a little too large for me to be confertable. Although its not a terrible range and some conclusions could be made but I wouldn't act to quickly on this day.