Homework 4 for Stat 3355, Section 001

Proportions shown to 3 significant figures, while other numbers rounded to 2nd decimal point.

Question 1

```
mQSAT = 575
sQSAT = 90
mVSAT = 530
sVSAT = 110
n1 = 45
```

a)

```
a = .05
t = qt(1-a/2, n1-1)
mQSATCI95 = mQSAT + c(-t,t)*sQSAT/sqrt(n1)
mVSATCI95 = mVSAT + c(-t,t)*sVSAT/sqrt(n1)
```

```
## [1] "We can be 95% confident that the mean quantitative SAT score of all students who take this course is
between 547.96  and  602.04"
```

```
## [1] "We can be 95% confident that the mean verbal SAT score of all students who take this course is betwe
en 496.95  and  563.05"
```

b)

```
a = .05
cLo = qchisq(a/2, n1-1)
cHi = qchisq(1-a/2, n1-1)
sQSATCI95 = sqrt(sQSAT^2*(n1-1)/c(cHi, cLo))
sVSATCI95 = sqrt(sVSAT^2*(n1-1)/c(cHi, cLo))
```

```
## [1] "We can be 95% confident that the standard deviation of the quantitative SAT score of all students wh
o take this course is between 74.51  and  113.69 . "
```

```
## [1] "We can be 95% confident that the standard deviation of the  verbal SAT score of all students who tak
e this course is between 91.06  and  138.95 . "
```

c)

```
a = .05
e = 5
s0 = 110
z = qnorm(a/2)
nSample = ceiling((z*s0/e)^2)
```

```
## [1] "We would need at least  1860  students to estimate the mean verbal SAT score with 95% confidence and
with error of no more than 5 if it is assumed that the s.d. is no more than 110."
```

d)

```
a = .05
MQSAT = 535
MVSAT = 505
tQSAT = (mQSAT - MQSAT)/(sQSAT/sqrt(n1))
pVQSAT = 2*(1-pt(abs(tQSAT), n1-1))
tVSAT = (mVSAT - MVSAT)/(sVSAT/sqrt(n1))
pVVSAT = 2*(1-pt(abs(tVSAT), n1-1))
```

```
## [1] "For the quantitative SAT, the p-value of  0.00466  was lower than the alpha of .05, so we reject the null hypothesis and infer that the students of the class have different scores than the general population."
```

```
## [1] "For the verbal SAT, the p-value of  0.135  was higher than the alpha of .05, so we cannot reject the null hypothesis that the scores of students differs from general test-takers."
```

Question 2

```
n = 640
nError = 80
p = nError/n
```

a)

```
a = .05
z = qnorm(1-a/2)
sHat = sqrt(p*(1-p)/n)
pErrorRateCI95 = p + c(-z,z)*sHat
```

```
## [1] "We can be 95% confident that the error rate for this company's invoices is between  0.0994  and  0.1
51 . "
```

b)

```
#hypothesis test for .07 rate
p0 = .07
a = .05
s = sqrt(p0*(1-p0)/n)
z = (p-p0)/s
pVErrorRate1 = 1-pnorm(z)

#hypothesis test for .10 rate
p0 = .10
z = (p-p0)/s
pVErrorRate2 = 1-pnorm(z)
```

```
## [1] "The hypothesis tests for both the 7% and 10% error rates, with p-values  2.47e-08  and  0.00659 , re
spectively, both reject the null hypotheses because of p-values lower than the alpha .05. We say that the co
mpany is seriously out of compliance."
```

c)

```
a = .05
P = .12
p0 = .1
s = sqrt(P*(1-P)/n)
z = (p0-P)/s
prob = 1-pnorm(z)
```

```
## [1] "The probability that a company with a 12% error rate would be rated as seriously out of compliance i
s  0.94026450661415 . "
```

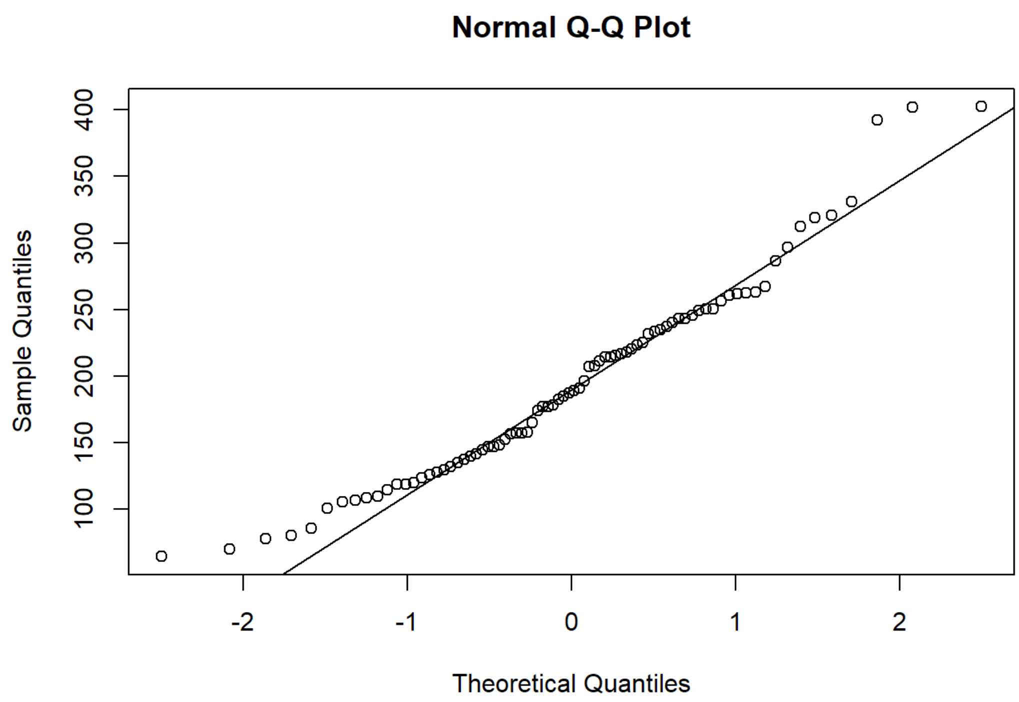
d)

```
p0 = .12
a = .01
z = qnorm(1-a/2)
e = .03
sampleN = ceiling((z/e)^2*p0*(1-p0))
```

```
## [1] "The auditor would need a sample size of at least  779  to estimate the invoice error rate to within 3% at 99% confidence. "
```

e)

```
InvErr = scan("http://www.utdallas.edu/~ammann/stat3355scripts/InvoiceErr1.txt")
m = mean(InvErr)
s = sd(InvErr)
n = length(InvErr)
a = .05
t = qt(1-a/2, n-1)
mErrorAmountCI95 = m + c(-t,t)*(s/sqrt(n))
qqnorm(InvErr)
qqline(InvErr)
```




```
## [1] "We can be 95% confident that the mean error amount among all erroneous invoices lies between  178.23 and  211.96 . "
```

```
## [1] "Since the quantile-quantile plot starts off above the line, then dips down, then rises above again at the upper quantiles, it indicates skewness and thus a non-normal distribution."
```

Question 3

```
n = 800
p = 48/n
p0 = .05
```

a)

```
a = 0.05
s = sqrt(p0*(1-p0)/n)
z = (p-p0)/s
#test if greater than p0
pVal = 1-pnorm(z)
```

```
## [1] "At 5% significance, the equipment should be unchanged because the p-value of  0.0972  is above the alpha value of .05."
```

b)

```
P = .08
s = sqrt(P*(1-P)/n)
z = (p0-P)/s
prob = 1-pnorm(z)
```

```
## [1] "The probability that the null hypothesis would be rejected if the population defective rate is actua
lly 8% is  0.999 . "
```

c)

```
a = .05
s = sqrt(p*(1-p)/n)
z = qnorm(1-a/2)
pDefectiveRateCI95 = p + c(-z,z)*s
```

```
## [1] "We can be 95% confident that the population defective rate lies between  0.0435  and  0.0765 . "
```

d)

```
a = .05
p0 = .08
z = qnorm(1-a/2)
e = .02
sampleN = ceiling((z/e)^2*p0*(1-p0))
```

```
## [1] "We would need a sample size of at least  707  to estimate the defective rate to within .02 with 95%
confidence."
```