Discussion 6

Practice Problem

1. a sample of teenagers might be divided into male and female on the one hand, and those that are and are not currently dieting on the other. We hypothesize, for example, that the proportion of dieting individuals is higher among the women than among the men, and we want to test whether any difference of proportions that we observe is significant. The data might look like this:

	men	women	Total
dieting	1	9	10
not dieting	11	3	14
Total	12	12	24

   a. Is it suitable for analysis by a chi-squared test?

   b. Perform Fisher's exact test on the observed data.

2. Let $Z \sim N(0,1)$. Find the following:

   a. $P(Z > 2)$

   b. $P(-1.96 < Z < 1.96)$

   c. the constant c such that $P(|Z| < c) = 0.9$.

   d. if $Y \sim N(10, 6)$, what is the distribution of $\frac{Y-10}{6}$?

3. The mean height of women in Britain is 163.3 cm with standard deviation 6.4 cm. Let $\bar{X}$ be the mean height of 36 British women randomly chosen from the population. Find:

   a. Find $P(160 < \bar{X} < 168)$.

   b. Find 0.95 quantile of the sampling distribution of $\bar{X}$.

   c. Find the cutoff values of the middle 90% of the sampling distribution of $\bar{X}$.

Solution

1. a. These data would not be suitable for analysis by a chi-squared test, because the expected values in the table are all below 10.

   b.

```
> x=matrix(c(1,11,9,3),ncol=2)
> x
     [,1] [,2]
[1,]    1    9
[2,]   11    3
> fisher.test(x,alternative="less")

        Fisher's Exact Test for Count Data

data:  x
p-value = 0.001380
alternative hypothesis: true odds ratio is less than 1
95 percent confidence interval:
 0.0000000 0.3260026
sample estimates:
odds ratio
0.03723312
```

2.

```
> 1-pnorm(2)
[1] 0.02275013
> pnorm(1.96)-pnorm(-1.96)
[1] 0.9500042
> qnorm(0.05)
[1] -1.644854
```

3. By central limit theorem, $\bar{X}$ will be approximately normal with mean 163.3 and sd $\frac{6.4}{\sqrt{36}} = 1.067$.

   a. $P(160 < \bar{X} < 168) = P(\frac{160-163.3}{1.067} < \frac{\bar{X}-163.3}{1.067} < \frac{168-163.3}{1.067}) = P(-3.093 < Z < 4.405) = ?$

```
> pnorm(4.405)-pnorm(-3.093)
[1] 0.999004
```

   b.

```
> qnorm(0.95,163.3,1.067)
[1] 165.0551
```

   c.

```
> qnorm(c(0.05,0.95),163.3,1.067)
[1] 161.5449 165.0551
```