1. “There’s a 95% chance that the true effect is between –4.5 and –9.3 mm Hg.”
   
   **No.** The true effect is some fixed but unknown value; we can’t talk about probability. In advance, the investigators had a 95% chance of getting a confidence interval that contained the true effect; after the fact, the interval either contains the true effect or doesn’t.

2. “There’s a 99.1% chance that the treatment affects blood pressure.”

   **No.** The P-value is the chance of getting data as or more extreme than was observed *if the null hypothesis (no treatment effect) were true*. We can’t talk about the chance that the treatment has an effect.

3. **10.5 (pg 400)**

   The expected counts are 106.875, 35.625, 35.625, 11.875.

   The $\chi^2$ statistic is
   
   $$\frac{(111 - 106.875)^2}{106.875} + \frac{(37 - 35.625)^2}{35.625} + \frac{(34 - 35.625)^2}{35.625} + \frac{(8 - 11.875)^2}{11.875} \approx 1.55$$

   Comparing this to the $\chi^2$ distribution with 3 degrees of freedom (Table 9, pg 686), we find that the P-value is $> 0.2$, and so we fail to reject the null hypothesis and conclude that the data conform reasonably well to the proportions 9:3:3:1.

   In R, we could calculate the P-value with $1 - \text{pchisq}(1.55, 3) \approx 0.67$.

   Alternatively, we could type

   ```r
   ob <- c(111, 37, 34, 8)
   chisq.test(ob, p=c(9/16, 3/16, 3/16, 1/16))
   ```

4. **10.26 (pg 412)**

   The expected counts are

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Ancrod</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemorrhage?</td>
<td>Yes</td>
<td>8.93</td>
</tr>
<tr>
<td>No</td>
<td>239.07</td>
<td>242.93</td>
</tr>
<tr>
<td>Total</td>
<td>248</td>
<td>252</td>
</tr>
</tbody>
</table>

   The $\chi^2$ statistic is
   
   $$\frac{(13 - 8.93)^2}{8.93} + \frac{(5 - 9.07)^2}{9.07} + \frac{(235 - 239.07)^2}{239.07} + \frac{(247 - 242.93)^2}{242.93} \approx 3.82$$
Comparing this to the $\chi^2$ distribution with 1 degree of freedom (Table 9, pg 686), we see that the P-value is between 0.05 and 0.10. At $\alpha = 0.05$, we would fail to reject the null hypothesis and conclude that there is insufficient evidence to show that there is a difference in the frequency of hemorrhage between the two groups. \textbf{But it's really close!}

In R, we would calculate the P-value with $1-\text{pchisq}(3.82, 1) \approx 0.051$.

Or we could do the whole thing with:

```r
tab <- rbind( c(13,5), c(235, 247) )
chisq.test(tab)
```

5. \textbf{10.46 (pgs 428)}

We create a table with the data as follows:

```r
tab <- rbind( c(2,21), c(8, 16) )
```

Note that the second row contains the numbers of individuals with low serum levels (not the totals)!

(a) $\chi^2$ test

`chisq.test(tab)` gives a P-value of \textbf{0.088}. This is based on a “continuity correction”.

The vanilla version of the $\chi^2$ test (as we’ve discussed in class) could be performed via `chisq.test(tab, correct=FALSE)` and gives a P-value of \textbf{0.039}.

(b) \textbf{Fisher’s exact test}

`fisher.test(tab)` gives a p-value of \textbf{0.072}.

With either test, we find that we have insufficient evidence to conclude that the two therapies differ in effectiveness.