Midterm Exam

1. Consider the following 2X2 table with fixed row and column marginals:

12	3	15
3	7	10
15	10	25

   (a) What is the range of n_{11}?

   (b) Consider the exact test of $H_o: \theta = 2$ vs. $H_A: \theta > 2$ ($\alpha = .05$). Find the rejection region and compute a p-value for this test.

2. Use the function `pexact` to help answer the following questions about unconditional tests for the 2x2 table below.

3	7	10
8	2	10
11	9	20

   Assume that the row marginals, n_{1+}, n_{2+} are fixed, so that n_{i1} has a binomial distribution with parameters n_{i+} and π_i.

   (a) Which tables lie in the pooled Z-test rejection region for the hypothesis $H_o: \pi_1 = \pi_2$ vs. $H_a: \pi_1 < \pi_2$? Answer this by entering an arbitrary value for π when using pexact and then examining the output list.

   (b) The following set of commands can generate a vector of p-values for a range of π:

```
p=rep(0,100)
pv=rep(0,100)
for (i in 1:100) {
p[i]=i/101
pv[i]=pexact(p[i],3,7,8,2)$pval
}
```

   Plot the p-value for the test as a function of π, $0 \leq \pi \leq 1$. What is its sup?

   (c) Now construct a Clopper-Pearson 99.9% CI for π (You can use Berger's web page for this). Would the p-value computed over the Clopper-Pearson CI range be any different from the p-value computed over the entire range of π? Why or why not?

3. The table below was compiled for a middle school from the 2003 English/Language Arts PACT exam.

	Grade		
	6	7	8
Below Basic	60	62	76
Basic	87	134	140
Proficient	87	102	100
Advanced	42	24	21

   (a) Compute the likelihood ratio test statistic for a test of independence

   (b) Partition the likelihood ratio test statistic into 6 indepedent 1 df components. What conclusions can you draw from these components?