1. A watch manufacturer claims that its products are accurate to within 3 seconds per year, or, more precisely, that the variance of the error that the watch makes over a one-year period is 1 second. A competitor claims that the variance is really 4 seconds. Two independent measurements will be made to test the manufacturer's claim. Denote them by T_1 and T_2. Suppose T_1 and T_2 are normal with mean $\mu = 0$ and either

$$H_0 : \sigma^2 = 1$$

or

$$H_1 : \sigma^2 = 4.$$

a) Verify that the most powerful test of H_0 versus H_1 is determined by $T_1^2 + T_2^2$.

b) Specify completely what the rejection region is for the most powerful test at level $\alpha = 0.1$.

c) What is the verdict if $T_1 = 2$ and $T_2 = -1.5$?

2. During the course of a season, a particular baseball player is involved in 200 games in which he has exactly four o cial times at bat. His distribution of hits during those games is summarized below:

Number of hits	0	1	2	3	4
Number of Games	44	86	56	12	2

Test the claim that X, the number of hits the player gets in four at-bats in a game, is a binomial random variable. Use 0.05 for the level of significance.

3. The table below lists the number of industrial accidents in 12 manufacturing plants for one-week periods before and after an intensive promotion on safety. (a) Do the data support the claim that the campaign was successful? What is the attained significance level? What would you conclude with $\alpha = 0.1$.? (b) Is there a reasonable way of doing a parametric analysis of this data set? If you can think of one, describe it briefly.

Plant	1	2	3	4	5	6	7	8	9	10	11	12
Before	3	4	6	3	4	5	5	3	2	4	4	5
After	2	1	3	5	4	2	3	3	0	3	1	2

4. The table below gives some results obtained on the association between left-handedness and "left-eyedness." Test for dependence between the two characteristics.

	Left-eyed	Ambiocular	Right-eyed
Left-handed	34	62	28
Ambidextrous	27	28	20
Right-handed	57	105	52

5. A runs test can be used to test for patterns in residuals in a regression analysis. Strictly speaking, the runs test is applicable only when the occurrences which produce the pattern of runs are independent. Nonetheless, in most practical regression situations when the degrees of freedom of SSE is near n, the number of residuals, the effect of correlation among the residuals can be ignored.

Suppose examination of a set of 27 residuals, 15 of which were of one sign and 12 of which were of the opposite sign, arranged in time sequence, reveals 7 runs. Does the arrangement of signs appear to have too few runs?