1. A large randomized trial was conducted to assess the efficacy of Chantix for smoking cessation compared with bupropion (more commonly known as Wellbutrin or Zyban) and a placebo. Chantix is different from most other quit-smoking products in that it targets nicotine receptors in the brain, attaches to them, and blocks nicotine from reaching them, while bupropion is an antidepressant often used to help people stop smoking. Generally healthy smokers who smoked at least 10 cigarettes per day were assigned at random to take Chantix (n = 352), bupropion (n = 329), or a placebo (n = 344). The study was double-blind, with the response measure being continuous cessation from smoking for Weeks 9 through 12 of the study. Here is a two-way table of the results:

	Chantix	Bupropion	Placebo
Didn't Smoke in Weeks 9-12	155	97	61
Smoked in Weeks 9-12	197	232	283

(a) Give a 95% confidence interval for the difference between the proportions of smokers in the bupropion and placebo groups who did not smoke in Weeks 9 through 12 of the study.

(b) What proportion of each of the three groups in the sample did not smoke in Weeks 9 through 12 of the study? Are there statistically significant differences among these proportions? State hypotheses and give a test statistic and its P-value.

(c) Is this an observational study or an experiment? Why does this make a difference in the type of conclusion we can draw?

2. Some people think recycled products are lower in quality than other products, a fact that makes recycling less practical. Here are data on attitudes toward coffee filters made of recycled paper.

	Higher	Same	Lower
Buyers	20	7	9
Nonbuyers	29	25	43

(a) Do buyers and nonbuyers of recycled filters differ significantly in their opinions on the quality of recycled products? State hypotheses, give the chi-square statistic and its P-value, and state your conclusion.

(b) Association does not prove causation. Explain how buying recycled filters might improve a person's opinion of their quality. Then explain how the opinion a person holds might influence his or her decision to buy or not. You see that the cause-and-effect relationship might go in either direction.

3. Sample surveys on sensitive issues can give different results depending on how the question is asked. A University of Wisconsin study divided 2400 respondents into three groups at random. All were asked if they had ever used cocaine. One group of 800 was interviewed by phone; 21% said they had used cocaine. Another 800 people were asked the question in a one-on-one personal interview; 25% said "Yes." The remaining 800 were allowed to make an anonymous written response; 28% said "Yes." Are there statistically significant differences among these proportions? State the hypotheses, convert the information given into a two-way table of counts, give the test statistic and its P-value, and state your conclusions.

4. The data for comparing two sample proportions can be presented in a two-way table containing the counts of successes and failures in both samples, with two rows and two columns. In Exercise 23.2, a survey of the consequences of video-gaming on 14- to 18-year-olds is described. Another question from the survey was about aggressive behavior as evidenced by getting into serious fights, and the comparison was between girls that have and have not played video games. Here are the data:

	Had Serious Fight	No Serious Fights
Played Games	36	55
Never Played Games	578	1436

(a) Is there evidence that the proportions of all 14- to 18-year-old girls who played or have never played video games and have gotten into serious fights differ? Find the two sample proportions, the z statistic, and its P-value.

(b) Is there evidence that the proportions of 14- to 18-year-old girls who have or have not gotten into serious fights differ between those who have played or have never played video games? Find the chi-square statistic χ^2 and its P-value.

(c) Show that (up to roundoff error) your χ^2 is the same as z^2. The two P-values are also the same. These facts are always true, so you will often see chi-square for 2×2 tables used to compare two proportions.

(d) Suppose that we are interested in finding out if the data give good evidence that video-gaming is associated with increased aggression in girls as evidenced by getting into serious fights. Can we use the z test for this hypothesis? What about the χ^2 test? What is the important difference between these two procedures?

5. Many birds are injured or killed by flying into windows. It appears that birds don't see windows. Can tilting windows down so that they reflect earth rather than sky reduce bird strikes? Place six windows at the edge of a woods: two vertical, two tilted 20 degrees, and two tilted 40 degrees. During the next four months, there were 53 bird strikes, 31 on the vertical windows, 14 on the 20-degree windows, and 8 on the 40-degree windows. If the tilt has no effect, we expect strikes on windows with all three tilts to have equal probability. Test this null hypothesis. What do you conclude? (Use the chi-square goodness-of-fit test.)

6. Births are not evenly distributed across the days of the week. Fewer babies are born on Saturday and Sunday than on other days, probably because doctors find weekend births inconvenient. A random sample of 140 births from local records shows this distribution across the days of the week:

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Births	13	23	24	20	27	18	15

(a) The null hypothesis is that all days are equally probable. What are the probabilities specified by this null hypothesis? What are the expected counts for each day in 140 births?

(b) Calculate the chi-square statistic for goodness of fit.

(c) What are the degrees of freedom for this statistic? Do these 140 births give significant evidence that births are not equally probable on all days of the week?

7. Some people think that the attitude of cancer patients can influence the progress of their disease. We can't experiment with humans, but here is a rat experiment on this theme. Inject 60 rats with tumor cells and then divide them at random into two groups of 30. All the rats receive electric shocks, but rats in Group 1 can end the shock by pressing a lever. (Rats learn this sort of thing quickly.) The rats in Group 2 cannot control the shocks, which presumably makes them feel helpless and unhappy. We suspect that the rats in Group 1 will develop fewer tumors. The results: 11 of the Group 1 rats and 22 of the Group 2 rats developed tumors.

(a) Make a two-way table of tumors by group. State the null and alternative hypotheses for this investigation.

(b) Although we have a two-way table, the chi-square test can't test a one-sided alternative. Carry out the z test and report your conclusion.