ap stat HW#4 p.314 # 18, 23, 29, 30, 37, 43
p. 323 # 34, 36, 38

1–20. What's the design? Read each brief report of statistical research, and identify:

a) whether it was an observational study or an experiment.

If it was an observational study, identify (if possible)

b) whether it was retrospective or prospective.
c) the subjects studied, and how they were selected.
d) the parameter of interest.
e) the nature and scope of the conclusion the study can reach.

If it was an experiment, identify (if possible)

b) the subjects studied.
c) the factor(s) in the experiment, and the number of levels for each.
d) the number of treatments.
e) the response variable measured.
f) the design (completely randomized, blocked, or matched).
g) whether it was blind (or double-blind).
h) the nature and scope of the conclusion the experiment can reach.

18. Weight is an issue for both humans and their pets. A dog food company wants to compare a new lower-calorie food with their standard dog food to see if it's effective in helping inactive dogs maintain a healthy weight. They have found several dog owners willing to participate in the trial. The dogs have been classified as small, medium, or large breeds, and the company will supply some owners of each size of dog with one of the two foods. The owners have agreed not to feed their dogs anything else for a period of 6 months, after which the dogs' weights will be checked.

23. Shoes. A running shoe manufacturer wants to test the speed of its new sprinting shoe on the 100-meter dash times. The company sponsors 5 athletes who are running the 100-meter dash in the 2004 Summer Olympic games. To test the shoe, they have all 5 runners run the 100-meter dash with a competitor's shoe and then again with their new shoe. They use the difference in times as the response variable.

a) Suggest some improvements to the design.
b) Why might the shoe manufacturer not be able to generalize the results they find to all runners?

29. Frumpies. The makers of Frumpies, "the breakfast of rug rats," want to improve their marketing, so they consult you:

a) They first want to know what fraction of children, ages 10 to 13, like their celery-flavored cereal. What kind of study should they perform?
b) They are thinking of introducing a new flavor, maple-marshmallow Frumpies, and want to know whether children will prefer the new flavor to the old one. Design a completely randomized experiment to investigate this question.
c) They suspect that children who regularly watch the Saturday morning cartoon show starring Frump, the flying teenage warrior rabbit who eats Frumpies in every episode, may respond differently to the new flavor. How would you take that into account in your design?

30. Full moon. It's a common belief that people behave strangely when there's a full moon, and that as a result police and emergency rooms are busier than usual. Design a way you could find out if there is any merit to this belief. Will you use an observational study or an experiment? Why?

37. Weekend deaths. A study published in the *New England Journal of Medicine* (Aug. 2001) suggests that it's dangerous to enter a hospital on a weekend. During a 10-year period, researchers tracked over 4 million emergency admissions to hospitals in Ontario, Canada. Their findings revealed that patients admitted on weekends had a much higher risk of death than those who went to the emergency room on weekdays.

a) The researchers said the difference in death rates was "statistically significant." Explain in this context what that means.
b) What kind of study was this? Explain.
c) If you think you're quite ill on a Saturday, should you wait until Monday to seek medical help? Explain.
d) Suggest some possible explanations for this troubling finding.

43. Skydiving, anyone? A humor piece published in the *British Medical Journal* notes ("Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomized control trials," Gordon, Smith, and Pell, *BMJ*, 2003:327) that we can't tell for sure whether parachutes are safe and effective because there has never been a properly randomized, double-blind, placebo-controlled study of parachute effectiveness in sky diving. (Yes, this is the sort of thing statisticians find funny . . . .) Suppose you were designing such a study:

a) What is the factor in this experiment?
b) What experimental units would you propose?[6]
c) Explain what would serve as a placebo for this study.
d) What would the treatments be?
e) What would be the response variable for such a study?
f) What sources of variability would you control?
g) How would you randomize this "experiment"?
h) How would you make the experiment double-blind?

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34. Pubs. In England, a Leeds University researcher said that the local watering hole's welcoming atmosphere helps men get rid of the stresses of modern life and is vital for their psychological well-being. Author of the report, Dr. Colin Gill, said rather than complain, women should encourage men to "pop out for a swift half." "Pub-time allows men to bond with friends and colleagues," he said. "Men need break-out time as much as women and are mentally healthier for it." Gill added that men might feel unfulfilled or empty if they had not been to the pub for a week. The report, commissioned by alcohol-free beer brand Kaliber, surveyed 900 men on their reasons for going to the pub. More than 40% said they went for the conversation, with relaxation and a friendly atmosphere being the other most common reasons. Only 1 in 10 listed alcohol as the overriding reason.

Let's examine this news story from a statistical perspective.

a) ~~What are the W's: *Who, What, When, Where, Why?*~~

b) What population does the researcher think the study applies to?

c) What is the most important thing about the selection process that the article does *not* tell us?

d) How do *you* think the 900 respondents were selected? (Name a method of drawing a sample that is likely to have been used.)

e) Do you think the report that only 10% of respondents listed alcohol as an important reason for going to the pub might be a biased result? Why?

36. Bias? Political analyst Michael Barone has written that "conservatives are more likely than others to refuse to respond to polls, particularly those polls taken by media outlets that conservatives consider biased" (*The Weekly Standard*, March 10, 1997). The Pew Research Foundation tested this assertion by asking the same questions in a national survey run by standard methods and in a more rigorous survey that was a true SRS with careful follow-up to encourage participation. The response rate in the "standard survey" was 42%. The response rate in the "rigorous survey" was 71%.

a) What kind of bias does Barone claim may exist in polls?

b) What is the population for these surveys?

c) On the question of political position, the Pew researchers report the following table:

	Standard Survey	Rigorous Survey
Conservative	37%	35%
Moderate	40%	41%
Liberal	19%	20%

What makes you think these results are incomplete?

d) The Pew researchers report that differences between opinions expressed on the two surveys were not statistically significant. Explain what "statistically significant" means in this context.

38. Bats. It's generally believed that baseball players can hit the ball farther with aluminum bats than with the traditional wooden ones. Is that true? And, if so, how much farther? Players on your local high school baseball team have agreed to help you find out. Design an appropriate experiment.

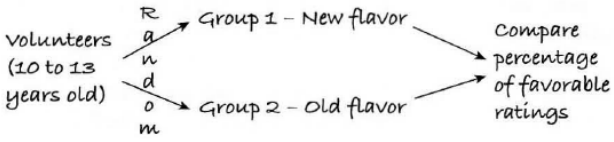
SOLUTIONS TO THE ODD #s
(from the back of the book)

23. a) First, they are using athletes who have a vested interest in the success of the shoe by virtue of their sponsorship. They should choose other athletes. Second, they should randomize the order of the runs, not run all the races with their shoes second. They should blind the athletes by disguising the shoes if possible, so they don't know which is which. The timers shouldn't know which athletes are running with which shoes, either. Finally, they should replicate several times since times will vary under both shoe conditions.

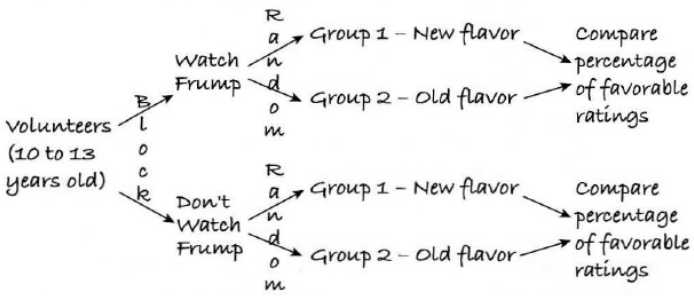
b) Because of the problems in (a), the results they obtain may be biased in favor of their shoes. In addition, the results obtained for Olympic athletes may not be the same as for the general runner.

29. a) Observational. Randomly select a group of children, ages 10 to 13, have them taste the cereal, and ask if they like the cereal.

b) Answers may vary. Get volunteers ages 10 to 13. Each volunteer will taste both cereals, randomizing the order in which they taste them. Compare the percentage of favorable ratings for each cereal.



c) Answers may vary. From the volunteers, identify the children who watch Frump and identify the children who do not watch Frump. Use a blocked design to reduce variation in cereal preference that may be associated with watching the Frump cartoon.



37. a) They mean that the difference is higher than they would expect from normal sampling variability.

b) An observational study.

c) No. Perhaps the differences are attributable to some confounding variable (like people are more likely to engage in riskier behaviors on the weekend) rather than the day of admission.

d) Perhaps people have more serious accidents and traumas on weekends and are thus more likely to die as a result.

43. a) Jumping with or without a parachute.

b) Volunteer skydivers (the dim-witted ones).

c) A parachute that looks real but doesn't work.

d) A good parachute and a placebo parachute.

e) Whether parachutist survives the jump (or extent of injuries).

f) All should jump from the same altitude in similar weather conditions and land on similar surfaces.

g) Randomly assign people the parachutes.

h) The skydivers (and the people involved in distributing the parachute packs) shouldn't know who got a working chute. And the people evaluating the subjects after the jumps should not be told who had a real parachute either!