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1. **Coin toss.** Is a coin flip random? Why or why not, in your opinion?
2. **Casino.** A casino claims that its electronic "video roulette" machine is truly random. What should that claim mean?
3. **The lottery.** Many states run lotteries, giving away millions of dollars if you match a certain set of winning numbers. How are those numbers determined? Do you think this method guarantees randomness? Explain.
4. **Games.** Many kinds of games people play rely on randomness. Cite three different methods commonly used in the attempt to achieve this randomness, and discuss the effectiveness of each.

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1-10. *What did they do?* For the following reports about statistical studies, identify the following items (if possible). If you can't tell, then say so—this often happens when we read about a survey.

- a) The population
 - b) The population parameter of interest
 - c) The sampling frame
 - d) The sample
 - e) The sampling method, including whether or not randomization was employed
 - f) Any potential sources of bias you can detect and any problems you see in generalizing to the population of interest
5. Researchers waited outside a bar they had randomly selected from a list of such establishments. They stopped every 10th person who came out of the bar and asked whether he or she thought drinking and driving was a serious problem.
 7. The Environmental Protection Agency took soil samples at 16 locations near a former industrial waste dump and checked each for evidence of toxic chemicals. They found no elevated levels of any harmful substances.
11. **Parent opinion, part 1.** In a large city school system with 20 elementary schools, the school board is considering the adoption of a new policy that would require elementary students to pass a test in order to be promoted to the next grade. The PTA wants to find out whether parents agree with this plan. Listed below are some of the ideas proposed for gathering data. For each, indicate what kind of sampling strategy is involved and what (if any) biases might result.
 - a) Put a big ad in the newspaper asking people to log their opinions on the PTA Web site.
 - b) Randomly select one of the elementary schools and contact every parent by phone.
 - c) Send a survey home with every student, and ask parents to fill it out and return it the next day.
 - d) Randomly select 20 parents from each elementary school. Send them a survey, and follow up with a phone call if they do not return the survey within a week.

14. **Fish.** The U.S. Fish and Wildlife Service plans to study the kinds of fish being taken out of Saginaw Bay. To do that, they decide to randomly select 5 fishing boats at the end of a randomly chosen fishing day and to count the numbers and types of all the fish on those boats.
 - a) What kind of design have they used?
 - b) What could go wrong with the design that they have proposed?

15. **Roller coasters.** An amusement park has opened a new roller coaster. It is so popular that people are waiting for up to 3 hours for a 2-minute ride. Concerned about how patrons (who paid a large amount to enter the park and ride on the rides) feel about this, they survey every 10th person on the line for the roller coaster, starting from a randomly selected individual.
 - a) What kind of sample is this?
 - b) Is it likely to be representative?
 - c) What is the sampling frame?

16. **Playground.** Some people have been complaining that the children's playground at a municipal park is too small and is in need of repair. Managers of the park decide to survey city residents to see if they believe the playground should be rebuilt. They hand out questionnaires to parents who bring children to the park. Describe possible biases in this sample.

21. **Survey questions.** Examine each of the following questions for possible bias. If you think the question is biased, indicate how and propose a better question.
 - a) Should companies that pollute the environment be compelled to pay the costs of cleanup?
 - b) Given that 18-year-olds are old enough to vote and to serve in the military, is it fair to set the drinking age at 21?

22. **More survey questions.** Examine each of the following questions for possible bias. If you think the question is biased, indicate how and propose a better question.
 - a) Do you think high-school students should be required to wear uniforms?
 - b) Given humanity's great tradition of exploration, do you favor continued funding for space flights?

27. **Accounting.** Between quarterly audits, a company likes to check on its accounting procedures to address any problems before they become serious. The accounting staff processes payments on about 120 orders each day. The next day, the supervisor rechecks 10 of the transactions to be sure they were processed properly.
 - a) Propose a sampling strategy for the supervisor.
 - b) How would you modify that strategy if the company makes both wholesale and retail sales, requiring different bookkeeping procedures?