

HW 9.23

For Problems 1 through 5, identify (i) the subjects, (ii) the treatments, and (iii) the response variable for each experiment.

1. A botanist was interested in determining the effects of watering (three days a week or daily) on the heat rating of jalapeño peppers. The botanist wanted to know which watering schedule would produce the highest heat rating in the peppers. He conducted an experiment, randomly assigning each watering schedule to half of 12 plots that had similar soil and full sun. The average final heat rating for the peppers grown in each plot was recorded at the end of the growing season.
2. A manufacturer advertises that its new plastic cake pan bakes cakes more evenly. A consumer group wants to carry out an experiment to see if the plastic cake pans do bake more evenly than standard metal cake pans. Twenty cake mixes (same brand and type) are randomly assigned to either the plastic pan or the metal pan. All of the cakes are baked in the same oven. The rating scale was then used to rate the evenness of each cake.
3. The city council of a large city is considering a new law that prohibits talking on a cell phone while driving. A consumer rights organization wants to know if talking on a cell phone while driving distracts a person's attention, causing that person to make errors while driving. An experiment is designed that uses a driving simulator to compare the two treatments: driving while talking on a cell phone and driving while not talking on a cell phone. The number of errors made while driving on an obstacle course will be recorded for each driver. Each person in a random sample of 200 licensed drivers in the city was asked to participate in the experiment. All of the drivers agreed to participate in the experiment. Half of the drivers were randomly assigned to drive an obstacle course while talking on a phone. The remaining half were assigned to drive the obstacle course while not talking on a phone.
4. Researchers studied 208 infants whose brains were temporarily deprived of oxygen as a result of complications at birth (*The New England Journal of Medicine*, October 13, 2005). An experiment was performed to determine if reducing body temperature for three days after birth improved their chances of surviving without brain damage. Infants were randomly assigned to usual care or whole-body cooling. The amount of brain damage was measured for each infant.
5. The head of the quality control department at a printing company would like to carry out an experiment to determine which of three different glues results in the greatest binding strength. Copies of a book were randomly assigned to one of the three different glues.

6. In Problem 3, suppose that drivers who talked on the phone while driving committed more errors on the obstacle course than drivers who did not talk on the phone while driving. Can we say that talking on the cell phone while driving is the cause of the increased errors on the obstacle course? Why or why not?

7. Can the results of the experiment in Problem 3 be generalized to all licensed drivers in the city? Why or why not?

8. In Problem 4, one of the treatment groups was to use usual care for the infants. Why was this treatment group included in the experiment?

9. In Problem 5, why were copies of only one book used in the experiment?

10. In the absence of special preparation, SAT math scores in recent years have varied normally with a mean of 518 and a standard deviation of 114. One hundred students in Los Angeles County sign up for a rigorous training program designed to raise their SAT math scores. Their average SAT math score after this training was 533.7.
 - a) Is this an example of an experiment or an observational study? How do you know?

 - b) If the results are statistically significant, can we conclude that the training leads to higher SAT math scores? Why or why not?

 - c) Can we generalize these findings to all Los Angeles County students? Why or why not?

Answers

- 1) i) 12 Plots of peppers ii) Watering 3 times per week, watering daily iii) Heat rating
- 2) i) 20 Cake mixes ii) Plastic pan, metal pan iii) Evenness rating
- 3) i) 200 randomly selected drivers ii) Driving while talking on cell phone, driving while not talking on cell phone
iii) Number of errors made on obstacle course
- 4) i) 208 infants born with oxygen deprivation ii) Whole body cooling, usual care iii) Amount of brain damage
- 5) i) Copies of a book ii) Three different glues iii) Binding strength
- 6) Yes. This was an experiment with random assignment of treatments.
- 7) Yes. The subjects were randomly selected from licensed drivers in the city.
- 8) The "usual care" group is used as a comparison for the "cooling" group.
- 9) This keeps other factors, like number of pages, from interfering in the results of the experiment.
- 10) a) It's an observational study because students were not assigned to the course.
b) No because people were not assigned a treatment at random. They chose to take the course or not.
c) No because the subjects were not chosen at random. They signed up for the course.

