Lesson 4.2.4

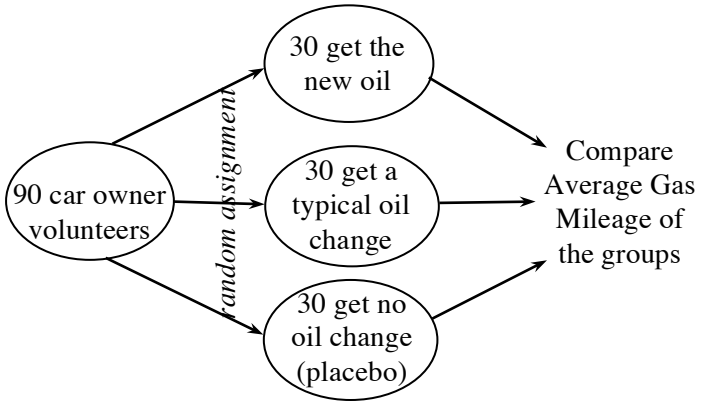
4-82. a. Expect $\frac{1}{3}$ or 33.3% of students to randomly choose the correct cup.

b. The distribution should be skew right with a center around 33% of the number of students in your class.

c. Students may feel that the class is a representative sample from the population of all students. Without random selection of subjects, there is no statistical support for generalizing to the wider population. The information students have simply describes the sample.

4-83. a. The problem is that by purchasing the new oil, car owners have chosen for themselves what test group they are in and this brings in all of the confounding variable problems that come with observational studies. Perhaps the kind of person who would choose a new type of oil would also be the kind to choose a new type of car, like a hybrid, or maybe they are more inclined to take better care of their cars or buy better gasoline.

b.



4-84. Answers will vary. Many car owners *(replication)*. Random assignment to treatments *(randomization)*. Control groups such as a placebo or typical oil change and blocking on variables like age of car *(control)*.

4-85. a. A census of all people would be impossible. Taking a sample is most appropriate.

b. Explanatory variable: whether or not a person counts sheep; response variable: how many minutes it takes a person to fall asleep.

c. Examples: How much a person had to eat before going to bed. How much caffeine was consumed before bed. The time a person goes to bed. The amount of light in the room. The amount of noise in the room. The temperature in the room.

d. Subjects will be asked to spend the night in a sleep clinic. The temperature will be the same in all the rooms and the amount of light and noise in the rooms will be kept to a minimum. Subjects will be randomly assigned to one of two treatments. One group will be instructed to count sheep and the second group will be instructed to follow their normal bedtime routine. All subjects will be hooked up to a sleep monitor and the time it takes them to fall asleep will be recorded. The average time it takes to fall asleep for each treatment will be compared.

4-86. Obtain a list of health club members and number them from 1 to 2735. Use a random number generator to select 50 unique numbers, ignore repeats. The 50 people who correspond to the numbers selected will be included in the sample.

4-87. A relative frequency table is below. There is almost no difference between the amount of cheese at Taco Shack and at the competitor. Any difference can easily be explained by natural sample-to-sample variability. No association. The Taco Shack owner does not need to adjust the amount of cheese, and should consider other reasons for the difference in perception.

	Taco Shack	Competitor
< 15 grams cheese	11%	10%
between 15 and 25 g cheese	60%	61%
> 25 grams cheese	30%	29%

4-88. a. Using a linear model, the expected length of an alligator increases by half a cm for every extra kilogram of mass. The expected length of a 0 kg alligator is 125 cm, which is nonsensical and evidence that a linear model does not work for values near 0.

b. The alligator has a mass of 435 kg.

4-89. a. 25%

b. 50%

c. No, because the individual data points are not given. However he can still estimate it to be higher than 5, since the distribution is skewed to the right.

d. A typical student watches about 5 hours of television per week. The distribution of television hours watched is right skewed with a range of 21 hours/week. About half of the students watch between 3 and 10 hours of television per week.

