Chapter 9 – Producing Data: Experiments

9.1 (a) The explanatory variable is the amount of alcohol drunk. The response is heart disease (unclear how this was measured). **(b)** Weight, sleep, exercise, etc., would be considered to be lurking variables, as they are not either the primary explanatory or response variables. (Some of these would be considered to be confounding because, for example, good exercise habits should promote heart health.) **(c)** Without an experiment, no causal relationship can be made.

9.5 Subjects: the students. Factors: type of attack and prime used. Treatments: for the prime: *love thy neighbor* prime or *eye-for-an-eye* prime; for the type of attack: on military target or on cultural/educational target. Response variable: rating of U.S. reaction to attack.

		Prime used	
		Love-thy-neighbor	Eye-for-an-eye
Target	Military	1	2
	Cultural	3	4

9.6 (a) Factors: harvest time and storage temperature. Treatments: for harvest time: 80, 95, and 110 days after fruit setting; for storage temperature: 20, 30, and 40 degrees centigrade. The treatment combinations are shown below. Response variable: time to ripening.

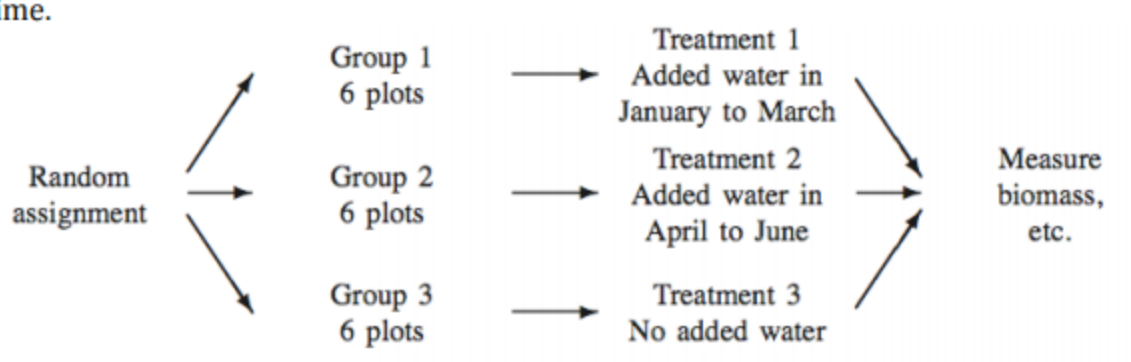
	Storage temperature (°C)		
Days after fruit set	20	30	40
80	1	2	3
95	4	5	6
110	7	8	9

(b) This would probably not be a good way to assign mangoes; if a tree were

diseased, for example, its fruit would most likely not withstand any treatment and would indicate that the treatment was not good, regardless of the treatment's effect.

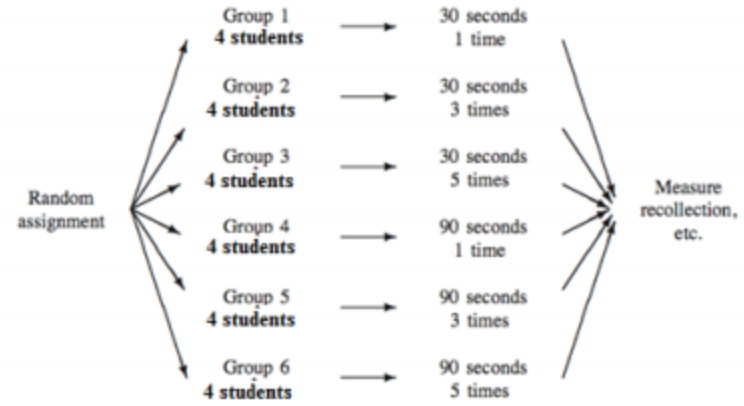
9.7 Making a comparison between the treatment group and the percent finding work *last year* is not helpful. Over a year, many things can change: the state of the economy, hiring costs (due to an increasing minimum wage or the cost of employee benefits), etc. (In order to draw conclusions, we would need to make the $500 bonus offer to some people and not to others during the same time period, and compare the two groups.)

9.9 (a) Diagram below. **(b)** If using Table B, label 01 to 36 and take two digits at a time.



9.10 Assign 24/6 = 4 students to each treatment. The diagram is shown on the next page. We assign labels 01 through 24, then use the first four two-digit numbers in this range for Group 1, the next four for Group 2, etc. The assignments are given below (presuming that you numbered down each column and then left to right in the list of names). Note that with this many assignments, you will run through many lines of Table B. Once you've filled out members for five groups, the sixth group contains all the remaining, unassigned subjects.

Group 1: 10 Santner, 07 Brower, 11 Delp, 20 Shi
Group 2: 15 Lahr, 13 Cressie, 12 Disbro, 08 Knab
Group 3: 14 Kessis, 09 Cohen, 24 Walsh, 16 Kruger
Group 4: 22 Tory, 17 Linder, 04 Baker, 19 Carson
Group 5: 18 Minor, 23 Verducci, 02 Anthony, 21 Stanley
Group 6: 01 Abramson, 03 Pearl, 05 Weingold, 06 Blake

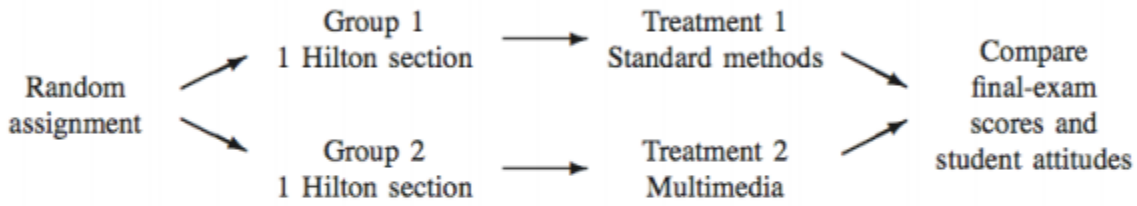


9.11 In a controlled scientific study, the effects of factors other than the nonphysical treatment (e.g., the placebo effect, differences in the prior health of the subjects) can be eliminated or accounted for, so that the differences in improvement observed between the subjects can be attributed to the differences in treatments.

9.13 (a) The researchers simply observed the diets of subjects; they did not alter them. (That is, no treatments were assigned.) **(b)** Such language is reasonable because with observational studies, no "cause-and-effect" conclusion would be reasonable.

9.15 In this case, "lack of blindness" means that the experimenter knows which subjects were taught to meditate. He or she may have some expectation about whether or not meditation will lower anxiety; this could unconsciously influence the end-of-month assessment.

9.18 For each block (pair of lecture sections), randomly assign one section to be taught using standard methods and the other to be taught with multimedia. Then (at the end of the term) compare final-exam scores and student attitudes. The diagram below is *part* of the whole block diagram; there would also be three other pieces like this (one for each of the other instructors). The randomization will vary with the starting line in Table B—or the randomization can be done by flipping a coin for each block.



9.19 (a) Life satisfaction is observed; no treatments were imposed.

9.20 (c) Parents tend to have higher satisfaction in their lives than nonparents. Because this was a survey, we cannot make conclusions about cause and effect, which is implied by both of the other options.

9.21 (b) All participating students had the same treatment.

9.22 (c)

9.23 (b)

9.24 (b) Both of the other two options would introduce lurking variables and *increase* confounding.

9.25 (a) The researchers did not randomly assign where the people lived, so no treatments were actively imposed.

9.26 (b) The communities are paired up, then one is randomly chosen to have the advertising campaign.

9.27 (a) The choice should be made randomly.

9.28 (b) This was a (matched pairs) experiment, but in order to give useful information, the subjects should be chosen from those who might be expected to buy this car.

9.29 (a) This is an observational study; the subjects chose their own "treatments" (how much red meat to eat). The explanatory variable is red meat consumption, and the response variable is whether or not a subject dies. (There may have been other variables, but these were the only ones mentioned in the problem.) **(b)** Many answers are possible. For example, smoking is known to increase the risk of cancer. These variables are called lurking variables. **(c)** Many answers are possible. For example, how many servings of fruits and vegetables were consumed along with the red meat?

9.31 This is an experiment, because the treatment is selected (randomly, we assume) by the interviewer. The explanatory variable (treatment) is the level of identification, and the response variable is whether or not the interview is completed.