1. High cholesterol level in people can be reduced by exercise or drug treatment. A pharmaceutical company has developed a new cholesterol-reducing drug. Researchers would like to compare its effects to the effects of the cholesterol-reducing drug that is currently available on the market. Volunteers who have a history of high cholesterol and who are currently not on medication will be recruited to participate in the study.

a. Explain how you would carry out a completely randomized experiment for the study. Include a diagram and a couple of sentences.

Volunteers will be listed alphabetically, then assigned a number from 1 to n. Where n is the number of volunteers. Using a random number generator, randomly select half of the numbers (without replacement). The volunteers corresponding to those numbers will be in the treatment group with the new medication. All remaining volunteers will be in the control group with the currently available medication. Measure everyone's cholesterol, apply the treatment for several months, then measure again and compare values. Compare results.

b. Describe an experimental design that would improve the design in (a) by incorporating blocking. Explain why you blocked by the variable you selected. Include a diagram and a couple of sentences.

An improvement would be to block by levels of high cholesterol. Very high, moderately high, barely high. (Or block by activity level... need to centralize.)

{block block}

High current < High current > Compare results
Moderate current < Moderate current > Compare results
Barely high < treatment > compare results

Compared results

Because the variable for blocking is gender

Yes. Everyone in each block is randomly assigned a treatment. Volunteers do not know which medication they are receiving, and administrators do not know which medication they are giving.
2. Students are designing an experiment to compare the productivity of 2 varieties of dwarf fruit trees. The site for the experiment is a field that is bordered by a densely forested area on the west (left) side. The field has been divided into 8 plots of approximately the same area. The students have decided that the test plots should be blocked. Four trees, two of each of the 2 varieties, will be assigned at random to the four plots within each block, with one tree planted in each plot. The two blocking schemes shown below are under consideration. For each scheme, the white region indicates one block and the gray region in the figure indicates the other block.

![Diagram of blocking schemes A and B]

a. Which of the blocking schemes, A or B, is better for this experiment? Explain your answer.

Because we expect the forest to have an effect on the growth of the trees in the fields nearby, so with the varieties should be by the forest & both away from the forest.

b. Even though the students have decided to block, they must randomly assign the varieties of trees to the plots within each block. What is the purpose of this randomization in the context of this problem?

By randomly assigning trees to plots, we are likely to get similar conditions for all the uncontrolled variables in the study (such as soil type, etc.) for both types of trees.
3. Because of concerns about employee stress, a large company is conducting a study to compare two programs (tai chi and yoga) that may help employees reduce their stress levels. Tai chi is a 1200 year-old practice, originating in China, which consists of slow, fluid movements. Yoga is a practice, originating in India, which consists of breathing exercises and movements designed to stretch and relax the muscles. The company has assembled a group of volunteer employees to participate in the study during the first half of their lunch hour each day for a 10-week period. Each volunteer will be assigned at random to one of the two programs. Volunteers will have their stress levels measured just before beginning the program and 10 weeks later at the completion of it.

a. A group of volunteers who work together ask to be assigned to the same program so that they can participate in that program together. (1) Give an example of a problem that might arise if this is permitted. (2) Explain to this volunteer group why random assignment to the two programs will address this problem.

b. Someone proposes that a control group be included in the design as well. The stress level would be measured for each volunteer assigned to the control group at the start of the study and again 10 weeks later. What additional information would this provide about the effectiveness of the two programs?

in addition to comparing effectiveness to each other, it provides a measure of effectiveness overall. If people had less stress in the control group, then there is little evidence that the treatments helped.

c. Is it reasonable to generalize the findings of this study to all employees of this company? No. Explain.

By using volunteers, there may be some characteristic that, say, makes them more likely to respond to the treatment, or just respond in some way differently than those who do not volunteer.