Directions: For each experiment, you are to create an outline that describes your process in performing the experiment. All of them will be done with a completely randomized design and then a blocking design and perhaps a matched pairs design. Do not confuse blocking with stratification. Stratification has to do with choosing your sample. Blocking occurs only in an experiment and then, once you have your sample.

1. You believe that self-checkouts in supermarkets are faster. Outline an experiment that uses randomized allocation. It is further thought that the gender of the customer might make a difference. Outline an experiment that does the same thing but blocks for gender. Finally, design a matched pairs experiment that blocks for the size of the order.

   RA: Have each customer flip a coin. Heads → use the self checkout. Tails → use the regular checkout. Repeat for all subjects.

2. A study is to be conducted with three diets: NomoreFat, ByeFat, and Fatbegone. The experiment will subject individuals for a period of 3 months and at the end of the period, their weight loss will be recorded. 120 people are available and they are classified into 3 groups:

   E: Excessively overweight (40 people)
   M: Moderately overweight (40 people)
   S: Slightly overweight (40 people)

Outline an experiment that uses randomized allocation. Then make an outline that uses people's initial weight as a block.

   RA: Block E → Put all 40 names in a hat. Draw a name and roll a die. Place the subject in the Nomore Fat group if the die lands on a 1 or 2. Place the subject in the Fatbegone group if the die lands on 3 or 4. Place the subject in the ByeFat group if the die lands on 5 or 6. Repeat this process for Blocks M and S.
3. In 1993, researchers proclaimed that listening to Mozart could make you smarter. Dubbed the “Mozart Effect,” this conclusion was based on a study that showed college students temporarily gained up to 9 IQ points after listening to a Mozart piano sonata. The experiment consisted of putting students in a room where there was light reading available with a Mozart sonata being piped in. Suppose you wanted to see whether there is a Mozart effect for students at Wissahickon. You plan to use 40 students in your sample.

RA: Put all subjects’ names in a hat. Draw 20 without replacement. Those 20 selected first will listen to Mozart. The rest will have no music.

4. It is believed by many people that the Macintosh Operating System (OS 10) is superior to that of Windows because it is much more intuitive. Experimenters decide to test this conjecture. They take a sample of 72 computer users, each claiming to have experience with both operating systems. They give them a series of tasks to do on each computer platform and record the amount of time it takes to complete the tasks in total. Design a completely randomized experiment that would test the theory. Then design an experiment where the experimenters block for the user’s level of computer expertise (a little, medium, expert). Finally, outline a matched pairs design where each subject acts as his/her own control.

RA: Put 72 names in a hat. Draw 36 names without replacement. Those 36 will use Mac and the rest will use Windows.

RA: Have each of the “little” experience users flip a coin. Heads they use Mac. Tails they use Windows. Repeat for the “medium” experience users and for the “expert” experience users.

RA: Flip a coin to see if the person uses the Mac 1st (Heads) or Windows 1st (Tails).
5. When students take math exams, the problems are usually in order of difficulty with easier problems first and more difficult problems towards the end. Does order of difficulty make a difference? 96 algebra 2 students taught by the same teacher are part of an experiment. Design a randomized experiment where students take exams whose problem difficulty ranges from easy to hard, hard to easy, and completely randomized. Then design the same experiment blocked by the student’s current grade going into the exam (A-B, C-D, or failing).

RA: Put the names of the 96 students in a hat. The 1st 32 selected without replacement will be placed in the Easy to Hard Group. The next 32 selected without replacement will be placed in the Hard to Easy Group. The last 32 selected will be placed in the Random Group.

6. Researchers have found that when people are offered either white or dark chocolate, they will generally prefer dark. However, they believe that people actually prefer the taste of white chocolate to dark chocolate (assuming they are of the same quality). Design an experiment that uses randomized allocation from a sample of 80 people. Then design a matched pairs experiment where everyone is his or her own control. Finally, design a similar matched pairs experiment if the quality of the chocolate is inexpensive and expensive and we are blocking for quality.

RA: Put all the “AB” student names in a hat. The 1st 1/3 selected will be placed in the E to H group. The 2nd 1/3 will be placed in the H to E group. The rest will be placed in the Random Group. Repeat the same process for the "CD" students and the "F" students.