Math 2311

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And by appointment

Class webpage: http://www.math.uh.edu/~bekki/Math2311.html

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1. A teacher wants to select students to interview about the school policies. She places all of the names in a hat and draws out 20 names at random. This is an example of a:

a. Stratified random sample
b. Simple random sample
c. Biased sample
d. Convenience sample

2. In __ sample design samples are taken from various subsets of the population until a manageable number of samples to interview are arrived upon.

a. Voluntary
b. Randomized
c. Multistage
d. Simple

6.2 – Designing Experiments

Experimental units are the individuals on which the experiment is done. When the units are people, they are called **subjects**.

A **treatment** is the specific experimental condition applied to the units.

Factors are the explanatory variables in an experiment. Note that factors may have several **levels**.

A **placebo** is a dummy treatment that can have no physical effect. When subjects respond to a placebo treatment, we call this the **placebo effect**.

The fundamental principle of experimental design is **control**.

There are three fundamental principles of control:

1. **comparison**
2. **randomization**
3. **blindness** (blind or double-blind)

We need a **control group** to manage the effects of **lurking variables**.

Matching is a technique where experimenters try to match treatment groups in a systematic way.

Completely randomized experiments use units allocated at random among all the treatments.

A **block** is a group of experimental units that are similar in ways that are expected to affect the response of the treatments

Matched pairs design is a form of block design with just two treatments.

An observed effect is **statistically significant** if it is too large to attribute plausibly to chance.

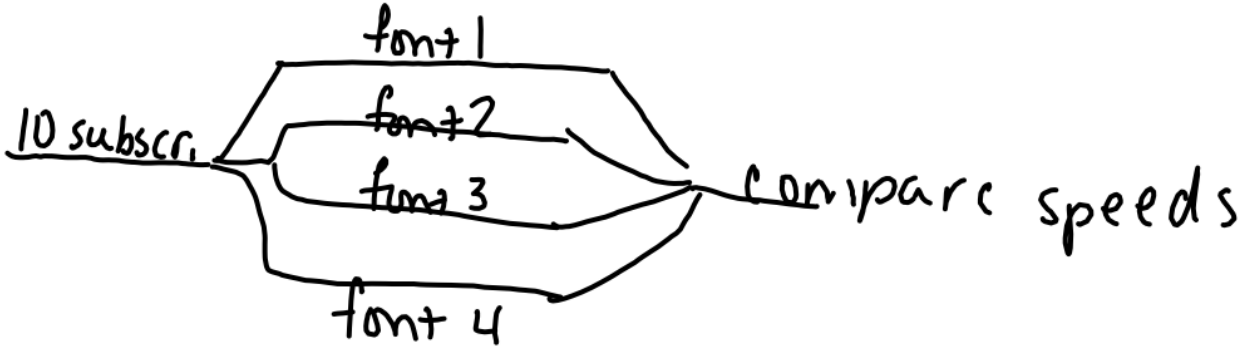
We must always watch for **hidden bias**, **confounding variables**, and be careful with **lack of realism.**

Examples:

1. The editor of a magazine is wondering if the type of font used in the articles affects the reading speed of the subscribers of the magazine. He asks 10 subscribers to read 4 articles each with different fonts. If the reading speed increases with a particular font, he will use it in the next publication.

   a. Is this an experiment or an observational study?
   b. If it is an experiment, is it randomized or block design?
   c. If it is an experiment, identify the explanatory and response variables.
   d. If this is an experiment, draw a diagram representing the levels and treatments.

expl. – font
resp – reading speed.



4. Researches investigated the effect of listening to music by Mozart before taking an IQ test. Subjects were randomly assigned to one of three groups and would either listen to Mozart music, be told to relax, or be given no instructions. The sample mean IQ in the Mozart group was 119, in the relax group was 111, and in the silent group was 110.

a. Is this an experiment or an observational study?

b. If it is an experiment, is it randomized or block design?

c. If it is an experiment, identify the explanatory and response variables.

d. If this is an experiment, draw a diagram representing the levels and treatments.

2. Many colleges and universities have developed "calculus reform" courses which substantially alter the way that calculus is taught. The goal is that the reform courses help students to understanc fundamental calculus concepts better than traditionally taught courses do.

a. If you simply compare scores on a standardized calculus test between students in traditional classes and those in reform classes, would you be able to conclude that any differences you might find are attributable to the teaching style?

b. Describe how you might design an experiment to assess whether the goal is being met.

a. No. Need classes w/ similar students
   - teachers
   - schools

   more info needed

traditional vs. reform

choose current classes

2 classes using reform

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3. ___ is a special form of block design

a. Matched pairs design
b. Completely randomized design
c. Blind design
d. None of these

4. We must always watch for

a. Lurking variables
b. Bias
c. Lack of realism.
d. All of these

6.3 – Simulating Experiments

01-08   09-99, 00

Simulation is the imitation of a chance behavior based on a model that reflects an experiment.

Examples:

00-07 = no show   08-99 = show

1. Mudlark Airlines has a 15-seater commuter turboprop that is used for short flights. Their data suggest that on average about 8% of the customers who buy tickets are no-shows. Wanting to avoid empty seats (they see this as missed opportunity to increase revenue), they decide to sell 17 tickets for each flight. Ticketed customers who cannot be seated on the plane will be accommodated on another flight and will receive a certificate good for a free flight at another time. You have been retained as a consultant to Mudlark. Your job is to determine if this particular overbooking is sound strategy. Use simulation methods to perform your analysis. Explain your solution completely, and write your recommendation to the company on whether this policy is good for the company or whether it should be adjusted.

114	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
115	55526	20038	12219	86208	07484	37662	54756	36799
→ 116	18383	07966	51951	02466	17759	12817	95865	79200
117	88229	14407	53248	94458	93869	03857	38378	69802
118	66837	20695	77142	97242	27779	90886	37570	17219
119	06339	43041	89297	00653	49434	11598	86545	10981

1st flight: S S S N S S S S S S N S S S S S S   15/17 ✓

2nd flight S S S S S S S S S S S S   17/17

2. Joey is interested in investigating streaks when flipping coins. He wants to use simulation methods to determine the longest run of heads, on average, for 20 consecutive coin flips.

a. Describe a correspondence between random digits from a random digit table and outcomes.

b. What will constitute one repetition in this simulation? 20 rand digits chosen

c. Starting with line 101 in the random digit table, carry out ~~10~~ repetitions and record the longest run of heads for each repetition.

d. What is the mean run length for the 10 repetitions?

5 (1) 4 (4) 2
(2) 5 (3) 1
(3) 4

Single digits odds = tails
evens = heads

	THTHH	HHTTA	HTTHH	THHTH	5			
101	98360	26534	47384	94612	88666	14170	10847	05567
102	55556	59863	86607	00094	77213	35711	52851	42108
103	31634	15399	73476	77412	06186	16636	54307	14947
104	13785	11509	54891	98375	68377	50572	08453	80376
105	80376	73842	95465	59746	38078	25727	78502	95324
106	21198	99781	53374	25595	12153	54228	13068	71757

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5. A