

Name(s): _____

DATA 101 Assignment 4: Experiments

Work in teams of 2

Instructions. Answer the following questions about experiments and causal designs. You may use the information from class and the lecture slides. Write your responses clearly in the spaces provided.

1. Suppose Dickinson wants to know whether weekly yoga classes reduce student stress.

(a) Propose a treatment and control group.

(b) Define the outcome variable(s).

(c) Explain how you would implement random assignment in practice.

(d) Identify one possible source of bias and how you would address it.

2. Read the following proposal:

Treatment: Students asked to give up their smartphones for 48 hours.

Control: Students continue normal use.

Outcome: Daily mood logs and GPA.

(a) Would you approve or reject this as an IRB member? Why?

(b) Suggest one modification that could make this study more ethical.

3. Imagine you have 12 students and need to split them into treatment and control groups.

(a) Write down one unfair way of assigning them to treatment that would be biased.

(b) Write down one method that would be considered random and fair.

(c) Explain why randomization is crucial in an experiment.

4. In 2007, Washington state became the first state to pass a law banning all drivers from sending text messages while driving. The law went into effect on January 1, 2008. Oregon did not adopt a texting ban until later, so it can serve as a reasonable control state in this comparison.

The table reports fatal crashes per 100,000 licensed drivers for Washington (treatment) and Oregon (control), before and after the ban:

	Pre (2007)	Post (2009)
Washington (treatment)	11.64	9.79
Oregon (control)	16.09	13.27

(a) Compute the DiD estimate by hand. Show your steps.

- (b) Interpret what the sign and magnitude of the estimate mean in context.

5. Suppose a scholarship awarded if $\text{SAT} \geq 1200$. Below are average college GPA outcomes:

SAT score	Average GPA
1197	2.6
1199	2.6
1201	3.3
1203	3.4

- (a) Plot by hand these four points on graph paper (SAT on x-axis, GPA on y-axis).

- (b) Does there appear to be a jump in GPA at the cutoff?

- (c) In plain words, what does that jump tell us about the effect of getting the scholarship?

6. Suppose Spotify wants to test a new playlist interface.

- (a) Sketch an experimental design (treatment, control, outcome).

- (b) Spotify runs the test for one week and finds the new design “wins.” A month later, usage drops back to normal. What might explain this?
- (c) Spotify changes the design at the same time Beyoncé drops a surprise album. How could that confuse the results?