Homework 2

STAT 4025/5025 – Due Friday, January 28th 11:00 pm

22 points

1. Fine particulate matter is an air pollutant that triggers inflammation and airway constriction in experimental models. A study evaluates the association of fine particulate matter with asthma in children. Researchers recruit 1,300 children, ages 4-8 years old, from pediatric clinics in three large metropolitan areas. Study children are free of asthma and reactive airway disease at the start of the study. Fine particulate matter data is collected from monitors located near each child's residence and new occurrences of asthma are assessed via annual examinations. The researchers categorize the amount of fine particulate matter as low versus high using a cut point of 15 ug/m3. Results are shown below.

	Development of Asthma		
Fine particulate matter level	Yes	No	Incidence rate per 100 person-years
Low (level <15 ug/m3)	200	800	6.1
High (level ≥15 ug/m3)	100	200	12.8

In the class notes, I went over 5 different criteria for establishing causality. Go through each of these criteria and justify why each is met/not met. [10 pts]

2. Refer back to the PPR_2022.csv data file that we discussed in class. Provide the R Code and resulting data frame in a table format which you would use to compare the mean litter depth in native sod vs. low diversity reconstruction sites within high priority areas. [5 pts – 3 for correct code and 2 for data table]

3. Utilize the *trout_hatchery_22.csv* data file for parts *a-c*.

   a. Use the R tidyverse package to construct a data set with three columns and 20 rows that has the structure in the table below – note the table below only shows 6 of the 20 rows for your resulting data set. (3 points – 1 for correct tidyverse code, 1 for correct resulting data set)

Diet	Raceway	Mean Length (6 weeks)
A	1	
A	2	
A	3	
A	4	
A	5	
B	6	

   b. If you want to use hypothesis testing to determine if there is a difference between Diets A and C in terms of average increase in length over a six week period, what would your null and alternative hypotheses be? [2 pts]
   c. Explain in practical terms what each symbol in part b represents [2 pts]