Question 4

Example

We were interested in finding causal relation between listening to classical music and cognitive performance, since as a student we are highly motivated to perform our best.

Causal question:
Does listening to classical music while studying improve cognitive performance on a test?

- Treatment (T): Listening to classical music while studying (binary)
- Outcome (Y): Score on a some cognitive test taken after the study session with or without listening to classical music
- Covariates (X): age, study time, IQ, musical preference

Is there confounding between Y and T

If we perform an observational study instead of RCT there could be people that will chose classical music. The choice will be dependent on their background and personal preferences which will affect both the outcome and treatment. A lot of times people from more prosperous households are exposed to classical music from childhood in addition their education upbringing is usually much better. In this case it's better to include such confounder such as socio-economic status.

In addition Students who choose to listen to classical music may already be more focused, disciplined, or have different study habits.

Prediction problem

Prediction of average grade in math course of a student based on his musical preferences.

In this case we aren't interested in causal relation but in predicting the outcome, there could be some additional confounders or no relation at all which could impact the model's performance.