1. Gina is a soccer play looking to improve her soccer skills. One measure of a player's skills is their "plus/minus" score. The plus/minus score subtracts a point for every goal surrendered while the player is on the field, and adds a point for every goal scored while the player is on the field.

   Suppose, through detailed analysis, Gina notices that, if she performs an aerobic conditioning workout in a given week, she is more likely to have a higher plus/minus score that week. From this, she concludes that the aerobic conditioning workout causes the increase in her plus/minus score.

   In reasoning in this way, Gina is most likely employing which theory of causality?

   - The structural model theory of causality
   - The probabilistic theory of causality
   - The counterfactual theory of causality

2. Gina is a soccer play looking to improve her soccer skills. One measure of a player's skills is their "plus/minus" score. The plus/minus score subtracts a point for every goal surrendered while the player is on the field,, and adds a point for every goal scored while the player is on the field.

   One week, Gina performs an aerobic conditioning workout, and notices that her plus/minus score is higher week. From this, she reasons: if I did not perform this aerobic conditioning workout, I would not have increased my plus/minus score.

   In reasoning in this way, Gina is most likely employing which theory of causality?

   - The probabilistic theory of causality
   - The structural model theory of causality
   - The counterfactual theory of causality

3. Beth and Jessie's Ice Cream Company is attempting to perfect their recipe for vegan chocolate ice cream. One change in the recipe is related to the milk substitute. In some recipes they use oat milk, and in others, almond milk.

   Through extensive focus group analysis, they notice an interesting trend: the use of oat milk increases the odds of a high mean consumer rating at a given focus group by a factor of two. They conclude that the oat milk is the cause of the odds increase.

   In reasoning in this way, Beth and Jessie are most likely employing which theory of causality?

   - The structural model theory of causality
   - The probabilistic theory of causality
   - The counterfactual theory of causality

4. Beth and Jessie's Ice Cream Company is attempting to perfect their recipe for vegan chocolate ice cream. One change in the recipe is related to the milk substitute. In some recipes they use oat milk, and in others, almond milk.

   Beth and Jessie hire several food scientists who explain to them that oat milk is sweeter, and there is a stable (stochastic) positive relationship between sweetness and consumer ratings. Based on this information, Beth and Jessie conclude that oat milk is the cause of the higher consumer rating.

   - The probabilistic theory of causality
   - The structural model theory of causality
   - The counterfactual theory of causality

5. Consider an experiment exploring factors related to the amount of pressure needed to have mountain climbing ropes fail. The experiment studied three factors, each with two levels:

   - Abrasion: whether the rope had an abrasion on it or not
   - Dirt: whether the rope was dirty or clean
   - Soaked: whether the rope was soaked in water or not

   Two replicates were recorded for each combination of factor levels.

   Suppose that each of these factors is negatively *associated* with the response - for example, an abrasion decreases the amount of pressure needed to have the rope fail. However, rope failure is actually largely due to a fourth variable, namely, whether the rope has been "fatigued" (that is, whether a climber has fallen on it before). Which condition for causal reasoning from experimental data is not met?

   - Temporal relationship
   - Nonspiriousness
   - Empirical relationship

6. Consider a study of the effectiveness of an "active learning" teaching method on student learning. In the study, 100 different senior-level high school math classes were randomly chosen from all such classes in the state of Colorado. Each class had $n = 25$ students. Among the 100 classes, 50 were randomly chosen, and teachers were asked to teach a lesson using a new active learning teaching method; in the classes, teachers used the standard "lecture" teaching method. The response in this experiment was an exam, which was administered to each student and measured the extent to which each student learned the content of the lesson.

   Identify the experimental units in this study.

   - The experimental units are the 100 teachers teaching the senior-level high school classes.
   - The experimental units are the 100 senior-level high school classes.
   - None of the above.
   - The experimental units are the 2500 students in the senior-level high school classes.

7. Consider a study of the effectiveness of an "active learning" teaching method on student learning. In the study, 100 different senior-level high school math classes were randomly chosen from all such classes in the state of Colorado. Each class had $n = 25$ students. Among the 100 classes, 50 were randomly chosen, and teachers were asked to teach a lesson using a new active learning teaching method; in the classes, teachers used the standard "lecture" teaching method. The response in this experiment was an exam, which was administered to each student and measured the extent to which each student learned the content of the lesson.

   Identify the sampling units in this study.

   - The sampling units are the 100 teachers teaching the senior-level high school classes.
   - None of the above.
   - The sampling units are the 100 senior-level high school classes.
   - The sampling units are the 2500 students in the senior-level high school classes.