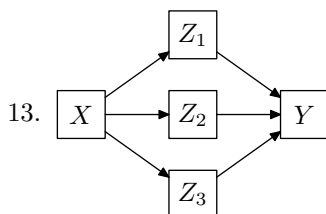


Philosophy 12: Introduction to Causal Reasoning

Causation to Unconditional Association answer key

1. Answer: B This is just a statement about the frequencies with which two different groups get colds. It is a claim that eating garlic is not associated with getting colds (or not getting colds).
2. Answer: A This is a claim that being constantly exposed to media violence will actually cause a person to have aggressive tendencies.
3. Answer: B This is just a claim about the frequency of breaking the law in two different groups. The claim is that growing up with only a mother is associated with breaking the law.
4. Answer: A This is a claim that capital punishment does not cause hardened criminals to commit few crimes.
5. Answer: D Recall the definition of when two variables are independent (from the lecture on Independence), and remember that two variables are associated if they are not independent. Choice C is close, but the claim that TAKING ANTIBIOTICS and 1-DAY RECOVERY are associated does not imply that the frequency of one-day recoveries is *higher* overall than among antibiotic takers. It might well be lower.
6. Answer: A and C Two binary variables X , with values (yes, no), and Y , with values (yes, no), are associated if $\text{Fr}(X)$ is different from $\text{Fr}(X | Y = \text{yes})$.
7. Answer: A and D Remember, there is an edge from X to Y if there are values for the other variables such that changing the value of X sometimes produces a change in Y . So, there is an edge from TAKES ANTIBIOTIC to 1-DAY RECOVERY if there are values for the variable DISEASE such that changing the value of TAKES ANTIBIOTIC produces a change in 1-DAY RECOVERY.
8. Answer: A $\text{Fr}(1\text{-DAY RECOVER})$ is not equal to $\text{Fr}(1\text{-DAY RECOVER} | 1\text{-DAY RECOVER} = \text{Yes})$, so the property 1-DAY RECOVER = Yes is associated with the property TAKES ANTIBIOTICS = yes. Since these two properties are associated, then the variables 1-DAY RECOVER and TAKES ANTIBIOTICS are associated.
9. Answer: B $\text{Fr}(1\text{-DAY RECOVER})$ is equal to $\text{Fr}(1\text{-DAY RECOVER} | 1\text{-DAY RECOVER} = \text{Yes})$, so the property 1-DAY RECOVER = Yes is independent of the property TAKES ANTIBIOTICS = yes. Since these two properties are independent, and the variables are binary, 1-DAY RECOVER and TAKES ANTIBIOTICS are independent
10. Answer: B and C EXPOSED is not a direct cause of SYMPTOMS because there is no arrow directly connecting them. It is an indirect cause.
11. Answer: B and F Two binary variables X {yes, no} and Y {yes, no} are associated if $\text{Fr}(X)$ is different from $\text{Fr}(X | Y = \text{yes})$.
12. Answer: A, B, and D The reason C is not correct is that it is not a chain of direct causes all going in the same direction.



14. Answer: B and C Remember, a pair has a direct common cause if there is another variable in the graph which is a direct cause of both members of the pair. The reason E is not correct is that, while it is close, Z_1 is a common cause of Z_3 , but not a *direct* common cause because Z_1 is not a direct cause of Y .
15. Answer: C

16. Answer: A,B,D, and E The pair Z_1, Z_2 are causally connected because of their common cause Z_3 , and because Z_1 is a direct cause of Z_2 . The pair Z_1, Z_3 are causally connected because Z_3 is a direct cause of Z_1 . The pair Z_1, Z_3 are causally connected because Z_3 is a direct cause of Z_2 , and because Z_3 is an indirect cause of Z_2 through Z_1 . The pair Z_2, Y are causally connected because Y is a direct cause of Z_2 .
17. Answer: D There are three causal connections: the causal path $X \rightarrow Z_1 \rightarrow Z_2$, the common cause $X \leftarrow Z_3 \rightarrow Z_2$, and the common cause $X \leftarrow Z_3 \rightarrow Z_1 \rightarrow Z_2$.
18. Answer: D There are three causal connections: the direct cause $Z_1 \rightarrow Z_2$, the common cause $Z_1 \leftarrow Z_3 \rightarrow Z_2$, and the common cause $Z_1 \leftarrow X \leftarrow Z_3 \rightarrow Z_2$.
19. Answer: A
20. Answer: A
21. Answer: B
22. Directed path
23. Directed path
24. Not a directed path
25. Directed path