

Bayesian Networks - Part 1 ('Copy')

1. Which of the following is true about a **random variable**?

- ☒ A **random variable** refers to an event and there is some degree of uncertainty as to the outcome of the event.
- ☐ A **random variable** is a variable that can take on exactly one value from a set of mutually exclusive and exhaustive values.
- ☐ The event of getting a heads on a coin flip is an example of a random variable.

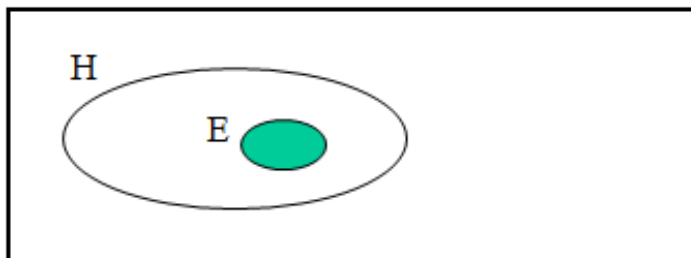
2. Which of the following is true about probability?

- ☒ $P(A) \geq 0$, where A is any proposition.
- ☐ $P(T) \geq 1$
- ☐ $P(A \text{ or } B) = P(A) + P(B)$ if A and B are mutually exclusive.

3. If $P(H|E) < P(H)$ then

- ☐ $P(H, E) = 0$
- ☐ H and E are independent.
- ☒ $P(E|H) < P(E)$

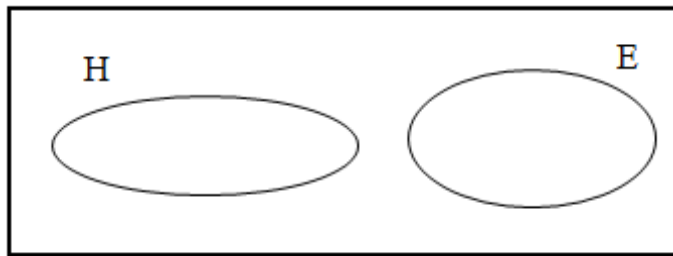
4.



According to figure, $P(H|E) = ?$

- ☐ 0
- ☐ 0.25
- ☒ 1
- ☐ 1.5

5.



According to figure, $P(H|E) = 0$.

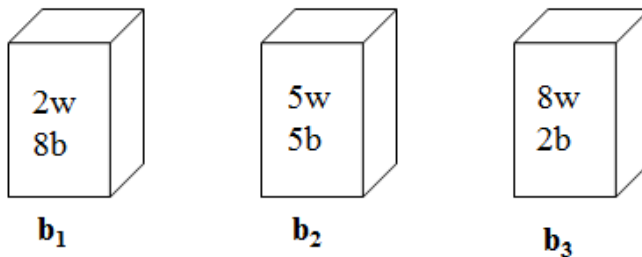
- ☒ True
☐ False

6. According to the joint probability distribution table, which of the following is correct about $P(A=\text{true} \mid B=\text{true})$?

- ☐ (A) $P(A=\text{true} \mid B=\text{true}) = [P(W5) + P(W6) + P(W7) + P(W8)] / [P(W2) + P(W4) + P(W6) + P(W8)]$
☒ (B) $P(A=\text{true} \mid B=\text{true}) = [P(W7) + P(W8)] / [P(W3) + P(W4) + P(W7) + P(W8)]$
☐ (C) $P(A=\text{true} \mid B=\text{true}) = [P(W5) + P(W6)] / [P(W2) + P(W4) + P(W6) + P(W8)]$

	A	B	C	P(A,B,C)
W1	false	false	false	0.1
W2	false	false	true	0.2
W3	false	true	false	0.05
W4	false	true	true	0.05
W5	true	false	false	0.3
W6	true	false	true	0.1
W7	true	true	false	0.05
W8	true	true	true	0.15

7.



If B stands for box and C stands for color, according to the figure of three boxes containing different amounts of white (w) and blue (b) balls, how can $P(C=w)$ be calculated?

- ☒ (A) $P(C=w) = P(C=w \mid B=b_1) P(B=b_1) + P(C=w \mid B=b_2) P(B=b_2) + P(C=w \mid B=b_3) P(B=b_3)$
☐ (B) $P(C=w) = P(C=w \mid B=b_1) + P(C=w \mid B=b_2) + P(C=w \mid B=b_3)$
☐ (C) $P(C=w) = P(C=w, B=b_1) / P(B=b_1) + P(C=w, B=b_2) / P(B=b_2) + P(C=w, B=b_3) / P(B=b_3)$

8. If A and B are variables that are independent, which of the following properties is false?

- ☐ (A) $P(A, B) = P(A) P(B)$
- ☐ (B) $P(A \mid B) = P(A)$
- ☐ (C) $P(B \mid A) = P(B)$
- ☒ (D) $P(A \mid B) = P(A) - P(B)$

9. Covid can cause a person to lose their sense of smell and sense of taste. Suppose nothing else can cause that. Which of the following is true?

- ☐ (A) Loss of taste is probabilistically independent of loss of smell
- ☒ (B) Loss of taste and loss of smell are probabilistically dependent
- ☒ (C) Loss of taste is probabilistically independent of loss of smell if we know a person has covid
- ☒ (D) Having covid is probabilistically dependent on loss of taste

10. The process of updating probabilities based on evidence is

- ☐ (A) Monotonic
- ☒ (B) Non-monotonic
- ☒ (C) How a rational agent should update its beliefs
- ☒ (D) The same as inference in FOL