Fa09

PacLabs has just created a new type of mini power pellet that is small enough for Pacman to carry around with him when he's running around mazes. Unfortunately, these mini-pellets don't guarantee that Pacman will win all his fights with ghosts, and they look just like the regular dots Pacman carried around to snack on.

Pacman just ate a snack (P), which was either a mini-pellet (+p), or a regular dot (-p), and is about to get into a Fight (W), which he can win (+w) or lose (-w). Both these variables are unknown, but fortunately, Pacman is a master of probability. He knows that his bag of snacks has 5 mini-pellets and 15 regular dots. He also knows that if he ate a mini-pellet, he has a 70% chance of winning, but if he ate a regular dot, he only has a 20% chance.

1. What is P(+w), the marginal probability that Pacman will win?
2. Pacman won! Hooray! What is the conditional probability P(+p | +w) that the food he ate was a mini-pellet, given that he won?

Consider the following full joint distribution for boolean variables A, B, and C:

|  |  |  |  |
| --- | --- | --- | --- |
| ***A*** | ***B*** | ***C*** | ***P(a,b,c)*** |
| *T* | *T* | *T* | *0.03* |
| *T* | *T* | *F* | *0.12* |
| *T* | *F* | *T* | *0.17* |
| *T* | *F* | *F* | *0.18* |
| *F* | *T* | *T* | *0.03* |
| *F* | *T* | *F* | *0.12* |
| *F* | *F* | *T* | *0.24* |
| *F* | *F* | *F* | *0.11* |
| *T* | *T* | *T* | *0.03* |

Calculate the following probabilities (write a number in the interval [0,1]):

1. P(A = F )
2. P(B = T )
3. P(B = T, C = T )
4. P(A = F, C = T )
5. P(A = T | B = T)

Note: Do not add up the numbers to produce a single numerical result. It is sufficient to write arithmetical expression to evaluate the result.