Example of Bayes' Theorem (basic version)

Consider an athletic course on a campus, for which students earn an A with probability .36. Let A denote the event that a student in the course gets an A. I.e., $P(A) = .36$.

Now suppose that 20% of the students on campus play at least one sport. Let B denote the event that a student plays at least one sport. So $P(B) = .20$.

Among the students who earn an A in the athletic course, 24% play at least one sport. In other words $P(B \mid A) = .24$.

Now our question: Given that a student plays at least one sport, what is the probability the student earns an A in the athletic course? I.e., what is $P(A \mid B)$?

$$P(A \mid B) = \frac{P(A)P(B \mid A)}{P(B)} = \frac{(.36)(.24)}{.20} = .432$$

In other words, given that a student plays at least one sport, they have a probability of .432 of earning an A in the athletic course. Makes sense because the unconditional probability of A, without knowing whether or not a student plays a sport, is just $P(A) = .36$. So playing a sport makes a student more likely to succeed in the athletic course.