

1. Suppose a company offers three different delivery methods for their products: standard delivery, express delivery, and same-day delivery. 60% of customers choose standard delivery, 30% choose express delivery, and 10% choose same-day delivery. The delivery success rates are 95% for standard delivery, 90% for express delivery, and 85% for same-day delivery. If a customer's delivery fails, what is the probability that they chose express delivery?

Answer:

From the narration, we know that,

60% are standard customers, with success rates 95%

30% are express customers, with success rates 90%

10% are same day customers, with success rates 85%

We want to know the probability of unsuccessful express delivery

So,

If there are 1000 customers, then

Standard = 600, Success = 570, Fail = 30

Express = 300, Success = 270, Fail = 30

Sameday = 100, Success = 85, Fail = 15

Probability of Express customers = probability of express delivery * probability of unsuccessful express delivery = $30\% * 10\% = 3\%$

Probability of unsuccessful delivery = $\frac{30+30+15}{1000} = \frac{75}{1000} = 7,5\%$

$$P(\text{Express}|\text{Fail}) = \frac{3\%}{7,5\%} = 40\%$$

Therefore, the probability of unsuccessful express delivery is 40%

2. If a medical test is 95% accurate in detecting a disease and 1% of the population has the disease. Calculate the probability of having the disease given a positive test result!

Answer:

From the narration, we know that,

The medical test accuracy in detecting a disease is 95%

1% of the population has the disease

We want to know the probability of having the disease and given a positive result

So,

If the population = 10000

Disease detected = 1%

The population who has the disease = 100

Sensitivity = 95%

Specificity = 95%

The medical test with positive results = 95

Positive result = $1\% * 95\% + (1 - 1\%) * (1 - 95\%) = 6\%$

Positive disease result = $95\% * \frac{1\%}{6\%} = 16.1\%$

Therefore, the probability of having the disease and given a positive result is 16,1%