Practice quiz on Bayes Theorem and the Binomial Theorem

TOTAL DES POINTS 9

1. A jewelry store that serves just one customer at a time is concerned about the safety of its isolated customers.   **1 / 1 point**

   The store does some research and learns that:

   - 10% of the times that a jewelry store is robbed, a customer is in the store.
   - A jewelry store has a customer on average 20% of each 24-hour day.
   - The probability that a jewelry store is being robbed (anywhere in the world) is 1 in 2 million.

   What is the probability that a robbery will occur while a customer is in the store?

   ○ $\dfrac{1}{500000}$

   ○ $\dfrac{1}{2000000}$

   ◉ $\dfrac{1}{4000000}$

   ○ $\dfrac{1}{5000000}$

   ✓ **Correct**

   What is known is:

   A: "a customer is in the store," $P(A) = 0.2$

   B: "a robbery is occurring," $P(B) = \frac{1}{2,000,000}$

   $P(\text{a customer is in the store} \mid \text{a robbery occurs}) = P(A \mid B)$

   $P(A \mid B) \approx 10\%$

   What is wanted:

   $P(\text{a robbery occurs} \mid \text{a customer is in the store}) = P(B \mid A)$

   By the product rule:

   $P(B \mid A) = \dfrac{P(A, B)}{P(A)}$

   and $P(A, B) = P(A \mid B)P(B)$

   Therefore:

   $P(B \mid A) = \dfrac{P(A \mid B)P(B)}{P(A)} = \dfrac{(0.1)\frac{1}{2000000}}{0.2} = \dfrac{1}{4000000}$

2. If I flip a fair coin, with heads and tails, ten times in a row, what is the probability that I will get exactly six heads?   **1 / 1 point**

   ○ 0.021

   ○ 0.187

   ◉ 0.2051

   ○ 0.305

   ✓ **Correct**

   By Binomial Theorem, equals

   $\binom{10}{6} 0.5^{10}$

   $= \dfrac{10!}{4! \times 6!} \dfrac{1}{1024}$

   $= 0.2051$

3. If a coin is bent so that it has a 40% probability of coming up heads, what is the probability of getting *exactly* 6 heads in 10 throws?   **1 / 1 point**

   ○ 0.0974

   ○ 0.1045

   ◉ 0.1115

   ○ 0.1219

   ✓ **Correct**

   $\binom{10}{6} \times 0.4^6 \times 0.6^4 = 0.1115$