

Show all necessary work and place your answers in/on the spaces provided.

Explosives Sensor.

A company claims to have invented a hand-held sensor that can detect the presence of explosives inside a closed container. The Metro Police Department is very interested in purchasing several of the devices if they are shown to perform effectively. An independent laboratory arranged the test. They placed four empty boxes in the corners of an otherwise empty room and place a small quantity of an explosive in one of the boxes selected at random. Thus, there is a 25% chance of randomly guessing where the explosive is located. The company's technician then entered the room and used the sensor to try to determine which of the four boxes contained the explosive.

1. Using notation, write the owner's null and alternative hypothesis.
2. In this context, describe a Type I Error and the impact such an error would have on the police department.
3. In this context, describe a Type II Error and the impact such an error would have on the police department.
4. Based on the data collected during the trial period, the police department found that a 95% confidence interval for the proportion of all trials in which the explosives sensor found the explosive was (19% , 45%). What conclusion should she reach about the explosives sensor? Defend your answer thoroughly.

5. What alpha level did the police department use?

5. _____

6. Describe to the police department an advantage and a disadvantage of using an alpha level of 1% instead.

Advantage:

Disadvantage:

7. The police department talked the company into increasing the number of trials, so that the police department could make a more informed decision. Will the power of the test increase, decrease, or remain the same? Why?

8. Over the trial period the rate that the sensors detect the explosives rose to 32%. The police department decided this increase was statistically significant. Now that the police department is convinced the explosive sensors work, why might the police department still chose not to purchase them?