

- Question 1

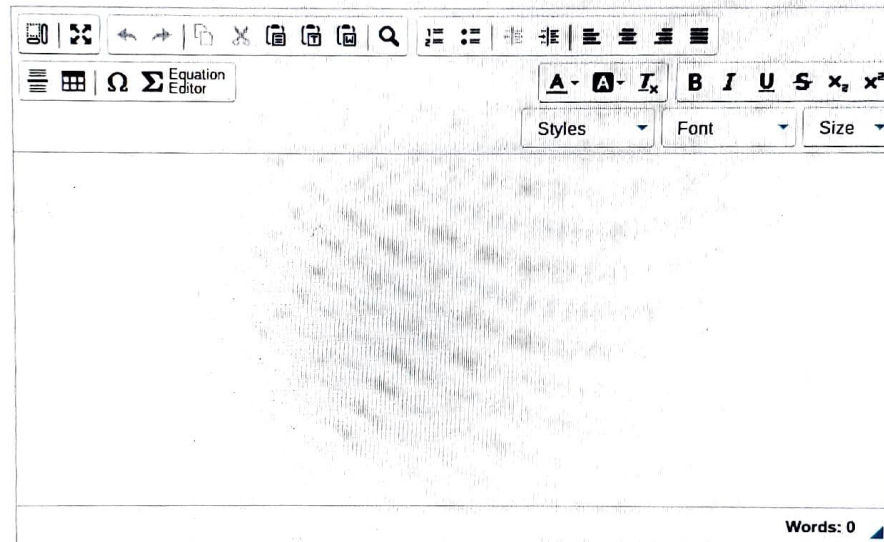
23 points

How Did I Do?

In May 2012, the FDA approved the first over-the-counter test for HIV, the virus that causes AIDS. In a news story on July 3, 2012, the *Associated Press* reported that, "When used by professionals, the test is shown to accurately identify both carriers and non-carriers [of the HIV virus] 99 percent of the time." But a trial conducted by the company that developed the test showed that individuals using the test on themselves at home correctly detected HIV in those carrying the virus only 92 percent of the time.[†]

Make sure that you fill in each answer area before checking "How Did I Do?".

- a. What do the percentages in the paragraph tell us about the specificity and sensitivity of the test when given at home and when given by a professional?



- b. Suppose that this test was administered by a professional (instead of at home) to a group of 10,000 people, of which 1% are infected with HIV. Fill in the following table in order to gather data on the test's effectiveness.

Hint: The key is to fill in the information in a certain order. You can use the fact that 1% of the 10,000 people are infected with HIV to determine the Total for the first column. A subtraction should then yield the Total for the second

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[illegible]

- | | Number of HIV-Positive Individuals | Number of HIV-Negative Individuals | Total |
|--------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Result of HIV Test is Positive | <input type="text" value="Number"/> | <input type="text" value="Number"/> | <input type="text" value="Number"/> |
| Result of HIV Test is Negative | <input type="text" value="Number"/> | <input type="text" value="Number"/> | <input type="text" value="Number"/> |
| Total | <input type="text" value="Number"/> | <input type="text" value="Number"/> | <input type="text" value="Number"/> |

- Round to the nearest hundredth of a percentage point (2 decimal places).

- e. Suppose that this same test was administered by a professional to 10,000 people in another country in which 10% of the population is infected with HIV. Fill in the following table:

	Number of HIV-Positive Individuals	Number of HIV-Negative Individuals	Total
Result of HIV Test is Positive	Number	Number	Number
Result of HIV Test is Negative	Number	Number	Number
Total	Number	Number	Number

- f. In this population, if someone tests positive with this new test, what is the probability that the person is not infected with HIV?

Round to the nearest hundredth of a percentage point (2 decimal places).

%

- g. In this population, if someone tests negative with this new test, what is the probability that the person is infected with HIV?

Round to the nearest hundredth of a percentage point (2 decimal places).

%

[†]Matthew Perrone, "FDA Approves First Rapid, Take Home HIV Test," USA Today, July 3, 2012, accessed April 13, 2017.

- Question 2

3 points

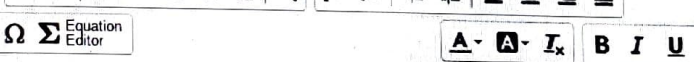
[How Did I Do?](#)

Suppose an even newer over-the-counter test for HIV, released in 2017, advertises that it has improved specificity, when administered by a professional, compared to the test described in Question 1. The advertisement then states that people should use the newer test because it is more effective. The two-way table below shows the data on which the advertisement's claims were based.

	Number of HIV-Positive Individuals	Number of HIV-Negative Individuals

How Did I Do?

	Number of HIV-Positive Individuals	Number of HIV-Negative Individuals
Result of HIV Test is Positive	49	40
Result of HIV Test is Negative	1	19,910



Question 3

11 points

How Did I Do?

Consider the following situation presented in a New York Times blog: "Before going on vacation for a week, you ask your spacey friend to water your ailing plant. Without water, the plant has a 90 percent chance of dying. Even with proper watering, it has a 20 percent chance of dying. And the probability that your friend will forget to water it is 30 percent." We can model this situation by using a hypothetical 100 ailing plants and entering what would happen into a two-way table like the one below.

Make sure that you fill in each answer area before checking "How Did I Do?".

- a. Fill in the table using the percentages in the scenario. (Hint: Fill in the bottom row first using the friend's information and then fill in the columns.)

	Watered	Not Watered	Total
Number of Plants that Died	Number	Number	Number
Number of Plants that Did Not Die	Number	Number	Number
Total	Number	Number	100

- b. Now you can answer the questions the New York Times blogger asks.

Round to the nearest percentage point.

- i. What's the chance that your plant will survive the week?

- ii. If the plant is dead when you return, what's the chance that your friend forgot to water it?

- iii. If your friend forgot to water the plant, what's the chance it'll be dead when you return?