WHAT IS A P-VALUE?

A researcher believes that more than 50% of UT students have only cell phones (i.e., have a cell phone but no landline). She has obtained a random sample of 100 UT students and has been able to find out whether or not each has only a cell phone. To test her claim, she used her sample to perform a hypothesis test with null and alternate hypotheses

H_0: $p = 0.5$ H_A: $p > 0.5$,

(where p is the proportion of UT students who have only cell phones). She obtained a P-value of 0.04.

Each of the following is an attempt to say what the statement, "The P-value is 0.04" means. Classify each attempt as follows:

A. Shows misunderstanding.
B. Gets the basic idea, but some details omitted. (State what is omitted.)
C. Good understanding.

1. The probability that the null hypothesis is true is .04.

2. There's a 4% chance that the null hypothesis is true.

3. The probability that the statement, "The proportion of UT students who have only cell phones is 0.5," is true is .04.

4. The P-value 0.04 is the conditional probability that the null hypothesis is true, given the data.

5. The P-value 0.04 is the probability that, in a randomly selected sample of 100 UT students, the proportion of students in that sample with only cell phones is greater than the proportion of students with only cell phones in the sample the researcher used.

6. The P-value 0.04 is the probability that, in a randomly selected sample of UT students, the proportion of students in that sample with only cell phones is greater than the proportion of students with only cell phones that the researcher calculated from her sample, if indeed the true proportion of UT students having only cell phones is 0.5

7. The P-value 0.04 is the probability that, in a randomly selected sample of 100 UT students, the proportion of students in that sample with only cell phones is greater than the proportion of students with only cell phones that the researcher calculated from her sample, if indeed the true proportion of UT students having only cell phones is 0.5

8. If you listed all random samples of 100 UT students, and then for each such sample found the proportion of students in that sample who have only cell phones, then 4% of those samples would have proportion of cell-phone-only users greater than or equal to the proportion in the sample the researcher used.

9. If the proportion of UT students having only cell phones is 0.5, then if you listed all random samples of 100 UT students, and then for each of those samples found the proportion of students in that sample who have only cell phones, you would find that 4% of those samples would have proportion of cell-phone-only users greater than or equal to the proportion in the sample the researcher used.