1. The following are a random sample of $n = 20$ IQ scores of seventh-grade girls from a school district in the Midwest:

111, 98, 132, 91, 108, 89, 114, 103, 86, 114, 111, 105, 118, 96, 120, 119, 112, 112, 72, 112

Suppose that a previous estimate of the mean IQ of 7th-grade girls from this school district is 100. We suspect that the true value μ may actually be higher. To test our suspicion, we carry out a test of significance on the data we collected above.

State the alternative hypothesis.

A. The alternative hypothesis is $H_a : \mu \neq 100$.

B. The alternative hypothesis is $H_a : \bar{x} < 100$.

C. The alternative hypothesis is $H_a : \mu > 100$.

D. The alternative hypothesis is $H_a : \bar{x} \neq 100$.

E. The alternative hypothesis is $H_a : \mu = 100$.

F. The alternative hypothesis is $H_a : \mu < 100$.

G. The alternative hypothesis is $H_a : \bar{x} > 100$.

H. The alternative hypothesis is $H_a : \bar{x} = 100$.

2. The following are a random sample of $n = 25$ IQ scores of seventh-grade girls from a school district in the Midwest:

103, 74, 96, 112, 93, 108, 111, 112, 103, 111, 100, 130, 120, 86, 91, 103, 107, 128, 72, 112, 132, 104, 102, 114, 119

A previous estimate of the mean IQ of 7th-grade girls from this school district is 99. We suspect that the true value μ may actually be higher. To test our suspicion, we carry out a test of significance on the data we collected above.

Which of the following is true about the p-value of the test of significance described above.

A. $0.005 < p\text{-value} < 0.01$

B. $0.05 < p\text{-value} < 0.1$

C. $p\text{-value} > 0.1$

D. $0.001 < p\text{-value} < 0.005$

E. $0.01 < p\text{-value} < 0.05$

F. $p\text{-value} < 0.001$

3. The following are a random sample of $n = 11$ IQ scores of seventh-grade girls from a school district in the Midwest:

112, 93, 107, 74, 105, 96, 102, 119, 72, 114, 89

Suppose that a previous estimate of the mean IQ of 7th-grade girls from this school district is 105. We suspect that the true value μ may actually be higher. To test our suspicion, we carry out a test of significance on the data we collected above.

Compute the t-statistic for the test of significance described above.

A. The t-statistic is -1.902.

B. The t-statistic is -2.102.

C. The t-statistic is -0.602.

D. The t-statistic is -0.802.

E. The t-statistic is -1.702.

F. The t-statistic is -1.002.

G. The t-statistic is -1.402.

H. The t-statistic is -1.802.

4. Breast-feeding mothers secrete calcium into their milk, and researchers suspect that some of that calcium comes from their bones. The percent change in mineral content of the spines of a random sample of $n = 15$ mothers during three months of breast-feeding is:

$-5.9\%,\ -6.5\%,\ -2.2\%,\ -6.8\%,\ -4\%,\ -4.7\%,\ -3.8\%,\ 0.2\%,\ -4.9\%,\ -4.7\%,\ -2.2\%,\ -5.3\%,\ -2.1\%,$
$-4.4\%,\ -4.9\%$

We would like to understand the extent that mothers overall lose bone mineral when breast-feeding.

Suppose that previous research suggests that the mean mineral loss in breast-feeding mothers is -3%. However, we suspect that the true value of the mean mineral loss μ may actually be lower. To test our suspicion, we carry out a test of significance.

At the $\alpha = 0.1$ level of significance, what is the conclusion?

A. There is significant evidence that the mean bone mineral loss in breast-feeding mothers is above -3%.

B. There is significant evidence that the mean bone mineral loss in breast-feeding mothers is not equal to -3%.

C. There is no significant evidence that the mean bone mineral loss in breast-feeding mothers is not equal to -3%.

D. There is no significant evidence that the mean bone mineral loss in breast-feeding mothers is above -3%.

E. There is significant evidence that the mean bone mineral loss in breast-feeding mothers is below -3%.

F. There is no significant evidence that the mean bone mineral loss in breast-feeding mothers is below -3%.

5. Billy Bob recently purchased a brand new car. In order to estimate his average gas mileage, over several months Billy Bob has recorded the following $n = 11$ mileages between each fill-up:

$29.41,\ 30.16,\ 28.36,\ 27.77,\ 25.71,\ 27.18,\ 28.79,\ 30.88,\ 32.65,\ 32.67,\ 22.69$

The manufacturer of the vehicle Billy Bob purchased reports that the average gas mileage is 30.4 MPG. However, Billy Bob suspects that the true mean gas mileage μ of his car is not the same as the one reported by the manufacturer. To test his suspicion, Billy Bob carries out a test of significance on his data assuming the values of the mean reported by the manufacturer.

At the $\alpha = 0.01$ level of significance, what is the conclusion?

A. We reject the null hypothesis.

B. We keep the null hypothesis.

6. Breast-feeding mothers secrete calcium into their milk, and researchers suspect that some of that calcium comes from their bones. The percent change in mineral content of the spines of a random sample of $n = 22$ mothers during three months of breast-feeding is:

$-5.9\%,\ 0.2\%,\ -3\%,\ -5.3\%,\ 1.7\%,\ 2.2\%,\ -2.3\%,\ -4.4\%,\ -6.8\%,\ -3.3\%,\ -2.1\%,\ -0.8\%,$
$-8\%,\ -0.3\%,\ -1.8\%,\ -8.3\%,\ -6.8\%,\ 0.4\%,\ -3.8\%,\ -1\%,\ -7\%,\ -2.2\%$

We would like to understand the extent that mothers overall lose bone mineral when breast-feeding.

Suppose that previous research suggests that the mean mineral loss in breast-feeding mothers is -2.7%. However, we suspect that the true value of the mean mineral loss μ may actually be lower. To test our suspicion, we carry out a test of significance.

State the null hypothesis.

A. The null hypothesis is $H_0 : \mu > -2.7\%$.

B. The null hypothesis is $H_0 : \bar{x} > -2.7\%$.

C. The null hypothesis is $H_0 : \bar{x} \neq -2.7\%$.

D. The null hypothesis is $H_0 : \mu \neq -2.7\%$.

E. The null hypothesis is $H_0 : \mu = -2.7\%$.

F. The null hypothesis is $H_0 : \bar{x} < -2.7\%$.

G. The null hypothesis is $H_0 : \bar{x} = -2.7\%$.

H. The null hypothesis is $H_0 : \mu < -2.7\%$.

7. Suppose we are testing the hypotheses

$$H_0 : \mu = 2.4$$
$$H_a : \mu \neq 2.4$$

This is an example of a:

A. 1-tailed test.

B. 2-tailed test.

8. Billy Bob recently purchased a brand new car. In order to estimate his average gas mileage, over several months Billy Bob has recorded the following $n = 24$ mileages between each fill-up:

24.27, 28.29, 22.32, 28.79, 30.88, 22.69, 23.68, 28.73, 36.8, 27.72, 27.77, 25.09, 25.95, 29.8, 28.36, 32.65, 30.16, 32.67, 31.23, 29.41, 27.18, 29.83, 26.69, 25.71

The manufacturer of the vehicle Billy Bob purchased reports that the average gas mileage is 28.8 MPG. However, Billy Bob suspects that the true mean gas mileage μ of his car is not the same as the one reported by the manufacturer. To test his suspicion, Billy Bob carries out a test of significance on his data assuming the values of the mean reported by the manufacturer.

Which of the following is true about the p-value of the test of significance described above.

A. p-value > 0.1

B. $0.02 <$ p-value < 0.05

C. $0.002 <$ p-value < 0.01

D. $0.01 <$ p-value < 0.02

E. $0.05 <$ p-value < 0.1

F. p-value < 0.002