

1. If data are normally distributed, which of the following is not true?  
 A) Their graph is a bell-shaped curve.  
 B) The mean and median are the same.  
 C) Most of the data tend to be clustered relatively far from the mean.  
 D) The data are symmetrically distributed above and below the mean.

2. If a set of data is normally distributed, then about 68% of the data lie within one standard deviation of the mean.

3. If a set of data is normally distributed, then about 95% of the data lie within three standard deviations of the mean.  
 A) True  
 B) False

4. For data points above the mean, the z-score is Positive.

5. The Percentile for a number relative to a list of data is the percentage of data points that are less than or equal to that number.

6. Assume we know that 20% of Americans suffer from a certain type of allergy. Suppose we take a random sample of 10,000 Americans and record the percentage who suffer from this allergy. Then the Central Limit Theorem says that percentages from such a survey will be normally distributed.  
 A) True  
 B) False

7. The average yearly high temperature in a certain city is recorded. It is found that the mean temperature is 70.2°F with a standard deviation of 8.2°F. Assuming that the data are normally distributed, in what range should 68% of the data lie?

$\bar{X} \pm S \Rightarrow 70.2 - 8.2 \text{ --- } 70.2 + 8.2 \Rightarrow 62.0^\circ\text{F} - 78.4^\circ\text{F}$

8. The average yearly high temperature in a certain city is recorded. It is found that the mean temperature is 70.2°F with a standard deviation of 8.2°F. Assuming that the data are normally distributed, in what range should 95% of the data lie?  $\Rightarrow \bar{X} \pm 2S$

$70.2^\circ\text{F} - 2(8.2) \text{ --- } 70.2^\circ\text{F} + 2(8.2)$   
 $= 53.8^\circ\text{F} \text{ --- } 86.6^\circ\text{F}$

9. Ridge counts on fingerprints are approximately normally distributed, with a mean of about 140 and a standard deviation of 50. It then follows that 68% of the population will have:

$$140 \pm 50 \text{ Ridges} = 90 - 190 \text{ Ridges}$$

10. Ridge counts on fingerprints are approximately normally distributed, with a mean of about 140 and a standard deviation of 50. It then follows that 99.7% of the population will have:

$$140 \pm 3(50) \text{ Ridges} = -10 \text{ to } 290 \text{ Ridges}$$

11. It is found that the number of raisins in a box of a popular cereal is normally distributed, with a mean of 142 raisins per box and a standard deviation of 11 raisins. Your cereal box has 159 raisins. What is the z-score for this box of cereal?

$$z = \frac{159 - 142}{11} \approx 1.5$$

12. It is found that the number of nuts in a bag of trail mix is normally distributed, with a mean of 240 nuts and a standard deviation of 15 nuts. A bag of trail mix contains 228 nuts. What is the z-score for this bag of trail mix?

$$z = \frac{228 - 240}{15} = -0.8$$

13. It is known that in the absence of treatment, 68% of the patients with a certain illness will improve. The Central Limit Theorem tells us that the percentages of patients in groups of 500 that improve in the absence of treatment are approximately normally distributed. Find the mean of the normal distribution given by the Central Limit Theorem.

$$\text{Mean} = 68\%$$

14. It is known that in the absence of treatment, 68% of the patients with a certain illness will improve. The Central Limit Theorem tells us that the percentages of patients in groups of 500 that improve in the absence of treatment are approximately normally distributed. Find the standard deviation of the normal distribution given by the Central Limit Theorem.

$$\sigma = \sqrt{\frac{p(100-p)}{n}} = \sqrt{\frac{68(100-68)}{500}} \approx 2.066\% \approx 2.1\%$$

15. Suppose we toss 150 fair coins and record the percentage of heads. According to the Central Limit Theorem, the percentages of heads resulting from such experiments are approximately normally distributed. Find the standard deviation of this normal distribution.

$$\sigma = \sqrt{\frac{50(100-50)}{150}} \approx 4.08\% \approx 4.1\%$$

16. A six-year study in a certain country found that birth weights of newborns were normally distributed, with a mean of 3758 grams and a standard deviation of 496 grams. What is the z-score for a newborn weighing 4000 grams?

$$z_{\text{score}} = \frac{4000 - 3758}{496} = 0.488 \approx 0.5$$

17. A six-year study in a certain country found that birth weights of newborns were normally distributed, with a mean of 3758 grams and a standard deviation of 496 grams. What is the z-score for a newborn weighing 3000 grams?

$$z_{\text{score}} = \frac{3000 - 3758}{496} = -1.5$$

18. Suppose we toss 150 fair coins and record the percentage of heads. According to the Central Limit Theorem, the percentages of heads resulting from such experiments are approximately normally distributed. Find the z-score for 90 heads.

step 2)  $\frac{90 - 75}{\sqrt{16.67}} = 3.7$   $\rightarrow$   $\boxed{3.7}$  step 1)  $\sigma = \sqrt{\frac{50(100-50)}{150}} = 4.1$

19. It is known that under ordinary circumstances, 18% of people will not contract a certain disease. Consider the situation where test groups of 600 were selected and the percentages that did not contract the disease were recorded. According to the Central Limit Theorem, the data collected are approximately normally distributed. Find the mean and standard deviation of this normal distribution. Round the standard deviation to one decimal place.

Mean = 18%  
 $\sigma = \sqrt{\frac{18(100-18)}{600}} = 1.568\% \approx \text{std deviation } \boxed{1.6\%}$

20. The margin of error of a poll expresses how close to the true result the result of the poll can be expected to lie.

TRUE

21. To find the confidence interval, adjust the result of the poll by adding and subtracting the \_\_\_\_\_.

Margin of Error

22. The \_\_\_\_\_ of a poll tells the percentage of such polls in which the confidence interval includes the true result.

Confidence level

23. For a 95% level of confidence and a sample size of  $n$ , the margin of error is approximately:

$$\frac{100}{\sqrt{n}} \%$$

24. If we conduct a poll of 1600 people, then the approximate margin of error for a 95% confidence interval would be 2.5%.

$$\frac{100}{\sqrt{1600}} \% = 2.5\% \quad \checkmark \quad \boxed{\text{TRUE}}$$

25. A polling organization conducts a poll by making a random survey of 2500 people. Estimate the margin of error at a confidence interval of 95%.

$$\frac{100}{\sqrt{n}} \% = \frac{100}{\sqrt{2500}} \% = \boxed{2.0\%}$$

26. A polling organization conducts a poll by making a random survey and is willing to accept a margin of error of 4% at a confidence level of 95%. What should the sample size be?

$$\boxed{n = 625}$$

$$\frac{100}{\sqrt{n}} \% = 4\% \\ 100 = 4\sqrt{n} \\ 25 = \sqrt{n} \Rightarrow n = 25^2 = 625$$

27. For a 90% confidence level and a sample size of  $n$ , the margin of error is approximately  $\frac{82}{\sqrt{n}}$ %. How many people should we survey if we'd like to have a 3% margin of error with a 90% confidence interval?

**Answer Key**

1. C
2. 68%
3. B
4. positive
5. percentile
6. A
7.  $62.0^{\circ}\text{F} - 78.4^{\circ}\text{F}$
8.  $53.8^{\circ}\text{F} - 86.6^{\circ}\text{F}$
9.  $140 \pm 50$  ridges
10.  $140 \pm 150$  ridges
11. 1.5
12. -0.8
13. 68%
14. 2.1%
15. 4.1%
16. 0.5
17. -1.5
18. 3.7
19. Mean: 18%  
Standard deviation: 1.6%
20. True
21. margin of error
22. confidence level
23.  $\frac{100}{\sqrt{n}}$ %
24. True
25. 2.0%
26. 625
27. 747

$$\frac{82}{\sqrt{n}}\% = 3\% \Rightarrow 82 = 3\sqrt{n}$$

$\rightarrow \frac{82}{3} = \sqrt{n}$ , Now square both sides of equation

$747 = n$