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1. What requirements are necessary for a normal probability distribution to be a *standard* normal probability distribution?

Choose the correct answer below.

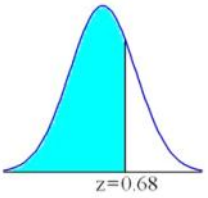
- ○ A. The mean and standard deviation have the values of $\mu = 1$ and $\sigma = 1$.
- ○ B. The mean and standard deviation have the values of $\mu = 1$ and $\sigma = 0$.
- ○ C. The mean and standard deviation have the values of $\mu = 0$ and $\sigma = 1$.
- ○ D. The mean and standard deviation have the values of $\mu = 0$ and $\sigma = 0$.

2. A statistics professor plans classes so carefully that the lengths of her classes are uniformly distributed between 50.0 and 52.0 minutes. Find the probability that a given class period runs less than 50.25 minutes.

Find the probability of selecting a class that runs less than 50.25 minutes.

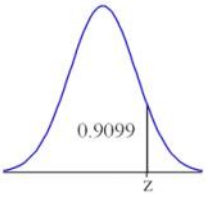
☐ (Type an integer or a decimal.)

3. Find the area of the shaded region. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.



The area of the shaded region is ☐.
(Round to four decimal places as needed.)

4. Find the indicated z score. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.



The indicated z score is ☐.
(Round to two decimal places as needed.)

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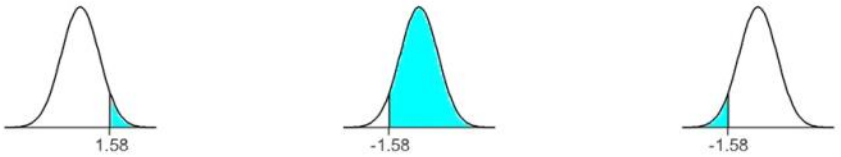
5. Assume the readings on thermometers are normally distributed with a mean of 0°C and a standard deviation of 1.00°C. Find the probability that a randomly selected thermometer reads greater than -1.58 and draw a sketch of the region.

Sketch the region. Choose the correct graph below.

○A. ○B. ○C.



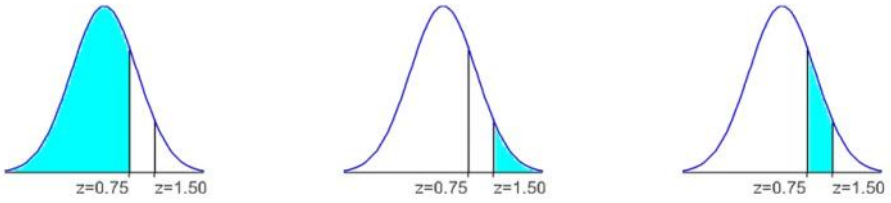
The probability is ☐.
(Round to four decimal places as needed.)

6. Assume that thermometer readings are normally distributed with a mean of 0°C and a standard deviation of 1.00°C. A thermometer is randomly selected and tested. For the case below, draw a sketch, and find the probability of the reading. (The given values are in Celsius degrees.)

Between 0.75 and 1.50

Draw a sketch. Choose the correct graph below.

○A. ○B. ○C.



The probability of getting a reading between 0.75°C and 1.50°C is ☐.
(Round to four decimal places as needed.)

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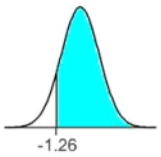
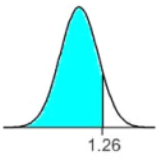
7. Assume the readings on thermometers are normally distributed with a mean of 0°C and a standard deviation of 1.00°C. Find the probability that a randomly selected thermometer reads greater than 1.26 and draw a sketch of the region.

Sketch the region. Choose the correct graph below.

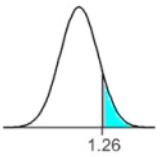
○A.



○B.



○C.



The probability is ☐.
(Round to four decimal places as needed.)

8. Find the indicated area under the curve of the standard normal distribution, then convert it to a percentage and fill in the blank.

About _____% of the area is between $z = -1.1$ and $z = 1.1$ (or within 1.1 standard deviations of the mean).

About ☐% of the area is between $z = -1.1$ and $z = 1.1$ (or within 1.1 standard deviations of the mean).
(Round to two decimal places as needed.)

9. Find the indicated critical value.

$z_{0.07}$

$z_{0.07} =$ ☐
(Round to two decimal places as needed.)

10. The distribution of IQ scores is a nonstandard normal distribution with a mean of 100 and a standard deviation of 15. What are the value of the mean and standard deviation after all IQ scores have been standardized by converting them to z scores using $z = (x - \mu) / \sigma$?

Choose the correct answer below.

○A. The mean is 0 and the standard deviation is 0.

○B. The mean is 1 and the standard deviation is 1.

○C. The mean is 100 and the standard deviation is 15.

○D. The mean is 0 and the standard deviation is 1.

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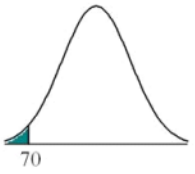
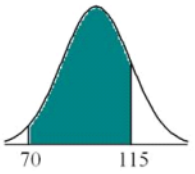
11. Find the area of the shaded region. The graph to the right depicts IQ scores of adults, and those scores are normally distributed with a mean of 100 and a standard deviation of 15.



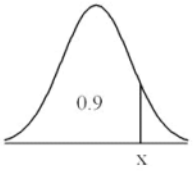
The area of the shaded region is ☐. (Round to four decimal places as needed.)

12. Find the area of the shaded region. The graph to the right depicts IQ scores of adults, and those scores are normally distributed with a mean of 100 and a standard deviation of 15.



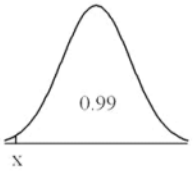
The area of the shaded region is ☐. (Round to four decimal places as needed.)

13. Find the indicated IQ score. The graph to the right depicts IQ scores of adults, and those scores are normally distributed with a mean of 100 and a standard deviation of 15.



The indicated IQ score, x, is ☐. (Round to one decimal place as needed.)

14. Find the indicated IQ score. The graph to the right depicts IQ scores of adults, and those scores are normally distributed with a mean of 100 and a standard deviation of 15.



The indicated IQ score, x, is ☐. (Round to one decimal place as needed.)

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15. Assume that adults have IQ scores that are normally distributed with a mean of $\mu = 100$ and a standard deviation $\sigma = 15$. Find the probability that a randomly selected adult has an IQ between 81 and 119.

The probability that a randomly selected adult has an IQ between 81 and 119 is ☐.
(Type an integer or decimal rounded to four decimal places as needed.)

16. Assume that adults have IQ scores that are normally distributed with a mean of 105 and a standard deviation 15. Find P_4, which is the IQ score separating the bottom 4% from the top 96%.

The IQ score that separates the bottom 4% from the top 96% is $P_4 =$ ☐.
(Round to the nearest hundredth as needed.)

17. A survey found that women's heights are normally distributed with mean 63.4 in and standard deviation 2.4 in. A branch of the military requires women's heights to be between 58 in and 80 in.
a. Find the percentage of women meeting the height requirement. Are many women being denied the opportunity to join this branch of the military because they are too short or too tall?
b. If this branch of the military changes the height requirements so that all women are eligible except the shortest 1% and the tallest 2%, what are the new height requirements?

a. The percentage of women who meet the height requirement is ☐%.
(Round to two decimal places as needed.)

Are many women being denied the opportunity to join this branch of the military because they are too short or too tall?

- ○ A. No, because the percentage of women who meet the height requirement is fairly small.
- ○ B. Yes, because the percentage of women who meet the height requirement is fairly large.
- ○ C. No, because only a small percentage of women are not allowed to join this branch of the military because of their height.
- ○ D. Yes, because a large percentage of women are not allowed to join this branch of the military because of their height.

b. For the new height requirements, this branch of the military requires women's heights to be at least ☐ in and at most ☐ in.
(Round to one decimal place as needed.)

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18. Which of the following statistics are unbiased estimators of population parameters?

Choose the correct answer below. Select all that apply.

- ☐ A. Sample mean used to estimate a population mean.
- ☐ B. Sample range used to estimate a population range.
- ☐ C. Sample median used to estimate a population median.
- ☐ D. Sample variance used to estimate a population variance.
- ☐ E. Sample proportion used to estimate a population proportion.
- ☐ F. Sample standard deviation used to estimate a population standard deviation.

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19. Three randomly selected households are surveyed. The numbers of people in the households are 2, 3, and 10. Assume that samples of size n = 2 are randomly selected with replacement from the population of 2, 3, and 10. Listed below are the nine different samples. Complete parts (a) through (c).

2,2 2,3 2,10 3,2 3,3 3,10 10,2 10,3 10,10

a. Find the variance of each of the nine samples, then summarize the sampling distribution of the variances in the format of a table representing the probability distribution of the distinct variance values.

s^2	Probability

(Type an integer or a fraction. Use ascending order of the sample variances.)

b. Compare the population variance to the mean of the sample variances. Choose the correct answer below.

- A. The population variance is equal to the square root of the mean of the sample variances.
- B. The population variance is equal to the square of the mean of the sample variances.
- C. The population variance is equal to the mean of the sample variances.

c. Do the sample variances target the value of the population variance? In general, do sample variances make good estimators of population variances? Why or why not?

- A. The sample variances do not target the population variance, therefore, sample variances make good estimators of population variances.
- B. The sample variances do not target the population variance, therefore, sample variances do not make good estimators of population variances.
- C. The sample variances target the population variance, therefore, sample variances do not make good estimators of population variances.
- D. The sample variances target the population variances, therefore, sample variances make good estimators of population variances.

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20. The assets (in billions of dollars) of the four wealthiest people in a particular country are 35, 34, 22, 12. Assume that samples of size 2 are randomly selected with replacement from this population of four values.

a. After listing the possible samples and finding the mean of each sample, use a table to describe the sampling distribution of the sample means.

$\bar{x}$	Probability	$\bar{x}$	Probability
35	☐	23.5	☐
34.5	☐	23	☐
34	☐	22	☐
28.5	☐	17	☐
28	☐	12	☐

(Type an integer or a fraction. Do not simplify.)

b. Find the mean of the sampling distribution.

$\mu =$ ☐ (Simplify your answer.)

c. Is the mean of the sampling distribution [from part (b)] equal to the mean of the population of the four listed values? If so, are those means always equal?

- ○A. No, the sample mean is not equal to the mean of the population. These means are not always equal, because the mean is an unbiased estimator.
- ○B. No, the sample mean is not equal to the mean of the population. These means are not always equal, because the mean is a biased estimator.
- ○C. Yes, the sample mean is equal to the mean of the population. These means are always equal, because the mean is an unbiased estimator.
- ○D. Yes, the sample mean is equal to the mean of the population. These means are always equal, because the mean is a biased estimator.

21. The ages (years) of three government officials when they died in office were 55, 44, and 61. Complete parts (a) through (d).

a. Assuming that 2 of the ages are randomly selected with replacement, list the different possible samples.

- ○A. (55,44),(55,61),(44,55),(44,61),(61,55),(61,44)
- ○B. (55,55), (55,44),(55,61),(44,44),(44,61),(61,61)
- ○C. (55,44),(55,61),(44,61)
- ○D. (55,55), (55,44),(55,61),(44,55),(44,44),(44,61),(61,55),(61,44),(61,61)

b. Find the range of each of the samples, then summarize the sampling distribution of the ranges in the format of a table representing the probability distribution.

Sample Range	Probability
▼	
▼	
▼	
▼	

(Type an integer or a fraction.)

c. Compare the population range to the mean of the sample ranges. Choose the correct answer below.

- ○A. The population range is not equal to the mean of the sample ranges (it is also not equal to the age of the oldest official or age of the youngest official at the time of death).
- ○B. The population range is equal to the mean of the sample ranges.
- ○C. The population range is equal to the youngest official at the time of death and the mean of the sample ranges is equal to the oldest official at the time of death.
- ○D. The population range is equal to the age of the oldest official at the time of death and the mean of the sample ranges is equal to the youngest official at the time of death.

d. Do the sample ranges target the value of the population range? In general, do sample ranges make good estimators of population ranges? Why or why not?

21. (cont.)

A. The sample ranges do not target the population range, therefore, sample ranges make good estimators of population ranges.

B. The sample ranges target the population range, therefore, sample ranges make good estimators of population ranges.

C. The sample ranges do not target the population range, therefore, sample ranges do not make good estimators of population ranges.

D. The sample ranges target the population range, therefore, sample ranges do not make good estimators of population ranges.

22. What is the standard error of the mean?

Choose the correct answer below.

A. The mean of the sample means.

B. The standard deviation of the sample means.

C. The variance of the sample means.

D. The range of the sample means.

23. Assume that women's heights are normally distributed with a mean given by $\mu = 64.2$ in, and a standard deviation given by $\sigma = 3.1$ in.
a. If 1 woman is randomly selected, find the probability that her height is less than 65 in.
b. If 40 women are randomly selected, find the probability that they have a mean height less than 65 in.

a. The probability is approximately ☐.
(Round to four decimal places as needed.)

b. The probability is approximately ☐.
(Round to four decimal places as needed.)

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24. Assume that women's heights are normally distributed with a mean given by $\mu = 63.6$ in, and a standard deviation given by $\sigma = 2.8$ in.

a. If 1 woman is randomly selected, find the probability that her height is between 62.9 in and 63.9 in.

The probability is approximately ☐. (Round to four decimal places as needed.)

b. If 18 women are randomly selected, find the probability that they have a mean height between 62.9 in and 63.9 in.

The probability is approximately ☐. (Round to four decimal places as needed.)

c. Why can the central limit theorem be used in part (b), even though the sample size does not exceed 30?

- ○A. The population is normally distributed.
- ○B. The population size is greater than 30.
- ○C. The sample size needs to be less than 30, not greater than 30.
- ○D. The sample is normally distributed.

25. The capacity of a lift is 12 people or 1992 pounds. The capacity will be exceeded if 12 people have weights with a mean greater than $1992 / 12 = 166$ pounds. Suppose the people have weights that are normally distributed with a mean of 171 lb and a standard deviation of 27 lb.

a. Find the probability that if a person is randomly selected, his weight will be greater than 166 pounds.

The probability is approximately ☐. (Round to four decimal places as needed.)

b. Find the probability that 12 randomly selected people will have a mean that is greater than 166 pounds.

The probability is approximately ☐. (Round to four decimal places as needed.)

c. Does the lift appear to have the correct weight limit? Why or why not?

- ○A. No, there is a good chance that 12 randomly selected people will exceed the lift capacity.
- ○B. Yes, there is a good chance that 12 randomly selected people will not exceed the lift capacity.
- ○C. No, 12 randomly selected people will never be under the weight limit.
- ○D. Yes, 12 randomly selected people will always be under the weight limit.

26. An airliner carries 150 passengers and has doors with a height of 76 in. Heights of men are normally distributed with a mean of 69.0 in and a standard deviation of 2.8 in. Complete parts (a) through (d).

a. If a male passenger is randomly selected, find the probability that he can fit through the doorway without bending.

The probability is ☐.
(Round to four decimal places as needed.)

b. If half of the 150 passengers are men, find the probability that the mean height of the 75 men is less than 76 in.

The probability is ☐.
(Round to four decimal places as needed.)

c. When considering the comfort and safety of passengers, which result is more relevant: the probability from part (a) or the probability from part (b)? Why?

- ○ A. The probability from part (b) is more relevant because it shows the proportion of male passengers that will not need to bend.
- ○ B. The probability from part (b) is more relevant because it shows the proportion of flights where the mean height of the male passengers will be less than the door height.
- ○ C. The probability from part (a) is more relevant because it shows the proportion of flights where the mean height of the male passengers will be less than the door height.
- ○ D. The probability from part (a) is more relevant because it shows the proportion of male passengers that will not need to bend.

d. When considering the comfort and safety of passengers, why are women ignored in this case?

- ○ A. There is no adequate reason to ignore women. A separate statistical analysis should be carried out for the case of women.
- ○ B. Since men are generally taller than women, a design that accommodates a suitable proportion of men will necessarily accommodate a greater proportion of women.
- ○ C. Since men are generally taller than women, it is more difficult for them to bend when entering the aircraft. Therefore, it is more important that men not have to bend than it is important that women not have to bend.

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27. The value given below is discrete. Use the continuity correction and describe the region of the normal distribution that corresponds to the indicated probability.

Probability of exactly 37 Senators who are men

Choose the correct answer below.

- ○ A. The area to the left of 36.5
- ○ B. The area to the right of 36.5
- ○ C. The area to the left of 37.5
- ○ D. The area to the right of 37.5
- ○ E. The area between 36.5 and 37.5

28. The value given below is discrete. Use the continuity correction and describe the region of the normal distribution that corresponds to the indicated probability.

Probability of exactly 8 passengers who do not show up for a flight

Choose the correct answer below.

- ○ A. The area to the right of 8.5
- ○ B. The area between 7.5 and 8.5
- ○ C. The area to the left of 7.5
- ○ D. The area to the right of 7.5
- ○ E. The area to the left of 8.5

29. (a) With $n = 13$ and $p = 0.5$, find P(at least 8) using a binomial probability table. (b) If $np \geq 5$ and $nq \geq 5$, also estimate P(at least 8) by using the normal distribution as an approximation to the binomial distribution; if $np < 5$ or $nq < 5$, then state that the normal approximation is not suitable.

(a) Find the probability by using a binomial probability table.

P(at least 8) = ☐
(Round to three decimal places as needed.)

(b) Estimate the probability using the normal distribution. If the normal distribution cannot be used to approximate this probability, then enter 'N'.

P(at least 8) = ☐
(Round to three decimal places as needed.)

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30. In a survey of 1229 people, 796 people said they voted in a recent presidential election. Voting records show that 62% of eligible voters actually did vote. Given that 62% of eligible voters actually did vote, (a) find the probability that among 1229 randomly selected voters, at least 796 actually did vote. (b) What do the results from part (a) suggest?

(a) $P(X \geq 796) =$ ☐ (Round to four decimal places as needed.)

(b) What does the result from part (a) suggest?

- ○A. People are being honest because the probability of $P(x \geq 796)$ is at least 1%.
- ○B. Some people are being less than honest because $P(x \geq 796)$ is at least 1%.
- ○C. Some people are being less than honest because $P(x \geq 796)$ is less than 5%.
- ○D. People are being honest because the probability of $P(x \geq 796)$ is less than 5%.

31. Assume 40% of us have Group O blood. A hospital is conducting a blood drive because its supply of Group O blood is low, and it needs at least 142 donors of Group O blood. If 374 volunteers donate blood, estimate the probability that the number with Group O blood is at least 142. Is the pool of 374 volunteers likely to be sufficient?

(a) $P(X \geq 142) =$ ☐ (Round to four decimal places as needed.)

(b) What does the result from part (a) suggest?

- ○A. The pool is likely to be sufficient because $P(x \geq 142)$ is less than 50%.
- ○B. The pool is not likely to be sufficient because $P(x \geq 142)$ is less than 50%.
- ○C. The pool is likely to be sufficient because $P(x \geq 142)$ is more than 50%.
- ○D. The pool is not likely to be sufficient because $P(x \geq 142)$ is more than 50%.

32. The probability of flu symptoms for a person not receiving any treatment is 0.045. In a clinical trial of a common drug used to lower cholesterol, 43 of 879 people treated experienced flu symptoms. Assuming the drug has no effect on the likelihood of flu symptoms, estimate the probability that at least 43 people experience flu symptoms. What do these results suggest about flu symptoms as an adverse reaction to the drug?

(a) $P(X \geq 43) =$ ☐ (Round to four decimal places as needed.)

(b) What does the result from part (a) suggest?

- ○ A. The drug has no effect on flu symptoms because $x \geq 43$ is not highly unlikely.
- ○ B. The drug has no effect on flu symptoms because $x \geq 43$ is highly unlikely.
- ○ C. The drug increases the likelihood of flu symptoms because $x \geq 43$ is highly unlikely.
- ○ D. The drug increases the likelihood of flu symptoms because $x \geq 43$ is not highly unlikely.