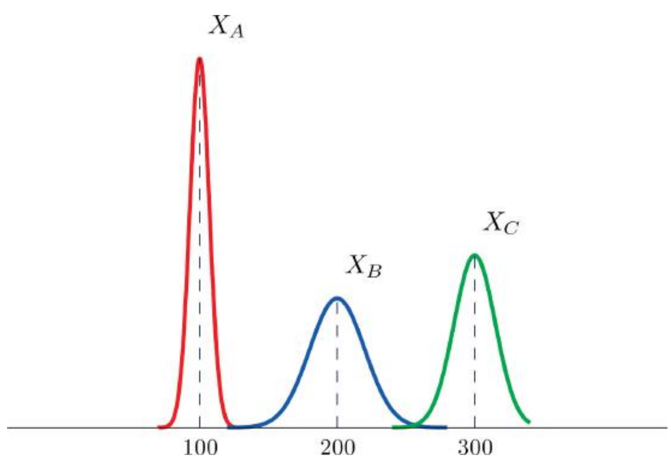
9.E: Continuous Random Variables (Exercises)

These are homework exercises to accompany the Textmap created for "Introductory Statistics" by Shafer and Zhang.

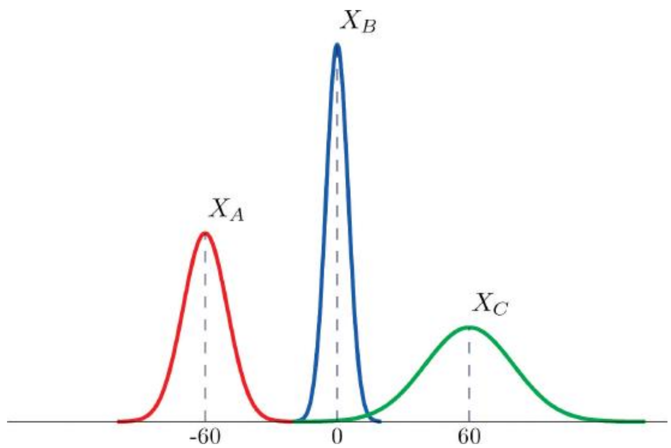
5.1: Continuous Random Variables

Basic

1. A continuous random variable X has a uniform distribution on the interval $[5, 12]$. Sketch the graph of its density function.
2. A continuous random variable X has a uniform distribution on the interval $[-3, 3]$. Sketch the graph of its density function.
3. A continuous random variable X has a normal distribution with mean 100 and standard deviation 10. Sketch a qualitatively accurate graph of its density function.
4. A continuous random variable X has a normal distribution with mean 73 and standard deviation 2.5. Sketch a qualitatively accurate graph of its density function.
5. A continuous random variable X has a normal distribution with mean 73. The probability that X takes a value greater than 80 is 0.212. Use this information and the symmetry of the density function to find the probability that X takes a value less than 66. Sketch the density curve with relevant regions shaded to illustrate the computation.
6. A continuous random variable X has a normal distribution with mean 169. The probability that X takes a value greater than 180 is 0.17. Use this information and the symmetry of the density function to find the probability that X takes a value less than 158. Sketch the density curve with relevant regions shaded to illustrate the computation.
7. A continuous random variable X has a normal distribution with mean 50.5. The probability that X takes a value less than 54 is 0.76. Use this information and the symmetry of the density function to find the probability that X takes a value greater than 47. Sketch the density curve with relevant regions shaded to illustrate the computation.
8. A continuous random variable X has a normal distribution with mean 12.25. The probability that X takes a value less than 13 is 0.82. Use this information and the symmetry of the density function to find the probability that X takes a value greater than 11.50. Sketch the density curve with relevant regions shaded to illustrate the computation.
9. The figure provided shows the density curves of three normally distributed random variables $X_A,\ X_B$ and X_C. Their standard deviations (in no particular order) are 15, 7, and 20. Use the figure to identify the values of the means $\mu_A,\ \mu_B,\ \text{and}\ \mu_C$ and standard deviations $\sigma_A,\ \sigma_B,\ \text{and}\ \sigma_C$ of the three random variables.



10. The figure provided shows the density curves of three normally distributed random variables $X_A,\ X_B$ and X_C. Their standard deviations (in no particular order) are 20, 5, and 10. Use the figure to identify the values of the means $\mu_A,\ \mu_B,\ \text{and}\ \mu_C$ and standard deviations $\sigma_A,\ \sigma_B,\ \text{and}\ \sigma_C$ of the three random variables.



Applications

11. Dogberry's alarm clock is battery operated. The battery could fail with equal probability at any time of the day or night. Every day Dogberry sets his alarm for $6:30\ a.m.$ and goes to bed at $10:00\ p.m.$. Find the probability that when the clock battery finally dies, it will do so at the most inconvenient time, between $10:00\ p.m.$ and $6:30\ a.m.$.
12. Buses running a bus line near Desdemona's house run every 15 minutes. Without paying attention to the schedule she walks to the nearest stop to take the bus to town. Find the probability that she waits more than 10 minutes.
13. The amount X of orange juice in a randomly selected half-gallon container varies according to a normal distribution with mean 64 ounces and standard deviation 0.25 ounce.
    a. Sketch the graph of the density function for X.
    b. What proportion of all containers contain less than a half gallon (64 ounces)? Explain.
    c. What is the median amount of orange juice in such containers? Explain.
14. The weight X of grass seed in bags marked 50 lb varies according to a normal distribution with mean 50 lb and standard deviation 1 ounce (0.0625 lb).
    a. Sketch the graph of the density function for X.
    b. What proportion of all bags weigh less than 50 pounds? Explain.
    c. What is the median weight of such bags? Explain.

Answers

1. The graph is a horizontal line with height $1/7$ from $x=5$ to $x=12$
2.
3. The graph is a bell-shaped curve centered at 100 and extending from about 70 to 130.
4.
5. 0.212
6.
7. 0.76
8.
9. $\mu_A=100,\ \mu_B=200,\ \mu_C=300,\ \sigma_A=7,\ \sigma_B=20,\ \sigma_C=15$
10.
11. 0.3542
12.
13.
    a. The graph is a bell-shaped curve centered at 64 and extending from about 63.25 to 64.75.
    b. 0.5
    c. 64

5.2: The Standard Normal Distribution

Basic

1. Use Figure 7.1.5: Cumulative Normal Probability to find the probability indicated.$/* <![CDATA[*/9.E.5/*]] > */$
   a. $P(Z < -1.72)$
   b. $P(Z < 2.05)$
   c. $P(Z < 0)$
   d. $P(Z > -2.11)$
   e. $P(Z > 1.63)$
   f. $P(Z > 2.36)$
2. Use Figure 7.1.5: Cumulative Normal Probability to find the probability indicated.$/* <![CDATA[*/9.E.5/*]] > */$
   a. $P(Z < -1.17)$
   b. $P(Z < -0.05)$
   c. $P(Z < 0.66)$
   d. $P(Z > -2.43)$
   e. $P(Z > -1.00)$
   f. $P(Z > 2.19)$
3. Use Figure 7.1.5: Cumulative Normal Probability to find the probability indicated.
   a. $P(-2.15 < Z < -1.09)$
   b. $P(-0.93 < Z < 0.55)$
   c. $P(0.68 < Z < 2.11)$
4. Use Figure 7.1.5: Cumulative Normal Probability to find the probability indicated.
   a. $P(-1.99 < Z < -1.03)$
   b. $P(-0.87 < Z < 1.58)$
   c. $P(0.33 < Z < 0.96)$
5. Use Figure 7.1.5: Cumulative Normal Probability to find the probability indicated.
   a. $P(-4.22 < Z < -1.39)$
   b. $P(-1.37 < Z < 5.11)$
   c. $P(Z < -4.31)$
   d. $P(Z < 5.02)$
6. Use Figure 7.1.5: Cumulative Normal Probability to find the probability indicated.
   a. $P(Z > -5.31)$
   b. $P(-4.08 < Z < 0.58)$
   c. $P(Z < -6.16)$
   d. $P(-0.51 < Z < 5.63)$
7. Use Figure 7.1.5: Cumulative Normal Probability to find the probability listed. Find the second probability without referring to the table, but using the symmetry of the standard normal density curve instead. Sketch the density curve with relevant regions shaded to illustrate the computation.
   a. $P(Z < -1.08),\ P(Z > 1.08)$
   b. $P(Z < -0.36),\ P(Z > 0.36)$
   c. $P(Z < 1.25),\ P(Z > -1.25)$
   d. $P(Z < 2.03),\ P(Z > -2.03)$
8. Use Figure 7.1.5: Cumulative Normal Probability to find the probability listed. Find the second probability without referring to the table, but using the symmetry of the standard normal density curve instead. Sketch the density curve with relevant regions shaded to illustrate the computation.
   a. $P(Z < -2.11),\ P(Z > 2.11)$
   b. $P(Z < -0.88),\ P(Z > 0.88)$
   c. $P(Z < 2.44),\ P(Z > -2.44)$
   d. $P(Z < 3.07),\ P(Z > -3.07)$
9. The probability that a standard normal random variable Z takes a value in the union of intervals $(-\infty, -\alpha] \cup [\alpha, \infty)$, which arises in applications, will be denoted $P(Z \leq -a \text{ or } Z \geq a)$. Use Figure 7.1.5: Cumulative Normal Probability to find the

following probabilities of this type. Sketch the density curve with relevant regions shaded to illustrate the computation. Because of the symmetry of the standard normal density curve you need to use Figure 7.1.5: Cumulative Normal Probability only one time for each part.

   a. $P(Z < -1.29 \text{ or } Z > 1.29)$
   b. $P(Z < -2.33 \text{ or } Z > 2.33)$
   c. $P(Z < -1.96 \text{ or } Z > 1.96)$
   d. $P(Z < -3.09 \text{ or } Z > 3.09)$

10. The probability that a standard normal random variable Z takes a value in the union of intervals $(-\infty, -\alpha] \cup [\alpha, \infty)$, which arises in applications, will be denoted $P(Z \leq -a \text{ or } Z \geq a)$. Use Figure 7.1.5: Cumulative Normal Probability to find the following probabilities of this type. Sketch the density curve with relevant regions shaded to illustrate the computation. Because of the symmetry of the standard normal density curve you need to use Figure 7.1.5: Cumulative Normal Probability only one time for each part.
    a. $P(Z < -2.58 \text{ or } Z > 2.58)$
    b. $P(Z < -2.81 \text{ or } Z > 2.81)$
    c. $P(Z < -1.65 \text{ or } Z > 1.65)$
    d. $P(Z < -2.43 \text{ or } Z > 2.43)$

Answers

1. a. 0.0427
   b. 0.9798
   c. 0.5
   d. 0.9826
   e. 0.0516
   f. 0.0091
2.
3. a. 0.1221
   b. 0.5326
   c. 0.2309
4.
5. a. 0.0823
   b. 0.9147
   c. 0.0000
   d. 1.0000
6.
7. a. $0.1401,\ 0.1401$
   b. $0.3594,\ 0.3594$
   c. $0.8944,\ 0.8944$
   d. $0.9788,\ 0.9788$
8.
9. a. 0.1970
   b. 0.01980
   c. 0.0500
   d. 0.0020

5.3: Probability Computations for General Normal Random Variables

Basic

1. X is a normally distributed random variable with mean 57 and standard deviation 6. Find the probability indicated.
   a. $P(X < 59.5)$
   b. $P(X < 46.2)$
   c. $P(X > 52.2)$

d. $P(X>70)$

2. X is a normally distributed random variable with mean -25 and standard deviation 4. Find the probability indicated.
   a. $P(X<-27.2)$
   b. $P(X<-14.8)$
   c. $P(X>-33.1)$
   d. $P(X>-16.5)$
3. X is a normally distributed random variable with mean 112 and standard deviation 15. Find the probability indicated.
   a. $P(100<X<125)$
   b. $P(91<X<107)$
   c. $P(118<X<160)$
4. X is a normally distributed random variable with mean 72 and standard deviation 22. Find the probability indicated.
   a. $P(78<X<127)$
   b. $P(60<X<90)$
   c. $P(49<X<71)$
5. X is a normally distributed random variable with mean 500 and standard deviation 25. Find the probability indicated.
   a. $P(X<400)$
   b. $P(466<X<625)$
6. X is a normally distributed random variable with mean 0 and standard deviation 0.75. Find the probability indicated.
   a. $P(-4.02<X<3.82)$
   b. $P(X>4.11)$
7. X is a normally distributed random variable with mean 15 and standard deviation 1. Use Figure 7.1.5 $/\ast <![CDATA[\ast/9.E.5/\ast]] > \ast/$ Cumulative Normal Probability to find the first probability listed. Find the second probability using the symmetry of the density curve. Sketch the density curve with relevant regions shaded to illustrate the computation.
   a. $P(X<12),\ P(X>18)$
   b. $P(X<14),\ P(X>16)$
   c. $P(X<11.25),\ P(X>18.75)$
   d. $P(X<12.67),\ P(X>17.33)$
8. X is a normally distributed random variable with mean 100 and standard deviation 10. Use Figure 7.1.5 $/\ast <![CDATA[\ast/9.E.5/\ast]] > \ast/$ Cumulative Normal Probability to find the first probability listed. Find the second probability using the symmetry of the density curve. Sketch the density curve with relevant regions shaded to illustrate the computation.
   a. $P(X<80),\ P(X>120)$
   b. $P(X<75),\ P(X>125)$
   c. $P(X<84.55),\ P(X>115.45)$
   d. $P(X<77.42),\ P(X>122.58)$
9. X is a normally distributed random variable with mean 67 and standard deviation 13. The probability that X takes a value in the union of intervals $(-\infty, 67-a] \cup [67+a, \infty)$ will be denoted $P(X \leq 67-a \text{ or } X \geq 67+a)$. Use Figure 7.1.5 $/\ast <![CDATA[\ast/9.E.5/\ast]] > \ast/$ Cumulative Normal Probability to find the following probabilities of this type. Sketch the density curve with relevant regions shaded to illustrate the computation. Because of the symmetry of the density curve you need to use Figure 7.1.5$/\ast <![CDATA[\ast/9.E.5/\ast]] > \ast/$ Cumulative Normal Probability only one time for each part.
   a. $P(X<57 \text{ or } X>77)$
   b. $P(X<47 \text{ or } X>87)$
   c. $P(X<49 \text{ or } X>85)$
   d. $P(X<37 \text{ or } X>97)$
10. X is a normally distributed random variable with mean 288 and standard deviation 6. The probability that X takes a value in the union of intervals $(-\infty, 288-a] \cup [288+a, \infty)$ will be denoted $P(X \leq 288-a \text{ or } X \geq 288+a)$. Use Figure 7.1.5 $/\ast <![CDATA[\ast/9.E.5/\ast]] > \ast/$ Cumulative Normal Probability to find the following probabilities of this type. Sketch the

density curve with relevant regions shaded to illustrate the computation. Because of the symmetry of the density curve you need to use Figure 7.1.5$/*<![CDATA[*/9.E.5/*]]>*/$: Cumulative Normal Probability only one time for each part.

a. $P(X<278 \text{ or } X>298)$
b. $P(X<268 \text{ or } X>308)$
c. $P(X<273 \text{ or } X>303)$
d. $P(X<280 \text{ or } X>296)$

Applications

11. The amount X of beverage in a can labeled 12 ounces is normally distributed with mean 12.1 ounces and standard deviation 0.05 ounce. A can is selected at random.

    a. Find the probability that the can contains at least 12 ounces.
    b. Find the probability that the can contains between 11.9 and 12.1 ounces.

12. The length of gestation for swine is normally distributed with mean 114 days and standard deviation 0.75 day. Find the probability that a litter will be born within one day of the mean of 114.
13. The systolic blood pressure X of adults in a region is normally distributed with mean 112 mm Hg and standard deviation 15 mm Hg. A person is considered “prehypertensive” if his systolic blood pressure is between 120 and 130 mm Hg. Find the probability that the blood pressure of a randomly selected person is prehypertensive.
14. Heights X of adult women are normally distributed with mean 63.7 inches and standard deviation 2.71 inches. Romeo, who is 69.25 inches tall, wishes to date only women who are shorter than he but within 4 inches of his height. Find the probability that the next woman he meets will have such a height.
15. Heights X of adult men are normally distributed with mean 69.1 inches and standard deviation 2.92 inches. Juliet, who is 63.25 inches tall, wishes to date only men who are taller than she but within 6 inches of her height. Find the probability that the next man she meets will have such a height.
16. A regulation hockey puck must weigh between 5.5 and 6 ounces. The weights X of pucks made by a particular process are normally distributed with mean 5.75 ounces and standard deviation 0.11 ounce. Find the probability that a puck made by this process will meet the weight standard.
17. A regulation golf ball may not weigh more than 1.620 ounces. The weights X of golf balls made by a particular process are normally distributed with mean 1.361 ounces and standard deviation 0.09 ounce. Find the probability that a golf ball made by this process will meet the weight standard.
18. The length of time that the battery in Hippolyta's cell phone will hold enough charge to operate acceptably is normally distributed with mean 25.6 hours and standard deviation 0.32 hour. Hippolyta forgot to charge her phone yesterday, so that at the moment she first wishes to use it today it has been 26 hours 18 minutes since the phone was last fully charged. Find the probability that the phone will operate properly.
19. The amount of non-mortgage debt per household for households in a particular income bracket in one part of the country is normally distributed with mean $\$28,350$ and standard deviation $\$3,425$. Find the probability that a randomly selected such household has between $\$20,000$ and $\$30,000$ in non-mortgage debt.
20. Birth weights of full-term babies in a certain region are normally distributed with mean 7.125 lb and standard deviation 1.290 lb. Find the probability that a randomly selected newborn will weigh less than 5.5 lb, the historic definition of prematurity.
21. The distance from the seat back to the front of the knees of seated adult males is normally distributed with mean 23.8 inches and standard deviation 1.22 inches. The distance from the seat back to the back of the next seat forward in all seats on aircraft flown by a budget airline is 26 inches. Find the proportion of adult men flying with this airline whose knees will touch the back of the seat in front of them.
22. The distance from the seat to the top of the head of seated adult males is normally distributed with mean 36.5 inches and standard deviation 1.39 inches. The distance from the seat to the roof of a particular make and model car is 40.5 inches. Find the proportion of adult men who when sitting in this car will have at least one inch of headroom (distance from the top of the head to the roof).

Additional Exercises

23. The useful life of a particular make and type of automotive tire is normally distributed with mean $57,500$ miles and standard deviation 950 miles.

    a. Find the probability that such a tire will have a useful life of between $57,000$ and $58,000$ miles.

b. Hamlet buys four such tires. Assuming that their lifetimes are independent, find the probability that all four will last between $57,000$ and $58,000$ miles. (If so, the best tire will have no more than $1,000$ miles left on it when the first tire fails.) Hint: There is a binomial random variable here, whose value of p comes from part (a).

24. A machine produces large fasteners whose length must be within 0.5 inch of 22 inches. The lengths are normally distributed with mean 22.0 inches and standard deviation 0.17 inch.
    a. Find the probability that a randomly selected fastener produced by the machine will have an acceptable length.
    b. The machine produces 20 fasteners per hour. The length of each one is inspected. Assuming lengths of fasteners are independent, find the probability that all 20 will have acceptable length. Hint: There is a binomial random variable here, whose value of p comes from part (a).
25. The lengths of time taken by students on an algebra proficiency exam (if not forced to stop before completing it) are normally distributed with mean 28 minutes and standard deviation 1.5 minutes.
    a. Find the proportion of students who will finish the exam if a 30-minute time limit is set.
    b. Six students are taking the exam today. Find the probability that all six will finish the exam within the 30-minute limit, assuming that times taken by students are independent. Hint: There is a binomial random variable here, whose value of p comes from part (a).
26. Heights of adult men between 18 and 34 years of age are normally distributed with mean 69.1 inches and standard deviation 2.92 inches. One requirement for enlistment in the military is that men must stand between 60 and 80 inches tall.
    a. Find the probability that a randomly elected man meets the height requirement for military service.
    b. Twenty-three men independently contact a recruiter this week. Find the probability that all of them meet the height requirement. Hint: There is a binomial random variable here, whose value of p comes from part (a).
27. A regulation hockey puck must weigh between 5.5 and 6 ounces. In an alternative manufacturing process the mean weight of pucks produced is 5.75 ounce. The weights of pucks have a normal distribution whose standard deviation can be decreased by increasingly stringent (and expensive) controls on the manufacturing process. Find the maximum allowable standard deviation so that at most 0.005 of all pucks will fail to meet the weight standard. (Hint: The distribution is symmetric and is centered at the middle of the interval of acceptable weights.)
28. The amount of gasoline X delivered by a metered pump when it registers 5 gallons is a normally distributed random variable. The standard deviation σ of Xmeasures the precision of the pump; the smaller σ is the smaller the variation from delivery to delivery. A typical standard for pumps is that when they show that 5 gallons of fuel has been delivered the actual amount must be between 4.97 and 5.03 gallons (which corresponds to being off by at most about half a cup). Supposing that the mean of X is 5, find the largest that σ can be so that $P(4.97 < X < 5.03)$ is $1.0000$to four decimal places when computed using Figure 7.1.5: Cumulative Normal Probability which means that the pump is sufficiently accurate. (Hint: The z-score of 5.03 will be the smallest value of Z so that Figure 7.1.5: Cumulative Normal Probability gives $P(Z < z) = 1.0000$).

Answers

1. a. 0.6628
   b. 0.0359
   c. 0.7881
   d. 0.0150
2.
3. a. 0.5959
   b. 0.2899
   c. 0.3439
4.
5. a. 0.0000
   b. 0.9131
6.
7. a. $0.0013,\ 0.0013$
   b. $0.1587,\ 0.1587$
   c. $0.0001,\ 0.0001$
   d. $0.0099,\ 0.0099$

8.
9. a. 0.4412
   b. 0.1236
   c. 0.1676
   d. 0.0208
10.
11. a. 0.9772
    b. 0.5000
12.
13. 0.1830
14.
15. 0.4971
16.
17. 0.9980
18.
19. 0.6771
20.
21. 0.0359
22.
23. a. 0.4038
    b. 0.0266
24.
25. a. 0.9082
    b. 0.5612
26.
27. 0.089

5.4: Areas of Tails of Distributions

Basic

1. Find the value of $z*$ that yields the probability shown.
   a. $P(Z < z*) = 0.0075$
   b. $P(Z < z*) = 0.9850$
   c. $P(Z > z*) = 0.8997$
   d. $P(Z > z*) = 0.0110$
2. Find the value of $z*$ that yields the probability shown.
   a. $P(Z < z*) = 0.3300$
   b. $P(Z < z*) = 0.9901$
   c. $P(Z > z*) = 0.0055$
   d. $P(Z > z*) = 0.7995$
3. Find the value of $z*$ that yields the probability shown.
   a. $P(Z < z*) = 0.1500$
   b. $P(Z < z*) = 0.7500$
   c. $P(Z > z*) = 0.3333$
   d. $P(Z > z*) = 0.8000$
4. Find the value of $z*$ that yields the probability shown.
   a. $P(Z < z*) = 0.2200$
   b. $P(Z < z*) = 0.6000$
   c. $P(Z > z*) = 0.0750$
   d. $P(Z > z*) = 0.8200$

5. Find the indicated value of Z. (It is easier to find $-z_c$ and negate it.)
   a. $Z_{0.025}$
   b. $Z_{0.20}$
6. Find the indicated value of Z. (It is easier to find $-z_c$ and negate it.)
   a. $Z_{0.002}$
   b. $Z_{0.02}$
7. Find the value of $x*$ that yields the probability shown, where X is a normally distributed random variable X with mean 83 and standard deviation 4.
   a. $P(X < x*) = 0.8700$
   b. $P(X > x*) = 0.0500$
8. Find the value of $x*$ that yields the probability shown, where X is a normally distributed random variable X with mean 54 and standard deviation 12.
   a. $P(X < x*) = 0.0900$
   b. $P(X > x*) = 0.6500$
9. X is a normally distributed random variable X with mean 15 and standard deviation 0.25. Find the values X_L and X_R of X that are symmetrically located with respect to the mean of X and satisfy $P(X_L < X < X_R) = 0.80$. (Hint. First solve the corresponding problem for Z).
10. X is a normally distributed random variable X with mean 28 and standard deviation 3.7. Find the values X_L and X_R of X that are symmetrically located with respect to the mean of X and satisfy $P(X_L < X < X_R) = 0.65$. (Hint. First solve the corresponding problem for Z).

Applications

11. Scores on a national exam are normally distributed with mean 382 and standard deviation 26.
    a. Find the score that is the 50^{th} percentile.
    b. Find the score that is the 90^{th} percentile.
12. Heights of women are normally distributed with mean 63.7 inches and standard deviation 2.47 inches.
    a. Find the height that is the 10^{th} percentile.
    b. Find the height that is the 80^{th} percentile.
13. The monthly amount of water used per household in a small community is normally distributed with mean $7,069$ gallons and standard deviation 58 gallons. Find the three quartiles for the amount of water used.
14. The quantity of gasoline purchased in a single sale at a chain of filling stations in a certain region is normally distributed with mean 11.6 gallons and standard deviation 2.78 gallons. Find the three quartiles for the quantity of gasoline purchased in a single sale.
15. Scores on the common final exam given in a large enrollment multiple section course were normally distributed with mean 69.35 and standard deviation 12.93. The department has the rule that in order to receive an A in the course his score must be in the top 10% of all exam scores. Find the minimum exam score that meets this requirement.
16. The average finishing time among all high school boys in a particular track event in a certain state is 5 minutes 17 seconds. Times are normally distributed with standard deviation 12 seconds.
    a. The qualifying time in this event for participation in the state meet is to be set so that only the fastest 5% of all runners qualify. Find the qualifying time. (Hint: Convert seconds to minutes.)
    b. In the western region of the state the times of all boys running in this event are normally distributed with standard deviation 12 seconds, but with mean 5 minutes 22 seconds. Find the proportion of boys from this region who qualify to run in this event in the state meet.
17. Tests of a new tire developed by a tire manufacturer led to an estimated mean tread life of $67,350$ miles and standard deviation of $1,120$ miles. The manufacturer will advertise the lifetime of the tire (for example, a “$50,000$ mile tire”) using the largest value for which it is expected that 98% of the tires will last at least that long. Assuming tire life is normally distributed, find that advertised value.
18. Tests of a new light led to an estimated mean life of $1,321$ hours and standard deviation of 106 hours. The manufacturer will advertise the lifetime of the bulb using the largest value for which it is expected that 90% of the bulbs will last at least that long. Assuming bulb life is normally distributed, find that advertised value.

19. The weights X of eggs produced at a particular farm are normally distributed with mean 1.72 ounces and standard deviation 0.12 ounce. Eggs whose weights lie in the middle 75% of the distribution of weights of all eggs are classified as "medium." Find the maximum and minimum weights of such eggs. (These weights are endpoints of an interval that is symmetric about the mean and in which the weights of 75% of the eggs produced at this farm lie.)
20. The lengths X of hardwood flooring strips are normally distributed with mean 28.9 inches and standard deviation 6.12 inches. Strips whose lengths lie in the middle 80% of the distribution of lengths of all strips are classified as "average-length strips." Find the maximum and minimum lengths of such strips. (These lengths are endpoints of an interval that is symmetric about the mean and in which the lengths of 80% of the hardwood strips lie.)
21. All students in a large enrollment multiple section course take common in-class exams and a common final, and submit common homework assignments. Course grades are assigned based on students' final overall scores, which are approximately normally distributed. The department assigns a C to students whose scores constitute the middle $2/3$ of all scores. If scores this semester had mean 72.5 and standard deviation 6.14, find the interval of scores that will be assigned a C.
22. Researchers wish to investigate the overall health of individuals with abnormally high or low levels of glucose in the blood stream. Suppose glucose levels are normally distributed with mean 96 and standard deviation $8.5\ mg/dl$, and that "normal" is defined as the middle 90% of the population. Find the interval of normal glucose levels, that is, the interval centered at 96 that contains 90% of all glucose levels in the population.

Additional Exercises

23. A machine for filling 2-liter bottles of soft drink delivers an amount to each bottle that varies from bottle to bottle according to a normal distribution with standard deviation 0.002 liter and mean whatever amount the machine is set to deliver.
    a. If the machine is set to deliver 2 liters (so the mean amount delivered is 2 liters) what proportion of the bottles will contain at least 2 liters of soft drink?
    b. Find the minimum setting of the mean amount delivered by the machine so that at least 99% of all bottles will contain at least 2 liters.
24. A nursery has observed that the mean number of days it must darken the environment of a species poinsettia plant daily in order to have it ready for market is 71 days. Suppose the lengths of such periods of darkening are normally distributed with standard deviation 2 days. Find the number of days in advance of the projected delivery dates of the plants to market that the nursery must begin the daily darkening process in order that at least 95% of the plants will be ready on time. (Poinsettias are so long-lived that once ready for market the plant remains salable indefinitely.)

Answers

1. a. -2.43
   b. 2.17
   c. -1.28
   d. 2.29
2.
3. a. -1.04
   b. 0.67
   c. 0.43
   d. -0.84
4.
5. a. 1.96
   b. 0.84
6.
7. a. 87.52
   b. 89.58
8.
9. 15.32
10.
11. a. 382
    b. 415

12.
13. $7030.14,\ 7069,\ 7107.86$
14.
15. 85.90
16.
17. $65,054$
18.
19. $1.58,\ 1.86$
20.
21. $66.5,\ 78.5$
22.
23. a. 0.5
    b. 2.005

Contributor

- Anonymous