Review for Chapter 5 Quiz

Name TEACHER

Find areas under a standard normal curve.

1) Find the area under the standard normal curve to the right of z = 1.

.1587

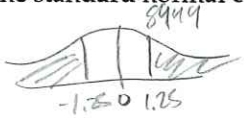
2) Find the area under the standard normal curve between z = 1 and z = 2.

at z = 2 ⇒ .9772
at z = 1 = .8413
.1359

3) Find the area under the standard normal curve to the left of z = 1.5.

.9332

4) Find the sum of the areas under the standard normal curve to the left of z = −1.25 and to the right of z = 1.25.



.1056
.1056
.2112

5) For the standard normal curve, find the z-score that corresponds to the third quartile. .75

.675

Find the requested probabilities. Show work.

6) The lengths of pregnancies of humans are normally distributed with a mean of 268 days and a standard deviation of 15 days.

a) Find the probability of a pregnancy lasting less than 250 days.

$z = \frac{250 - 268}{15} = -1.2$

−1.2 → .1151 → 11.51%

P = .1151

b) Out of 50 pregnancies, how many would you expect to last less than 250 days?

~~$\frac{15}{\sqrt{50}} = 2.12$~~

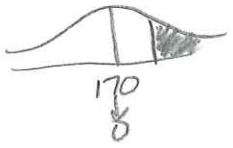
~~$\frac{250 - 268}{2.12} = -8.49 \Rightarrow 0\%$~~

50 · .1151 → 5.755

2729 31 3459

7) The distribution of cholesterol levels in teenage boys is approximately normal with $\mu = 170$ and $\sigma = 30$ (Source: U.S. National Center for Health Statistics). Levels above 200 warrant attention.

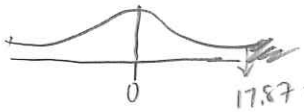
a) Find the probability that a teenage boy has a cholesterol level greater than 225.



$\frac{225-170}{30} = z = 1.833 \Rightarrow p = .9664$

$1 - .9664 = .0336$ ✓

b) If 95 teenage boys are examined, how many would you expect to have cholesterol levels greater than 225?



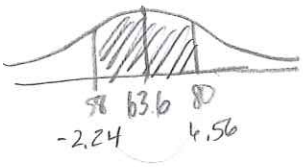
$\text{s.e.} \frac{30}{\sqrt{95}} = 3.077 \Rightarrow z = \frac{225-170}{3.077} = 17.87 \Rightarrow p = 1$

$1 - 1 = 0\% \Rightarrow$ no teenage boys.

$95 \times .0336 = 3.1 \Rightarrow$ 3 Boys

8) Assume that the heights of women are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. The U.S. Army requires that the heights of women be between 58 and 80 inches.

a) If a woman is randomly selected, what is the probability that her height is between 58 and 80 inches?



$\frac{58-63.6}{2.5} = z = -2.24 \Rightarrow p = .0125$

$\frac{80-63.6}{2.5} = z = 6.56 \Rightarrow p = 1$

$1 - .0125 = .9875$ ✓

b) If 200 women want to enlist in the U.S. Army, how many would you expect to meet the height requirements?

$SE = \frac{2.5}{\sqrt{200}} = .1768$

$z = \frac{58-63.6}{.1768} = -31.67 \Rightarrow p = 0$

$z = \frac{80-63.6}{.1768} = 92.7 \Rightarrow p = 1$

$1 - 0 = 1 \Rightarrow 100\%$ or all 200 women

$200(.9875)$ 197 women

Find the requested values. Show work.

9) IQ test scores are normally distributed with a mean of 100 and a standard deviation of 15. Find the x-score that corresponds to a z-score of 2.33.

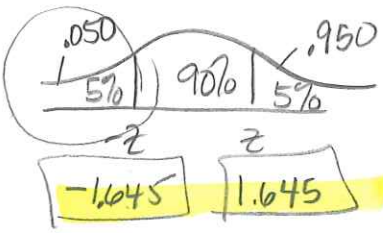
$2.33 = \frac{x-100}{15}$

$x = 134.95$ or $x = 135$ ✓

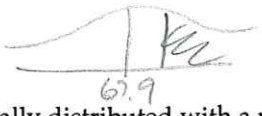
10) For the standard normal curve, find the z-score that corresponds to the 90th percentile.

$\Rightarrow .9000 \Rightarrow z = 1.285$ ✓

11) Find the z-scores for which 90% of the distribution's area lies between -z and z.



✓



18) Assume that the heights of men are normally distributed with a mean of 67.9 inches and a standard deviation of 2.8 inches. If 64 men are randomly selected, find the probability that they have a mean height greater than 68.9 inches.

.0021

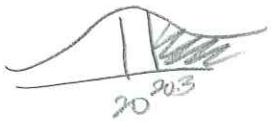
normal cdf

$\frac{68.9-67.9}{2.8/\sqrt{64}} = 2.86$

19) The body temperatures of adults are normally distributed with a mean of 98.6° F and a standard deviation of 0.60° F. If 25 adults are randomly selected, find the probability that their mean body temperature is less than 99° F.

.9996

20) A soda machine dispenses normally distributed amounts of soda with a mean of 20 ounces and a standard deviation of 0.2 ounce. Are you more likely to randomly select one bottle with more than 20.3 ounces or are you more likely to select a sample of eight bottles with a mean amount of more than 20.3 ounces? Explain.



$SE = \frac{.2}{\sqrt{8}} = .0707$

$z = \frac{20.3-20}{.2} = 1.5$

$1 - .9332 = .0668$

$\frac{20.3-20}{.0707} = 4.24 \Rightarrow 0.00$

$p=1$ so $1-1=0$

* you are more likely

$5x - 12.5 = 4x - 10$

$4x - 10 = (5e - x01)\frac{2}{1}$

$4.5x - 10 = 4x - 10$

$\frac{1}{3}(ax - 30)$

$\frac{1}{3}(3x + 15 + 6x - 35)$

12) Assume that blood pressure readings are normally distributed with $\mu = 124$ and $\sigma = 9$. A researcher wishes to select people for a study but wants to exclude the top and bottom 10 percent. What would be the upper and lower readings to qualify people to participate in the study?

$z@.100 \Rightarrow -1.285 \longrightarrow -1.285 = \frac{x-124}{9}$ $\quad x = 112.44$

$z@.90 \Rightarrow 1.285 \longrightarrow 1.284 = \frac{x-124}{9}$ $\quad x = 135.57$

13) Assume that the salaries of elementary school teachers in the United States are normally distributed with a mean of \$35,000 and a standard deviation of \$4000. What is the cutoff salary for teachers in the top 10%?

$1.285 = \frac{x - 35000}{4000}$ $\quad x = 40,140$ OR 40,120 (rounded z)

14) Assume that the salaries of elementary school teachers in the United States are normally distributed with a mean of \$34,000 and a standard deviation of \$2000. What is the cutoff salary for teachers in the bottom 10%?

$-1.285 = \frac{x - 34000}{2000}$ $\quad x = 31,430$ OR 31,440 (rounded z)

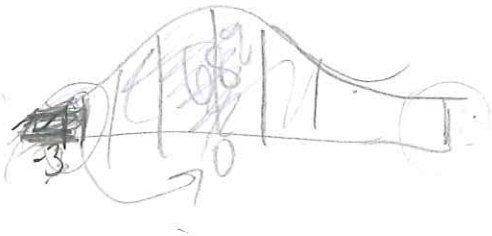
15) Assume that the heights of women are normally distributed with a mean of 64.9 inches and a standard deviation of 1.6 inches. Find Q_3, the third quartile that separates the bottom 75% from the top 25%.

$.675 = \frac{x - 64.9}{1.6}$ $\quad x = 65.98 \Rightarrow 66$

Answer the following question using the Central Limit Theorem. Show work.

16) The distribution of room and board expenses per year at a four-year college is normally distributed with a mean of \$5850 and standard deviation of \$1125. Random samples of size 20 are drawn from this population. Would a sample mean of \$5180 be considered unusual?

$\frac{1125}{\sqrt{20}} = 251.55$ $\quad z = -2.66$ $\quad$ YES

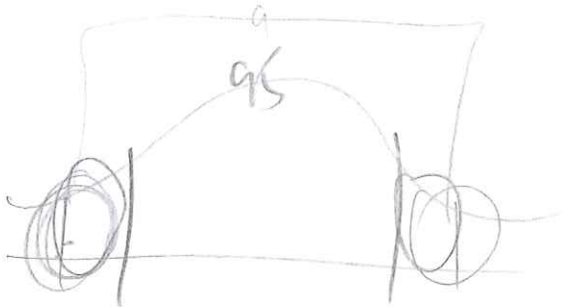


17) Assume that the heights of women are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 75 women are randomly selected, find the probability that they have a mean height between 63 and 65 inches.

$SE = \frac{2.5}{\sqrt{75}} = .2887$

$\frac{63 - 63.6}{.2887} = -2.08 \Rightarrow p = .0188$

$\frac{65 - 63.6}{.2887} = 4.85 \Rightarrow p = 1$



$p = 1 - .0188$

$p = .9812$

Worksheet 5: ~~1.3~~ Review Questions Test ch 5.

Name_____

Solve the problem.

1) Find the area under the standard normal curve between z = 0 and z = 3.

normalcdf(0, 3, 0, 1) = .499

2) Use the standard normal distribution to find P(0 < z < 2.25).

normalcdf(0, 2.25, 0, 1) = .488

3) Use the standard normal distribution to find P(−2.25 < z < 0).

normalcdf(−2.25, 0, 0, 1) = .488

4) Use the standard normal distribution to find P(−2.25 < z < 1.25).

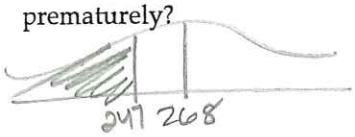
normalcdf(−2.25, 1.25, 0, 1) = .8821

5) Use the standard normal distribution to find P(−2.50 < z < 1.50).

normalcdf(−2.5, 1.5, 0, 1) = .921

6) The lengths of pregnancies of humans are normally distributed with a mean of 268 days and a standard deviation of 15 days. A baby is premature if it is born three weeks early. What percentage of babies are born prematurely?

21 days

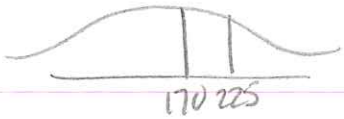


P(x<247) = normalcdf(−∞, 247, 268, 15) = .0808

7) The lengths of pregnancies of humans are normally distributed with a mean of 268 days and a standard deviation of 15 days. Find the probability of a pregnancy lasting more than 300 days.

P(x>300) = normalcdf(300, ∞, 268, 15) = .0164

8) The distribution of cholesterol levels in teenage boys is approximately normal with μ = 170 and σ = 30 (Source: U.S. National Center for Health Statistics). Levels above 200 warrant attention. What percentage of teenage boys have levels between 170 and 225?

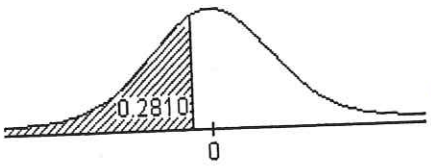


P(170<x<225) = normalcdf(170, 225, 170, 30) = .4666

9) An airline knows from experience that the distribution of the number of suitcases that get lost each week on a certain route is approximately normal with μ = 15.5 and σ = 3.6. What is the probability that during a given week the airline will lose between 10 and 20 suitcases?

P(10<x<20) = normalcdf(10, 20, 15.5, 3.6) = .831

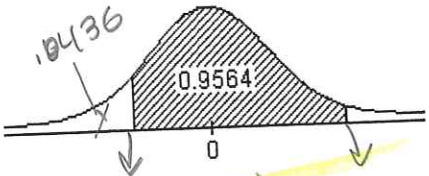
10) Find the z-score that corresponds to the given area under the standard normal curve.



-,5799

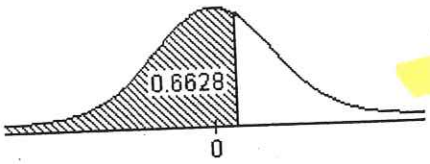
inv.norm(

11) Find the z-score that corresponds to the given area under the standard normal curve.



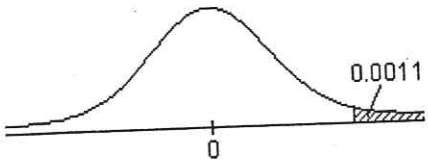
-1.71 = z

12) Find the z-score that corresponds to the given area under the standard normal curve.



z = ,420

13) Find the z-score that corresponds to the given area under the standard normal curve.

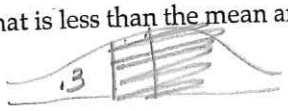


1 - ,0011 = ,9989

invnorm(,9989, 0, 1)

z = 3.06

14) Find the z-score that is less than the mean and for which 70% of the distribution's area lies to its right



Area = ,3

z = -,524

15) Find the z-score that is greater than the mean and for which 70% of the distribution's area lies to its left.

Area = ,7

z = ,5244

16) The times for completing one circuit of a bicycle course are normally distributed with a mean of 76.6 minutes and a standard deviation of 4.4 minutes. An association wants to sponsor a race but only wants the fastest 25% of riders included. In a trial run, what should be the cutoff time?

$-.674 = \frac{x - 76.6}{4.4}$ $x = 73.6 \text{ min}$

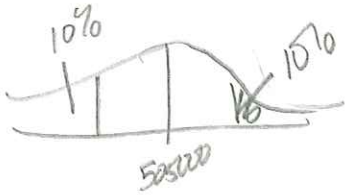
17) Assume that the heights of women are normally distributed with a mean of 62.3 inches and a standard deviation of 2.1 inches. Find Q_3, the third quartile that separates the bottom 75% from the top 25%.

$.674 = \frac{x - 62.3}{2.1}$ $x = 63.7 \text{ in}$

18) The body temperatures of adults are normally distributed with a mean of 98.6° F and a standard deviation of 0.13° F. What temperature represents the 95th percentile?

$1.64 = \frac{x - 98.6}{.13}$ $x = 98.8$

19) A tire company finds the lifespan for one brand of its tires is normally distributed with a mean of 50,500 miles and a standard deviation of 4000 miles. If the manufacturer is willing to replace no more than 10% of the tires, what should be the approximate number of miles for a warranty?



$z = -1.28 = \frac{x - 50500}{4000}$

45373