

7.E: Normal Distribution (Exercises)

You may want to use the "Calculate Area for a given X " and the "Calculate X for a given Area" calculators for some of these exercises.

General Questions

Q1

If scores are normally distributed with a mean of 35 and a standard deviation of 10, what percent of the scores is: (relevant section)

- a. greater than 34
- b. smaller than 42
- c. between 28 and 34

Q2

- a. What are the mean and standard deviation of the standard normal distribution?
- b. What would be the mean and standard deviation of a distribution created by multiplying the standard normal distribution by 8 and then adding 75? (relevant section & here)

Q3

The normal distribution is defined by two parameters. What are they? (relevant section)

Q4

- a. What proportion of a normal distribution is within one standard deviation of the mean?
- b. What proportion is more than 2.0 standard deviations from the mean?
- c. What proportion is between 1.25 and 2.1 standard deviations above the mean? (relevant section)

Q5

A test is normally distributed with a mean of 70 and a standard deviation of 8.

- a. What score would be needed to be in the 85th percentile?
- b. What score would be needed to be in the 22nd percentile? (relevant section)

Q6

Assume a normal distribution with a mean of 70 and a standard deviation of 12. What limits would include the middle 65% of the cases? (relevant section)

Q7

A normal distribution has a mean of 20 and a standard deviation of 4. Find the Z scores for the following numbers: (relevant section)

- a. 28
- b. 18
- c. 10
- d. 23

Q8

Assume the speed of vehicles along a stretch of $I - 10$ has an approximately normal distribution with a mean of 71 mph and a standard deviation of 8 mph.

- a. The current speed limit is 65 mph. What is the proportion of vehicles less than or equal to the speed limit?
- b. What proportion of the vehicles would be going less than 50 mph?
- c. A new speed limit will be initiated such that approximately 10% of vehicles will be over the speed limit. What is the new speed limit based on this criterion?
- d. In what way do you think the actual distribution of speeds differs from a normal distribution? (relevant section)

Q9

A variable is normally distributed with a mean of 120 and a standard deviation of 5. One score is randomly sampled. What is the probability it is above 127? (relevant section)

Q10

You want to use the normal distribution to approximate the binomial distribution. Explain what you need to do to find the probability of obtaining exactly 7 heads out of 12 flips. (relevant section)

Q11

A group of students at a school takes a history test. The distribution is normal with a mean of 25, and a standard deviation of 4.

- Everyone who scores in the top 30% of the distribution gets a certificate. What is the lowest score someone can get and still earn a certificate?
- The top 5% of the scores get to compete in a statewide history contest. What is the lowest score someone can get and still go onto compete with the rest of the state? (relevant section)

Q12

Use the normal distribution to approximate the binomial distribution and find the probability of getting 15 to 18 heads out of 25 flips. Compare this to what you get when you calculate the probability using the binomial distribution. Write your answers out to four decimal places. (relevant section & relevant section)

Q13

True/false: For any normal distribution, the mean, median, and mode will have the same value. (relevant section)

Q14

True/false: In a normal distribution, 11.5% of scores are greater than $Z = 1.2$. (relevant section)

Q15

True/false: The percentile rank for the mean is 50% for any normal distribution. (relevant section)

Q16

True/false: The larger the π , the better the normal distribution approximates the binomial distribution. (relevant section & relevant section)

Q17

True/false: A Z -score represents the number of standard deviations above or below the mean. (relevant section)

Q18

True/false: Abraham de Moivre, a consultant to gamblers, discovered the normal distribution when trying to approximate the binomial distribution to make his computations easier. (relevant section)

Q19

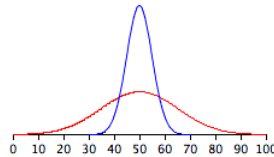
True/false: The standard deviation of the blue distribution shown below is about 10. (relevant section)

Q20

True/false: In the figure below, the red distribution has a larger standard deviation than the blue distribution. (relevant section)

Q21

True/false: The red distribution has more area underneath the curve than the blue distribution does. (relevant section)



Questions from Case Studies

The following question uses data from the Angry Moods (AM) case study.

Q22

For this problem, use the Anger Expression (AE) scores.

- Compute the mean and standard deviation.
- Then, compute what the 25th, 50th and 75th percentiles would be if the distribution were normal.
- Compare the estimates to the actual 25th, 50th and 75th percentiles. (relevant section)

The following question uses data from the Physicians Reaction (PR) case study.

Q23

For this problem, use the time spent with the overweight patients.

- Compute the mean and standard deviation of this distribution.
- What is the probability that if you chose an overweight participant at random, the doctor would have spent 31 minutes or longer with this person?
- Now assume this distribution is normal (and has the same mean and standard deviation). Now what is the probability that if you chose an overweight participant at random, the doctor would have spent 31 minutes or longer with this person? (relevant section)

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Q24

A set of test scores are normally distributed. Their mean is 100 and standard deviation is 20. These scores are converted to standard normal z scores. What would be the mean and median of this distribution?

- 0
- 1
- 50
- 100

Q25

Suppose that weights of bags of potato chips coming from a factory follow a normal distribution with mean 12.8 ounces and standard deviation 0.6 ounces. If the manufacturer wants to keep the mean at 12.8 ounces but adjust the standard deviation so that only 1% of the bags weigh less than 12 ounces, how small does he/she need to make that standard deviation?

Q26

A student received a standardized (z) score on a test that was -0.57 . What does this score tell about how this student scored in relation to the rest of the class? Sketch a graph of the normal curve and shade in the appropriate area.

Q27

Suppose you take 50 measurements on the speed of cars on Interstate 5, and that these measurements follow roughly a Normal distribution. Do you expect the standard deviation of these 50 measurements to be about 1 mph, 5 mph, 10 mph, or 20 mph? Explain.

Q28

Suppose that combined verbal and math SAT scores follow a normal distribution with mean 896 and standard deviation 174. Suppose further that Peter finds out that he scored in the top 3% of SAT scores. Determine how high Peter's score must have been.

Q29

Heights of adult women in the United States are normally distributed with a population mean of $\mu = 63.5$ inches and a population standard deviation of $\sigma = 2.5$. A medical researcher is planning to select a large random sample of adult women to participate in a future study. What is the standard value, or z -value, for an adult woman who has a height of 68.5 inches?

Q30

An automobile manufacturer introduces a new model that averages 27 miles per gallon in the city. A person who plans to purchase one of these new cars wrote the manufacturer for the details of the tests, and found out that the standard deviation is 3 miles per gallon. Assume that in-city mileage is approximately normally distributed.

- What is the probability that the person will purchase a car that averages less than 20 miles per gallon for in-city driving?
- What is the probability that the person will purchase a car that averages between 25 and 29 miles per gallon for in-city driving?

Select Answers

S1

- 75.8%

S2

- Mean = 75

S4

- 0.088

S5

- 78.3

S7

- 2.0

S8

- 0.227

S11

- 27.1

S12

0.2037(normal approximation)

S22

25th percentile:

- 28.27
- 26.75

S23

b. 0.053

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