

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## THE NORMAL DISTRIBUTION COMMON CORE ALGEBRA II



Many populations have a distribution that can be well described with what is known as **The Normal Distribution** or the **Bell Curve**. This curve, as seen in the accompanying handout to this lesson, shows the percent or proportion of a normally distributed data set that lies certain amounts from the mean.

**Exercise #1:** For a population that is normally distributed, find the percentage of the population that lies

(a) within one standard deviation of the mean.                      (b) within two standard deviations of the mean.

(c) more than three standard deviations away from the mean.                      (d) between one and two standard deviations above the mean.

As can be easily seen from *Exercise #1*, the majority of any normally distributed population will lie within one standard deviation of its mean and the vast majority will lie within two standard deviations. A whole variety of problems can be solved if we know that a population is normally distributed.

**Exercise #2:** At Arlington High School, 424 juniors recently took the SAT exam. On the math portion of the exam, the mean score was 540 with a standard deviation of 80. If the scores on the exam were normally distributed, answer the following questions.

(a) What percent of the math scores fell between 500 and 660?                      (b) How many scores fell between 500 and 660? Round your answer to the nearest whole number.

(c) If Evin scored a 740 on her math exam, what percent of the students who took the exam did better than her?                      (d) Approximately how many students did better than Evin?



**Exercise #3:** The heights of 16 year old teenage boys are normally distributed with a mean of 66 inches and a standard deviation of 3. If Jabari is 72 inches tall, which of the following is closest to his height's percentile rank?

- (1) 85<sup>th</sup>                      (3) 98<sup>th</sup>  
(2) 67<sup>th</sup>                      (4) 93<sup>rd</sup>
- 

**Exercise #4:** The amount of soda in a standard can is normally distributed with a mean of 12 ounces and a standard deviation of 0.6 ounces. If 250 soda cans were pulled by a company to check volume, how many would be expected to have less than 11.1 ounces in them?

- (1) 17                          (3) 28  
(2) 23                          (4) 11
- 

**Exercise #5:** Biologists are studying the weights of Red King Crabs in the Alaskan waters. They sample 16 crabs and compiled their weights, in pounds, as shown below.

9.8, 10.1, 11.1, 12.4, 11.8, 13.2, 12.8, 12.5, 13.7, 11.6, 13.4, 12.3, 12.6, 14.8, 14.2 15.1

- (a) Determine the mean and sample standard deviation for this sample of crabs. Round both statistical measures to the nearest *tenth* of a pound.
- (b) Why does this sample indicate that the population would be well modeled using a normal distribution? Explain. Hint – Use your calculator to sort this data in ascending order.
- (c) Assuming your mean and standard deviation from part (a) apply to a normally distributed population of crabs caught in Alaska, what percent will fall between 9.6 pounds and 15.6 pounds?
- (d) If fishermen must throw back any crab caught below 10.4 pounds, approximately what percent of the crabs caught will need to be thrown back if the weights are normally distributed?



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**THE NORMAL DISTRIBUTION**  
**COMMON CORE ALGEBRA II HOMEWORK**

**FLUENCY**

1. A variable is normally distributed with a mean of 16 and a standard deviation of 6. Find the percent of the data set that:
- (a) is greater than 16                      (b) falls between 10 and 22                      (c) is greater than 28
- (d) is less than 1                      (e) falls between 4 and 19                      (f) falls between 22 and 31

**APPLICATIONS**

2. The weights of Siamese cats are normally distributed with a mean of 6.4 pounds and a standard deviation of 0.8 pounds. If a breeder of Siamese cats has 128 in his care, how many can he expect to have weights between 5.2 and 7.6 pounds?
- (1) 106                      (3) 98
- (2) 49                      (4) 111                      \_\_\_\_\_
3. If one quart bottles of apple juice have weights that are normally distributed with a mean of 64 ounces and a standard deviation of 3 ounces, what percent of bottles would be expected to have less than 58 ounces?
- (1) 6.7%                      (3) 0.6%
- (2) 15.0%                      (4) 2.3%                      \_\_\_\_\_
4. Historically daily high temperatures in July in Red Hook, New York, are normally distributed with a mean of  $84^{\circ}\text{F}$  and a standard deviation of  $4^{\circ}\text{F}$ . How many of the 31 days of July can a person expect to have temperatures above  $90^{\circ}\text{F}$ ?
- (1) 6                      (3) 9
- (2) 2                      (4) 4                      \_\_\_\_\_



5. The weights of four year old boys are normally distributed with a mean of 38 pounds and a standard deviation of 4 pounds. Which of the following weights could represent the 90<sup>th</sup> percentile for the weight of a four year old?
- (1) 47 pounds                      (3) 43 pounds
- (2) 45 pounds                      (4) 41 pounds
- \_\_\_\_\_
6. The lengths of songs on the radio are normally distributed with a mean length of 210 seconds. If 38.2% of all songs have lengths between 194 and 226 seconds, then the standard deviation of this distribution is
- (1) 16 seconds                      (3) 8 seconds
- (2) 32 seconds                      (4) 64 seconds
- \_\_\_\_\_
7. The heights of professional basketball players are normally distributed with a standard deviation of 5 inches. If only 2.3% of all pro basketball players have heights above 7 foot 5 inches, then which of the following is the mean height of pro basketball players?
- (1) 6 feet 5 inches                      (3) 6 feet 10 inches
- (2) 6 feet 2 inches                      (4) 6 feet 7 inches
- \_\_\_\_\_
8. On a recent statewide math test, the raw score average was 56 points with a standard deviation of 18. If the scores were normally distributed and 24,000 students took the test, answer the following questions.
- (a) What percent of students scored below a 38 on the test?                      (b) How many students scored less than a 38?
- (c) If the state would like to scale the test so that a 90% would correspond to a raw score that is one and a half standard deviations above the mean, what raw score is needed for a 90%?
- (d) How many of the 24,000 students receive a scaled score greater than a 90%?
- (e) The state would like no more than 550 of the 24,000 students to fail the exam. What percent of the total does the 550 represent? Round to the nearest tenth of a percent.
- (f) What should the raw passing score be set at so that no more than the 550 students fail?



# THE NORMAL DISTRIBUTION

## BASED ON STANDARD DEVIATION



