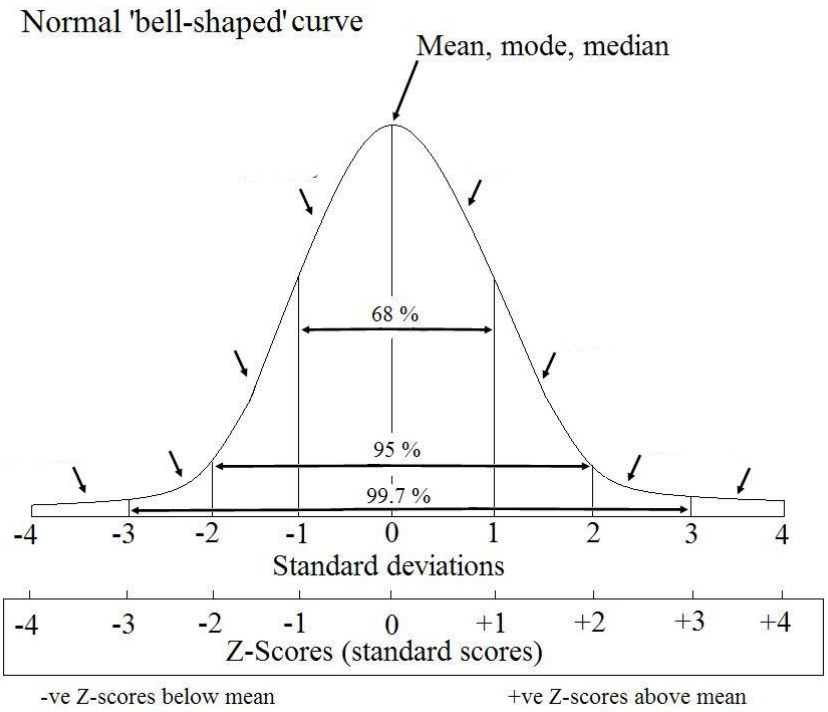
Probabilities using Z-Score Tables

Name: _____ Date: _____

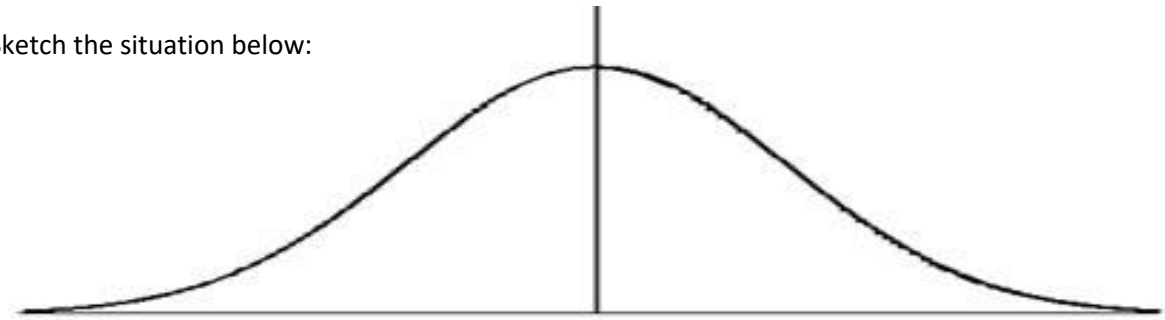
By converting a data-point to a z-score value you can then use a z-score table to calculate probabilities for any ranges of values. We will also learn to use technology (online applets) to help solve these as well.



Examples

The mean height of students at Acton High School is 1.7m. The standard deviation of the heights is 0.1m. Calculate the following percentages using the z-score table method. You can compare the answers using technology as well.

Sketch the situation below:



a) Calculate the percentage of people that are less than 1.8m in height.

b) Calculate the percentage of students that are less than 1.53m in height.

c) Calculate the percentage of students that are greater than 1.647m.

d) Calculate the percentage of students that are between 157cm and 173cm.

Practice Questions

Do the following questions using z-score tables method even if they fall right on a standard deviation value. You can check your values using technology (e.g. Wolfram Alpha) as well.

1. A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/hr and a standard deviation of 10 km/hr. What is the probability that a car picked at random is travelling at more than 100 km/hr?

2. For a certain type of computers, the length of time between charges of the battery is normally distributed with a mean of 50 hours and a standard deviation of 12 hours. John owns one of these computers and wants to know the probability that the length of time will be between 50 and 70 hours.

3. Entry to a certain University is determined by a national test. The scores on this test are normally distributed with a mean of 500 and a standard deviation of 95. Tom wants to be admitted to this university and he knows that he must score better than at least 70% of the students who took the test. Tom takes the test and scores 585. Will he be admitted to this university?

4. The length of similar components produced by a company are approximated by a normal distribution model with a mean of 5 cm and a standard deviation of 0.023 cm. If a component is chosen at random
   a) what is the probability that the length of this component is between 4.98 and 5.02 cm?
   b) what is the probability that the length of this component is between 4.96 and 5.04 cm?

5. The length of life of an instrument produced by a machine has a normal distribution with a mean of 12 months and standard deviation of 2 months. Find the probability that an instrument produced by this machine will last
   a) less than 7 months.
   b) between 7 and 12 months.

6. The time taken to assemble a car in a certain plant is a random variable having a normal distribution of 20 hours and a standard deviation of 2.3 hours. What is the probability that a car can be assembled at this plant in a period of time
   a) less than 19.5 hours?
   b) between 20 and 22 hours?

7. A large group of students took a test in Physics and the final grades have a mean of 70 and a standard deviation of 7. If we can approximate the distribution of these grades by a normal distribution, what percent of the students
   a) scored higher than 80?
   b) should pass the test (grades≥60)?
   c) should fail the test (grades<60)?

8. The annual salaries of employees in a large company are approximately normally distributed with a mean of $50,000 and a standard deviation of $20,000.
   a) What percent of people earn less than $40,000?
   b) What percent of people earn between $45,000 and $65,000?
   c) What percent of people earn more than $70,000?