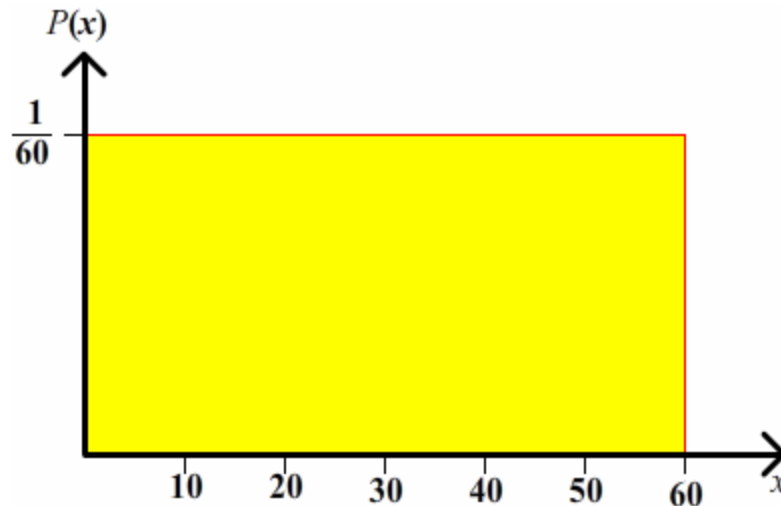# The Normal Distribution

- Area Under the Uniform Distribution
- The Standard Normal Distribution
- The General Normal Distribution

Uniform Distribution
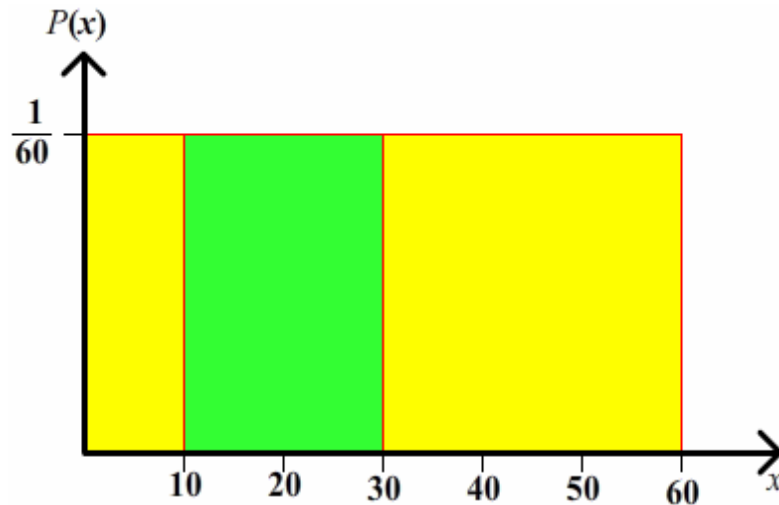## *Continuous Variable*

The number of seconds after the exact minute that classes end follows a uniform distribution. The graph below shows the distribution curve.
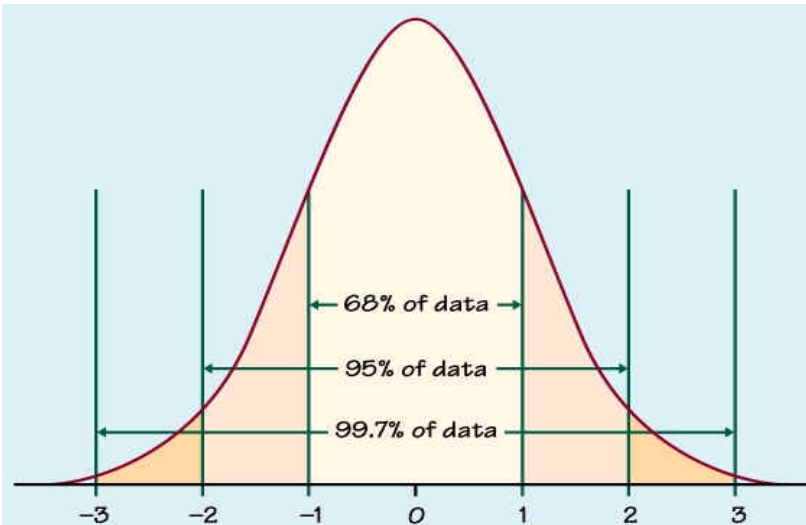
Uniform Distribution
Continuous Variable

Find the probability that a randomly selected class will end with seconds hand between 10 and 30 seconds.
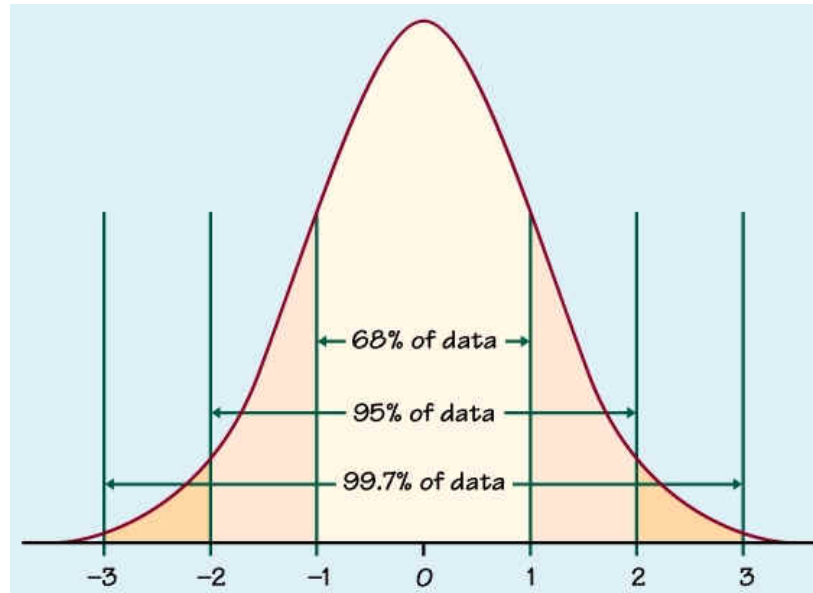
The Standard Normal Distribution

- Mean 0, Standard Deviation 1
- 68% of the data between -1 and 1.
- 95% of the data between -2 and 2.
- 99.7% of the data between -3 and 3.

68% of data
95% of data
99.7% of data

-3 -2 -1 0 1 2 3

Standard Normal Distribution

If z follows the standard normal distribution

- Find P(-3 < z < 3)
- Find P(z < 1)
- Find P(z > 2)

Using the TI 83/84

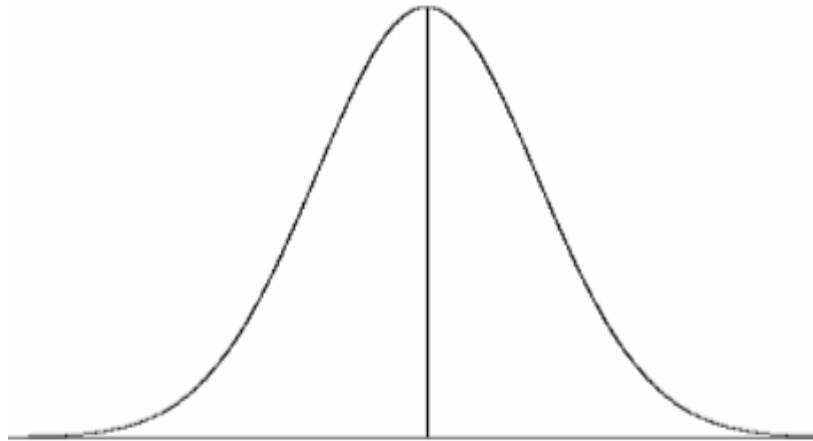For any value of z, we can find the probability with the TI 83/84:
2nd VARS (DISTR) then normalcdf(a,b) where a is the lower bound and b is the upper bound. To find $P(z < b)$ type in normalcdf(-99999,b). To find $P(z > a)$ type in normalcdf(a,99999).

A.   P(0.21 < z < 1.18)

B.   P(z >0.57)

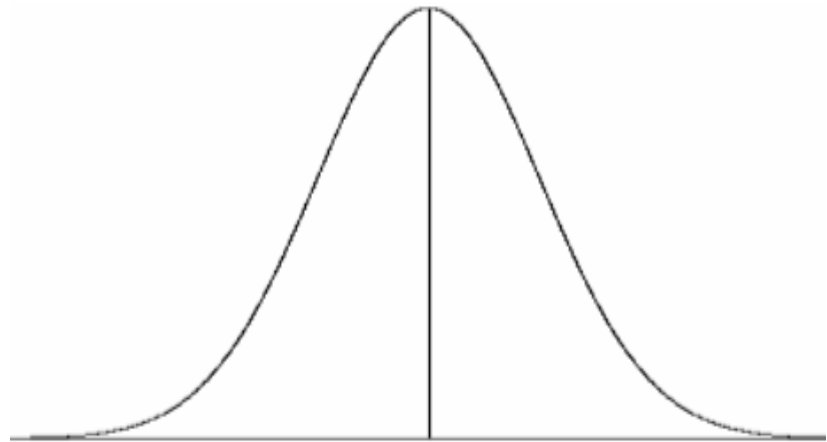C.   P(z < 1.34)

D.   P(z > -1.24)
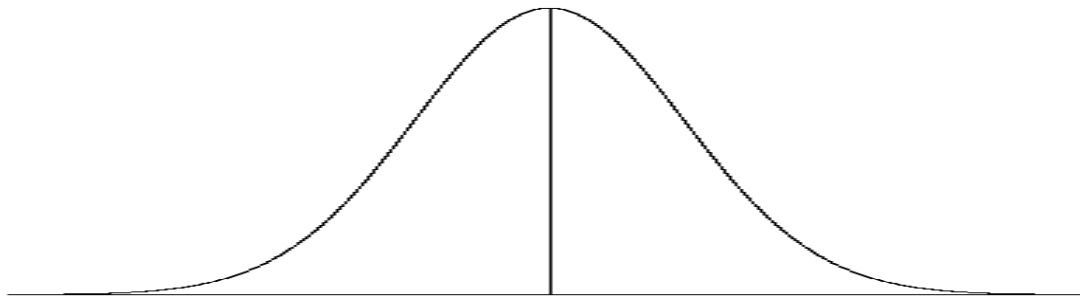
Using the TI 83/84

For any probability p, we can find the corresponding z such that the area to the left of z is p with theTI83/84:

2nd VARS(DISTR) then invNorm(p)

A.   Find a such that $P(z < a) = 0.38$.

B.   Find a such that $P(z > a) = 0.17$.

# What value of z corresponds to the tenth percentile?

Review of the z-score

Define the z-score as:

$$z = \frac{x - \mu}{\sigma}$$

The z-score tells us how many standard deviations away from the mean the value of x is. It allows us to convert from a general normal distribution to the standard normal distribution.

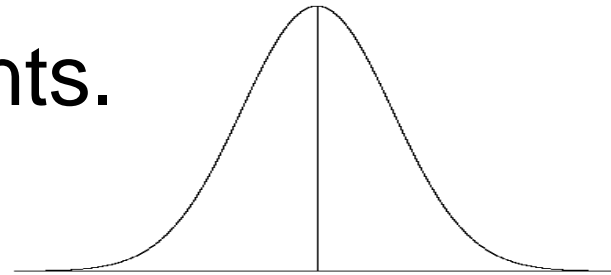# IQ scores are normally distributed with mean 100 and standard deviation 10.

- Find the probability that a randomly selected person will have an IQ score between 80 and 120.

- Find the probability that a randomly selected person will have an IQ score greater than 110.

68% of data

95% of data

99.7% of data

−3 −2 −1 0 1 2 3

- What IQ score must a person have to be in the bottom 2.5 percentile?
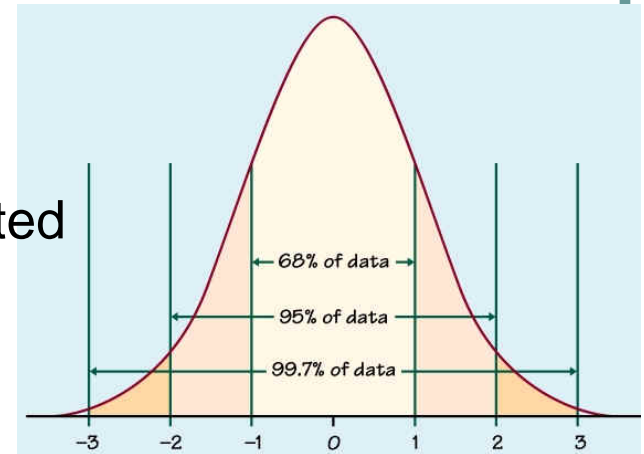
Suppose the mean class size at college is 22 and the standard deviation is 5. Assume the distribution is normal. Find the probability that a randomly selected class has

A. Fewer than 15 students.

B. More than 19 students.

C. Between 18 and 25 students.