

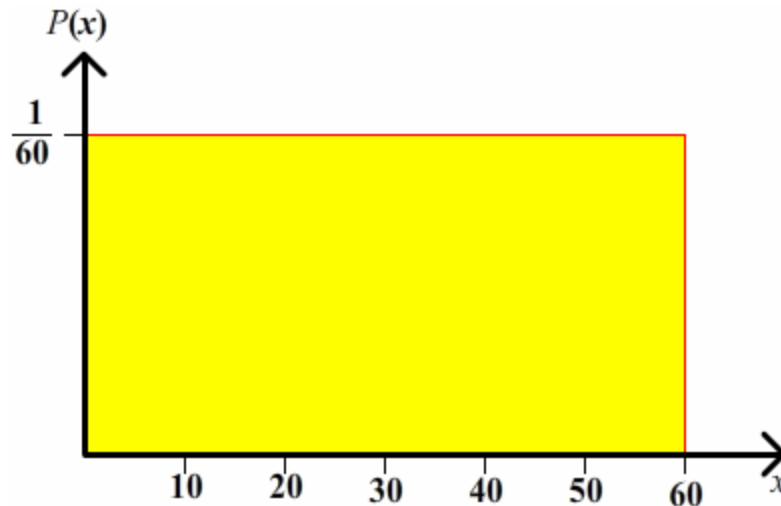
# The Normal Distribution

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

# Uniform Distribution

## *Continuous Variable*

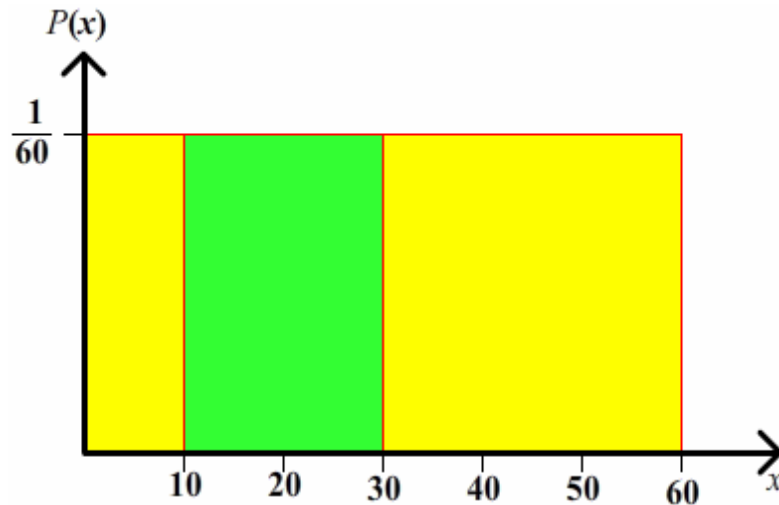
The number of seconds after the exact minute that classes end follows a **uniform distribution**. The graph below shows the distribution curve.



# Uniform Distribution

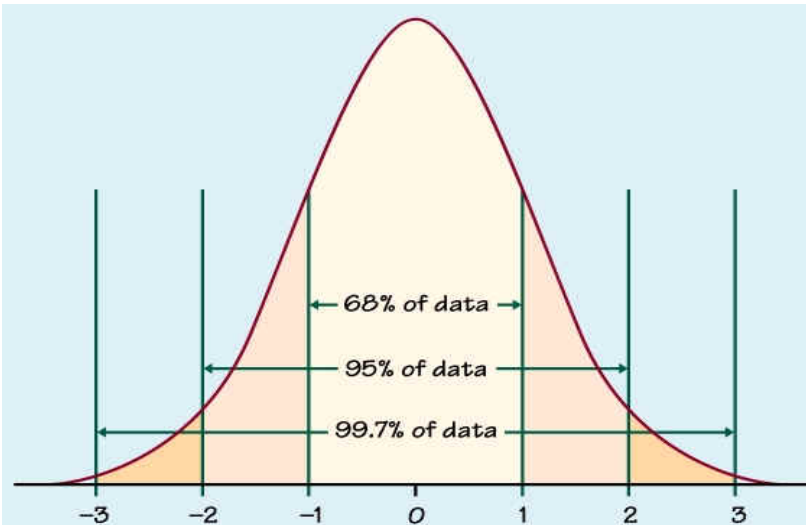
## *Continuous Variable*

Find the probability that a randomly selected class will end with seconds hand between **10** and **20** seconds.



# The Standard Normal Distribution

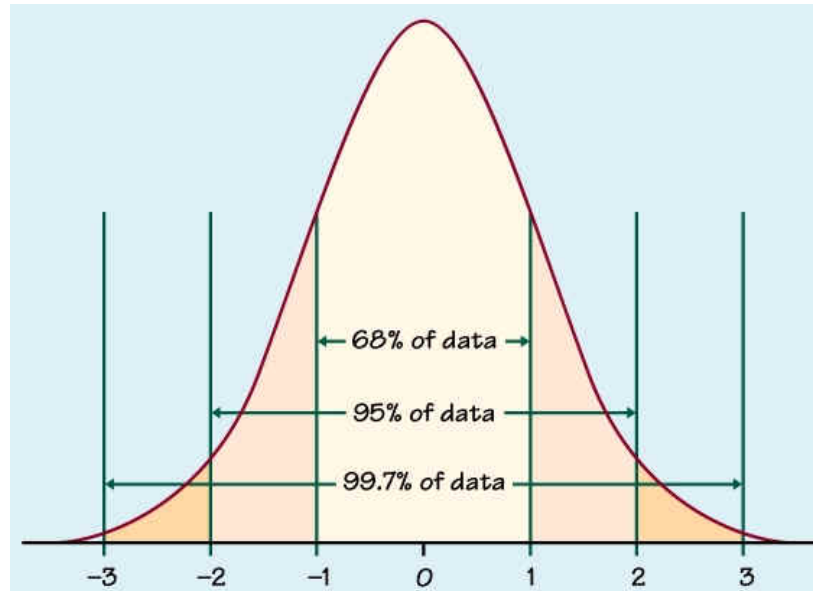
- Mean **0**, Standard Deviation **1**
- **68%** of the data between **-1** and **1**.
- **95%** of the data between **-2** and **2**.
- **99.7%** of the data between **-3** and **3**.



# 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:

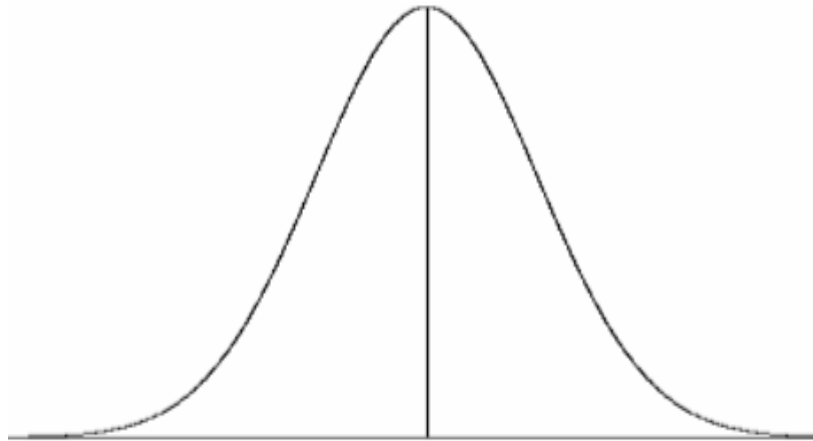
**2<sup>nd</sup> VARS (DISTR)** then **normalcdf( $a,b$ )** where  $a$  is the lower bound and  $b$  is the upper bound. To find  $P(z < b)$  type in **normalcdf(-99999, $b$ )**. To find  $P(z > a)$  use the rule of complements and type in **1 – normalcdf(-99999, $a$ )**.

A.  $P(0.21 < z < 1.18)$

B.  $P(z > 0.57)$

C.  $P(z < 1.34)$

D.  $P(z > -1.24)$



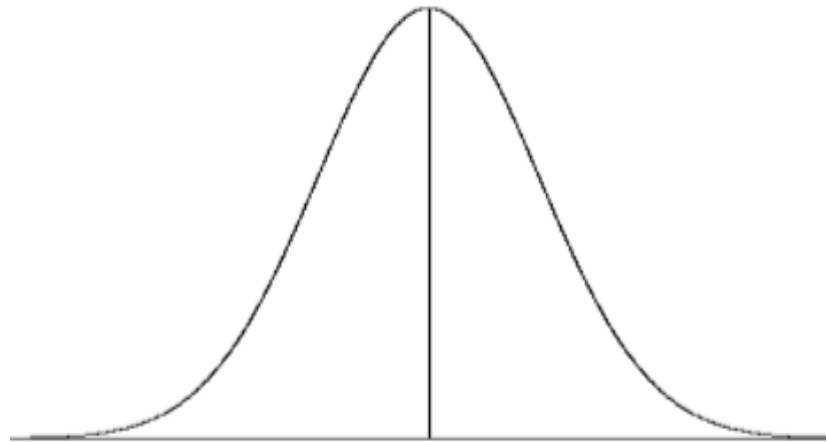
# Using the TI 83/84

For any value probability  $p$ , we can find the corresponding  $z$  such that the area to the left of  $z$  is  $p$  with the TI83/84:

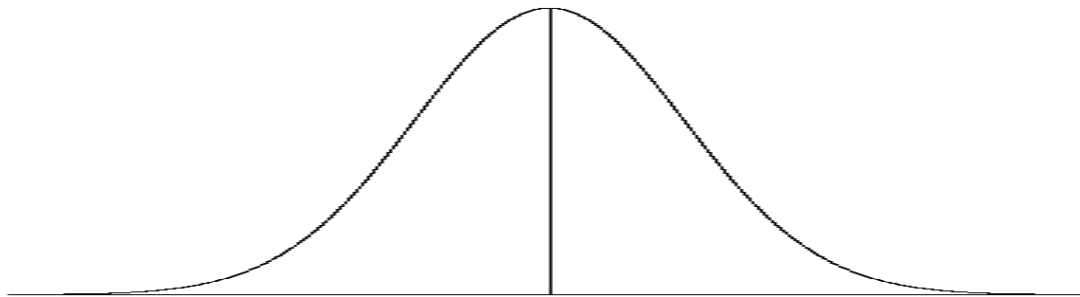
2<sup>nd</sup> VARS(DISTR) then invNorm( $p$ )

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

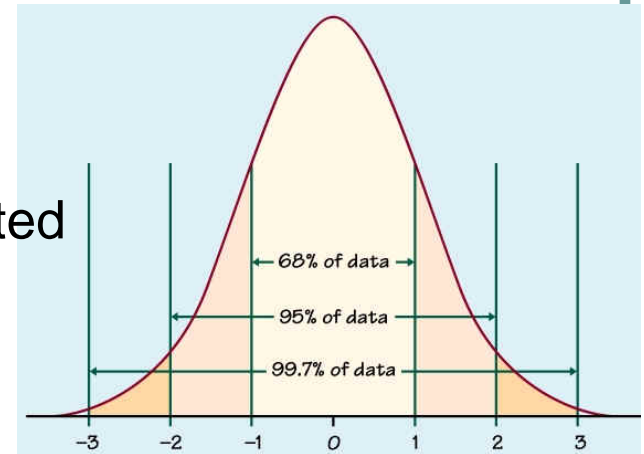
Define the **z-score** as:

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

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.

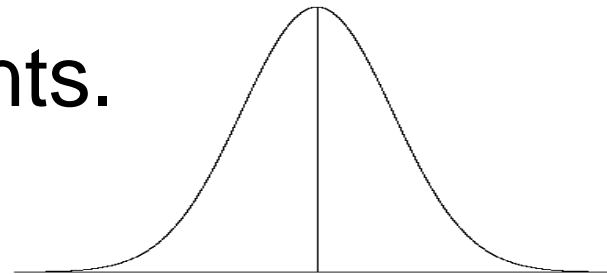
- Find the probability that a randomly selected person will have an IQ score between 80 and 120.
- Find the probability that a randomly selected person will have an IQ score greater than 110.
- What IQ score must a person have to be in the bottom 2.5 percentile?



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.