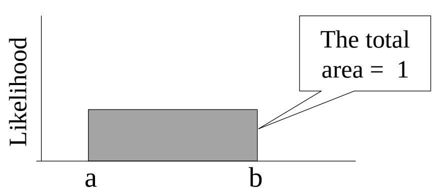
Statistics 300: Elementary Statistics

Section 6-2

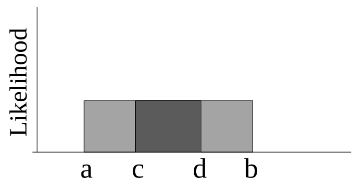
Continuous Probability Distributions

- **Quantitative data**
- **Continuous values**
  - **Physical measurements are common examples**
- **No “gaps” in the measurement scale**
- **Probability = “Area under the Curve”**

The Uniform Distribution X ~ U[a,b]

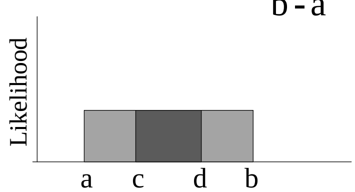


If X ~ U[a,b] then
P(c < x < d) = ?



If X ~ U[a,b] then

$$P(c < x < d) = \frac{d - c}{b - a}$$

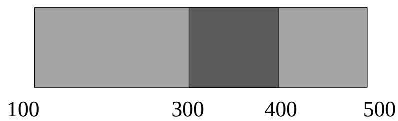


If X ~ U[100,500] then

- **P(120 < x < 170) =**

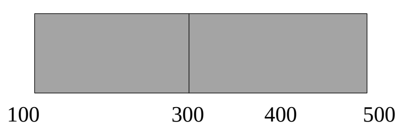
If X ~ U[100,500] then

- **$P(300 < x < 400) =$**



If X ~ U[100,500] then

- **$P(x = 300) = (300-300)/(500-100)$**
- **$= 0$**

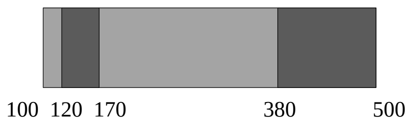


If X ~ U[100,500] then

- **$P(x < 220) =$**

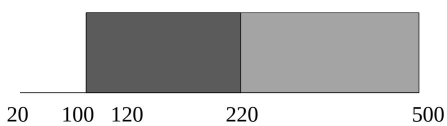
If X ~ U[100,500] then

- **P(120 < x < 170 or 380 < x) =**



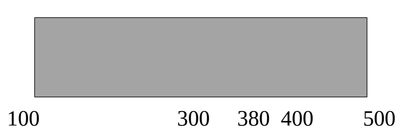
If X ~ U[100,500] then

- **P(20 < x < 220) =**



If X ~ U[100,500] then

- **P(300 < x < 400 or 380 < x) =**



If X ~ U[100,500] then

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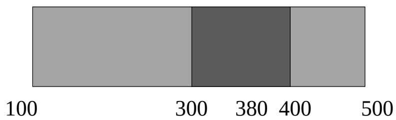

If X ~ U[100,500] then

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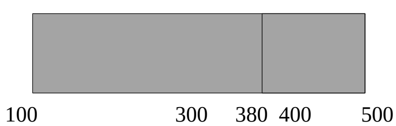

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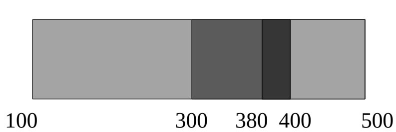
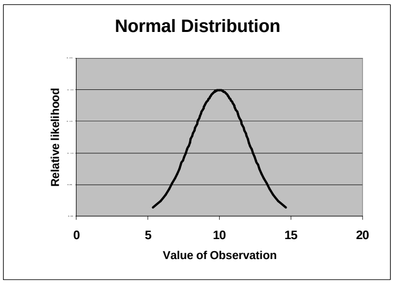


The Normal Distribution
X ~ N(m, s)



Normal Distributions

- **Family of "bell-shaped" distributions**
- **Each unique normal distribution is determined by the mean (m) and the standard deviation (s)**
- **The mean tells where the center of the distribution is located**
- **The Standard Deviation tells how spread out (wide) the distribution is**

Normal Distributions

- **If I say "the rectangle I am thinking of has base = 10 centimeters (cm) and height = 4 cm." You know exactly what shape I am describing.**
- **Similarly, each normal distribution is determined uniquely by the mean (m) and the standard deviation (s)**

The Standard Normal Distribution

- **The "standard normal distribution" has m = 0 and s = 1.**
- **Table A.2 in the textbook contains information about the standard normal distribution**
- **Section 6-2 shows how to work with the standard normal distribution using Table A.2**

The Standard Normal Distribution

- **The "standard normal distribution" has m = 0 and s = 1.**
- **Sometimes called the "Z distribution" because ...**
- **If x ~ N(m = 0, s = 1), then every value of "x" is its own z-score.**

$$z = \frac{(x - m)}{s} = \frac{(x - 0)}{1} = x$$

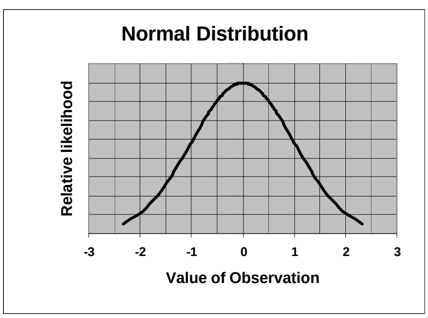
Standard Normal Distribution : Two types of problems

- **Given a value for "z", answer probability questions relating to "z"**
- **Given a specified probability, find the corresponding value(s) of "z"**

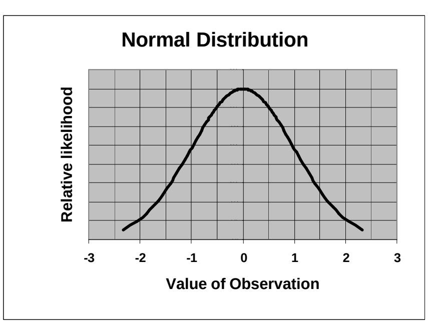
Standard Normal Distribution : Given “z”, find probability

- Given: x ~ N($\mu = 0$ and $\sigma = 1$)
- For specified constant values (a,b,c, …)
- Examples:
  - P(0 < x < 1.68)
  - P(x < 1.68) [not the same as above]
  - P(x < - 1.68) [not same as either of above]

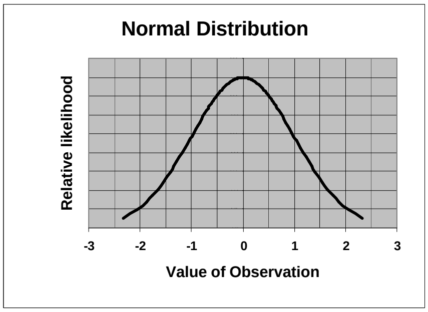
P(0 < x < 1.68)



P(0 < x < 1.68)



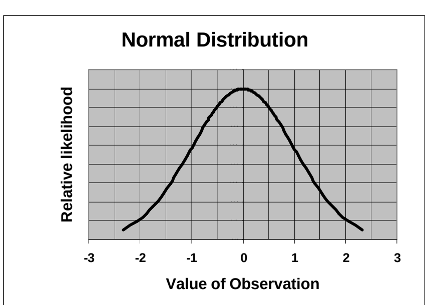
P(x < - 1.68)



<u>Standard Normal Distribution : Given probability, find “z”</u>

- **Given: x ~ N(m = 0 and s = 1)**
- **For specified probability, find “z”**
- **Example: For N(m = 0 and s = 1), what value of “z” is the 79th percentile, P_{79}?**
- **Example: For N(m = 0 and s = 1), what value of “z” is the 19th percentile, P_{19}?**

What is P_{79} for N(0,1)



What is P_{19} for N(0,1)