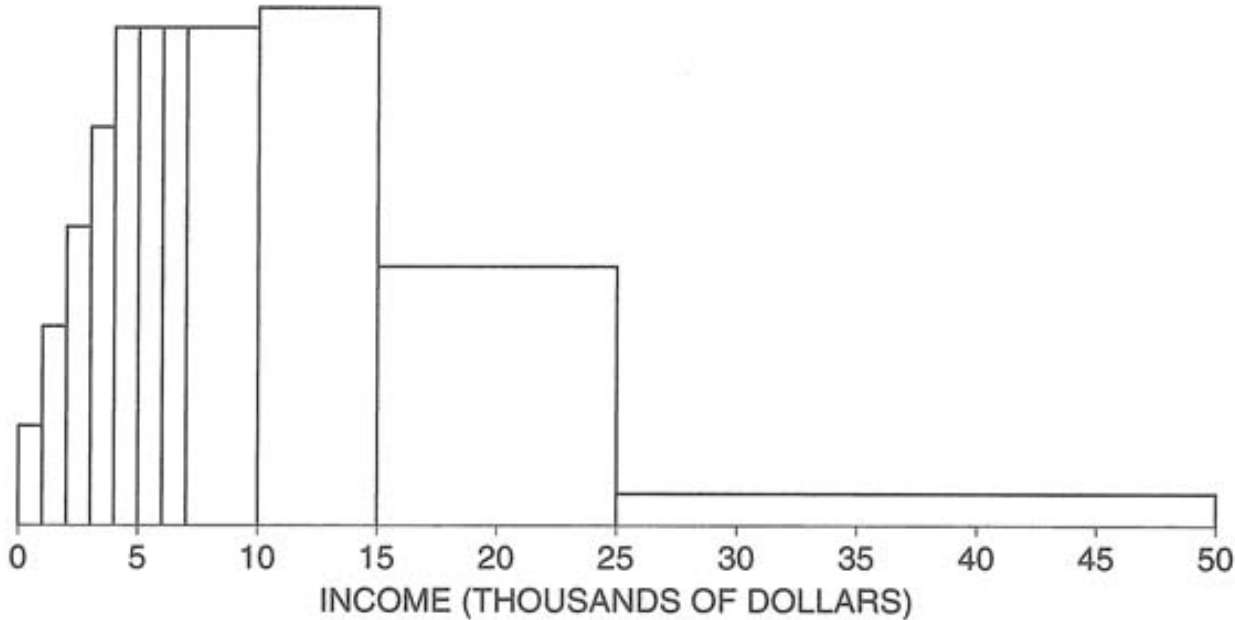


# MA-120 Probability and Statistics

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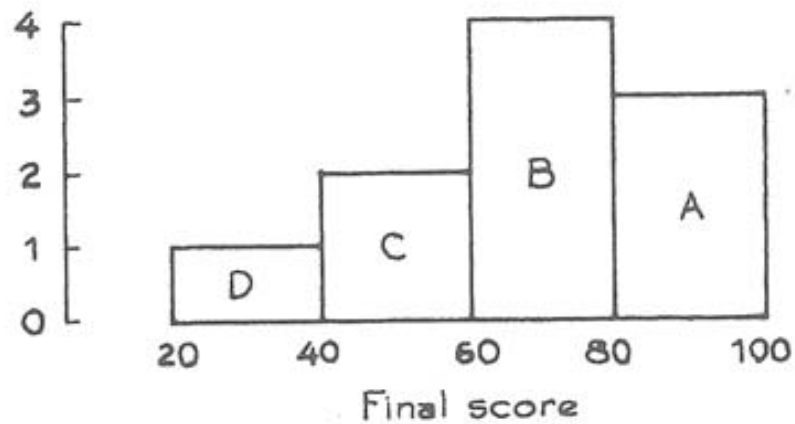
Lecture 4: Interpreting  
Histograms

Figure 1. A histogram. This graph shows the distribution of families by income in the U.S. in 1973.



The histogram below shows the distribution of final scores in a certain class.

- (a) Which block represents the people who scored between 60 and 80?
- (b) Ten percent scored between 20 and 40. About what percentage scored between 40 and 60?
- (c) About what percentage scored over 60?



# Drawing a histogram

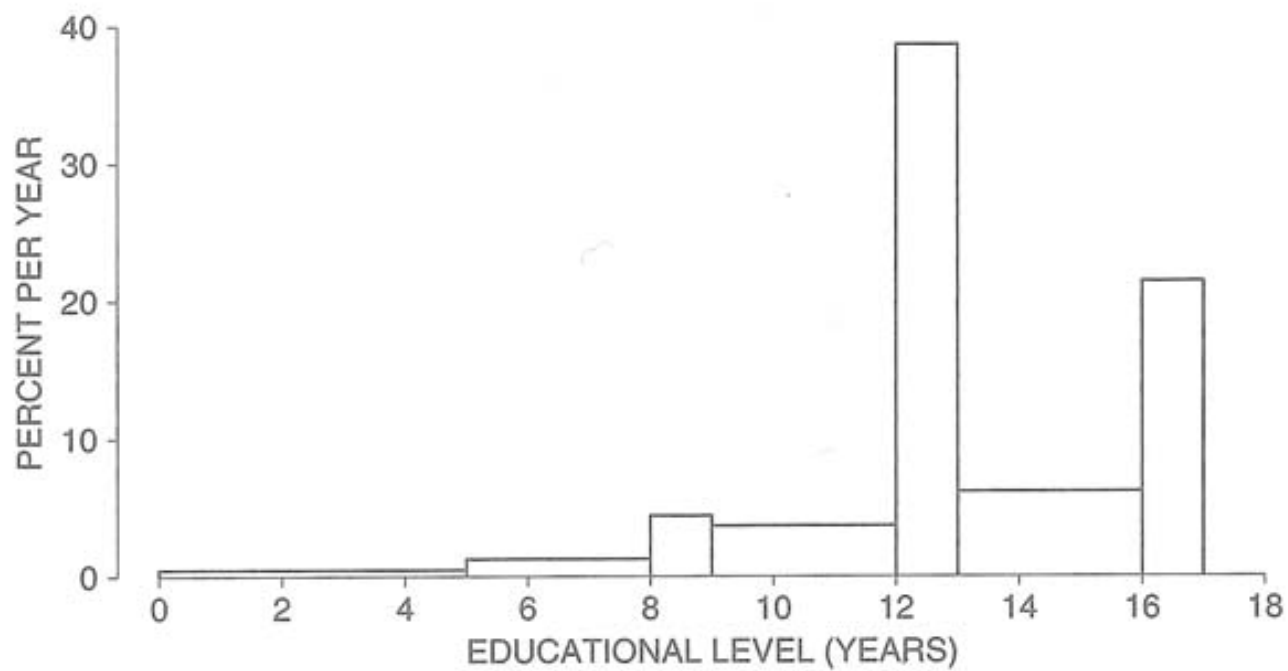
- Horizontal scale
- Vertical scale
- End-point notation

Table 1. Distribution of families by income in the U.S. in 1973. Class intervals include the left endpoint, but not the right endpoint.

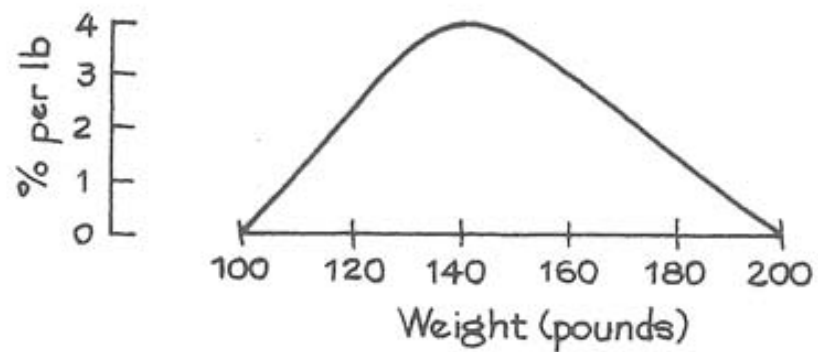
<i>Income level</i>	<i>Percent</i>
\$0-\$1,000	1
\$1,000-\$2,000	2
\$2,000-\$3,000	3
\$3,000-\$4,000	4
\$4,000-\$5,000	5
\$5,000-\$6,000	5
\$6,000-\$7,000	5
\$7,000-\$10,000	15
\$10,000-\$15,000	26
\$15,000-\$25,000	26
\$25,000-\$50,000	8
\$50,000 and over	1

Note: Percents do not add to 100%, due to rounding.

Figure 5. Distribution of persons age 25 and over in the U.S. in 1991 by educational level.



*Example 2.* Someone has sketched a histogram for the weights of some people, using the density scale. What's wrong?



# Variable

- A characteristic that changes from sample to sample in the study
  - Age, Income, Smoker, Marital Status, Political affiliation, etc
- Qualitative
  - Marital status, Political affiliation
- Quantitative
  - Discrete
    - Age, Year of birth
  - Continuous
    - Income, Time

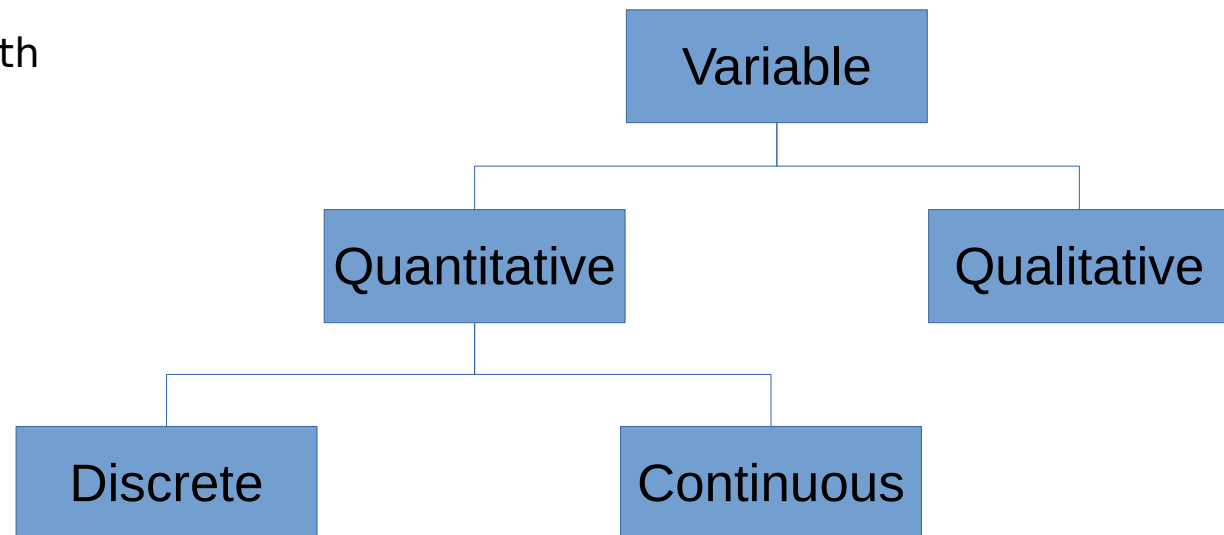
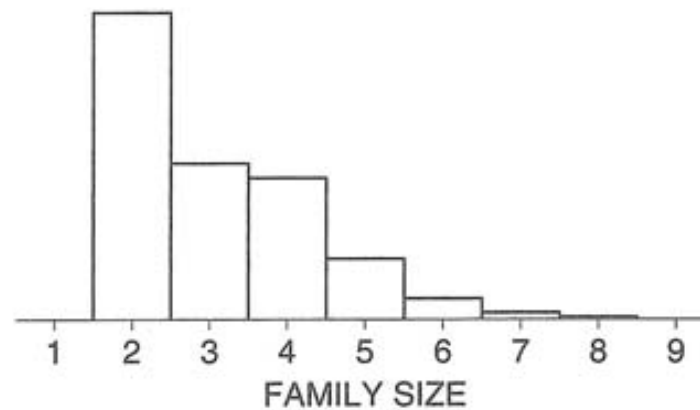




Figure 6. Histogram showing distribution of families by size in 2005. With a discrete variable, the class intervals are centered at the possible values.



# Is intelligence genetic?

- A theory\* in Psychology states that scores on intellectual tests depend on
  - general intelligence, and
  - ability specific to the test
- Robert Tyron checked this on rats.
  - 142 rats
  - 19 runs through a maze
  - Dead-ends were counted for each run of each mouse.
- Selective breeding
  - Maze-bright rats were bred with each other.
  - Maze-dull rats were bred with each other.

\* Charles Spearman, *Abilities of Man*, 1927

# Selective Breeding

Figure 8. Tryon's experiment. Distribution of intelligence in the original population.

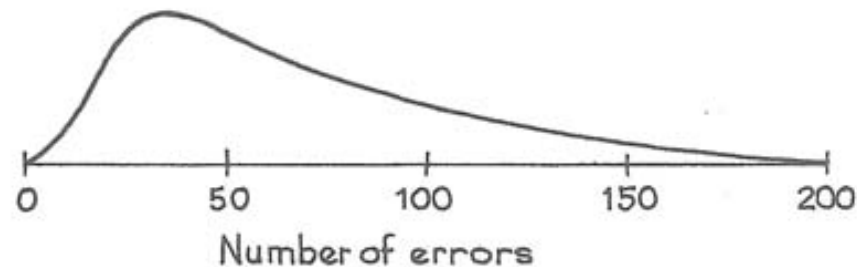
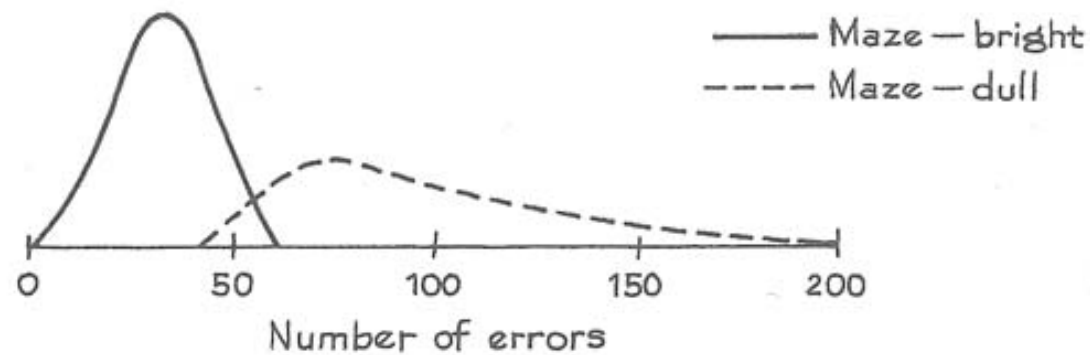


Figure 9. Tryon's experiment. After seven generations of selective breeding, there is a clear separation into "maze-bright" and "maze-dull" strains.



**Does this support Spearman's theory?  
Is intelligence genetic?**

# Is intelligence genetic?

- Interestingly, Tyron found that maze-bright rats were no better than maze-dull rats on **other** tasks.
- This actually goes against Spearman's theory.
  - A certain mental ability might have been genetically transferred, but not overall intelligence.