

# Density Curves

## Sections 3.1 - 3.2

### Lecture 8

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# Outline

- 1 Density Curves
- 2 Creating Density Curves
- 3 Describing Density Curves
- 4 Mean and Standard Deviation
- 5 Assignment

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# Density Curves

## Definition (Density Curve)

A **density curve** is similar to a histogram, with the following differences.

- The vertical scale is adjusted so that the total area is 1.
- The density curve may use rectangles, but it will more likely be a smooth curve.
- The smooth curve would be the result of using so many rectangles that the eye could no longer distinguish them.
- That would require an enormous amount of data.

# Outline

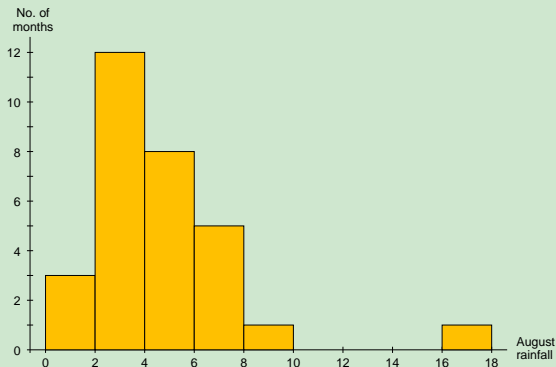
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# Creating Density Curves

- Find the total area by computing the area of each rectangle and then adding up the area.
- Divide the numbers on the vertical scale by the total area.
- The effect is to change the scale so that the total area is now 1.

# Example

## Example (August Rainfall)



- What is the total area of the rectangles in the histogram?

# Example

## Example (August Rainfall)

- Multiply width (2) by the height of each rectangle and add:

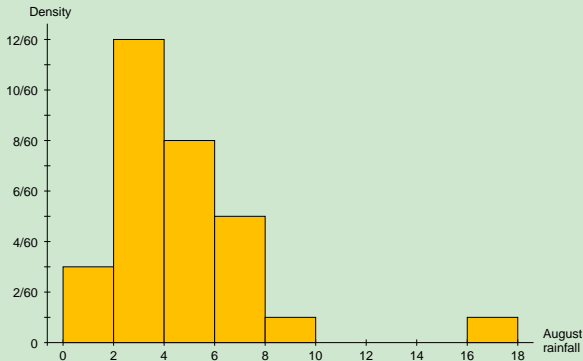
$$\begin{aligned}\text{Area} &= (2 \times 3) + (2 \times 12) + (2 \times 8) + (2 \times 5) + (2 \times 1) + (2 \times 1) \\ &= 2 \times (3 + 12 + 8 + 5 + 1 + 1) \\ &= 60.\end{aligned}$$

- Divide the numbers on the vertical scale by 60.



# Example

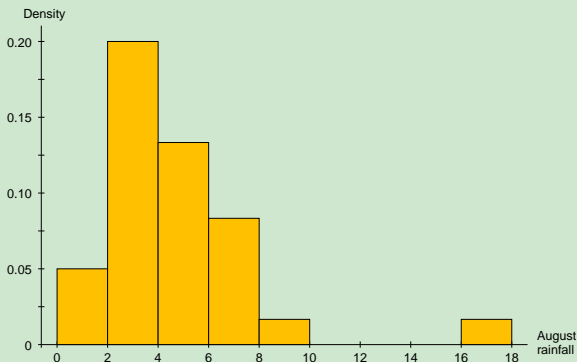
## Example (August Rainfall)



- Now the total area is 1.

# Example

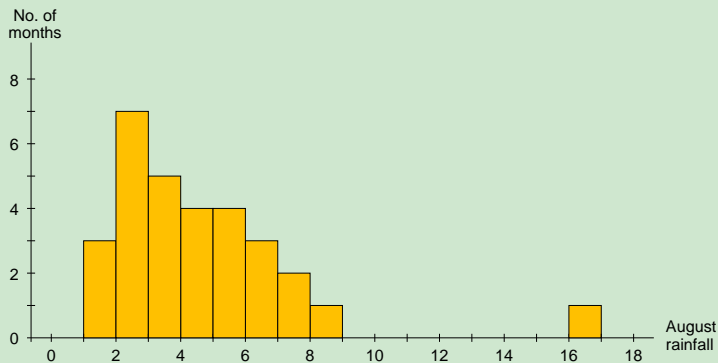
## Example (August Rainfall)



- Relabel the vertical scale in more standard units.

# Example

## Example (August Rainfall)



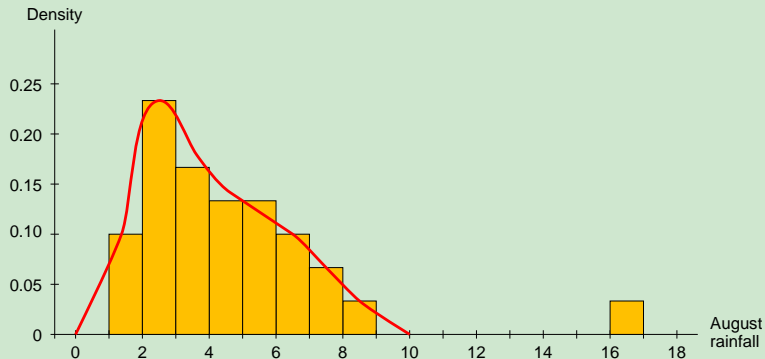
- Suppose had used a class width of 1 instead of 2.

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# Example

## Example (August Rainfall)



- The histogram is suggestive of a smooth curve representing the “true” distribution.

# Describing Density Curves

- We can describe the density curve as
  - Symmetric
  - Skewed right
  - Skewed left
  - Uniform – Flat, no peak

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- For density curves,
  - The symbol  $\mu$  (the Greek letter mu) is used for the mean.
  - The symbol  $\sigma$  (the Greek letter sigma) is used for the standard deviation.
- For the different density-curve descriptions, where would be place  $\mu$ ?



- For density curves,
  - The symbol  $\mu$  (the Greek letter mu) is used for the mean.
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- For the different density-curve descriptions, where would be place  $\mu$ ?
- How does  $\sigma$  relate to the graph?

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# Assignment

## Assignment

- Read Sections 3.1, 3.2.
- Apply Your Knowledge: 3.1, 3.2, 3.3, 3.4.