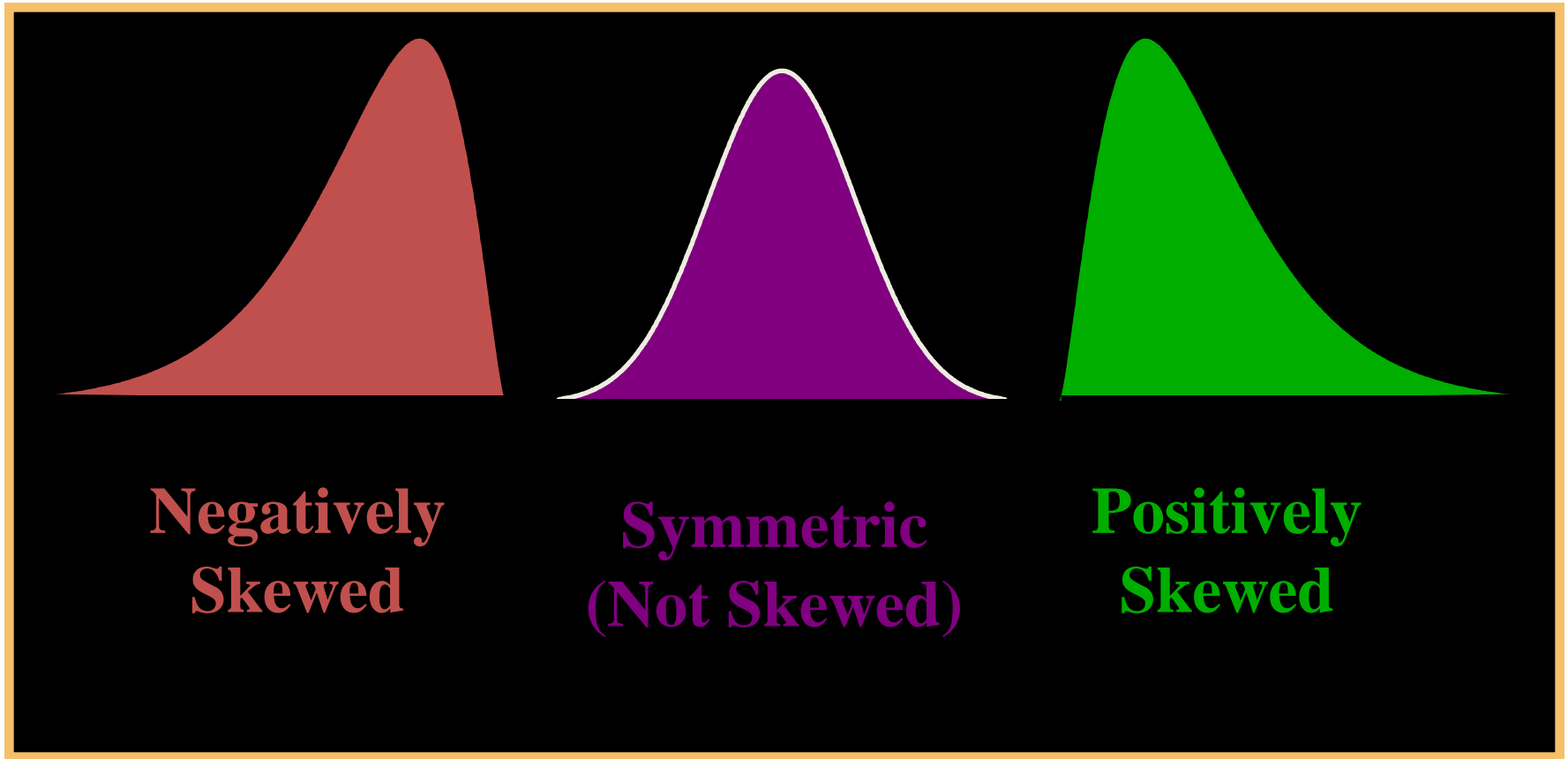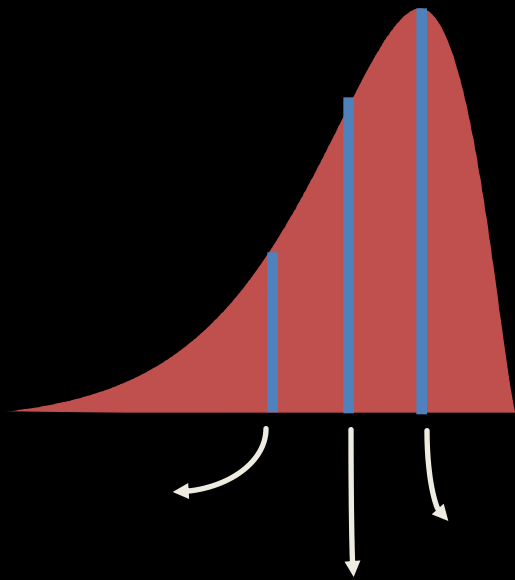# Measure of Shapes

Measures of Shape

- **Skewness**
  - Absence of symmetry
  - Extreme values in one side of a distribution
- **Kurtosis**
  - Peakedness of a distribution
- **Box and Whisker Plots**
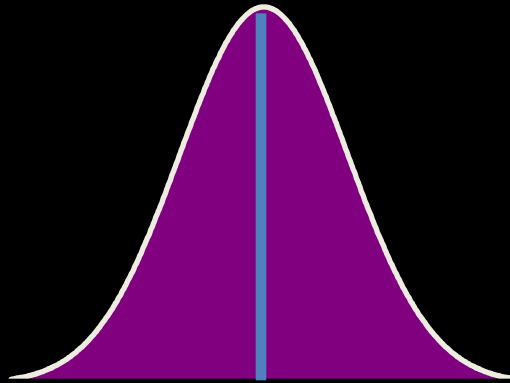 - Graphic display of a distribution
  - Reveals skewness

Skewness

Negatively Skewed   **Symmetric (Not Skewed)**   **Positively Skewed**
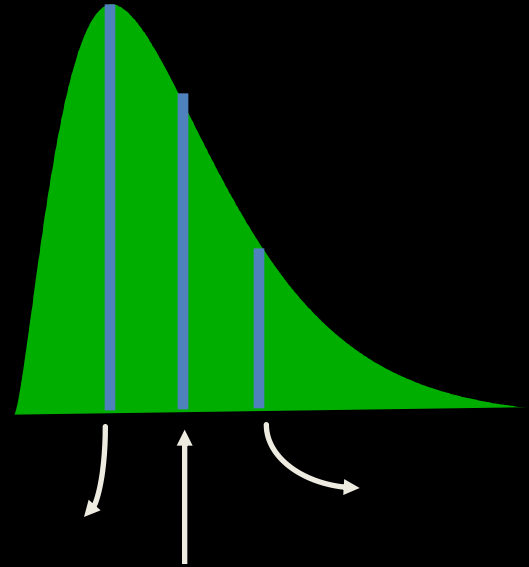
Skewness

Negatively Skewed   **Symmetric (Not Skewed)**   **Positively Skewed**

Coefficient of Skewness

- Summary measure for skewness

$$S = \frac{3(\mu - M_d)}{\sigma}$$

- If S < 0, the distribution is <u>negatively skewed</u> (skewed to the left).

- If S = 0, the distribution is <u>symmetric</u> (not skewed).

- If S > 0, the distribution is <u>positively skewed</u> (skewed to the right).

Coefficient of Skewness

$$\mu_1 = 23$$

$$M_{d1} = 26$$

$$\sigma_1 = 12.3$$

$$S_1 = \frac{3(\mu_1 - M_{d1})}{\sigma_1}$$

$$= \frac{3(23 - 26)}{12.3}$$

$$= -0.73$$

$$\mu_2 = 26$$

$$M_{d2} = 26$$

$$\sigma_2 = 12.3$$

$$S_2 = \frac{3(\mu_2 - M_{d2})}{\sigma_2}$$

$$= \frac{3(26 - 26)}{12.3}$$

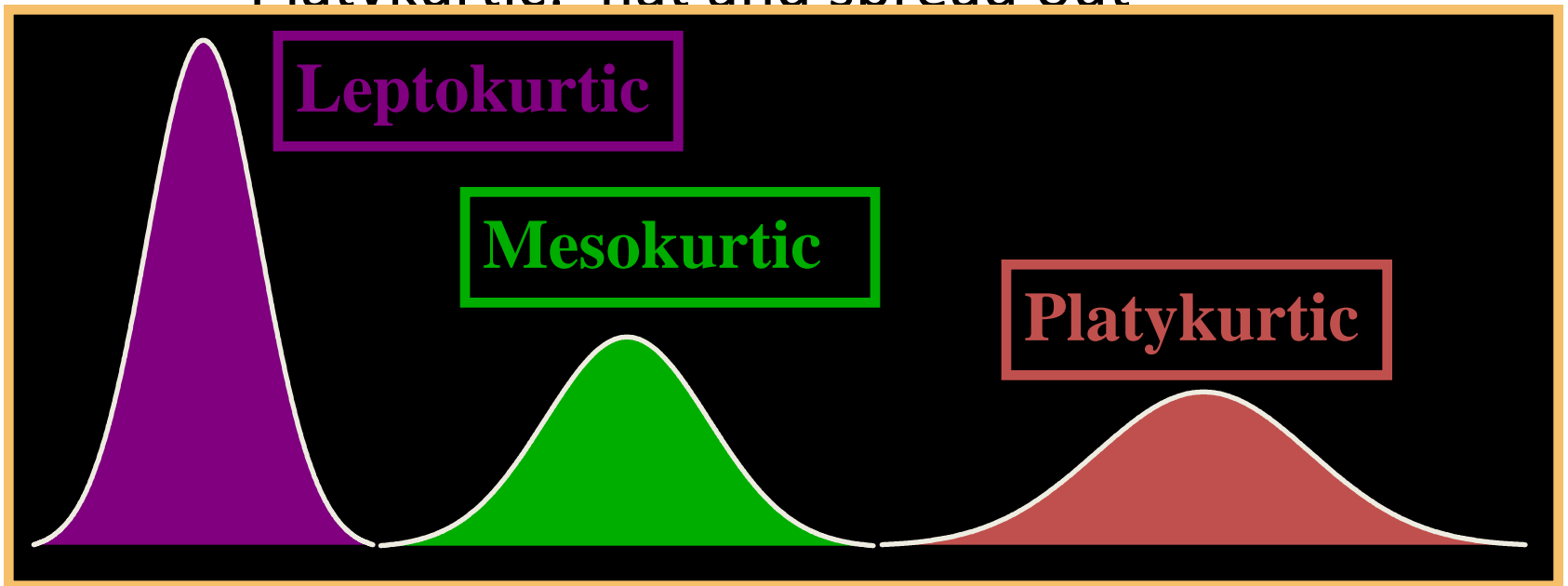$$= 0$$

$$\mu_3 = 29$$

$$M_{d3} = 26$$

$$\sigma_3 = 12.3$$

$$S_3 = \frac{3(\mu_3 - M_{d3})}{\sigma_3}$$

$$= \frac{3(29 - 26)}{12.3}$$

$$= +0.73$$

Kurtosis

- Peakedness of a distribution
  - Leptokurtic: high and thin
  - Mesokurtic: normal in shape
  - Platykurtic: flat and spread out

Box and Whisker Plot

- **Five specific values are used:**
  - **Median, Q_2**
  - **First quartile, Q_1**
  - **Third quartile, Q_3**
  - **Minimum value in the data set**
  - **Maximum value in the data set**

Box and Whisker Plot, *continued*

- **Inner Fences**
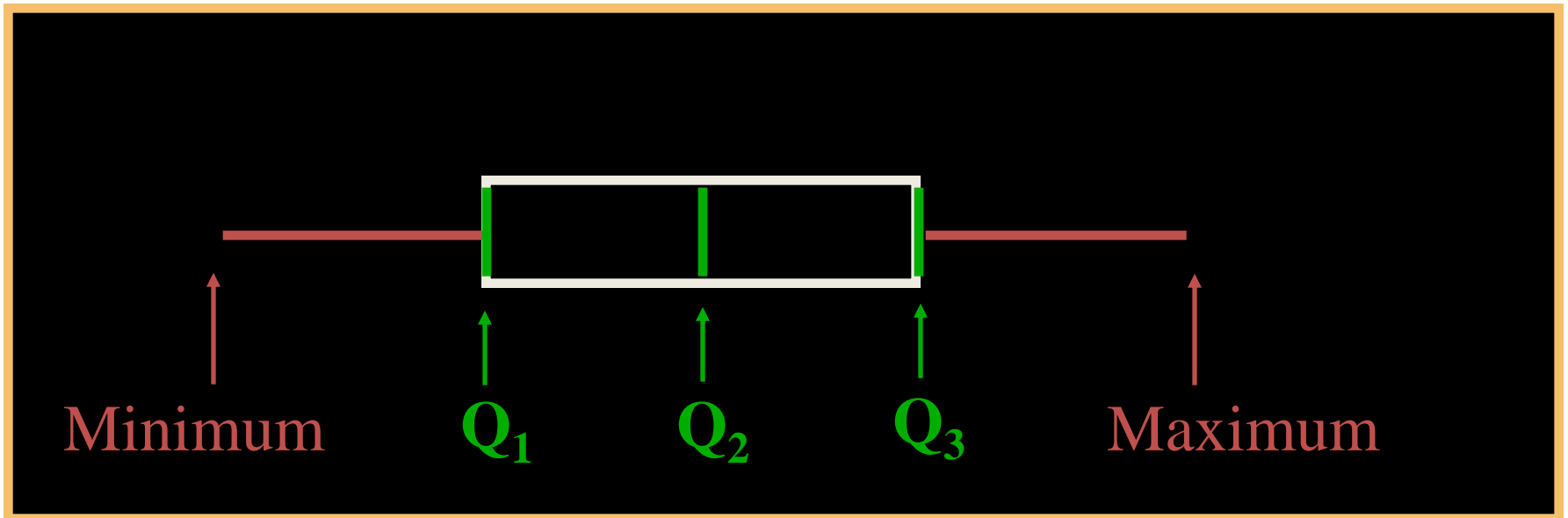 - **IQR = Q_3 - Q_1**
  - **Lower inner fence = Q_1 - 1.5 IQR**
  - **Upper inner fence = Q_3 + 1.5 IQR**

- **Outer Fences**
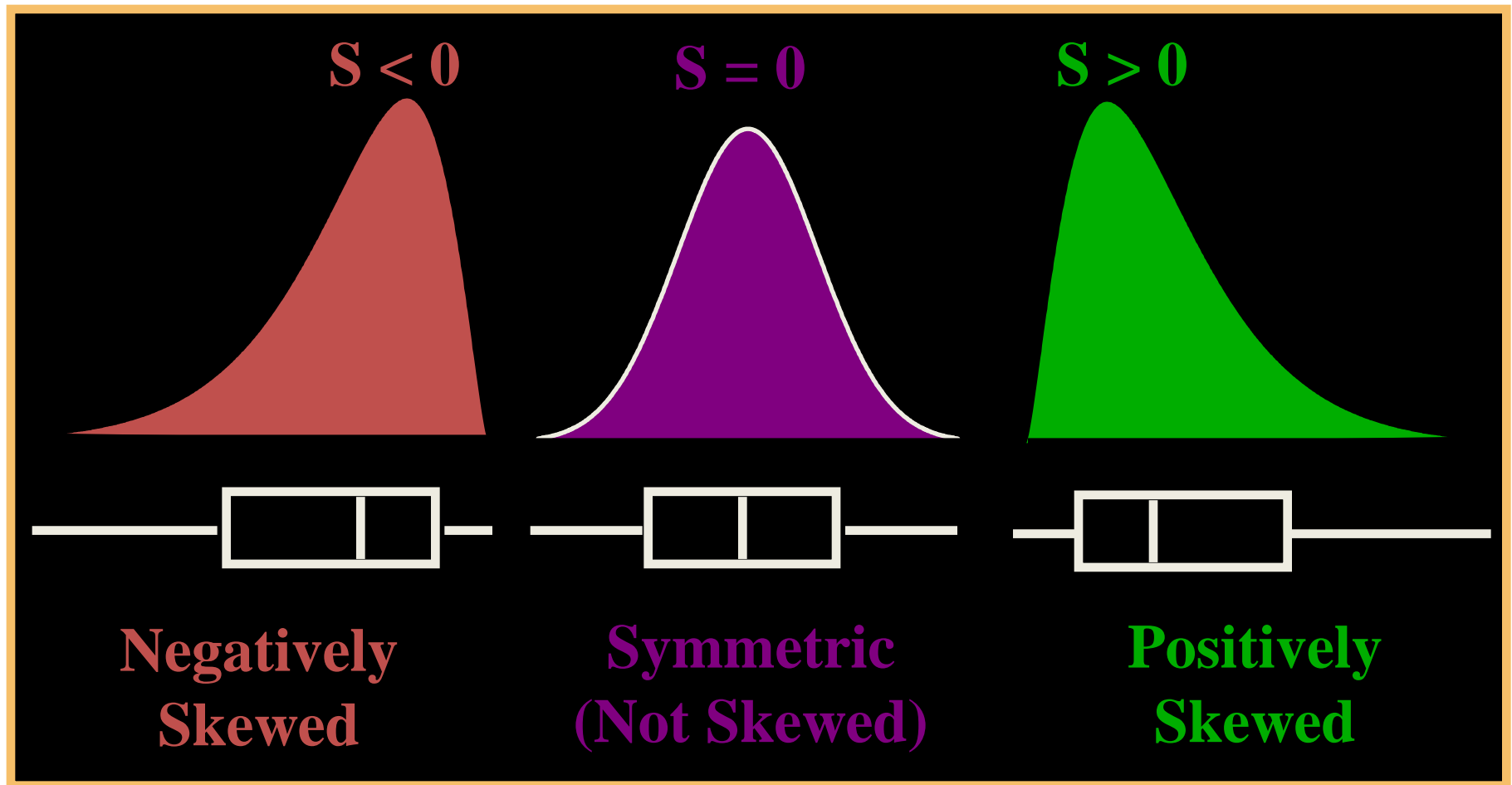 - **Lower outer fence = Q_1 - 3.0 IQR**
  - **Upper outer fence = Q_3 + 3.0 IQR**

Box and Whisker Plot

Skewness: Box and Whisker Plots, and Coefficient of Skewness

THANK YOU