Organizing Qualitative Data

MATH 130, *Elements of Statistics I*

J Robert Buchanan

Department of Mathematics

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Tallies and Frequencies

Definition

A **frequency distribution** lists each category of data and the number of occurrences for each category of data.

Example

The grades earned by students in a previous semester of MATH 130 are listed in the table below. Construct a frequency distribution of the grades.

C	C	C	C	B	C
F	A	C	A	D	A
B	B	C	B	A	D

Example

The grades earned by students in a previous semester of MATH 130 are listed in the table below. Construct a frequency distribution of the grades.

C	C	C	C	B	C
F	A	C	A	D	A
B	B	C	B	A	D

Grade	**Frequency**
A	4
B	4
C	7
D	2
F	1
Total	18

Relative Frequency

Definition

The **relative frequency** is the proportion of observations within a category and is found using the formula

$$\text{relative frequency} = \frac{\text{frequency}}{\text{sum of all frequencies}}.$$

A **relative frequency distribution** lists each category of data together with the relative frequency.

Example

Construct a relative frequency distribution of the grades presented earlier.

Grade	Frequency	Relative Frequency
A	4	
B	4	
C	7	
D	2	
F	1	
Total	18	

Solution

Grade	Frequency	Relative Frequency
A	4	0.2222
B	4	0.2222
C	7	0.3888
D	2	0.1111
F	1	0.0556
Total	18	1.0000

Bar Graphs

Definition

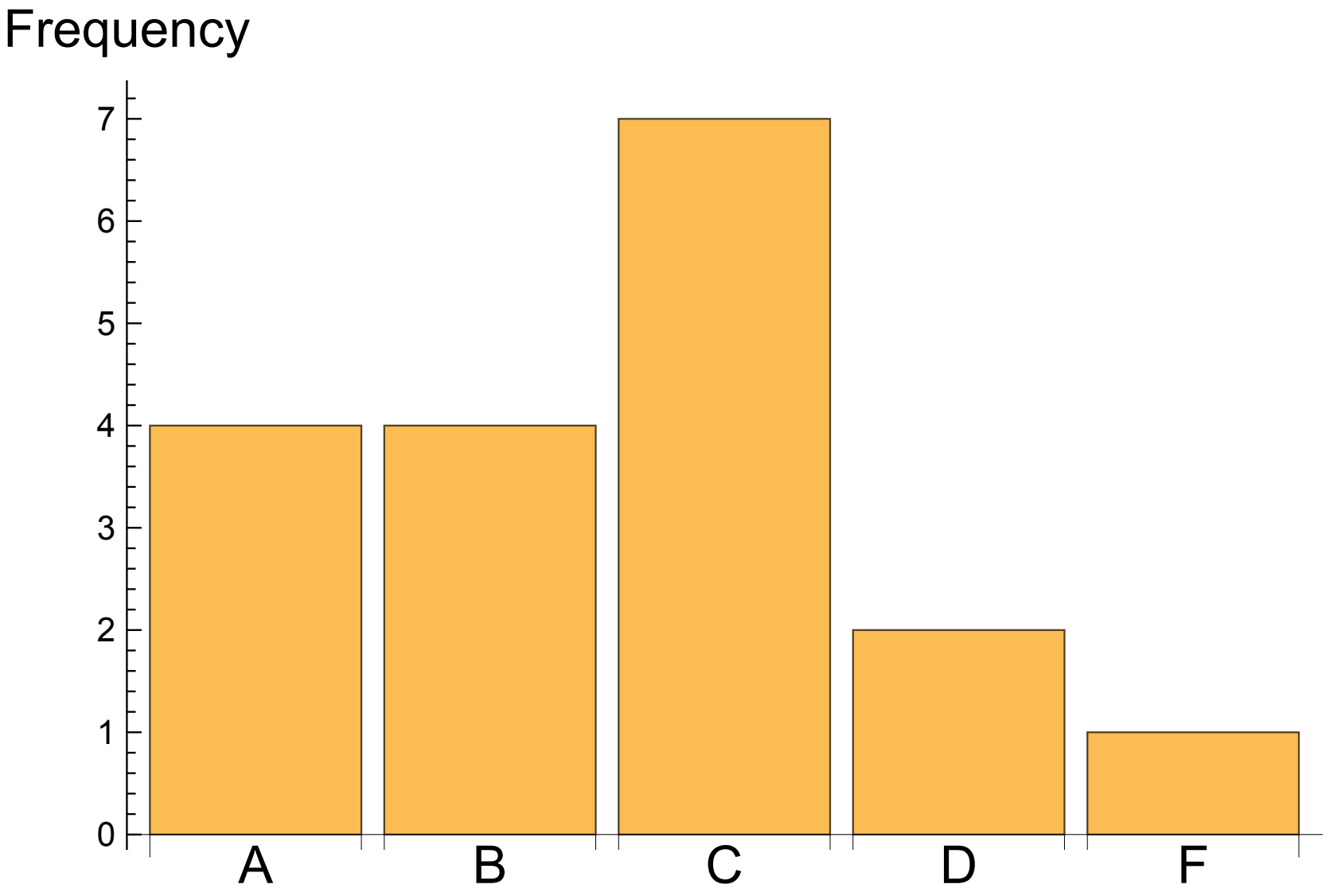
A **bar graph** is constructed by labeling each category of data on a horizontal axis and the frequency or relative frequency of the category on the vertical axis. Rectangles of equal width are drawn for each category. The height of each rectangle is the category's frequency or relative frequency.

Example

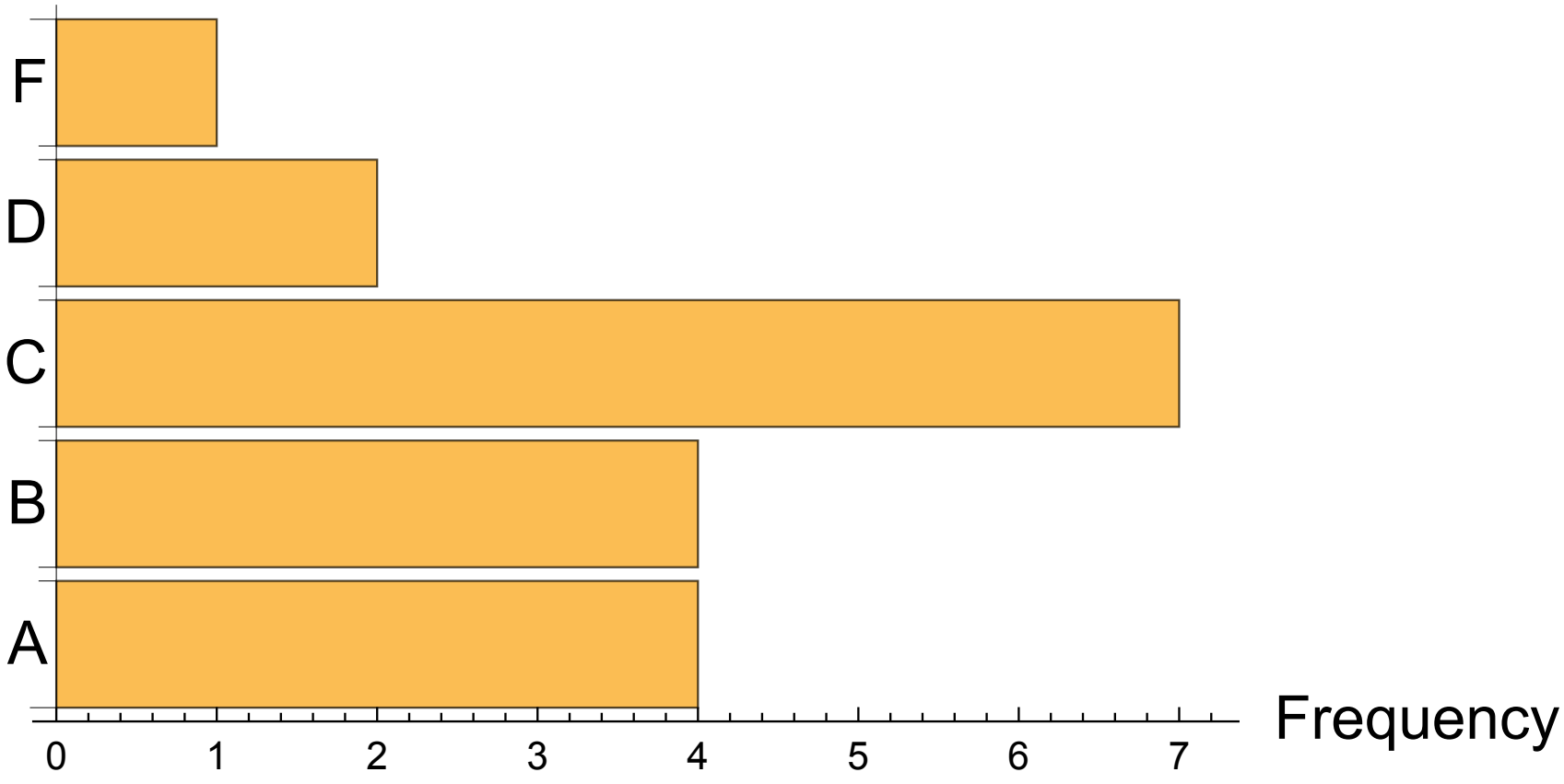
Construct a frequency bar graph and a relative frequency bar graph of the grades presented earlier.

Grade	Frequency	Relative Frequency
A	4	0.2222
B	4	0.2222
C	7	0.3888
D	2	0.1111
F	1	0.0556

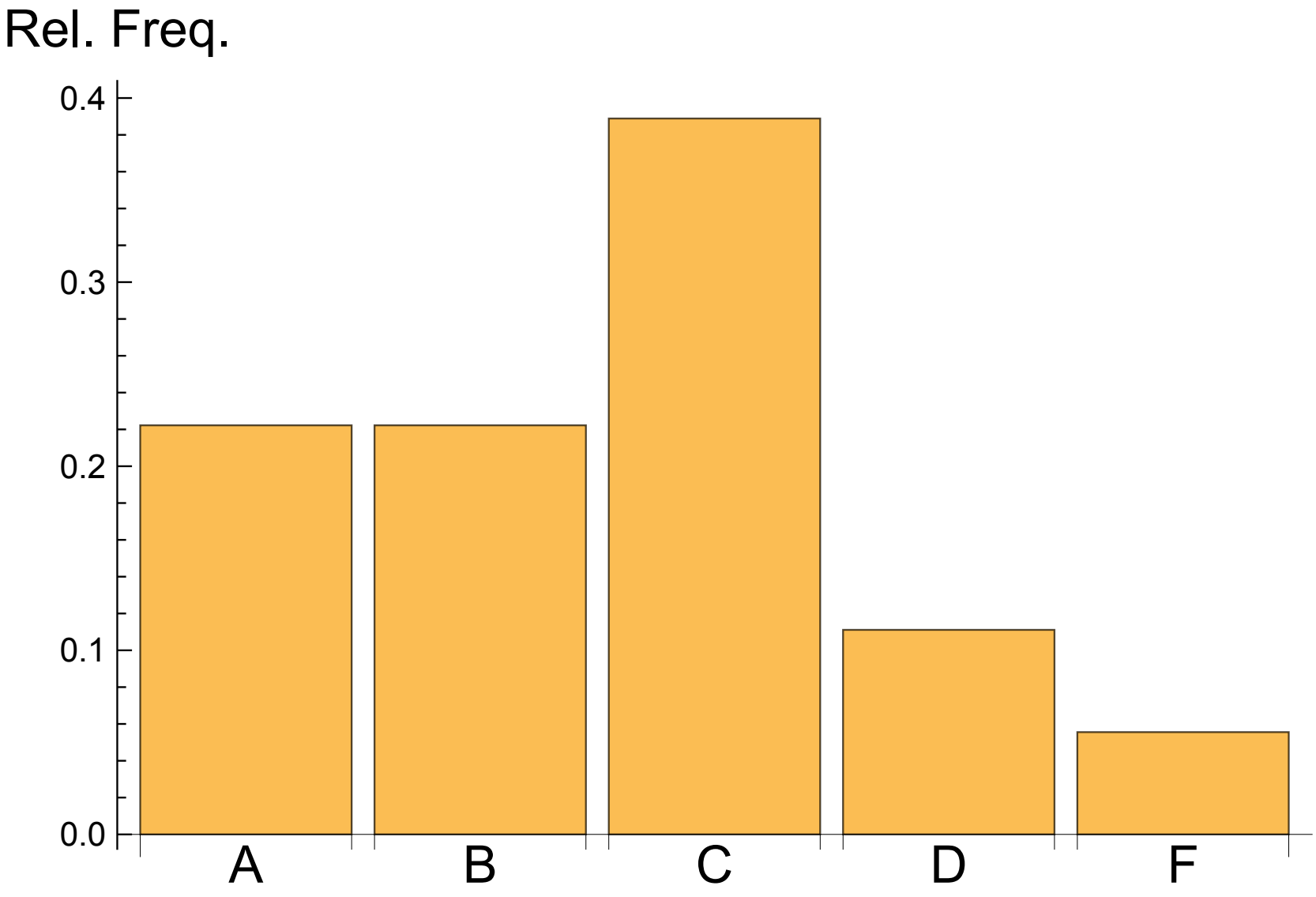
Bar Graph Solution



Horizontal Bar Graph



Relative Frequency Bar Graph Solution



Side-by-Side Bar Chart

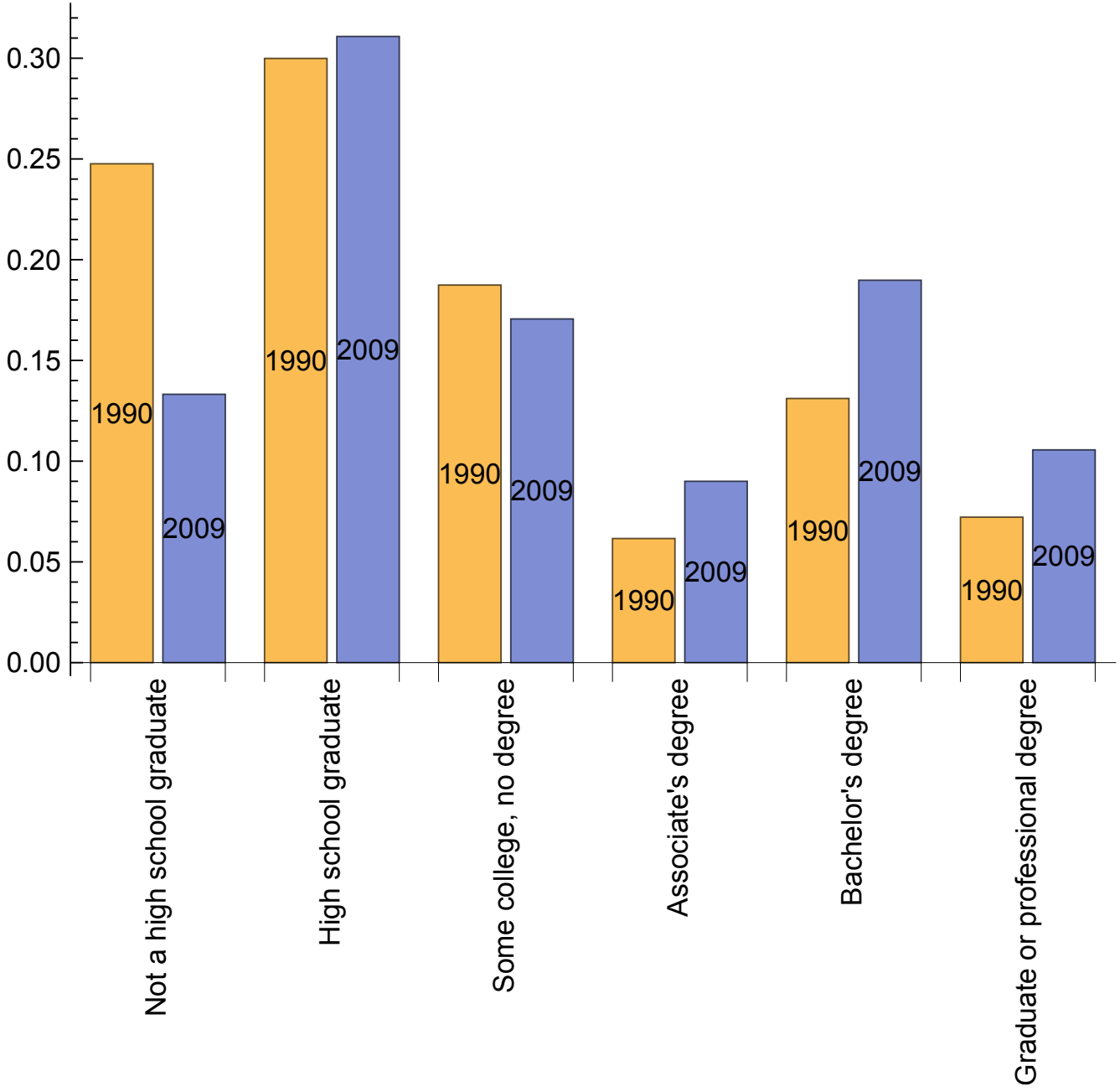
We can use a bar chart to compare two sets of data.

Educational Attainment	**1990**	**2009**
Not a high school graduate	39,344	26,414
High school graduate	47,643	61,626
Some college, no degree	29,780	33,832
Associate's degree	9,792	17,838
Bachelor's degree	20,833	37,635
Graduate or professional degree	11,478	20,938
Totals	158,870	198,283

Relative Frequency Table

Educational Attainment	**1990**	**2009**
Not a high school graduate	0.2476	0.1332
High school graduate	0.2999	0.3108
Some college, no degree	0.1874	0.1706
Associate's degree	0.0616	0.0900
Bachelor's degree	0.1311	0.1898
Graduate or professional degree	0.0722	0.1056

Paired Bar Chart



Pareto Chart

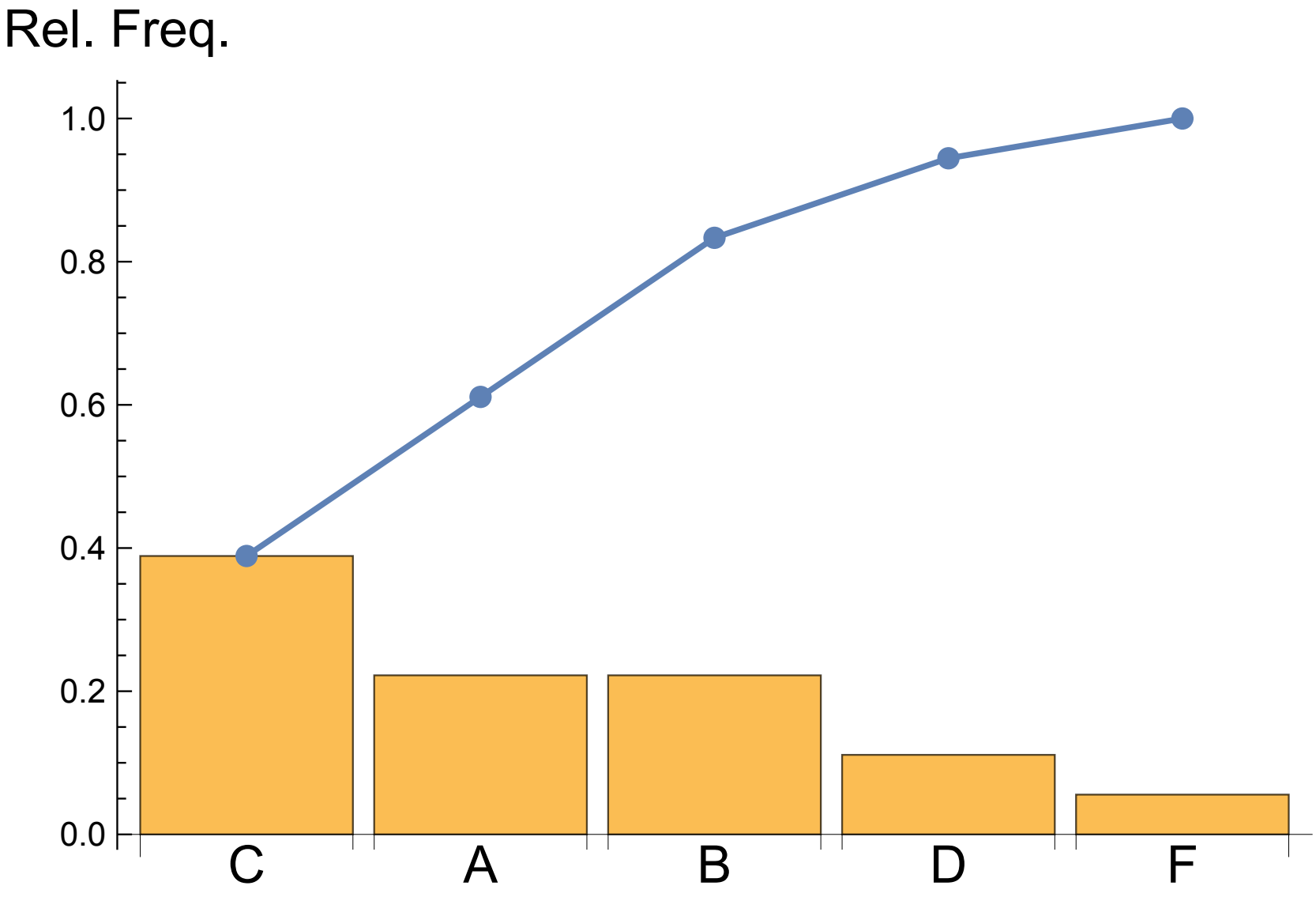
Definition

A **Pareto chart** is a bar graph whose bars are drawn in decreasing order of frequency or relative frequency.

Example

Create a Pareto chart of the grades presented earlier.

Solution



Pie Charts

Definition

A **pie chart** is a circle divided into sectors. Each sector represents a category of data. The area of each sector is proportional to the frequency of the category.

Example

Construct a pie chart of the grades presented earlier.

Making a Pie Chart

Grade	Frequency	Relative Frequency	Degree Measure of Each Sector
A	4	0.2222	$0.2222 \times 360 = 80$
B	4	0.2222	80
C	7	0.3888	140
D	2	0.1111	40
F	1	0.0556	20
Total	18	1.0000	360

Solution