

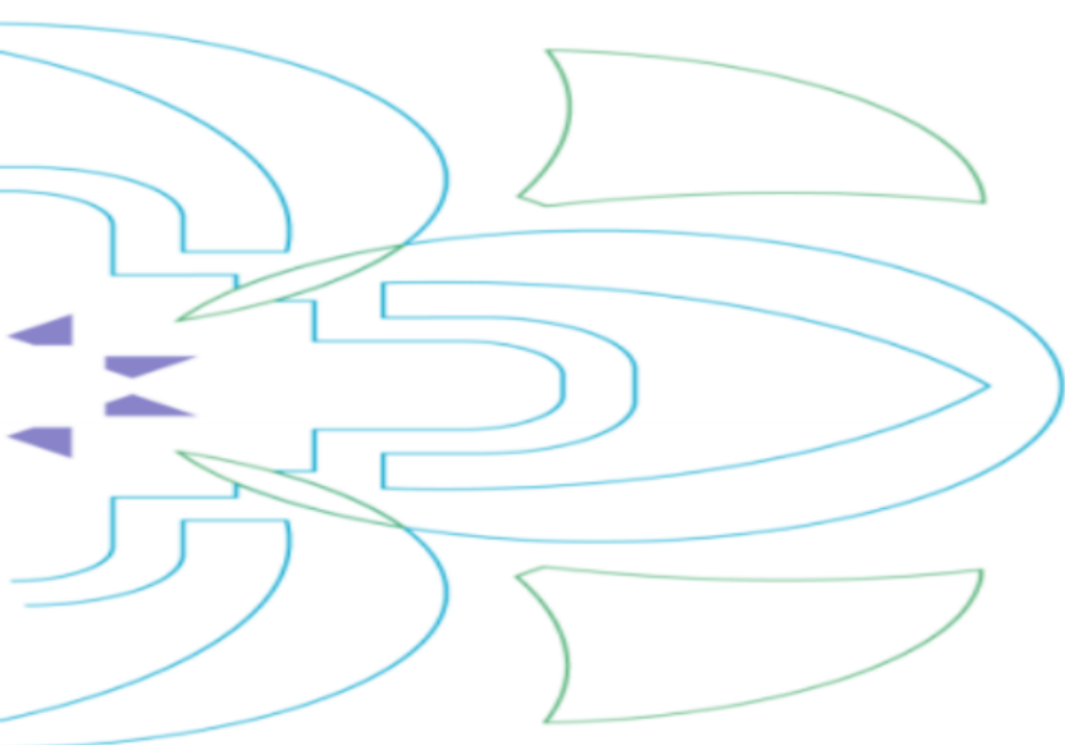


# Lecture 2

الرسوم البيانية

# Graphs and Displays

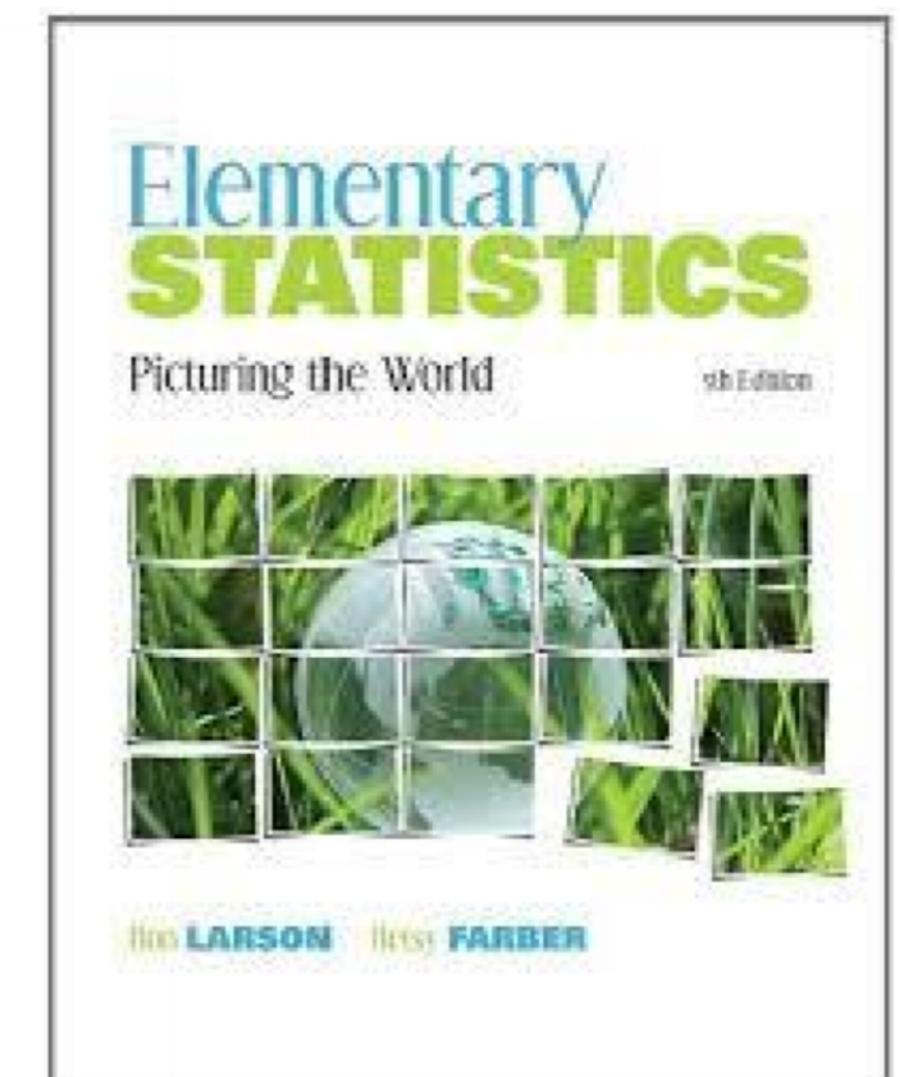
**Mathematical Sciences Department**



# References



Larson, R., Farber, B., Elementary Statistics-Picturing the world, 5<sup>th</sup> Ed.



# The Second Lecture

## Graphs and Displays



### WHAT YOU SHOULD LEARN?

- How to construct frequency histograms, frequency polygons, relative frequency histogram , and cumulative frequency Graph (ogive)
- How to graph and interpret quantitative data sets using stem-and-leaf plots.
- How to graph and interpret qualitative data sets using: pie charts and pareto charts.



الرسم البياني

# Graphs and Displayes

البيانات الكمية

## Quantitative data

البيانات الوصفية

## Qualitative data

بيانات من هورقا جدول

## Grouped data

من غير جدول

## Ungrouped data

pie chart

Histogram

Polygon

relative frequency histogram

cumulative frequency Graph (ogive)

Stem and leaf

Pareto chart

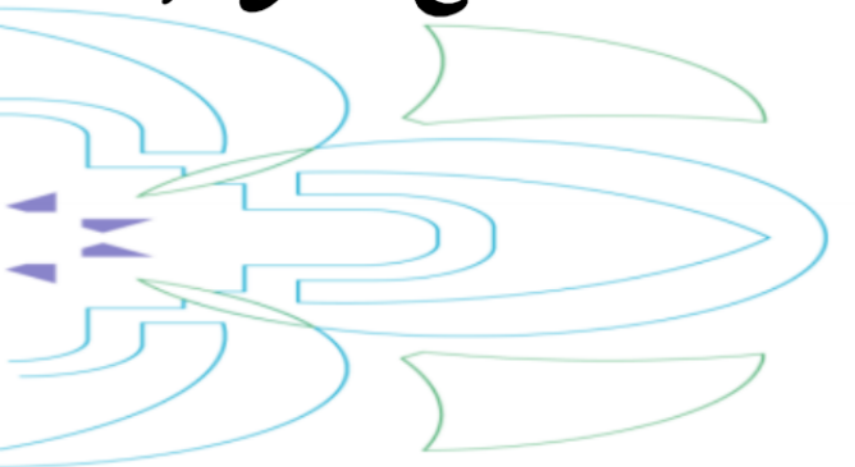
مدرج تكراري

مضلع

لاحنى

الورقة والساق

(ترجمة لرسومات من هتترقا لليم ازاى بنعمل كل رسمه)



# Representation of Frequency

تکرار

نسب



اگرچہ

① ➤ Frequency Histogram

لمبرج، تکراری

② ➤ Frequency Polygon

لمضلع ~

③ ➤ Relative frequency histogram.

لمبرج، تکراری نسب

④ ➤ Cumulative frequency Graph (ogive)

لمتجمعی تکرار



# A Frequency Histogram

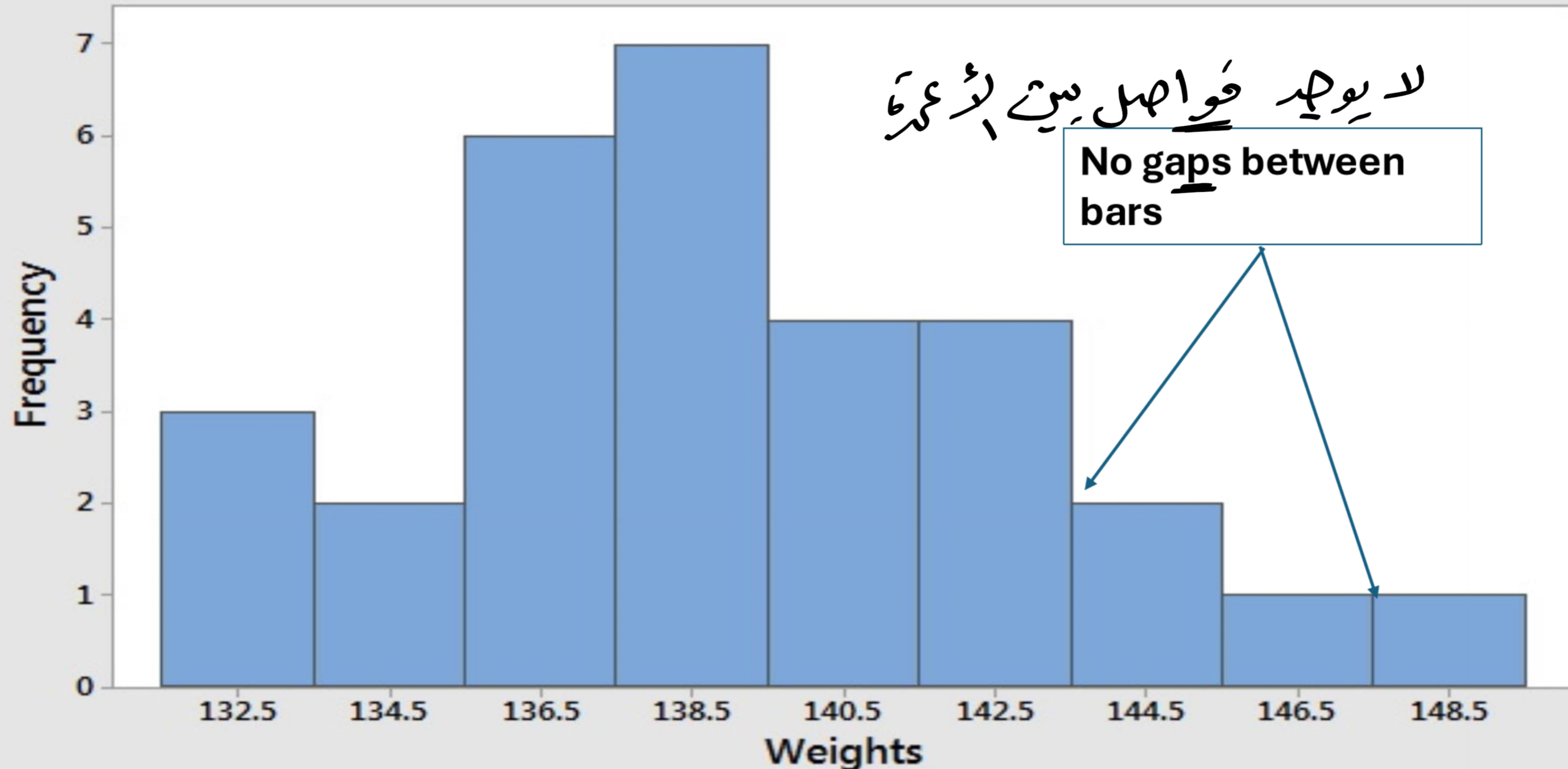
## Definition (p. 42)

التكرار  
المخرج  
بيانية  
أكثر  
هو  
تقسيم  
النسب  
الخصائص  
الآتية  
A frequency **histogram** is a bar graph that represents the frequency distribution of a data set. A histogram has the following properties.

1. The horizontal scale is quantitative and measures the data values.  
الخطة الأفقية  
القياس  
البيانات
2. The vertical scale measures the frequencies of the classes.  
الخطة الرأسية  
القياس  
التكرار  
الفئات
3. Consecutive bars must touch.  
لا يوجد فواصل بين الأشرطة

# Histogram

Histogram of Weights



- Because consecutive bars of a histogram must touch, bars must begin and end at class boundaries (True Class Interval) instead of class limits.  
وَتَسْمَى أَنْ تَبْدَأَ لِأَبَرِ - بِجِبْ أَنْ تَتَلَاسَسَ - الأَدْمَةُ لِجَبَاوَرَةَ لَازِن  
عِنْدَ الْقَتْرَاتِ الْحَقِيقَةِ
- Class boundaries are the numbers that separate classes without forming gaps between them.  
فَوَاهِلُ بِدُونِ أَرْقَامٍ هِيَ الْحَقِيقَةُ الْقَتْرَاتِ
- If data entries are integers, subtract 0.5 from each lower limit to find the lower class boundaries. To find the upper class boundaries, add 0.5 to each upper limit. The upper boundary of a class will equal the lower boundary of the next higher class.  
الْقِسْمَةُ لِصَغِيرٍ مِنْ نَحْرٍ نَزُودِ الْعِمَّةِ الْكَبِيرَةِ

Example 1 pg. 39 Larson and Farber :

الآلية العينة توضيح السعر

The following sample data set lists the prices (in dollars) of 30 portable global positioning system (GPS) navigators.

Construct a frequency distribution that has seven classes.

Draw a frequency histogram distribution for this data.

$$k = 7$$

250	150	250	325	70	350	200	400	130	90
130	300	450	160	200	59	130	150	270	275
150	170	180	95	250	200	400	200	100	220

حدود الفترات  
حساب  
بتأدب

CLASS INTERVAL	CLASS BOUNDARY	FREQUENCY
59-114	58.5-114.5	5
115-170	114.5-170.5	8
171-226	170.5-226.5	6
227-282	226.5-282.5	5
283-338	282.5-338.5	2
339-394	338.5-394.5	1
395-450	394.5-450.5	3
Total		30

• To start with, compute the class boundaries as follows:

-First class lower boundary =  $59 - 0.5 = 58.5$

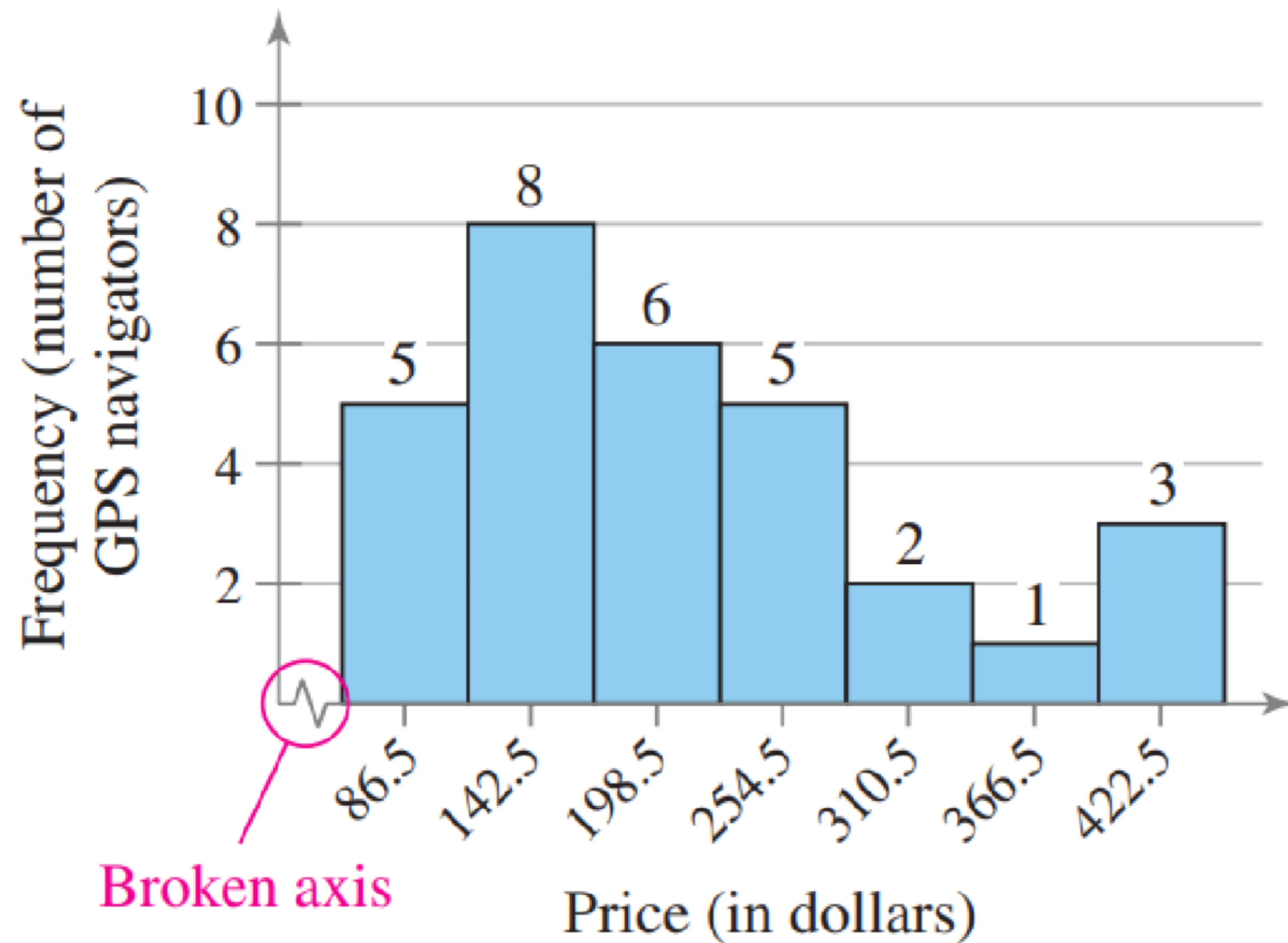
-First class upper boundary =  $114 + 0.5 = 114.5$

-The boundaries of the remaining classes are computed as shown in the table.

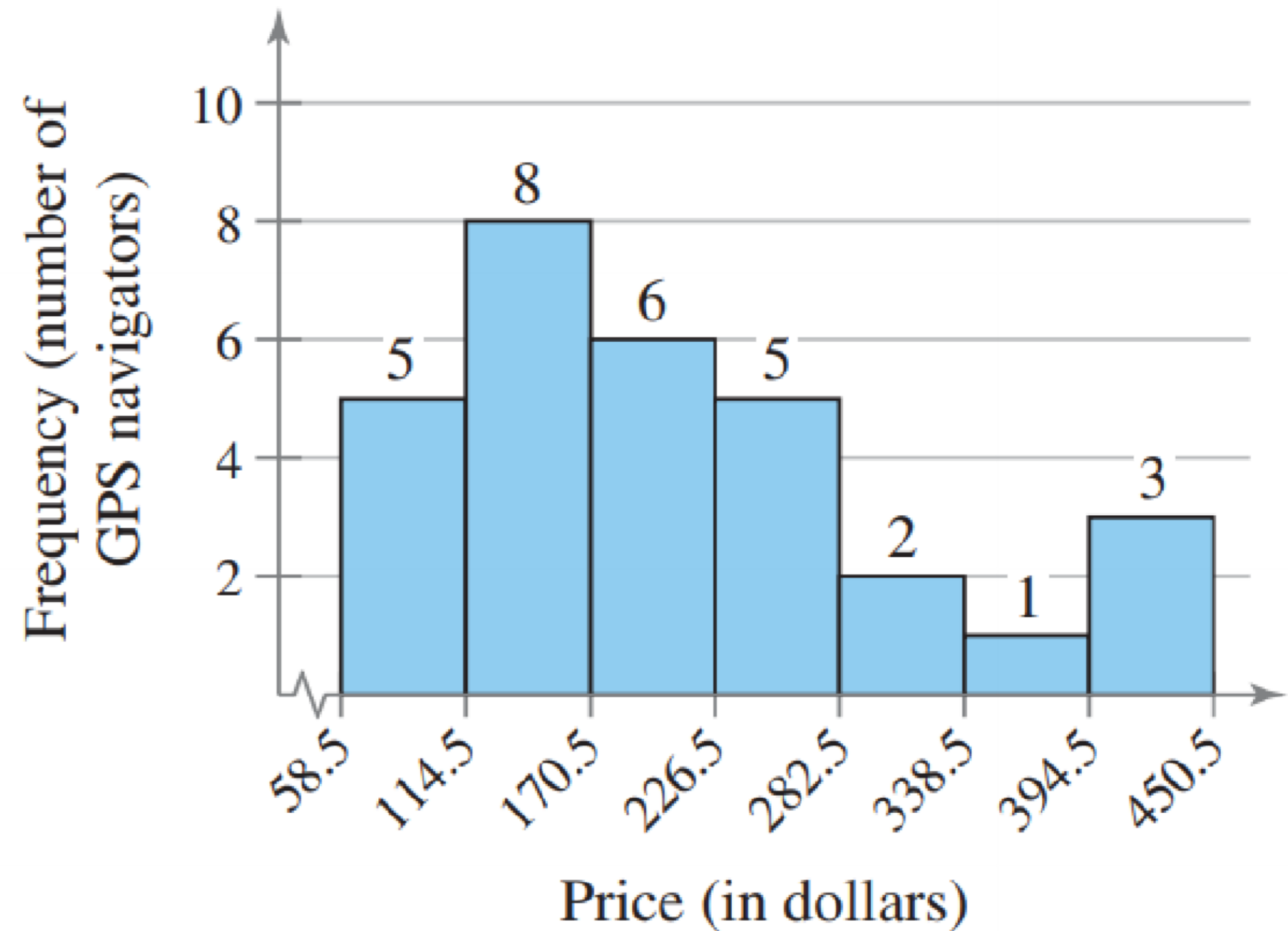
**Note:** To construct the histogram, choose possible frequency values for the vertical scale. You can mark the horizontal scale either at the midpoints or at the class boundaries. Both histograms are shown.

فختار مصيبيات مناسبة للنظ العمودي وبتأدب

**Prices of GPS Navigators  
(labeled with class midpoints)**



**Prices of GPS Navigators  
(labeled with class boundaries)**



نصف اکثریت

**Interpretation** From either histogram, you can see that more than half of the GPS navigators are priced below \$226.50.

اکثریت



# A Frequency Polygon

# A Frequency Polygon



Larson, R., Farber, B, page 43

Another way to graph a frequency distribution is to use a **frequency polygon**.

A frequency polygon is a line graph that emphasizes the continuous change in frequencies.

التغيرات  
في التكرارات

Example 1 pg. 39 Larson and Farber :

The following sample data set lists the prices (in dollars) of 30 portable global positioning system (GPS) navigators.

Construct a frequency distribution that has seven classes.

Draw a frequency polygon distribution for this data.

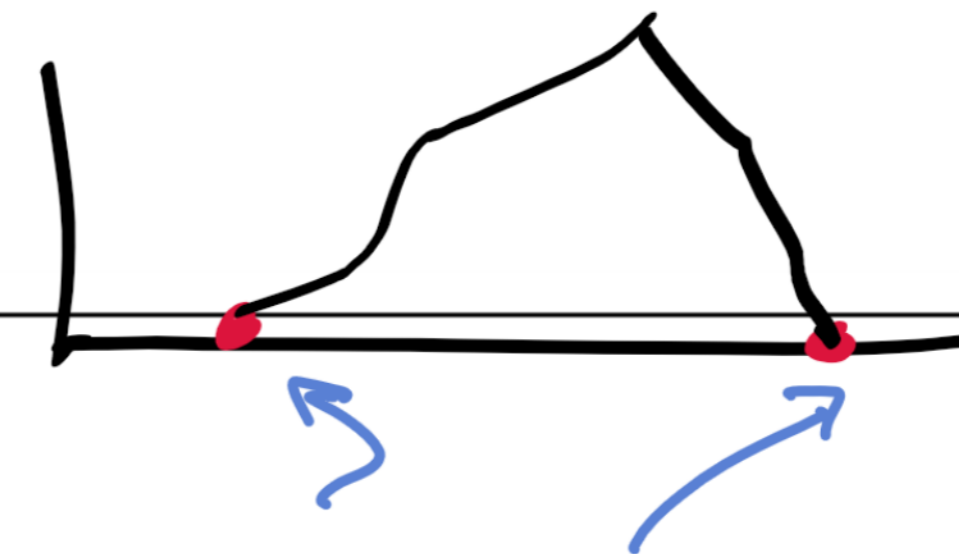
# درستاء

To construct the frequency polygon,

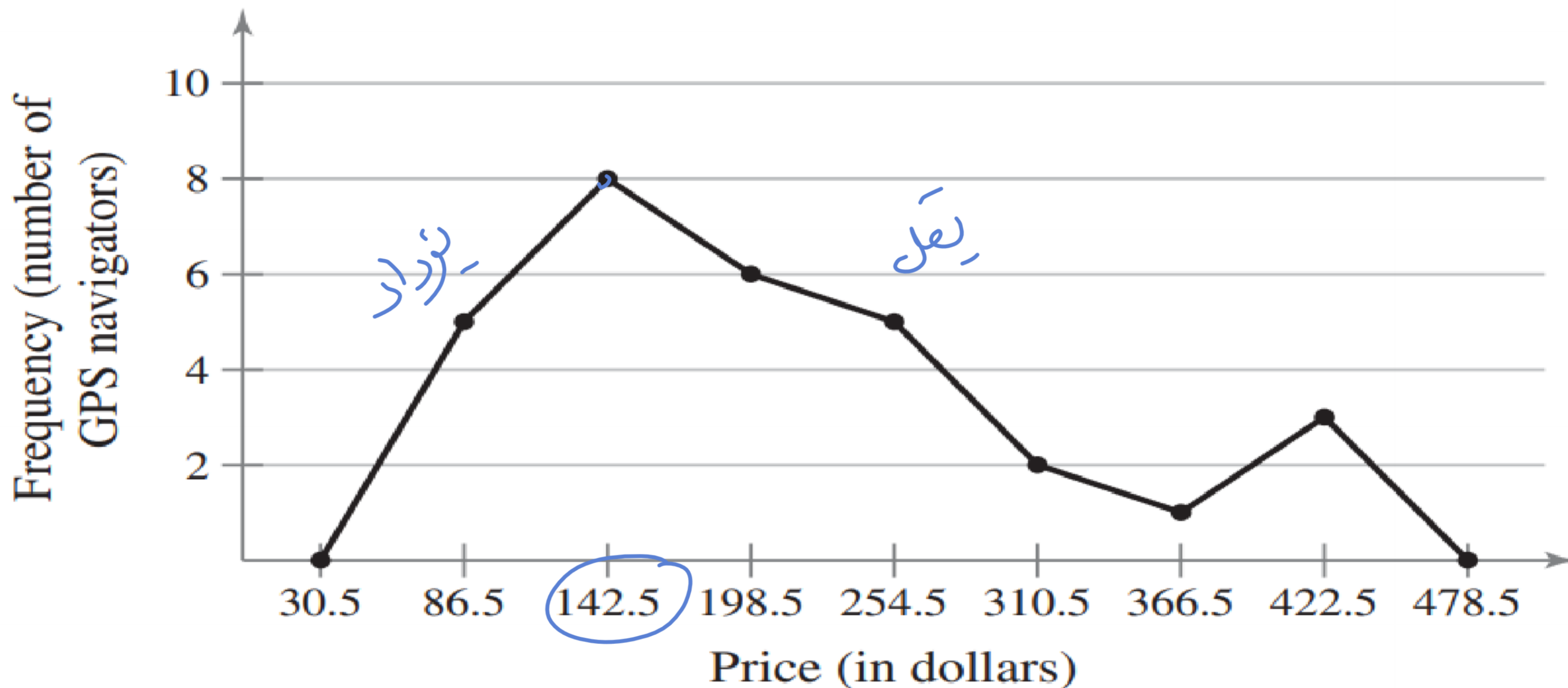
- Use the horizontal and vertical scales that were used in the histogram. <sup>والرؤسي والخط الأفقي</sup> <sup>نفس</sup> <sup>من أمثلة السابق</sup> labeled with class midpoints in Example 1.
- Plot points that represent the midpoint and frequency of each class. <sup>النقطة التي تحتها</sup> <sup>و نقطتين</sup> <sup>التكرار</sup>
- Connect the points in order from left to right. <sup>النقاط</sup> <sup>التي من</sup> <sup>لليمين</sup>

**Note:** Because the graph should begin and end on the horizontal axis, extend the left side to **one class width before** the first-class midpoint and extend the right side to **one class width after** the last class midpoint.

دي على صيها نضيف فترة من البداية و النهاية  
وتوصل بالهفر



# Prices of GPS Navigators



**Interpretation** You can see that the frequency of GPS navigators increases up to **\$142.50** and then decreases.

# Relative Frequency Histogram



Larson, R., Farber, B, page 44

شکل نفس له المدرج التكراري ليس

A relative frequency histogram has the same shape and the same horizontal scale as the corresponding frequency histogram. المدرج التكراري

ليس المحور الرأس أن الفرق

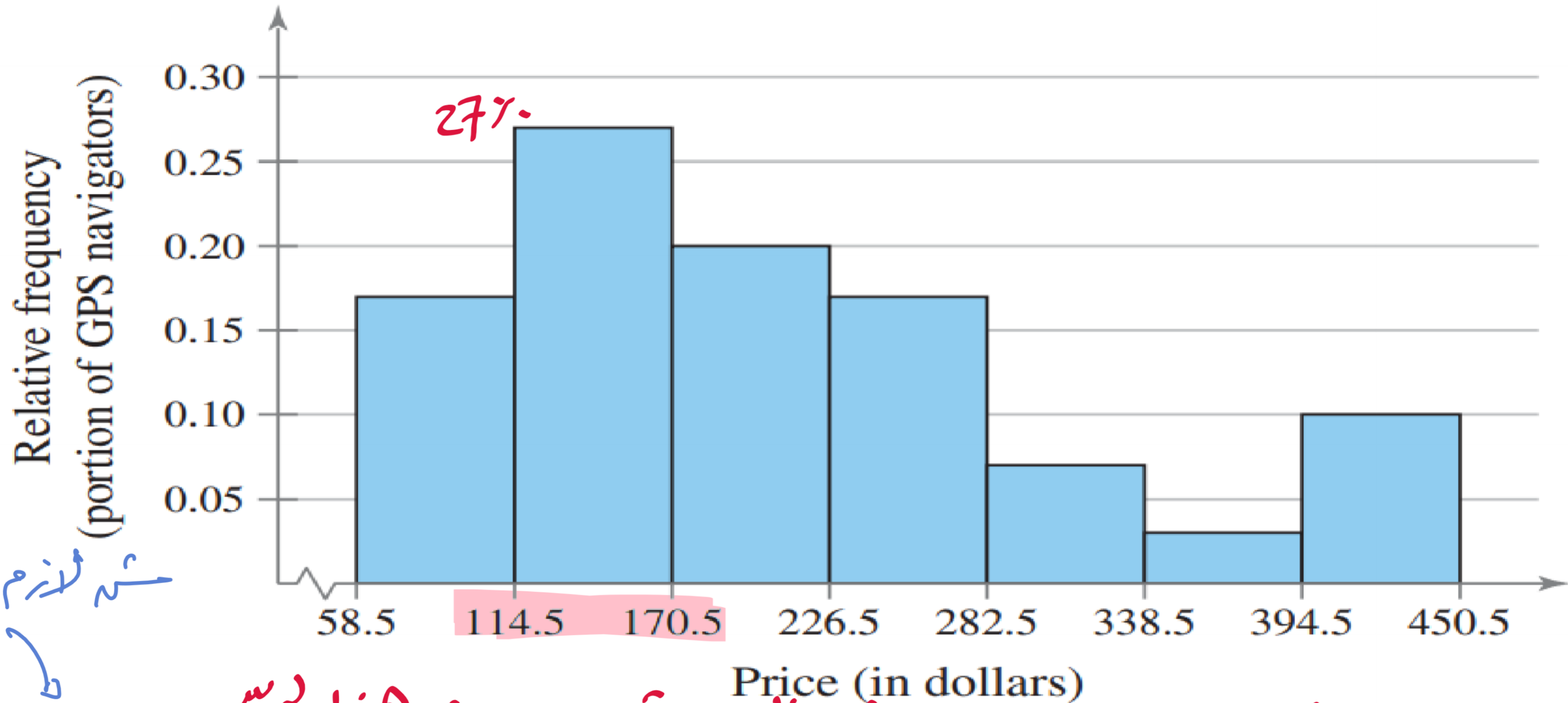
The difference is that the vertical scale measures the relative frequencies, not frequencies.

ليس التكراري وليس التكراري ليس

Example 1 pg. 39 Larson and Farber :

Constructing a Relative Frequency Histogram Draw a relative frequency histogram for the frequency distribution in Example 1.

# Prices of GPS Navigators



منه لازم نقولها

منه لهذا الرسم

ان نلاحظ برة

من

**Interpretation** From this graph, you can quickly see that 0.27 or 27% of the GPS navigators are priced between \$114.50 and \$170.50, which is not as immediately obvious from the frequency histogram

نعم

# cumulative frequency Graph (ogive)

لیختی پتھاری

Larson, R., Farber, B, page 44

If you want to describe the number of data entries that are equal to or below a certain value, you can easily do so by constructing a **cumulative frequency graph**.

A cumulative frequency graph, or ogive is a line graph that displays the cumulative frequency of each class at its upper class boundary.

The upper boundaries are marked on the horizontal axis, and the cumulative frequencies are marked on the vertical axis.

پتھاری پتھاری

رکون

Mathematical Sciences Department

علی محور پتھاری

ogive رسم

Example 1 pg 39 Larson and Farber :

-Draw an ogive for the frequency distribution in Example 1.

اجب  
-Estimate how many GPS navigators cost \$300 or less.

Also, use the graph to estimate when the greatest increase in price occurs.

## GUIDELINES

دی خطوات بحل [ذلیہباً کما بالشرح]

### Constructing an Ogive (Cumulative Frequency Graph)

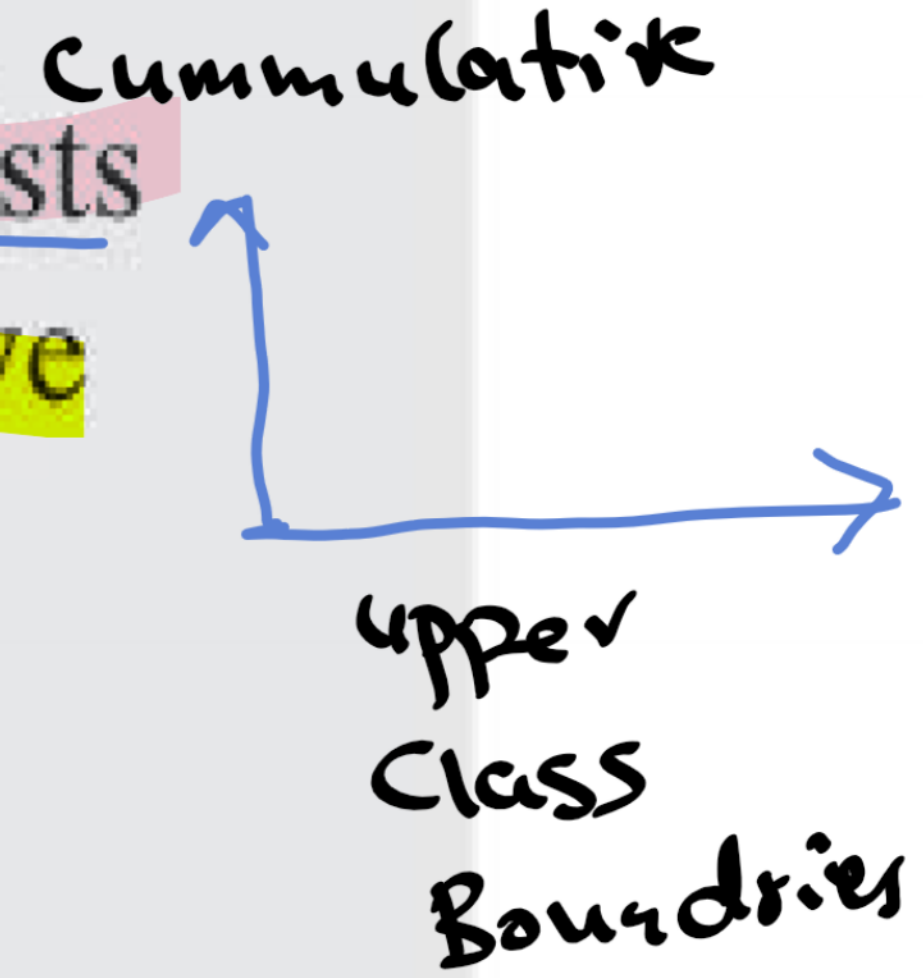
1. Construct a frequency distribution that includes cumulative frequencies as one of the columns. تکمیل ارقام من الجدول

2. Specify the horizontal and vertical scales. The horizontal scale consists of upper class boundaries, and the vertical scale measures cumulative frequencies. نرسم الخط الأفقي والرأس

3. Plot points that represent the upper class boundaries and their corresponding cumulative frequencies. وضع النقاط

4. Connect the points in order from left to right. وصل النقاط

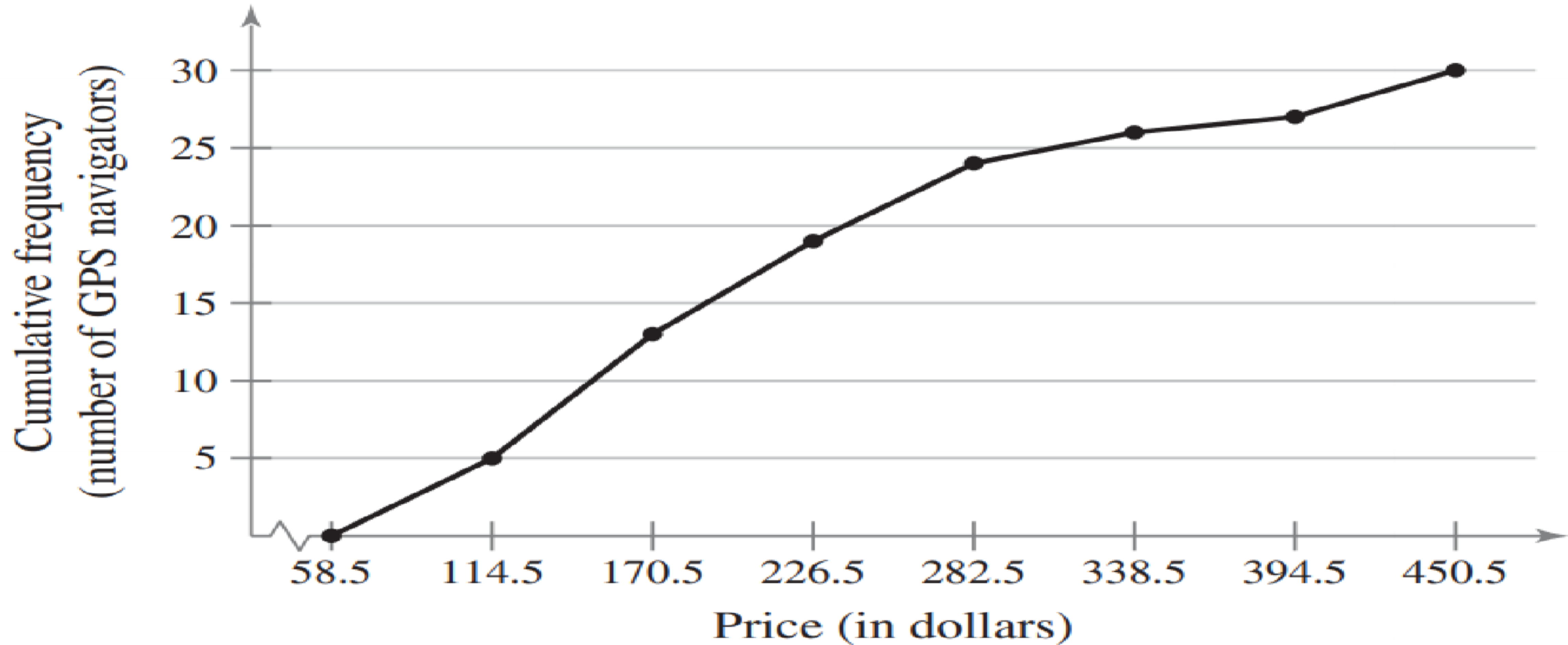
5. The graph should start at the lower boundary of the first class (cumulative frequency is zero) and should end at the upper boundary of the last class (cumulative frequency is equal to the sample size). تبدأ من الصفر



Upper class boundary	Frequency	Cumulative frequency
114.5	5	5
170.5	8	13
226.5	6	19
282.5	5	24
338.5	2	26
394.5	1	27
450.5	3	30
<b>Total</b>	<b>30</b>	

- Notice that the graph starts at 58.5, where the cumulative frequency is 0, and the graph ends at 450.5, where the cumulative frequency is 30.

## Prices of GPS Navigators



**Interpretation** From the ogive, you can see that about 25 GPS navigators cost \$300 or less. It is evident that the greatest increase occurs between \$114.50 and \$170.50, because the line segment is steepest between these two class boundaries.

## Section 2.2: More graphs and displays (page:53)

### Stem and leaf plot

تنفصده رقم كل الورقة و بيان من  
- In a stem-and-leaf plot, each number is separated into a **stem** (for instance, the entry's leftmost digits) and a **leaf** (for instance, the rightmost digit).

- You should have as many leaves as there are entries in the original data set and the leaves should be single digits.

نيزة له لكن مشابه  
- A stem-and-leaf plot is similar to a histogram but has the advantage that the graph still contains the original data values.

لترتيب بطريقة سهله - نودنا هي انه  
- Another advantage of a stem-and-leaf plot is that it provides an easy way to sort data.

البينات (من رسم لترجمه هنا رسم انزاي انهد السوال)

## Example:

Use a stem-and-leaf plot to display the data.

The following data represent students' marks in Statistics course.

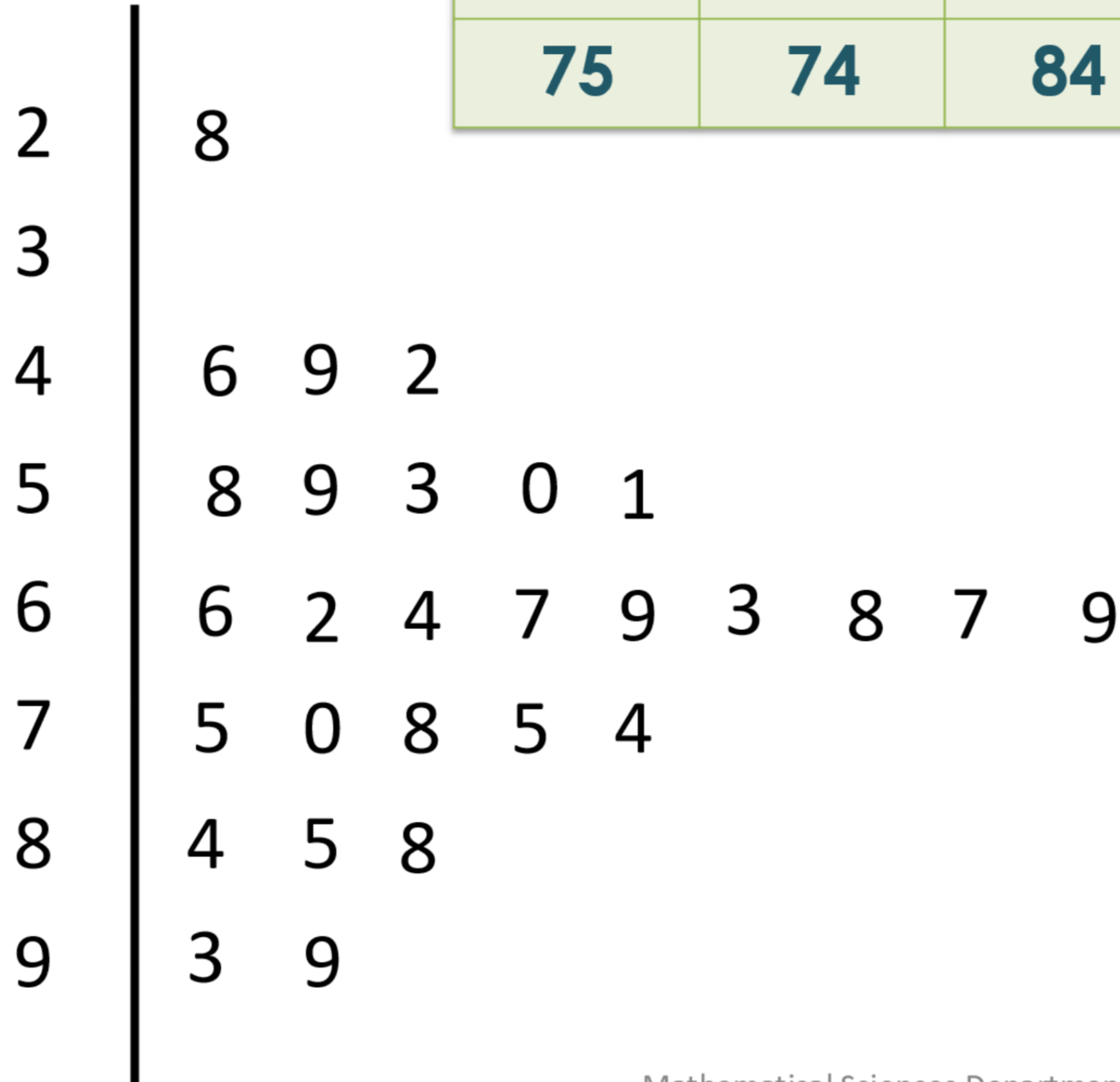
کھلائی دہ عنی اسوآل ببصہ اچن کما فالضبرو

28	46	49	42	58	59	53
50	51	66	62	64	67	69
63	68	67	69	75	70	78
75	74	84	85	88	93	99

# Unordered Stem-and-Leaf Plot

خبرنامه

28	46	49	42	58	59	53
50	51	66	62	64	67	69
63	68	67	69	75	70	78
75	74	84	85	88	93	99

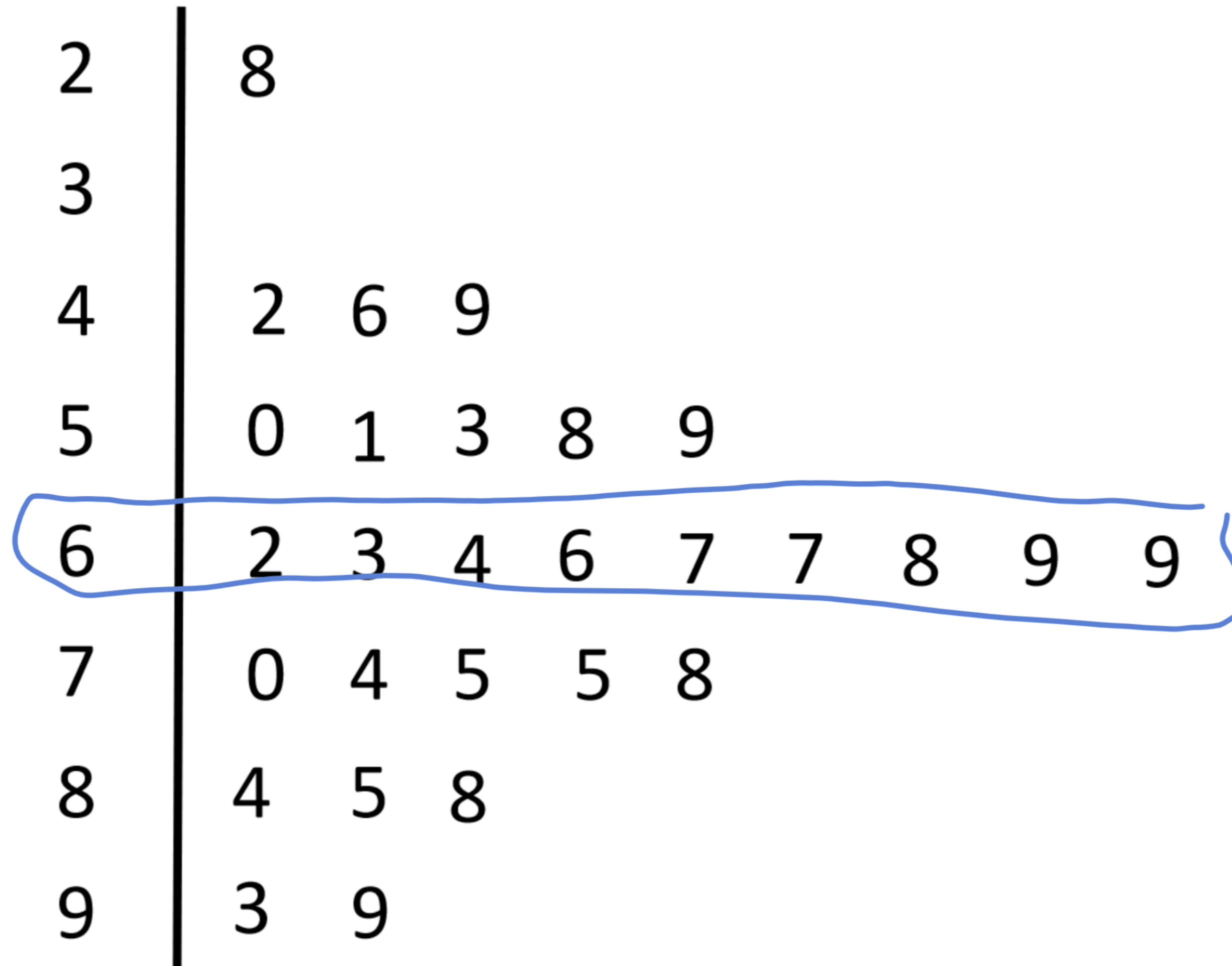


Key 2 | 8 = 28

# Ordered Stem-and-Leaf Plot

كرتبه

Key 2|8=28



من الشكل نلاحظ ان اكثر كرتبه

**Interpretation:** From the display, you can conclude that most of the scores are in the **60s**

تعمير

البيانات الوصفية

# Representation of Qualitative Data



➤ Pie chart

شكل، لاشرف

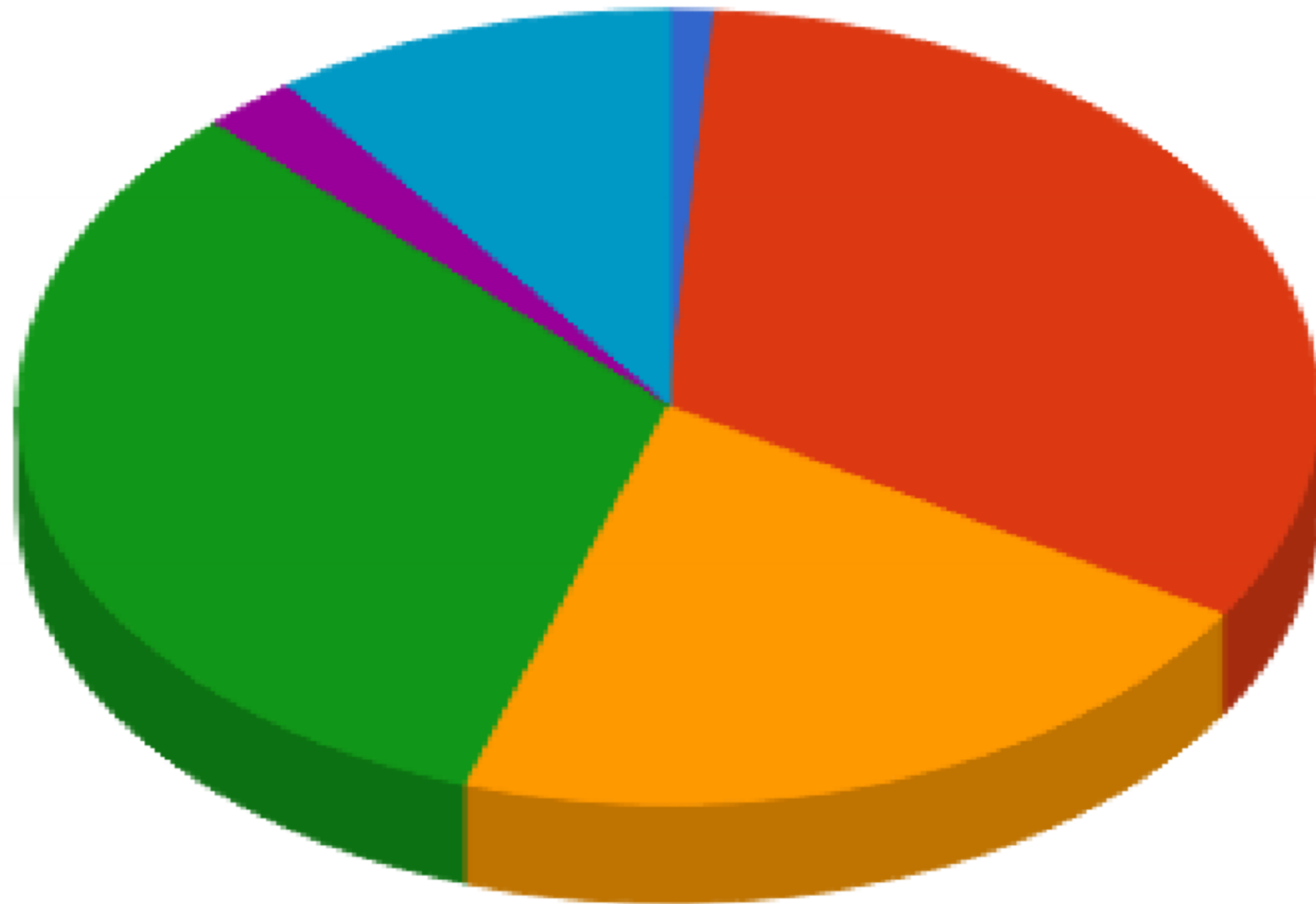
➤ Pareto chart

الاشرف المتفصلة

# Pie Chart



Animals



- Chickens
- Cats
- Dogs
- Goats
- Cows
- Donkeys

قطاعات

المساحة

متناسبة

التكرار

A pie chart is a circle that is divided into sectors that represent categories. The area of each sector is proportional to the frequency of each category.

دايرة لهُو

مقسمة

تُشير

المساحة

قطاعات

ح

# Definition and Formula (p.56)



## • In order to draw a pie chart:

- Calculate the angle for each category.

- Draw a circle, mark the centre and draw a radius.

- Measure and draw the angle for the first category.

- Measure and draw the angle for each further category and add data labels.

$$\text{Angle} = \frac{\text{Category Value}}{\text{Total value}} \times 360^\circ$$

الاجمالي

درجات

قانون حساب الزاوية

“The total value of the pie is always 100%”

Note: It is not mandatory to convert the given data into percentages until it is specified. We can directly calculate the degrees for given data values and draw the pie chart accordingly.

خطوات في

الدرجات  
مكرو

**Example ( p. 56):** The numbers of earned degrees conferred (in thousands) in 2007 are shown in the table. Use a pie chart to organize the data. What can you conclude?

موضحة بالجدول



Pie chart

### Earned Degrees Conferred in 2007

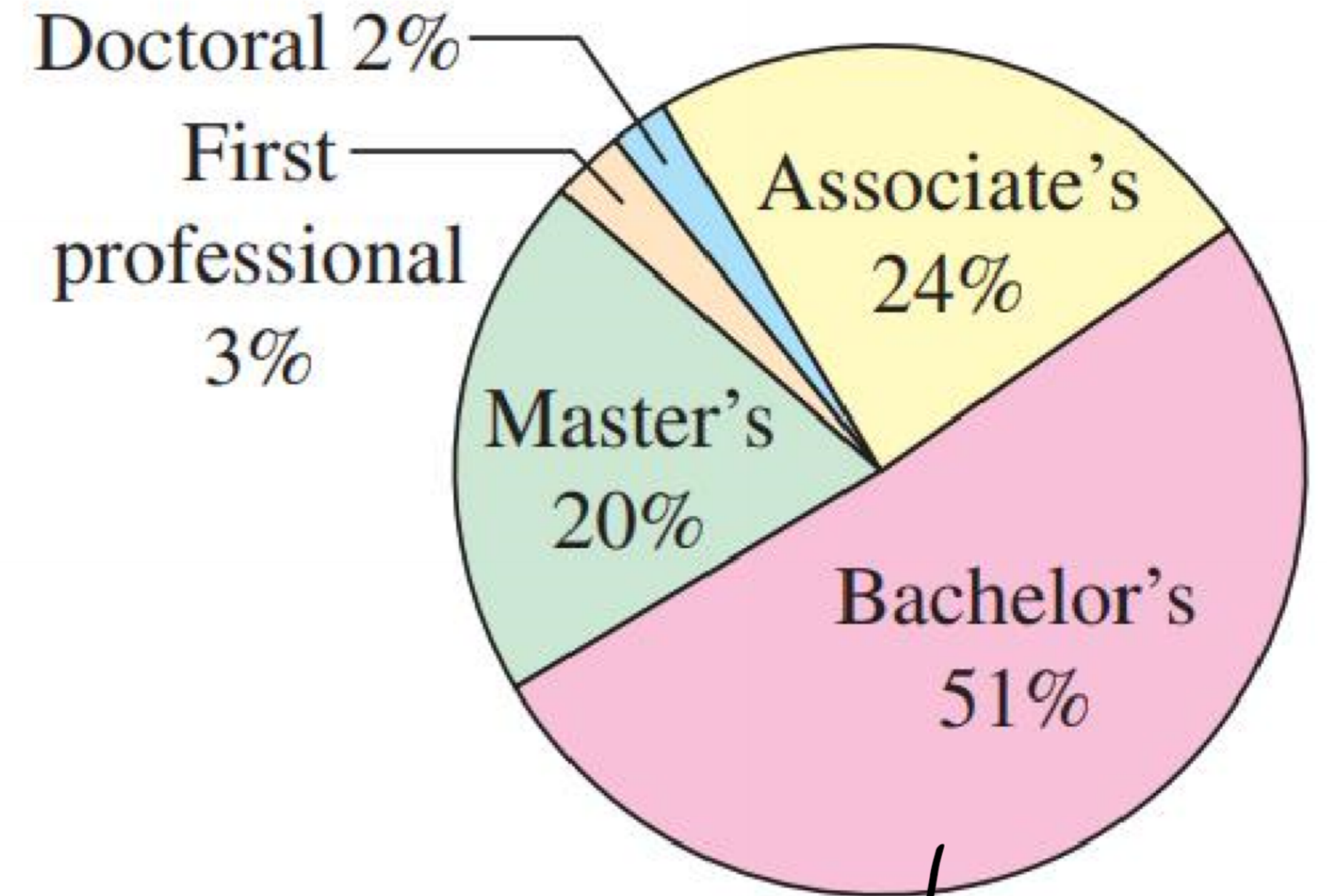
Type of degree	Number (thousands)
Associate's	728
Bachelor's	1525
Master's	604
First professional	90
Doctoral	60



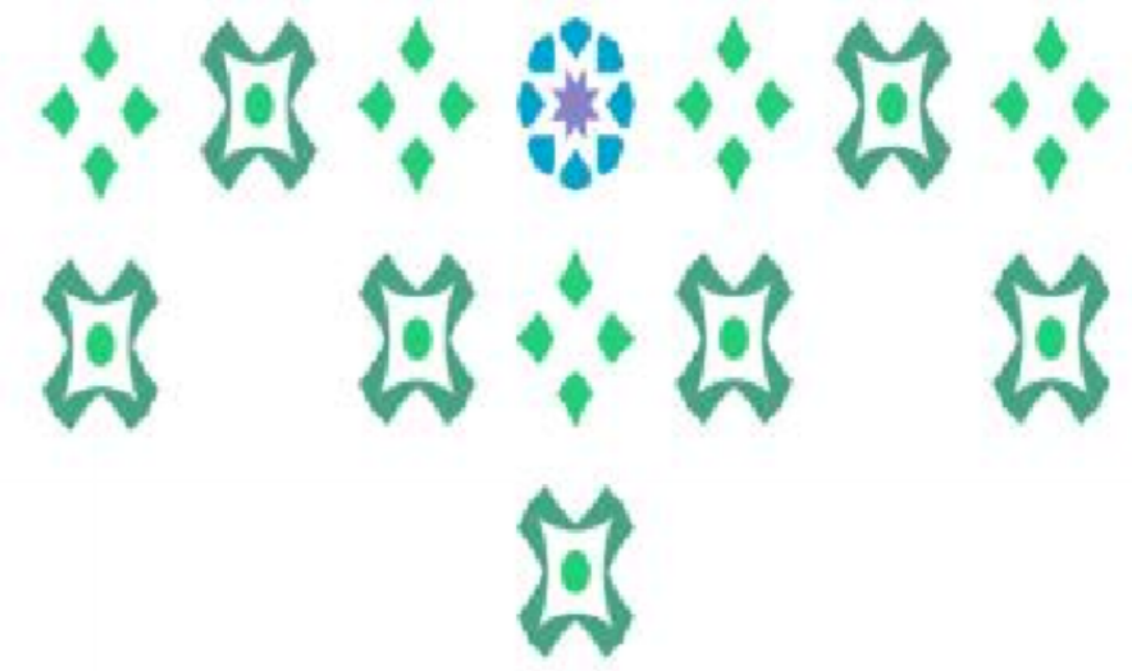
Type of degree	f	Relative frequency	angle
Associate	728	$\frac{728}{3007} = 0.24$	$0.24 \times 360 = 86$
Bachelor	1525	$\frac{1525}{3007} = 0.51$	$0.51 \times 360 = 184$
Master	604	$\frac{604}{3007} = 0.20$	$0.20 \times 360 = 72$
F. Professional	90	$\frac{90}{3007} = 0.03$	$0.03 \times 360 = 11$
Doctoral	60	$\frac{60}{3007} = 0.02$	$0.02 \times 360 = 7$
<b>sum</b>	<b>3007</b>	<b>1</b>	<b>360</b>

Type of degree	$f$	Relative frequency	Angle
Associate's	728	0.24	$86^\circ$
Bachelor's	1525	0.51	$184^\circ$
Master's	604	0.20	$72^\circ$
First professional	90	0.03	$11^\circ$
Doctoral	60	0.02	$7^\circ$

## Earned Degrees Conferred in 2007



**Interpretation** <sup>من الرسم</sup> From the pie chart, you can see <sup>تلاحظون</sup> that over one half of the degrees conferred in 2007 were bachelor's degrees. <sup>أكثر من النصف من الدرجات</sup>



# Pareto chart

# Definition (p.57)



استخدام البيانات الوصفية كرمز سريع آخر

Another way to graph qualitative data is to use a Pareto chart.

A **Pareto chart** is a vertical bar graph in which the height of each bar represents frequency or relative frequency. The bars are positioned in order of decreasing height, with the tallest bar positioned at the left. Such positioning helps highlight important data and is used frequently in business.





ترجمة السؤال سمة

اننا بتوف هو عاوز ايه

لصيت Pareto chart بيص عاوز برسكيا

بتوف ليدر تام خي السؤال وا عمال من اسول من اذ بكر للانسف

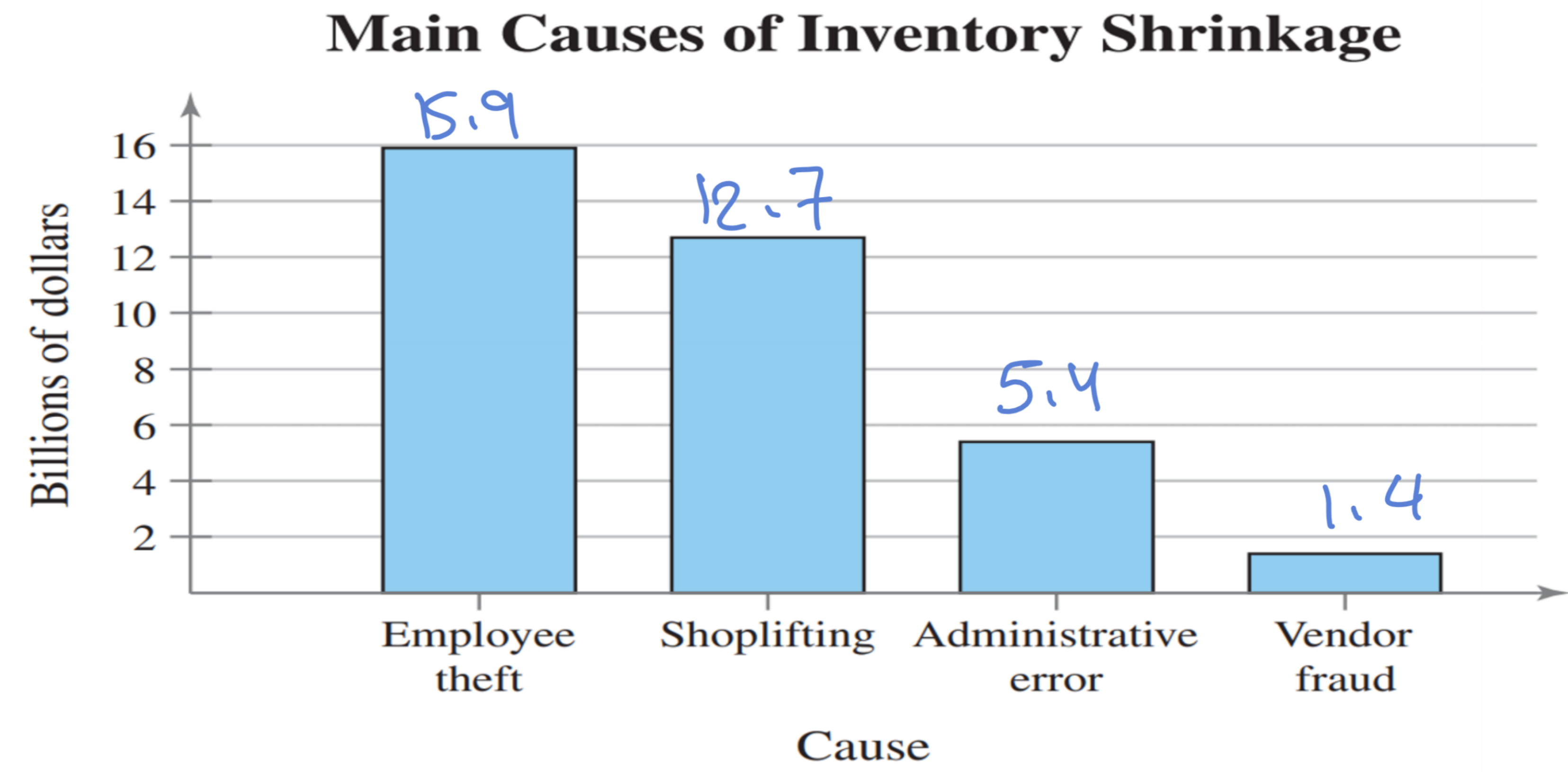
### Example ( p. 57): Constructing a Pareto Chart

In a recent year, the retail industry lost \$36.5 billion in inventory shrinkage. Inventory shrinkage is the loss of inventory through breakage, pilferage, shoplifting, and so on. The main causes of inventory shrinkage are **administrative error (\$5.4 billion)**, **employee theft (\$15.9 billion)**, **shoplifting (\$12.7 billion)**, and **vendor fraud (\$1.4 billion)**. If you were a retailer, which causes of inventory shrinkage would you address first?



- **Solution**

Using frequencies for the vertical axis, you can construct the Pareto chart as shown.

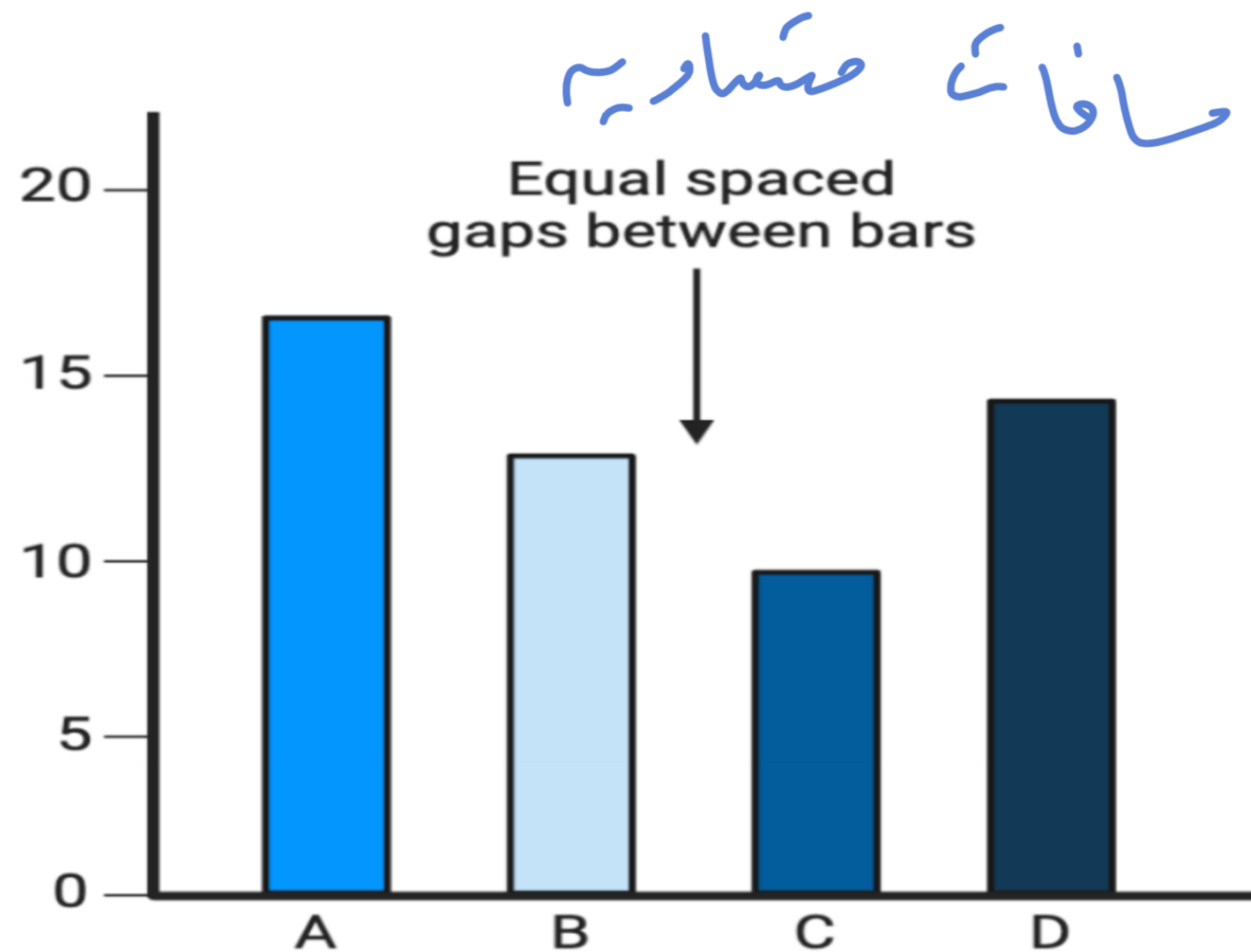


**Interpretation** From the graph, it is easy to see that the causes of inventory shrinkage that should be addressed first are employee theft and shoplifting.

# Bar Chart vs. Histogram

## Bar Chart

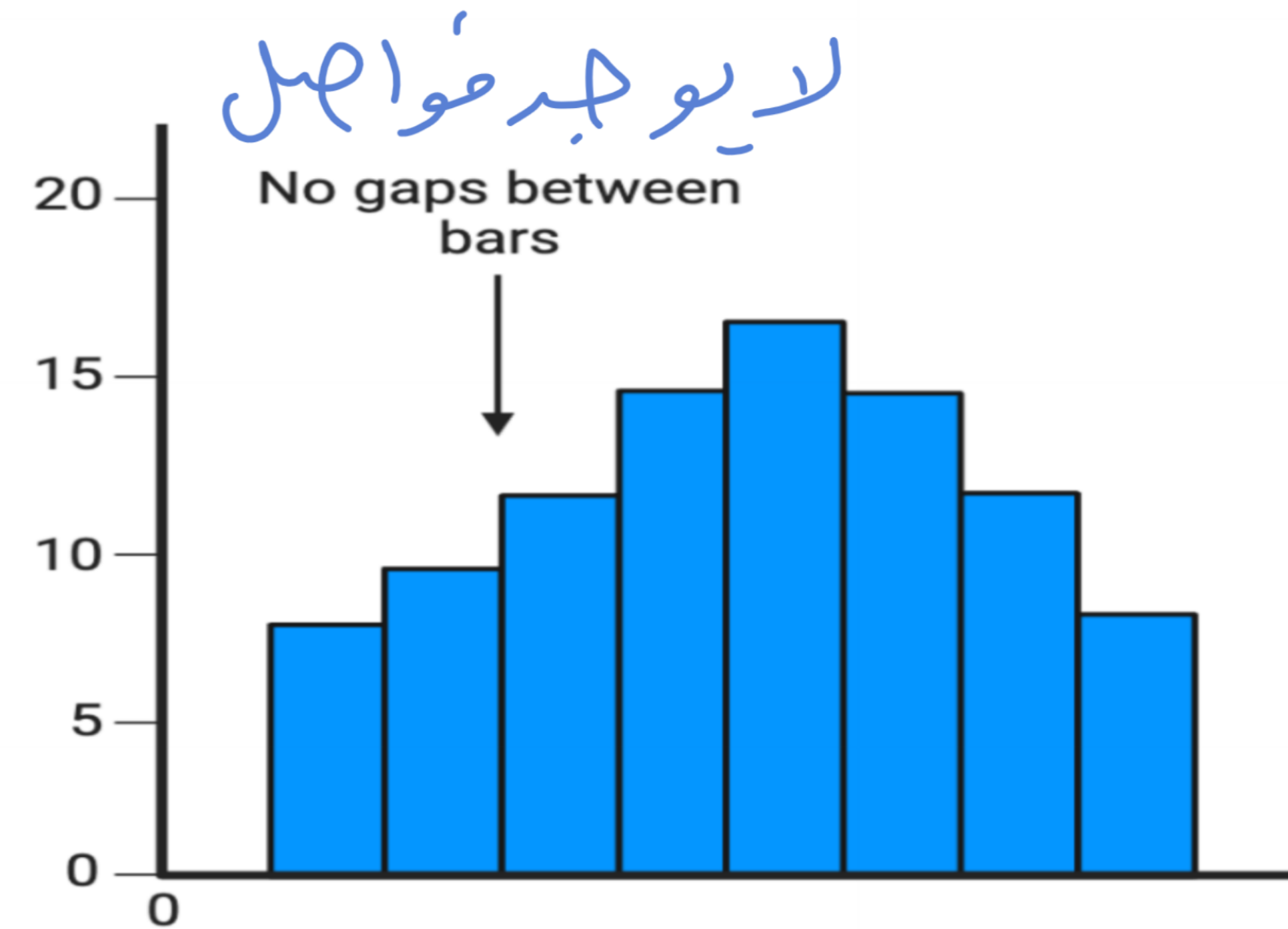
Shows comparison of 2+ categories



X-axis: categories  
Y-axis: numerical values

## Histogram

Shows frequency distribution of data



X-axis: intervals of continuous number  
Y-axis: numerical values



# Practical Application By Excel .





Example 1 pg. 39 Larson and Farber :

The following sample data set lists the prices (in dollars) of 30 portable global positioning system (GPS) navigators.

Construct a frequency distribution that has seven classes.

Draw a frequency histogram distribution for this data.

Get & Transform Data | Queries & Connections | Data Types | Sort & Filter | Data Tools | Forecast | Analysis

G4 fx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

the prices

Class interval	bin
59-114	114
115-	170
171-	226
227-	282
283-	338
339-	394
395-	450

Data Analysis

Analysis Tools

- Anova: Two-Factor With Replication
- Anova: Two-Factor Without Replication
- Correlation
- Covariance
- Descriptive Statistics
- Exponential Smoothing
- F-Test Two-Sample for Variances
- Fourier Analysis
- Histogram**
- Moving Average

OK Cancel Help

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1																
2																
3		the prices														
4		250		Class interval	bin											
5		150		59-114	114											
6		250		115-	170											
7		325		171-	226											
8		70		227-	282											
9		350		283-	338											
10		200		339-	394											
11		400		395-	450											
12		130														
13		90														
14		130														
15		300														

### Histogram

**Input**

Input Range:  ↑

Bin Range:  ↑

Labels \*

**Output options**

Output Range: \*  ↑

New Worksheet Ply:

New Workbook

Pareto (sorted histogram)

Cumulative Percentage

Chart Output \*

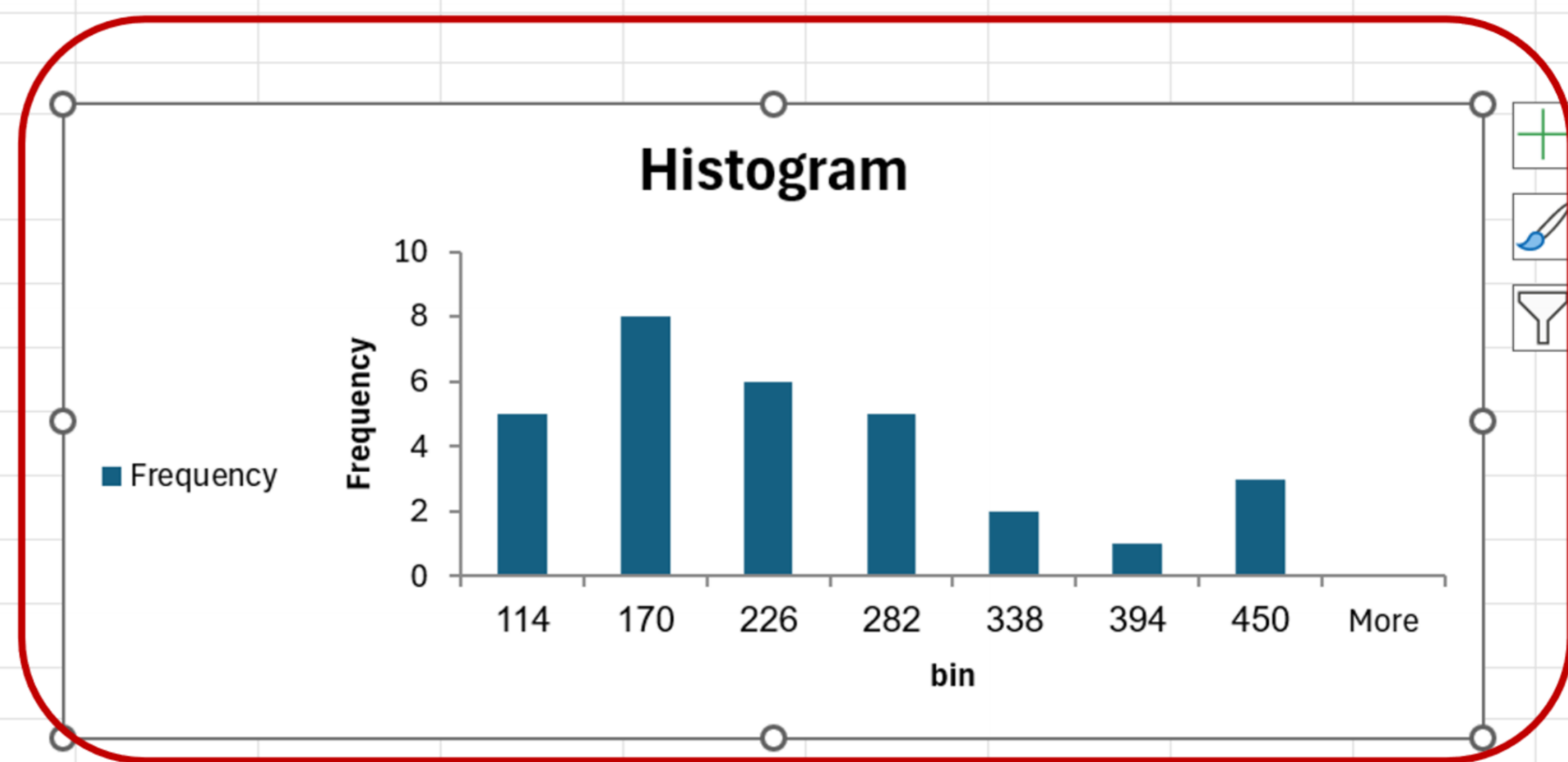
Select any cell

Clipboard Font Alignment Number Styles Cells Editing Sensitivity Add-ins Analyze Data

Chart 2

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																
2																
3		the prices														
4	250		Class interval	bin												
5	150		59-114	114												
6	250	Output	115-	170												
7	325		171-	226												
8	70		227-	282												
9	350		283-	338												
10	200		339-	394												
11	400		395-	450												
12	130															
13	90															
14	130															
15	300															

bin	Frequency
114	5
170	8
226	6
282	5
338	2
394	1
450	3
More	0



We have bar chart and we need to convert them to Histogram.

Chart Layouts: Add Chart Element, Quick Layout, Change Colors

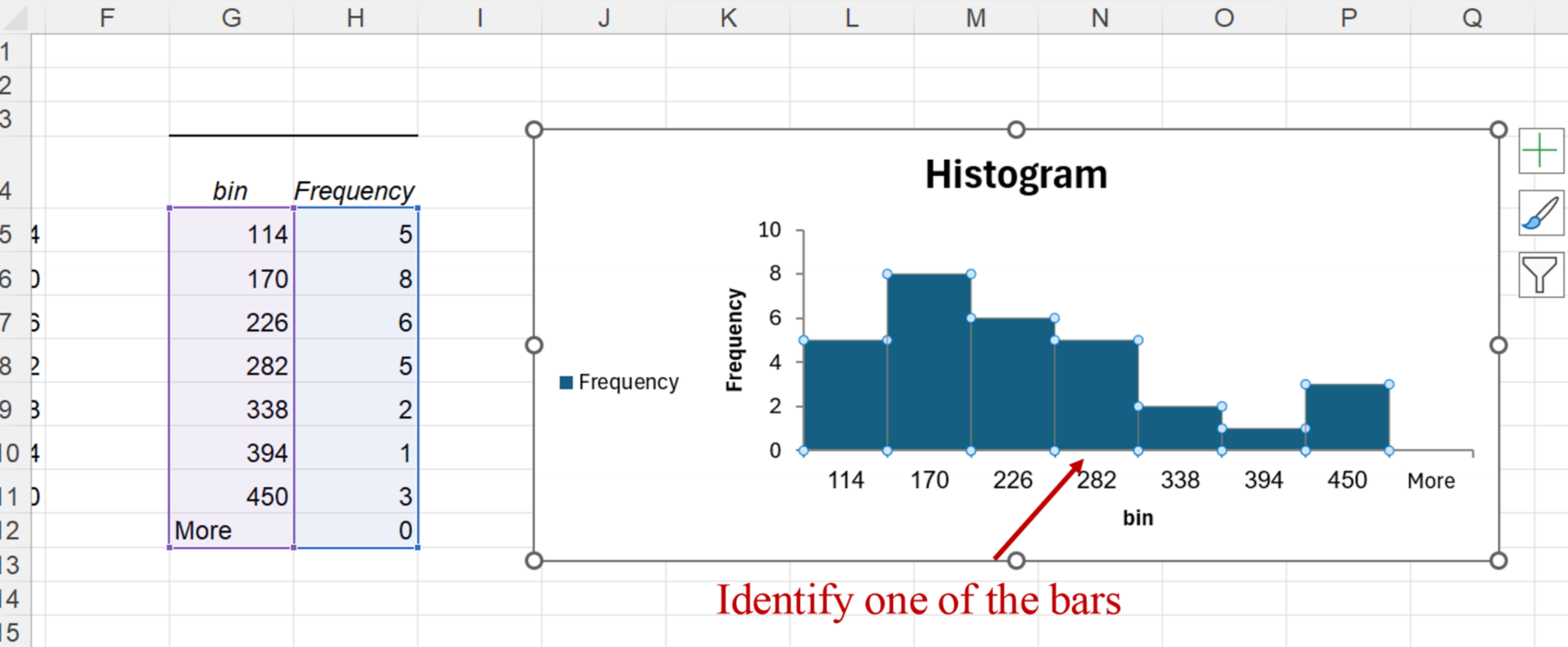
Chart Styles: [8 style thumbnails]

Data: Switch Row/Column, Select Data

Type: Change Chart Type

Location: Move Chart

Chart 2: =SERIES("Frequency",Sheet1!\$G\$5:\$G\$12,Sheet1!\$H\$5:\$H\$12,1)



### Format Data Series

Series Options

Plot Series On

- Primary Axis
- Secondary Axis

Series Overlap: 0%

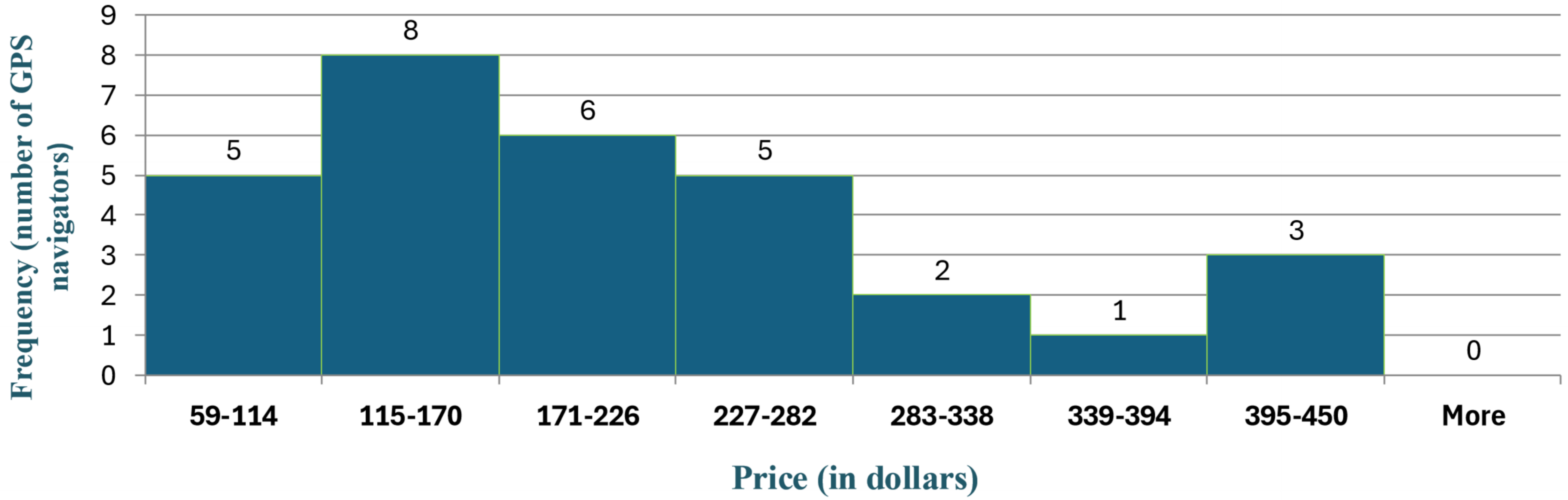
**Gap Width: 0%**

Identify one of the bars

It must be zero



## Prices of GPS Navigators (labeled with class boundaries)





Example 1 pg. 39 Larson and Farber :

The following sample data set lists the prices (in dollars) of 30 portable global positioning system (GPS) navigators.

Construct a frequency distribution that has seven classes.

Draw a frequency polygon distribution for this data.

PivotTable  
 Recommended PivotTables  
 Table  
 Illustrations  
 Checkbox  
 Recommended Charts  
 2-D Line  
 Column  
 Win/Loss  
 Slicer  
 Timeline  
 Link  
 Comment  
 Text  
 Symbols

I17 : fx 0

G H I J K L M N O P Q R S T U

		midpoint	Frequency
14			
15			
16			
17	ss val	30.5	0
18	14	86.5	5
19	5-	142.5	8
20	-	198.5	6
21	7-	254.5	5
22	3-	260.5	2
23	9-	366.5	1
24	5-	422.5	3
25	al	0	0
26			
27			

**2-D Line**

**3-D Line**

**2-D Area**

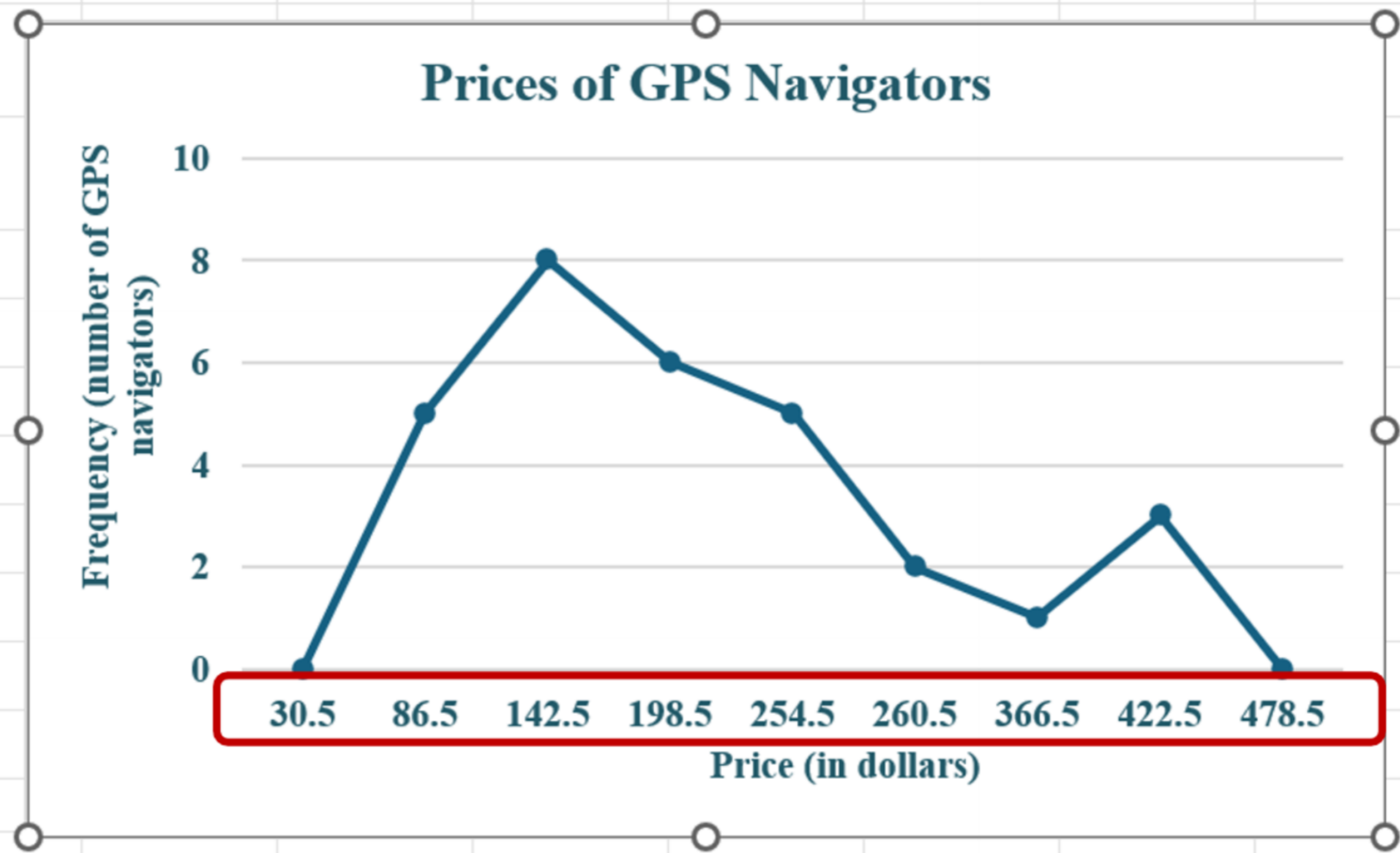
**3-D Area**

[More Line Charts...](#)

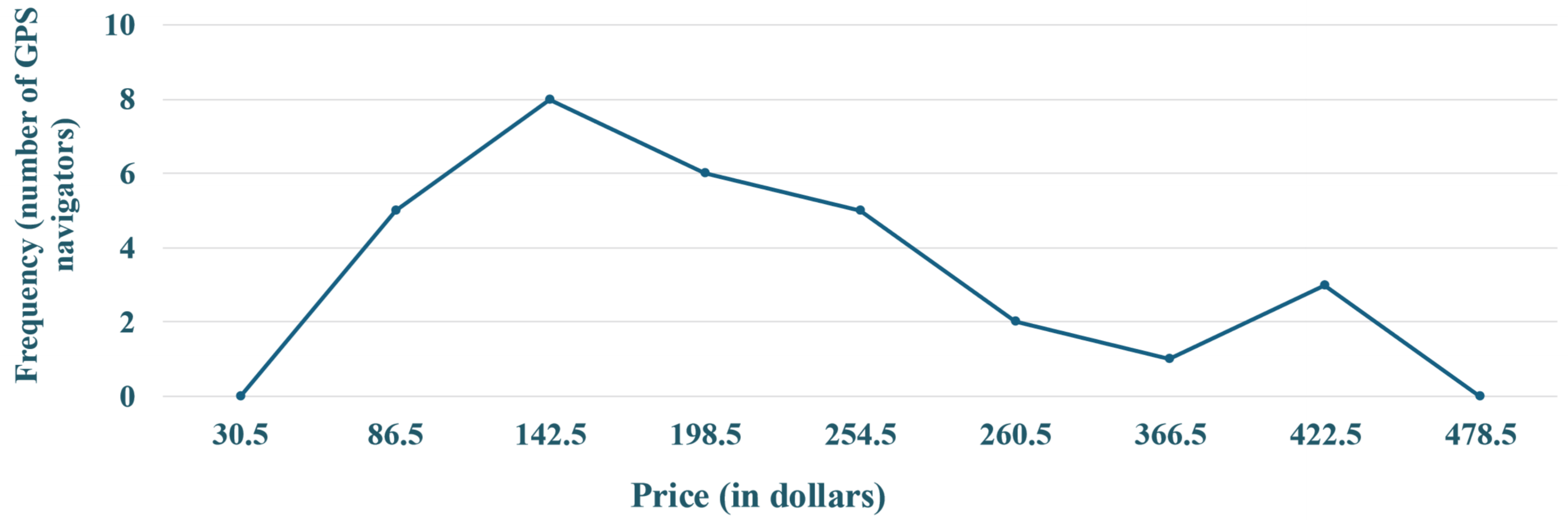
Clipboard Font Alignment Number Styles Cells Editing Sensitivity Add-ins Analyze Data

Chart 3

	D	E	F	G	H	I
15						
16					midpoint	Frequency
17	lower	upper	Class interval	Frequency	30.5	0
18	59	114	59-114	5	86.5	5
19	115	170	115-	8	142.5	8
20	171	226	171-	6	198.5	6
21	227	282	227-	5	254.5	5
22	183	338	283-	2	260.5	2
23	339	394	339-	1	366.5	1
24	395	450	395-	3	422.5	3
25			total	30	478.5	0
26						
27						
28						



# Prices of GPS Navigators



Example 1 pg. 39 Larson and Farber :

Constructing a Relative Frequency Histogram Draw a relative frequency histogram for the frequency distribution in Example 1.

PivotTable Recommended PivotTables Table Illustrations Checkbox Recommended Charts

3D Map Tours Line Column Win/Loss Sparklines Slicer Timeline Filters Link Links Comment Comments Text Symbols

F28 the relative Frequency

Class Interval	Frequency	the relative Frequency	the percentage frequency	the cumulative frequency
114	5	0.1667	16.67	5
170	8	0.2667	26.67	13
226	6	0.2000	20.00	19
282	5	0.1667	16.67	24
338	2	0.0667	6.67	26
394	1	0.0333	3.33	27
450	3	0.1000	10.00	30
total	30		100.00	

2-D Column

3-D Column

2-D Bar

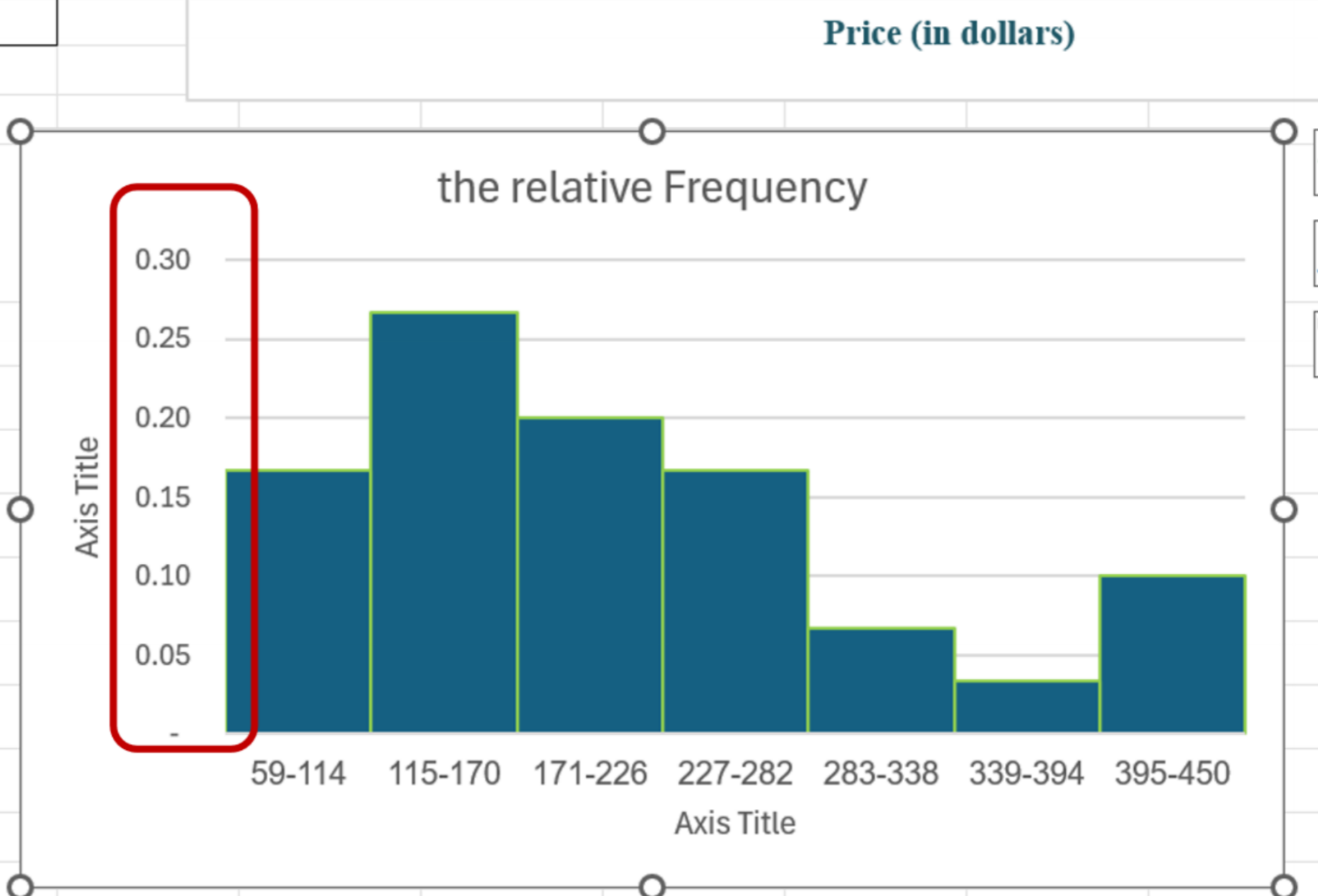
3-D Bar

More Column Charts...

Clipboard | Font: Aptos Narrow (Body) 10 | Alignment | Number: General | Styles: Conditional Formatting, Format as Table, Cell Styles | Cells: Insert, Delete, Format | Editing: Sum, Filter, Sort, Find, Replace, Undo, Redo | Sensitivity | Add-ins | Analyze Data

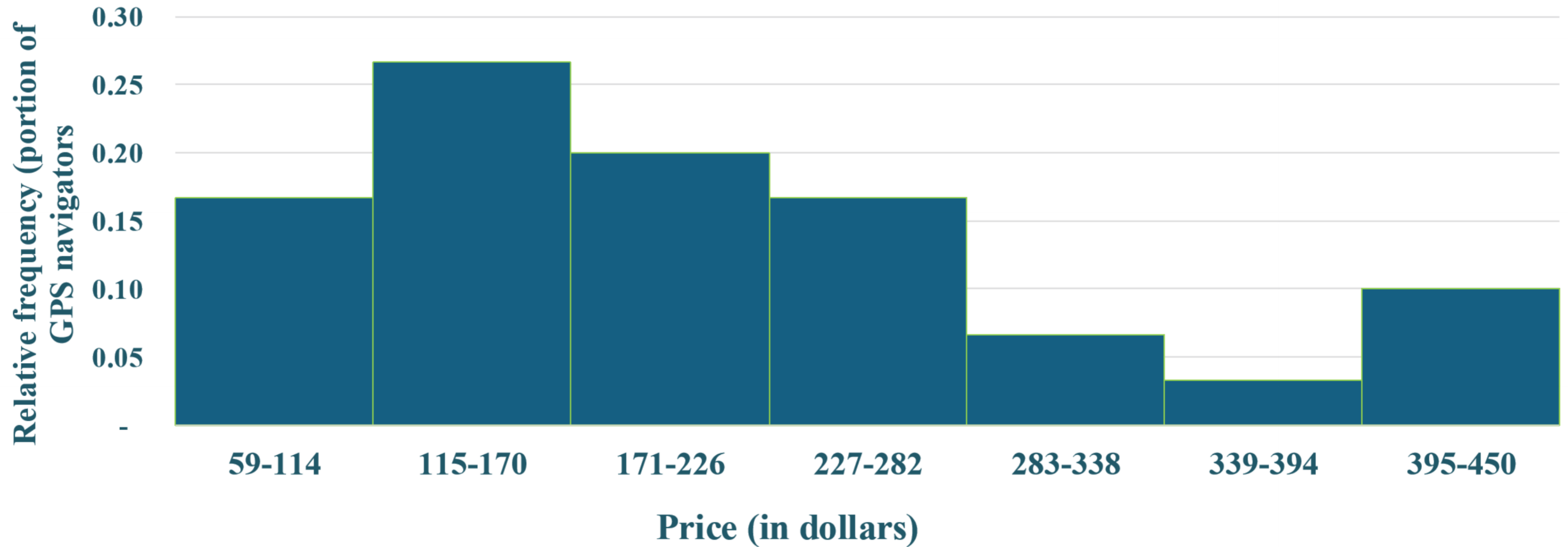
Chart 7 | fx

	F	G	H	I
25	total	30	478.5	0
28	the relative Frequency	the percentage frequency	the cumulative frequency	
29	5	0.17	16.67	5
30	8	0.27	26.67	13
31	6	0.20	20.00	19
32	5	0.17	16.67	24
33	2	0.07	6.67	26
34	1	0.03	3.33	27
35	3	0.10	10.00	30
36	30	1	100.00	





## Prices of GPS Navigators



Example 1 pg. 39 Larson and Farber :

- Draw an ogive for the frequency distribution in Example 1.
- Estimate how many GPS navigators cost \$300 or less.

Also, use the graph to estimate when the greatest increase in price occurs.

PivotTable Recommended PivotTables Table Illustrations Checkbox Recommended Charts **Line** Maps PivotChart 3D

Line Column Win/Loss Sparklines Slicer Timeline Filters Link Links Comment Comments Text Symbols

140 fx 0

	G	H	I	J	K	O	P	Q	R	S	T	U
38			<b>the</b>									
39		<b>midpoint</b>	<b>cumulative</b>									
40	<b>Frequency</b>	<b>30.5</b>			0							
41	<b>5</b>	<b>86.5</b>			5							
42	<b>8</b>	<b>142.5</b>			13							
43	<b>6</b>	<b>198.5</b>			19							
44	<b>5</b>	<b>254.5</b>			24							
45	<b>2</b>	<b>260.5</b>			26							
46	<b>1</b>	<b>366.5</b>			27							
47	<b>3</b>	<b>422.5</b>			30							
48	<b>30</b>	<b>478.5</b>			60							
49												
50												

**2-D Line**

**3-D Line**

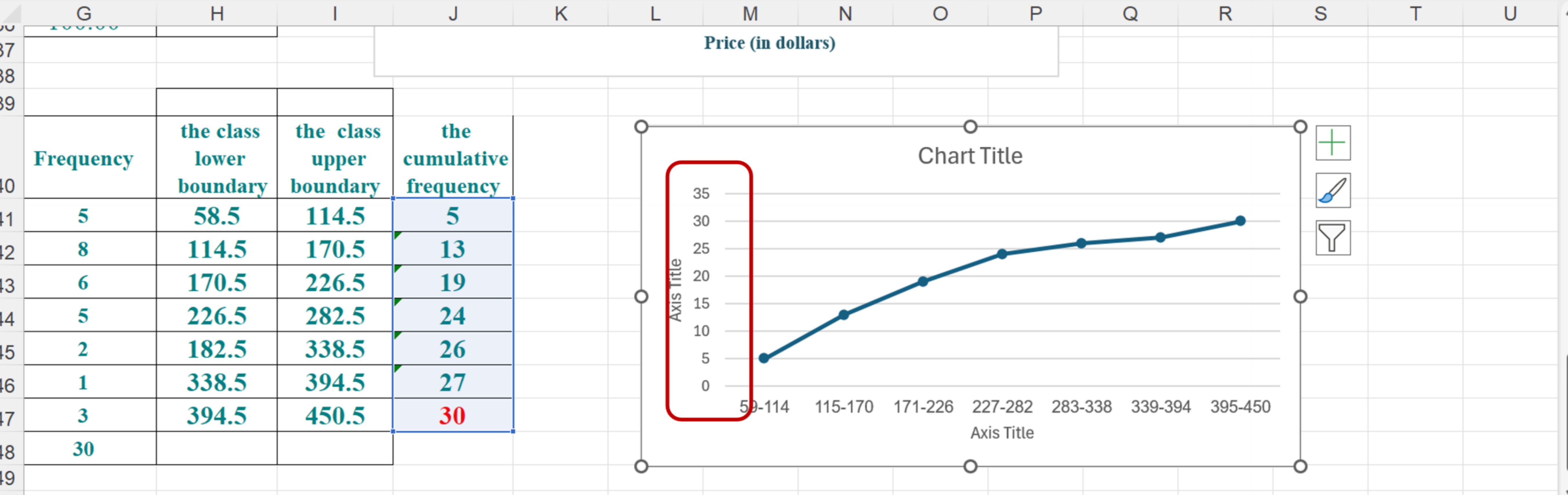
**2-D Area**

**3-D Area**

[More Line Charts...](#)

Clipboard | Font: Aptos Narrow (Body) 10 | Alignment | Number | Styles: Conditional Formatting, Format as Table, Cell Styles | Cells: Insert, Delete, Format | Editing: Sum, Filter, Sort, Find, Zoom | Sensitivity | Add-ins | Analyze Data

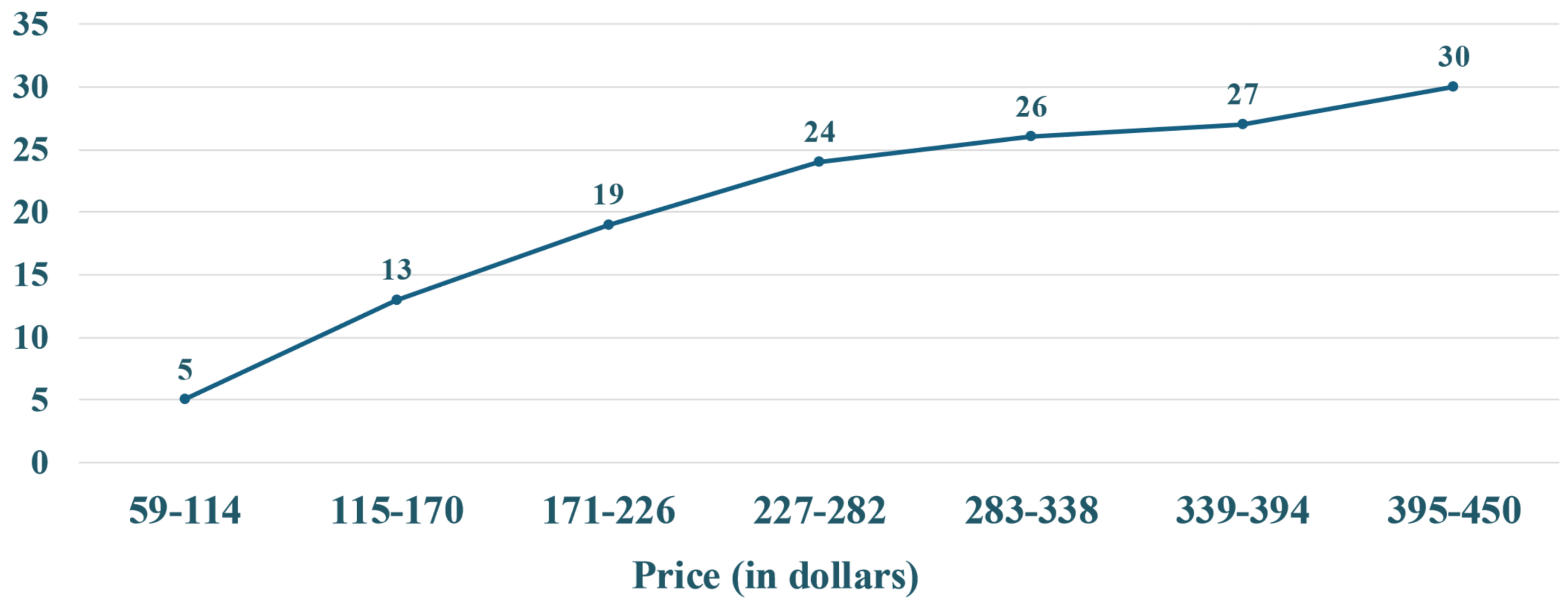
Chart 9





# Prices of GPS Navigators

Cumulative frequency (number of GPS navigators)



## Example:

Use a stem-and-leaf plot to display the data.

The following data represent students' marks in Statistics course.

28	46	49	42	58	59	53
50	51	66	62	64	67	69
63	68	67	69	75	70	78
75	74	84	85	88	93	99

Enter the data in one column and sort it ascending

Insert Delete Format Cells Editing Sensitivity Add-ins Analyze Data

=FLOOR.MATH(B5/10)

=RIGHT(B5,1)

students' marks in Statistics course.

Stem Leaf

28	2	8
42	4	2
46	4	6
49	4	9
50	5	0
51	5	1
53	5	3
58	5	8
59	5	9
62	6	2
63	6	3
64	6	4
66	6	6
67	6	7
67	6	7
68	6	8
69	6	9

Clipboard Font Alignment Number Styles Cells Editing Sensitivity Add-ins Analyze Data

L17

	A	B	C	D	E	F	G	H	I	J	K	L	M
2													
3													
4		<b>students' marks in Statistics course.</b>		<b>Stem</b>	<b>Leaf</b>								
5		28		2	8								
6		42		4	2				<b>Stem</b>	<b>Leaf</b>			
7		46		4	6				2	8			
8		49		4	9				3				
9		50		5	0				4	2 6 9			
10		51		5	1				5	0 1 3 8 9			
11		53		5	3				6	2 3 4 6 7 7 8 9 9 9			
12		58		5	8				7	0 4 5 5 8			
13		59		5	9				8	4 5 8			
14		62		6	2				9	3 9			
15		63		6	3								
16		64		6	4								
17		66		6	6								
18		67		6	7								
19		67		6	7								

**Example ( p. 56):** The numbers of earned degrees conferred (in thousands) in 2007 are shown in the table. Use a pie chart to organize the data. What can you conclude?



**Earned Degrees Conferred in 2007**

Type of degree	Number (thousands)
Associate's	728
Bachelor's	1525
Master's	604
First professional	90
Doctoral	60

PivotTable Recommended PivotTables Table Illustrations Checkbox Recommended Charts **Pie and Doughnut** Maps PivotChart 3D Map Tours Line Column Win/Loss Sparklines Slicer Timeline Filters Link Comments Text Symbols

E39 fx Angle

**Insert Pie or Doughnut Chart**

Use this chart type to show proportions of a whole. Use it when the total of your numbers is 100%.

Click the arrow to see the different types of pie and doughnut charts available and pause the pointer on the icons to see a preview in your document.

**stem-and-leaf plot**

**Earned Degrees Conferred in 2007**

Type of degree	Number (thousands)	Relative frequency	Angle
Associate's	728	0.24	24.21
Bachelor's	1525	0.51	50.71
Master's	604	0.20	20.09
First professional	90	0.03	2.99
Doctoral	60	0.02	2.00
	<b>3007</b>		<b>100.00</b>

Clipboard Font General Conditional Formatting Insert Delete Sensitivity Add-ins Analyze Data

**Begin by finding the relative frequency, or percent, of each category**

Chart 1

31		93		9	3										
32		99		9	9										

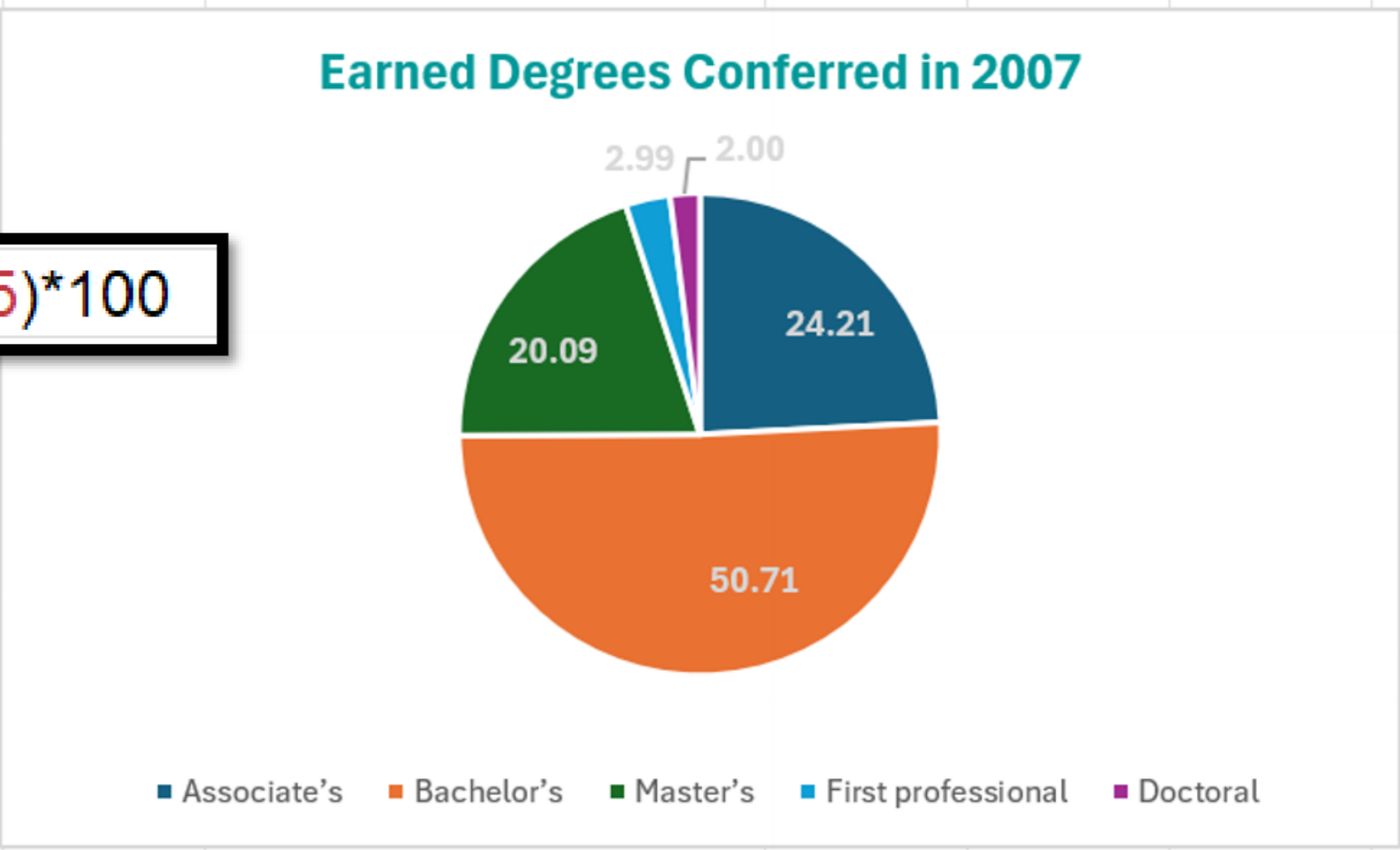
pie chart

Earned Degrees Conferred in 2007

Type of degree	Number (thousands)	Relative frequency	Angle
Associate's	728	0.24	24.21
Bachelor's	1525	0.51	50.71
Master's	604	0.20	20.09
First professional	90	0.03	2.99
Doctoral	60	0.02	2.00
	3007		100.00

$= (C40 / C\$45) * 100$

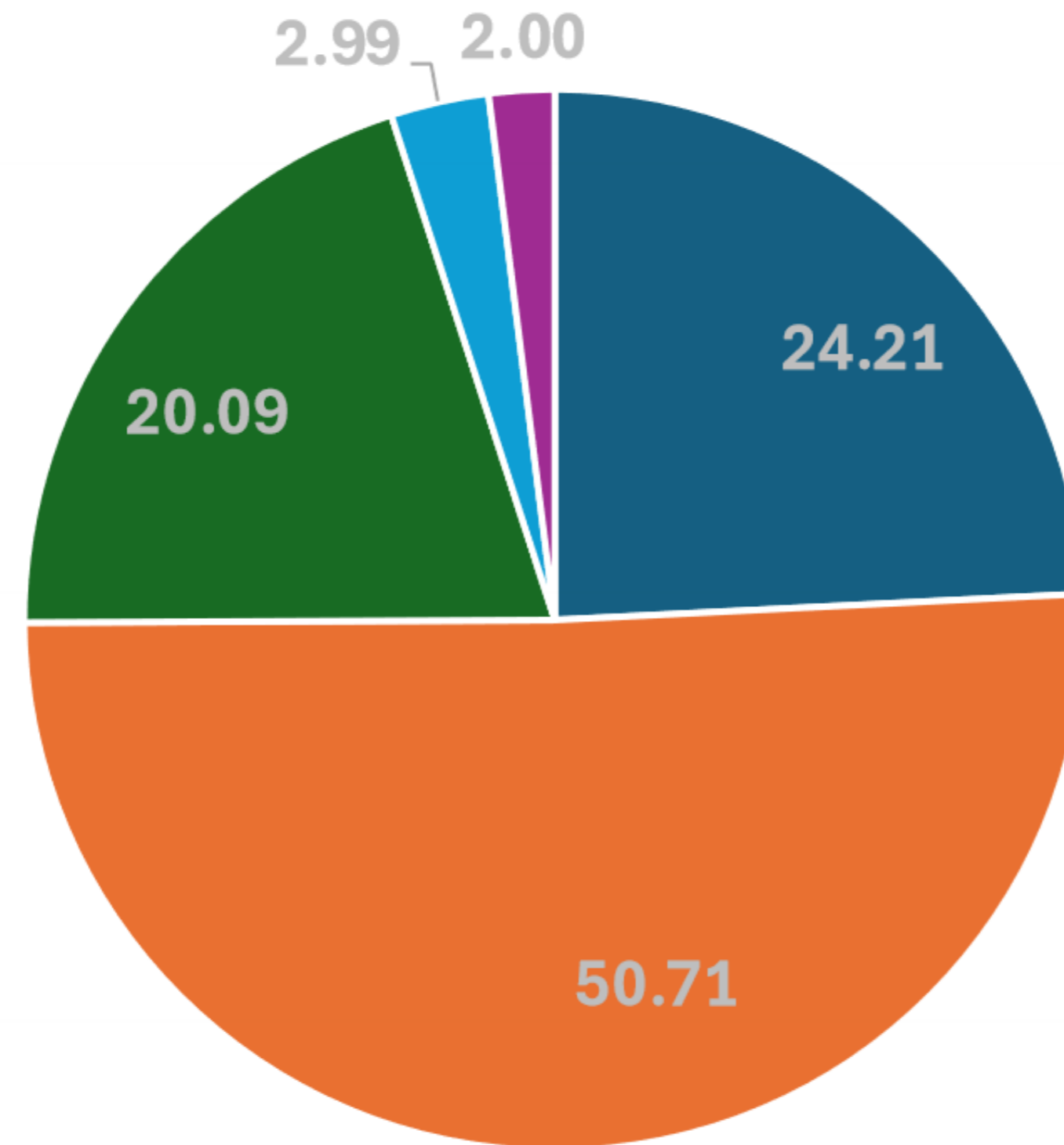
Earned Degrees Conferred in 2007



Pareto Chart



# Earned Degrees Conferred in 2007



■ Associate's ■ Bachelor's ■ Master's ■ First professional ■ Doctoral



### Example ( p. 57): Constructing a Pareto Chart

In a recent year, the retail industry lost \$36.5 billion in inventory shrinkage. Inventory shrinkage is the loss of inventory through breakage, pilferage, shoplifting, and so on. The main causes of inventory shrinkage are **administrative error (\$5.4 billion)**, **employee theft (\$15.9 billion)**, **shoplifting (\$12.7 billion)**, and **vendor fraud (\$1.4 billion)**. If you were a retailer, which causes of inventory shrinkage would you address first?

PivotTable  
 Recommended PivotTables  
 Table  
 Illustrations  
 Checkbox  
 Recommended Charts

3D Map  
 Line  
 Column  
 Win/Loss  
 Slicer  
 Timeline  
 Link  
 Comment  
 Text  
 Symbols

C52 Billions of dollars

	B	C
43	First professional	90
44	Doctoral	60
45		3007

**Pareto Chart**

**Main Causes of Inventory Shrinkage**

Cause	Billions of dollars
Employee theft	15.9
Shoplifting	12.7
Administrative error	5.4
Vendor fraud	1.4

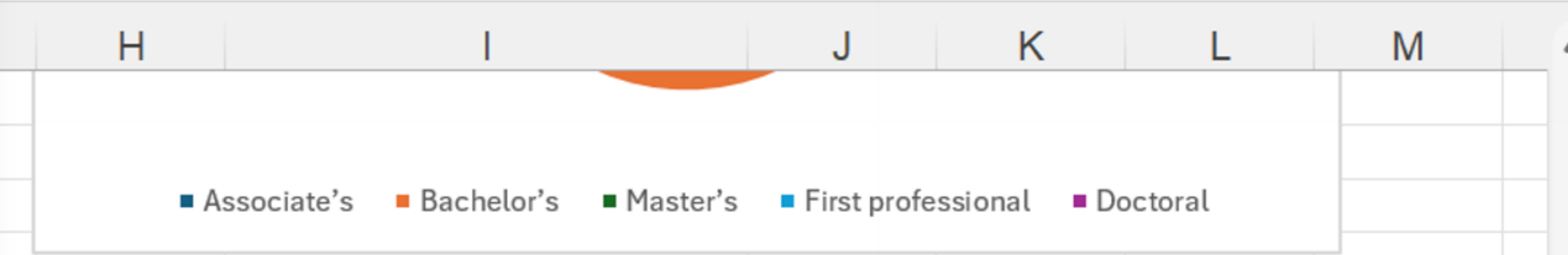
**2-D Column**

**3-D Column**

**2-D Bar**

**3-D Bar**

[More Column Charts...](#)

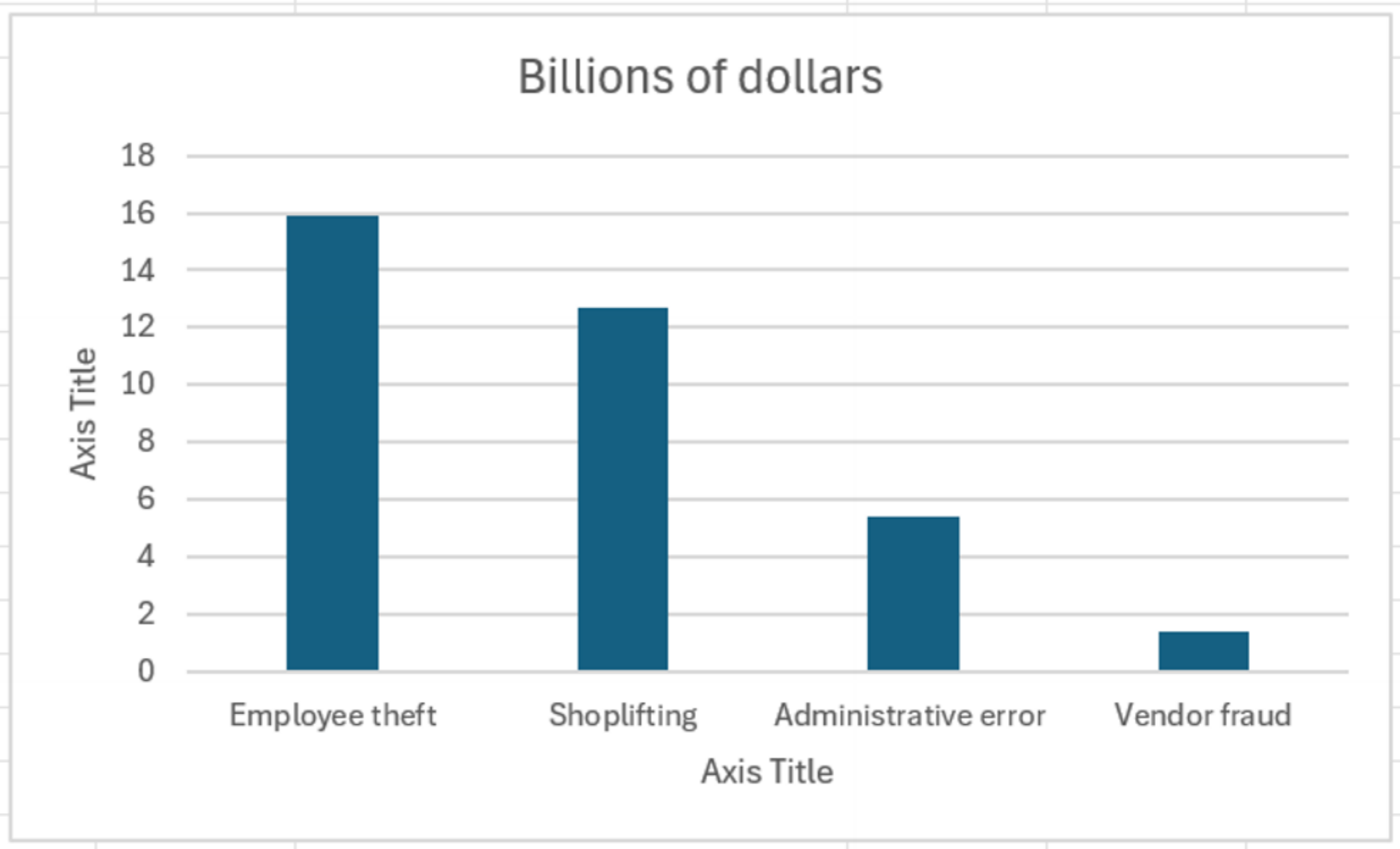


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L66 fx

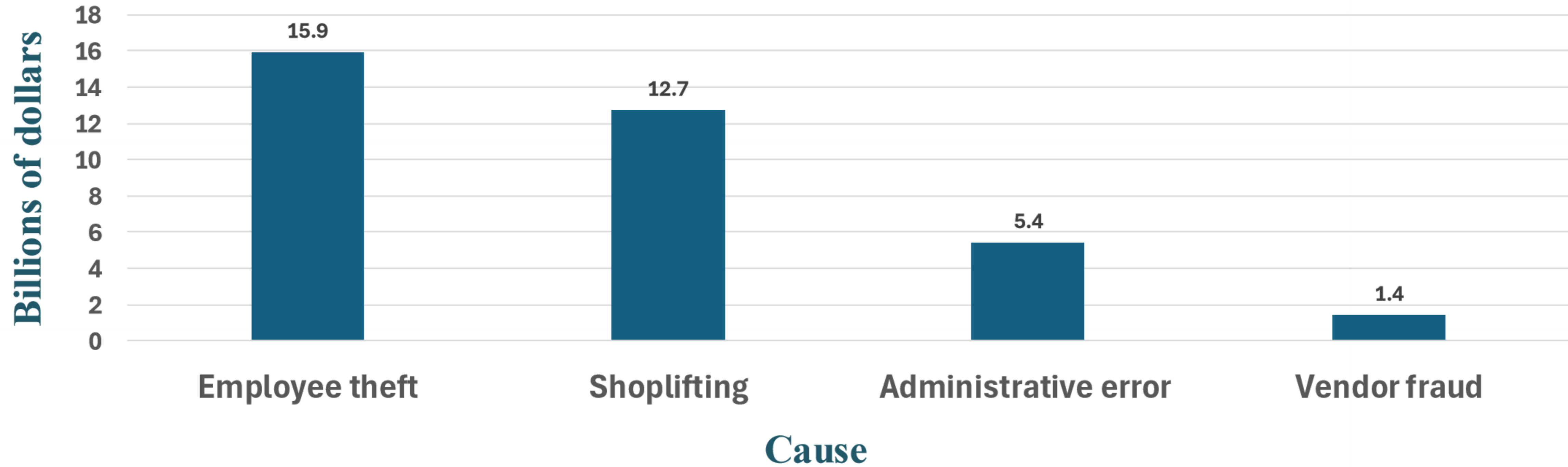
A B C D E F G H I J K L M

46														
47														
48														
49		<b>Pareto Chart</b>												
50														
51		<b>Main Causes of Inventory Shrinkage</b>												
52		<b>Cause</b>	<b>Billions of dollars</b>											
53		Employee theft	15.9											
54		Shoplifting	12.7											
55		Administrative error	5.4											
56		Vendor fraud	1.4											
57														
58														
59														
60														
61														
62														
63														
64														
65														

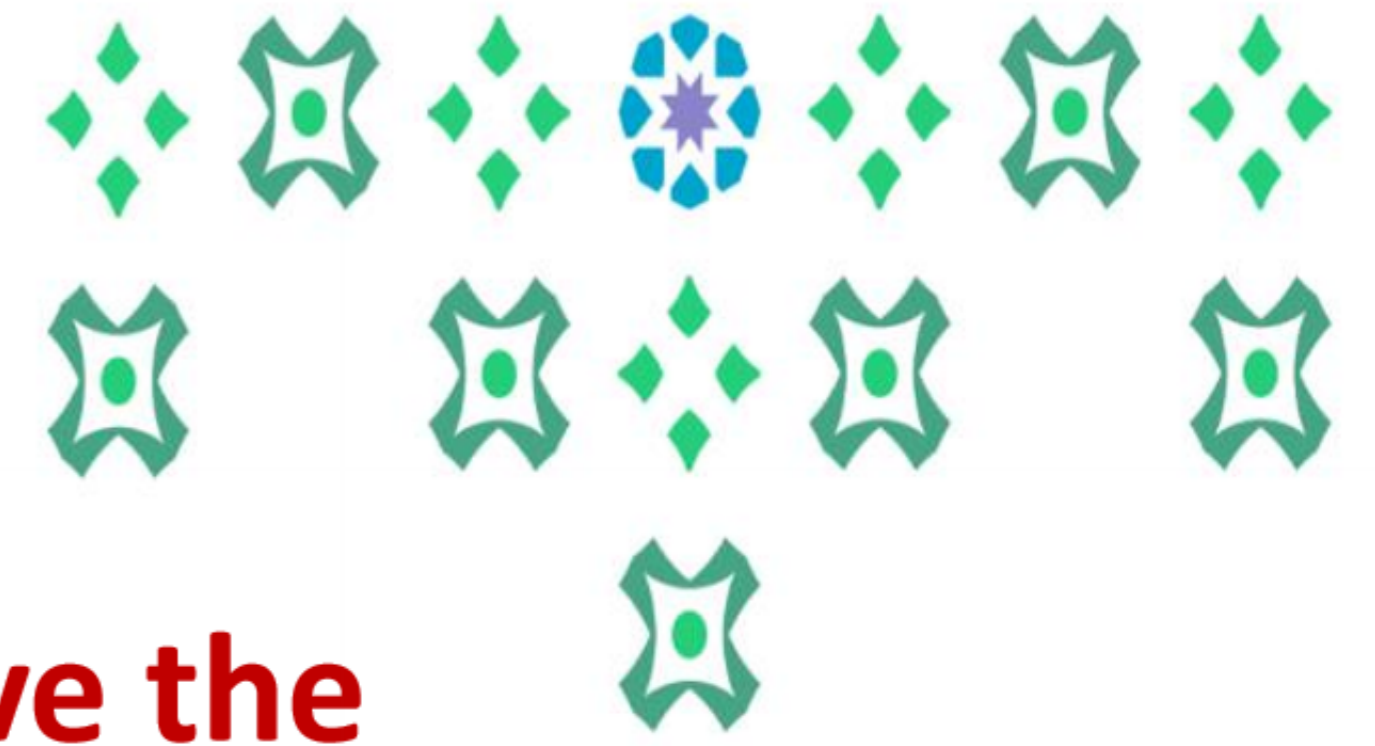




# Main Causes of Inventory Shrinkage



# Homework



Use the Excel program and manual calculations to solve the numerical exercises:

- **Ex 2.1, P 47: 19,20, 24, 25,26 ,31, 39**
- **Ex 2.2, P60: 6,10, 13, 14, 18, 23, 25.**

