Variables:

- Categorical (non-numerical categories)
- Quantitative (numerical)

NUM	PLAYER	HT	WT	FROM	YRS
2	Derek Fisher	6'1"	210	Arkansas-Little Rock	13
24	Kobe Bryant	6'6"	205	Lower Merion HS (PA)	13
7	Lamar Odom	6'10"	225	Rhode Island	10
16	Pau Gasol	7'0"	250	Spain	8
17	Andrew Bynum	7'0"	285	St. Joseph HS (NJ)	4

- Are you male or female? Left- or right-handed?
- To the nearest inch, how tall are you?
- How old do you think Barack Obama is?
- Do you own a laptop computer?
- What is your favorite type of music?
- How many brothers and sisters do you have?
- Would you date someone with a great personality even though you don't find them attractive?

Distribution of a variable:

what values it takes, and how often it takes them.

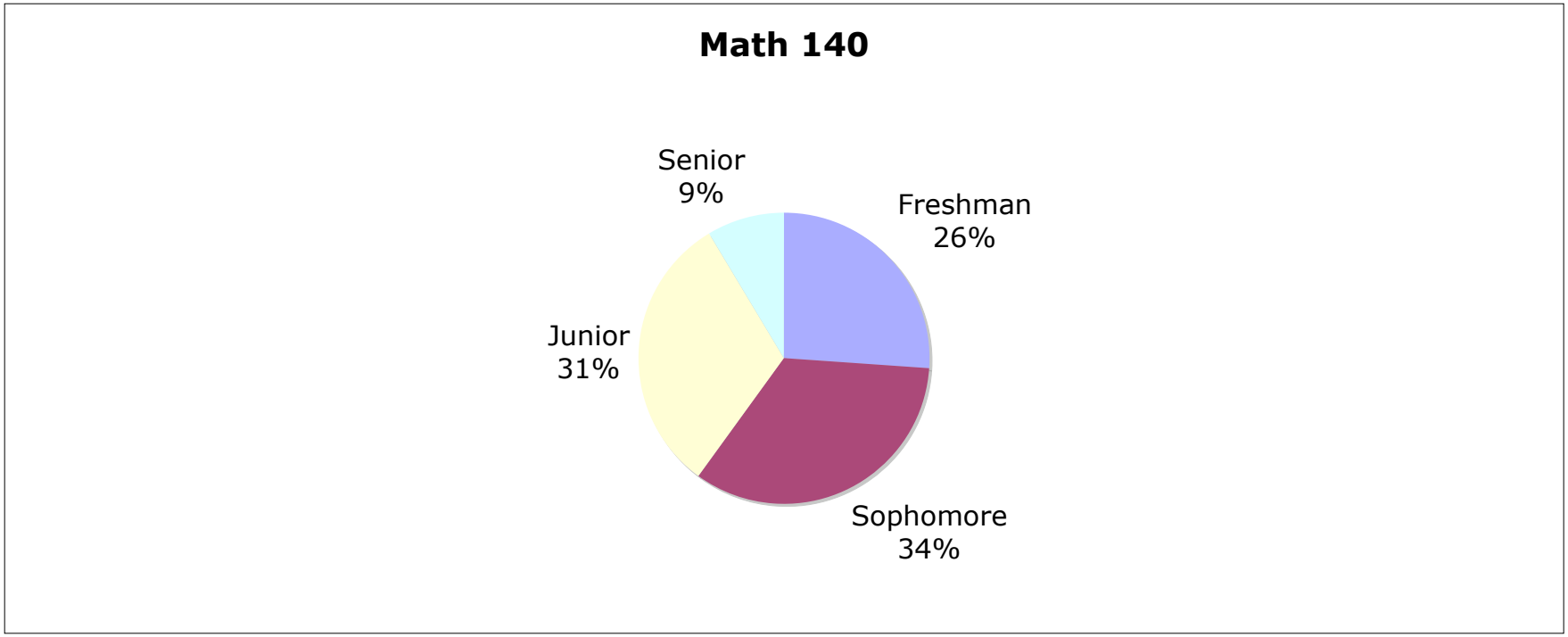
- We can describe a distribution with a table of numbers. But that's boring.

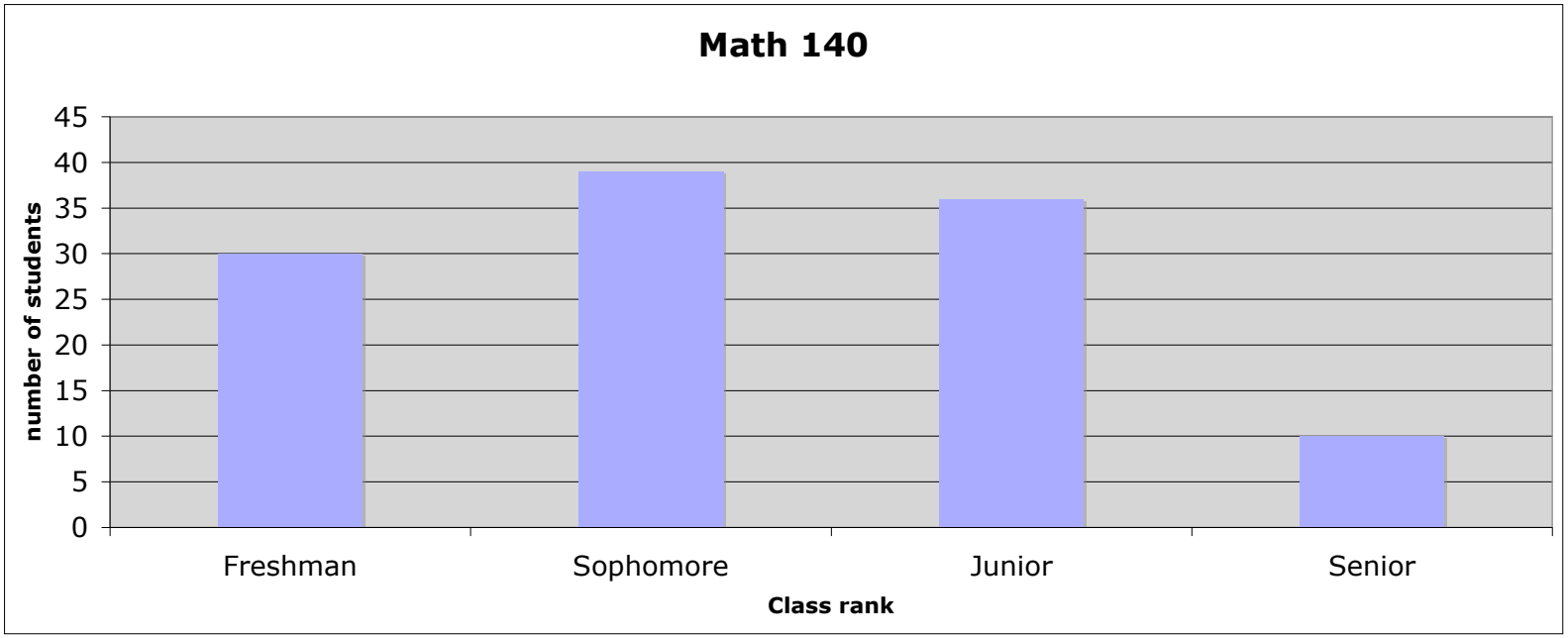
- How can we picture a distribution?

  For categorical variables:
  - Pie charts
  - Bar graphs

Math 140 distribution:

Class rank:	Number	Percentage
Freshman	30	0.26
Sophomore	39	0.34
Junior	36	0.31
Senior	10	0.09
TOTAL	115	


Math 140
Senior
9%
Freshman
26%
Junior
31%
Sophomore
34%


Math 140
number of students
45
40
35
30
25
20
15
10
5
0
Freshman
Sophomore
Junior
Senior
Class rank

How can we picture the distribution of a quantitative variable?

Histogram:

1. Divide the data into ranges (“classes”)
2. Count how many in each class
3. Draw the histogram as a bar graph

51	86	85	87	91	90	71	77	77	83
76	76	74	90	69	93	98	78	92	76
60	91	72	79	67	71	96	50	93	64
84	61	56	97	75	92	78	63	82	65
81	47	98	90	97	59	77	62	61	78
82	59	59	58	93	75	15	96	82	88
79	82	59	76	67					

Range:	Count:
90 to 99	16
80 to 89	11
70 to 79	18
60 to 69	10
50 to 59	8
40 to 49	1
30 to 39	0
20 to 29	0
10 to 19	1

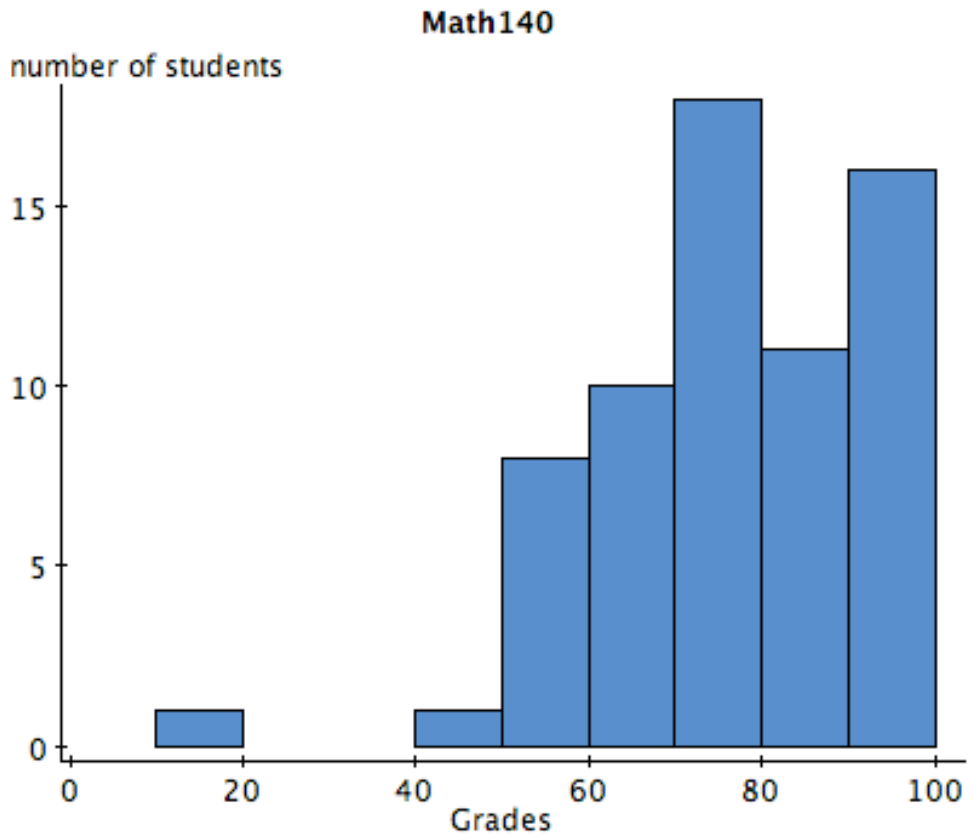

Math140
number of students
15
10
5
0
0
20
40
60
80
100
Grades

TABLE 1.1 Percent of state population born outside the United States

STATE	PERCENT	STATE	PERCENT	STATE	PERCENT
Alabama	2.8	Louisiana	2.9	Ohio	3.6
Alaska	7.0	Maine	3.2	Oklahoma	4.9
Arizona	15.1	Maryland	12.2	Oregon	9.7
Arkansas	3.8	Massachusetts	14.1	Pennsylvania	5.1
California	27.2	Michigan	5.9	Rhode Island	12.6
Colorado	10.3	Minnesota	6.6	South Carolina	4.1
Connecticut	12.9	Mississippi	1.8	South Dakota	2.2
Delaware	8.1	Missouri	3.3	Tennessee	3.9
Florida	18.9	Montana	1.9	Texas	15.9
Georgia	9.2	Nebraska	5.6	Utah	8.3
Hawaii	16.3	Nevada	19.1	Vermont	3.9
Idaho	5.6	New Hampshire	5.4	Virginia	10.1
Illinois	13.8	New Jersey	20.1	Washington	12.4
Indiana	4.2	New Mexico	10.1	West Virginia	1.2
Iowa	3.8	New York	21.6	Wisconsin	4.4
Kansas	6.3	North Carolina	6.9	Wyoming	2.7
Kentucky	2.7	North Dakota	2.1	Dist. of Columbia	12.7

Classes:

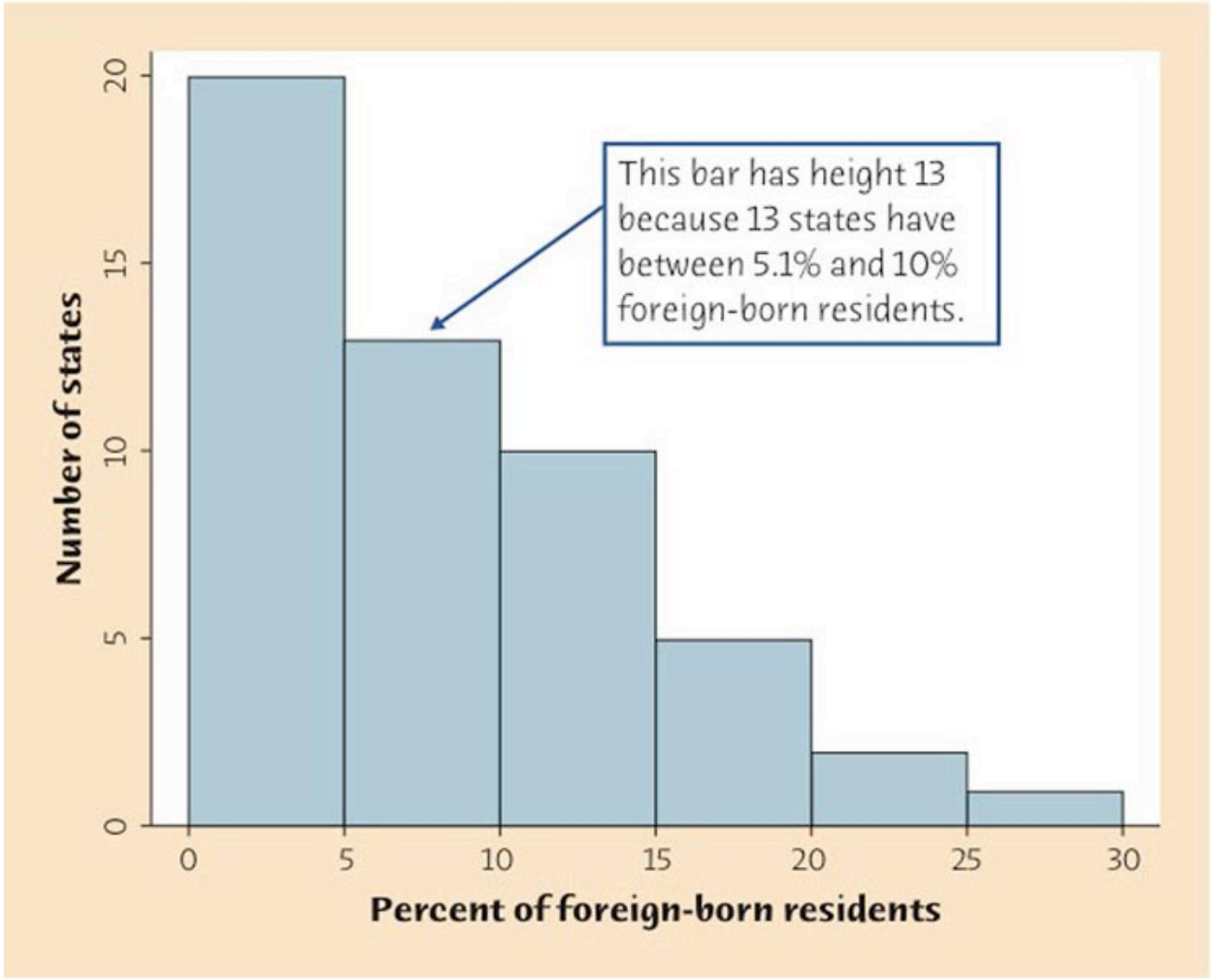
0.0 < percent with bachelor's degree ≤ 5.0

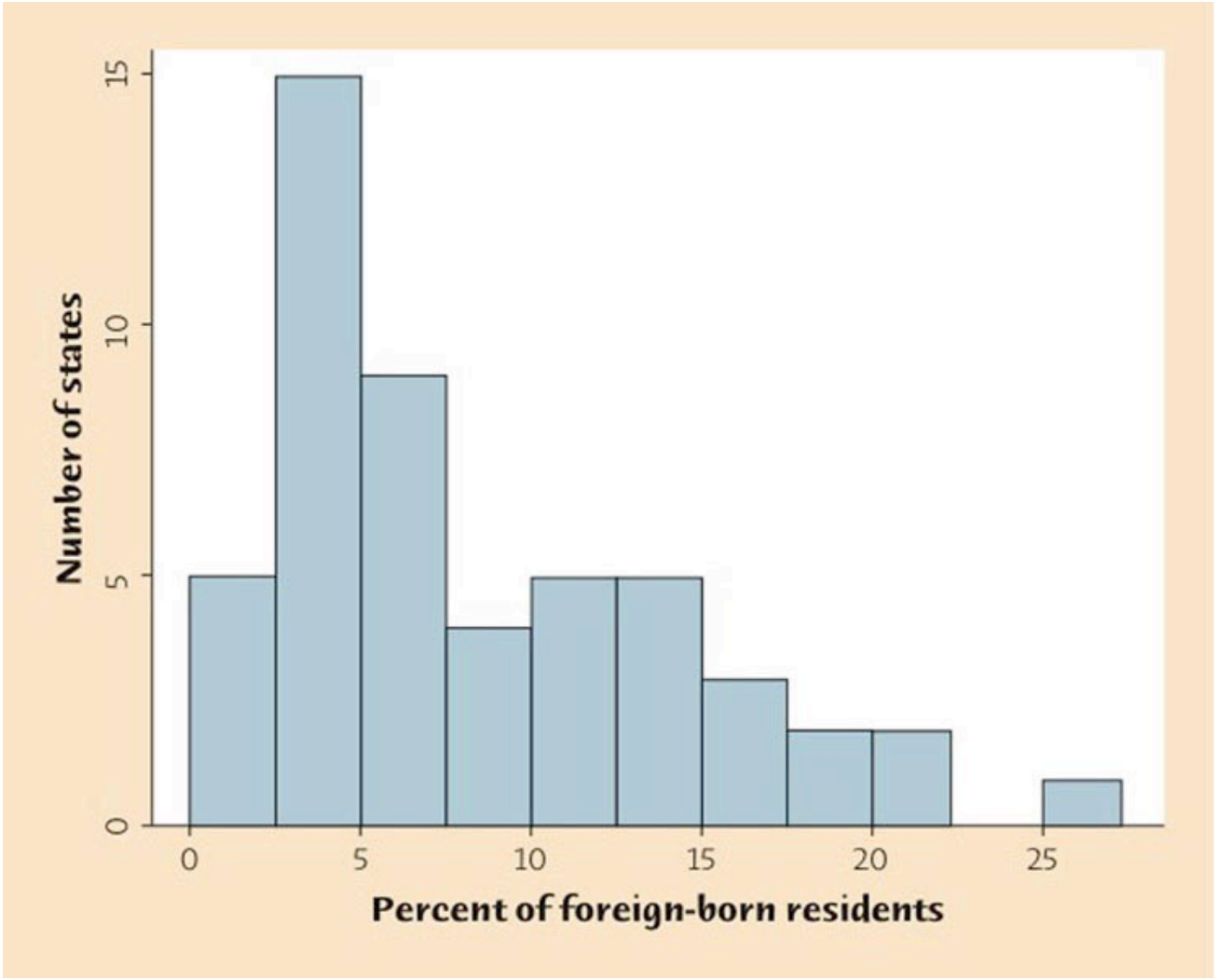
5.0 < percent with bachelor's degree ≤ 10.0.

10.0 < percent with bachelor's degree ≤ 15.0

etc.

Class:	Count:
0.1 to 5.0	20
5.1 to 10.0	13
10.1 to 15.0	10
15.1 to 20.0	5
20.1 to 25.0	2
25.1 to 30.0	1


This bar has height 13 because 13 states have between 5.1% and 10% foreign-born residents.
Number of states
0
5
10
15
20
0
5
10
15
20
25
30
Percent of foreign-born residents


Number of states
0
5
10
15
0
5
10
15
20
25
Percent of foreign-born residents

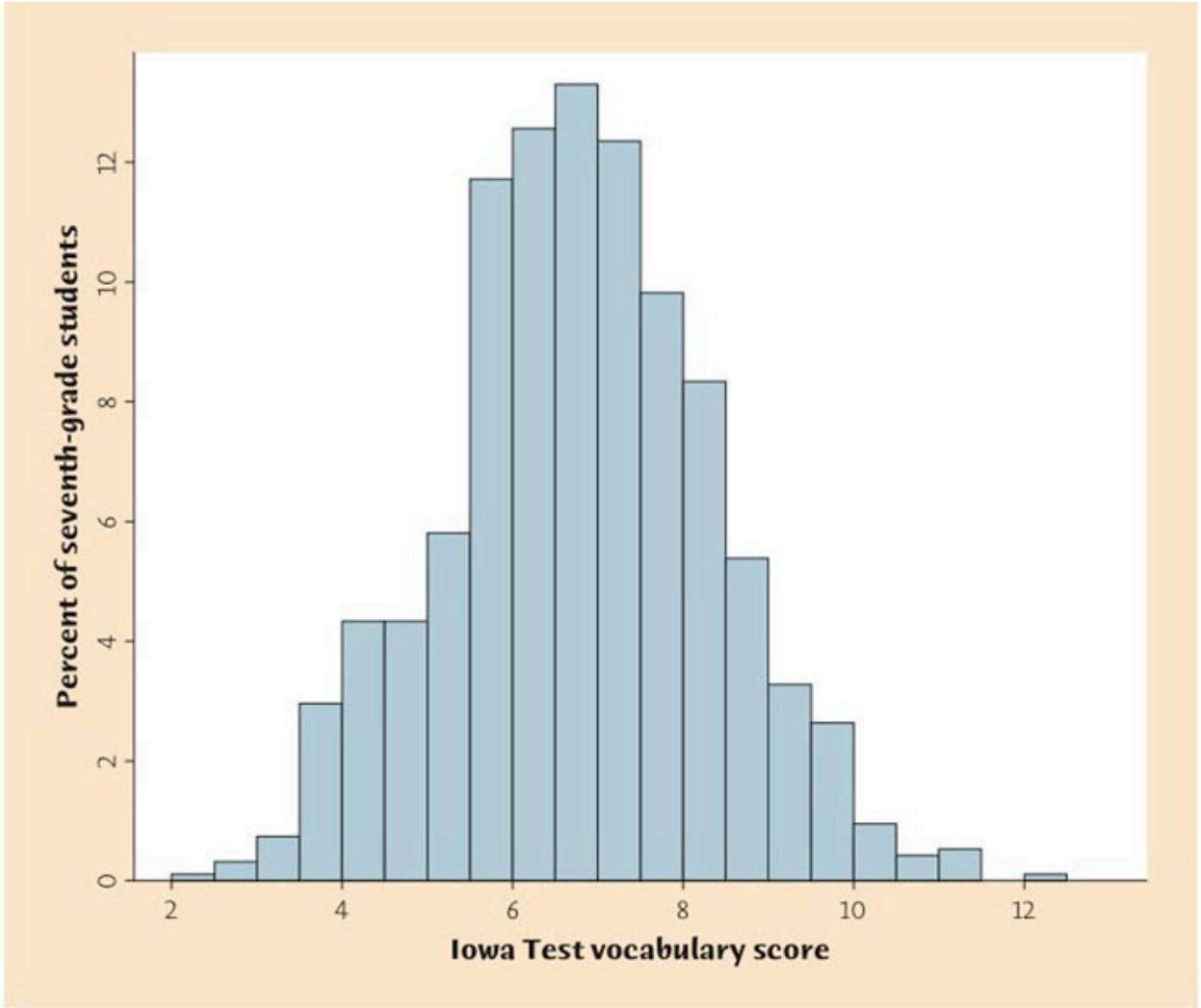
Interpreting histograms:

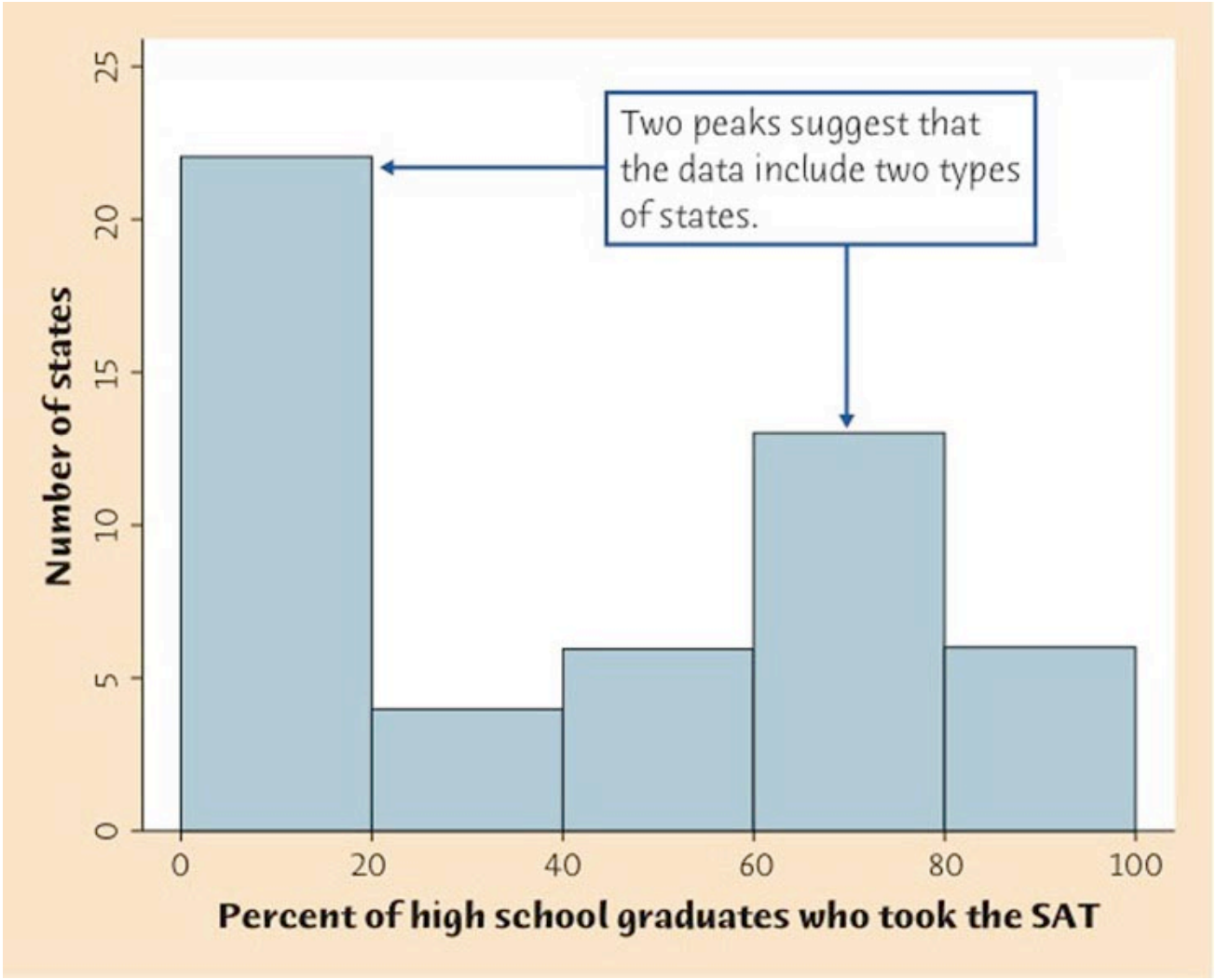
Look at:

- shape
- center
- spread

Shape can be:

- Symmetric
- Skewed to the left/right
- none of the above …


Percent of seventh-grade students
0
2
4
6
8
10
12
2
4
6
8
10
12
Iowa Test vocabulary score


Two peaks suggest that the data include two types of states.
Number of states
0
5
10
15
20
25
0
20
40
60
80
100
Percent of high school graduates who took the SAT

Center (more later): for now, approximate the “midpoint”

Spread (more later): for now, list the range from smallest to largest values

Example: percent of foreign-born residents, by state:

- Shape: skewed to the right
- Center: ≈ 6%
- Spread: from 1.2 to 27.2%

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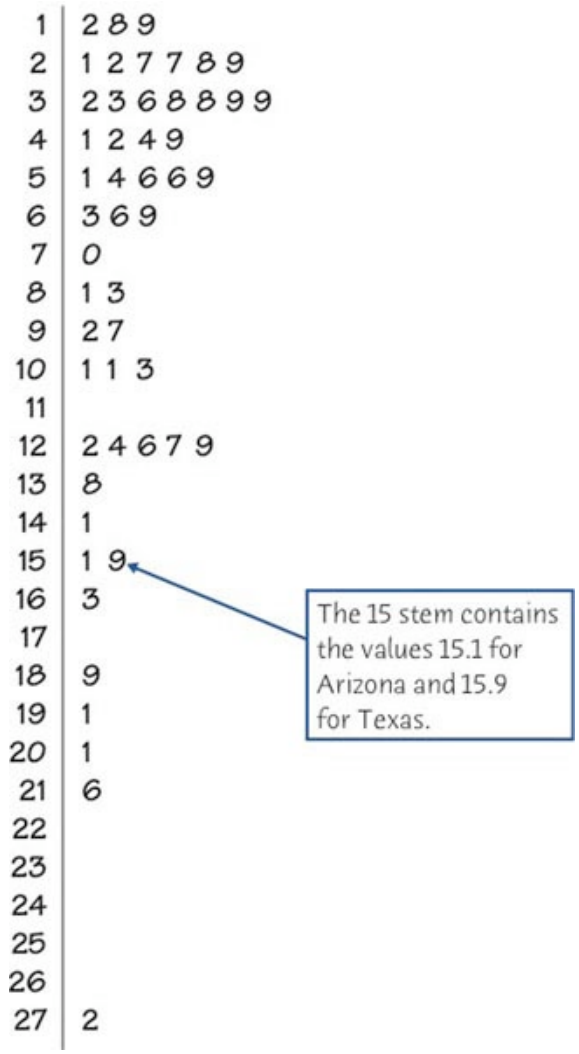
1 | 2 8 9
2 | 1 2 7 7 8 9
3 | 2 3 6 8 8 9 9
4 | 1 2 4 9
5 | 1 4 6 6 9
6 | 3 6 9
7 | 0
8 | 1 3
9 | 2 7
10 | 1 1 3
11 |
12 | 2 4 6 7 9
13 | 8
14 | 1
15 | 1 9
16 | 3
17 |
18 | 9
19 | 1
20 | 1
21 | 6
22 |
23 |
24 |
25 |
26 |
27 | 2
The 15 stem contains the values 15.1 for Arizona and 15.9 for Texas.

Math 140 Exam grades:

1	5
2	
3	
4	7
5	0 1 6 8 9 9 9 9
6	0 1 1 2 3 4 5 7 7 9
7	1 1 2 4 5 5 6 6 6 6 7 7 7 8 8 8 9 9
8	1 2 2 2 2 3 4 5 6 7 8
9	0 0 0 1 1 2 2 3 3 3 6 6 7 7 8 8

Histograms versus stemplots:

Histograms:

- flexibility with ranges
- can't "see" data
- useful for large data sets

Stemplots:

- lack of flexibility with ranges
- can see data
- useful for small data sets only

Tricks for increasing flexibility of stemplots…

- Stemplot too spread out? Try dropping last digit(s).

Breaking strength of wood (pounds):

strength:	
33190	331
31860	318
32590	325
26520	265
32320	323
33020	330
32030	320
30460	304
23040	230
30930	309
32720	327
33650	336
24050	240
30170	301
31300	313
28730	287
33280	332
32700	327
32340	323
31920	319

23	0
24	0
25	
26	5
27	
28	7
29	
30	1 4 9
31	3 8 9
32	0 3 3 5 7 7
33	0 1 2 6

(Textbook says to also round. You don't have to.)

Tricks for increasing flexibility of stemplots…

- Stemplot too thin? Try “split stems”

before:

8	1 2 2 2 2 3 4 5 6 7 8
9	0 0 0 1 1 2 2 3 3 3 6 6 7 7 8 8

with split stems:

8	1 2 2 2 2 3 4
8	5 6 7 8
9	0 0 0 1 1 2 2 3 3 3
9	6 6 7 7 8 8