



Probability & Statistics Workbook

Visualizing data

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MATH

ONE-WAY TABLES

- 1. Identify the variables in the following data description and classify the variables as categorical or quantitative. If the variable is quantitative, list the units.

“The Indianapolis 500 is a car race that’s been taking place since 1911 and is often scheduled to take place over Memorial Day weekend. The race takes place at the Indianapolis Motor Speedway and a driver needs to complete 200 laps that cover a distance of 500 miles. Race results are reported by driver number, the driver’s name, the type of car the driver uses, and the time to the nearest ten-thousandth of a second. If a driver doesn’t finish the race, instead of the time to complete the race, their number of laps completed is recorded.”

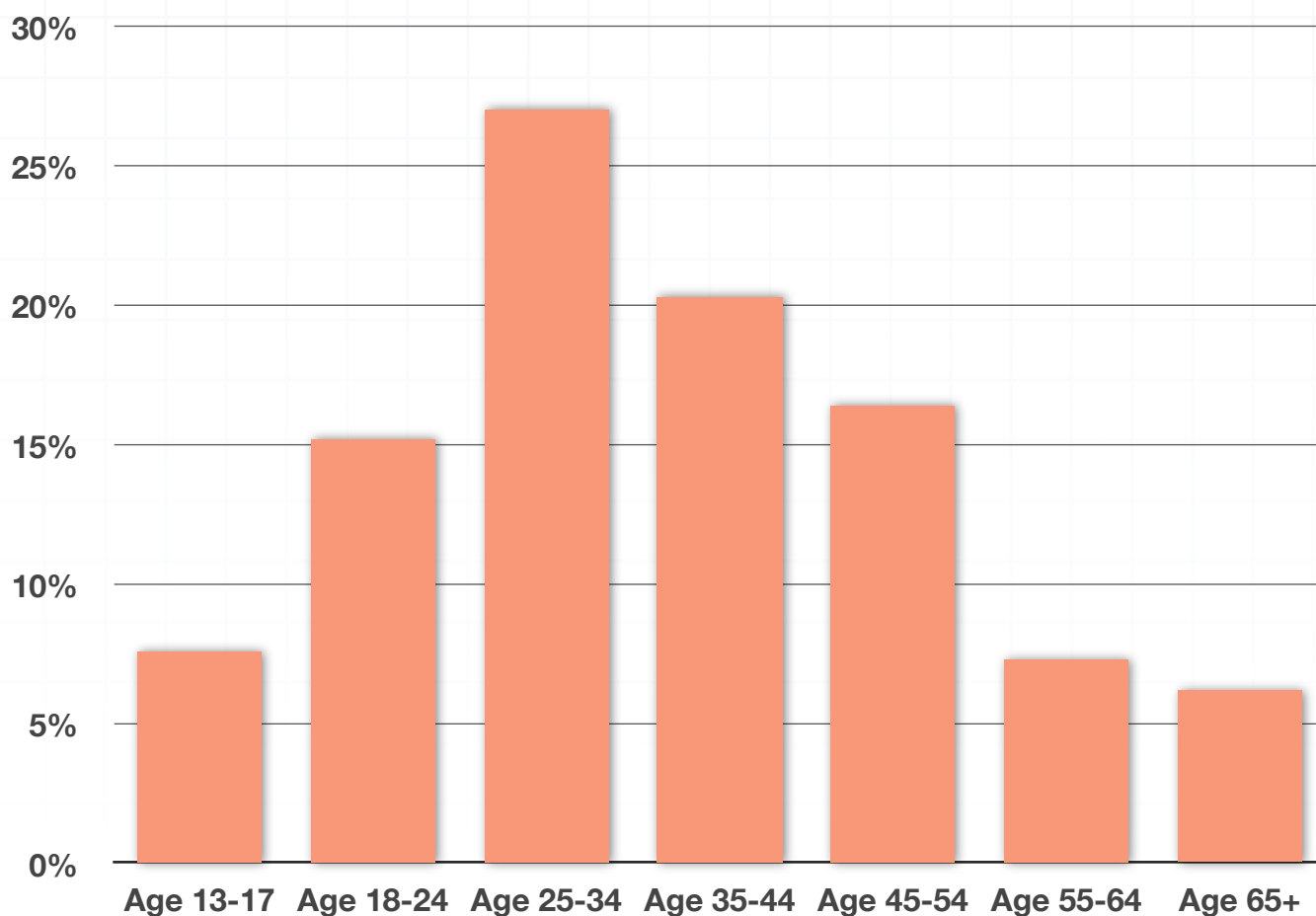
- 2. Casey is taking a survey of her senior class. She plans to ask the seniors this question:

“In general do you think things have gotten better or worse for our students over the course of the year?”

Her survey has a checklist with these responses: Better, Worse, Stayed the same, and Don’t know. Who are the individuals in the survey? What type of response variable is Casey looking for? Is it categorical or quantitative? What is the level of measurement of the data?



- 3. The graph below shows the age breakdown of Apple iPad owners in the United States in February, 2011. Who are the individuals in the data? What is the variable? Is it categorical or quantitative?



Source: www.statista.com

- 4. The table below shows the number of rejected products by worker and shift. Can the data be used to build a one-way table? Why or why not? Is the number of rejected products a discrete or continuous quantitative variable?



Worker ID	1st shift	2nd shift	3rd shift
1123	42	45	42
2256	45	74	32
6435	36	78	41

■ 5. Why is this table an example of a one-way data table?

Flavor	Scoops	Contains	Smooth or
Vanilla	300	No	Smooth
Chocolate	450	Yes	Smooth
Cookies &	275	Yes	Chunky
Mint Chocolate	315	Yes	Chunky
Fudge Brownie	375	Yes	Chunky
Rocky Road	250	Yes	Chunky

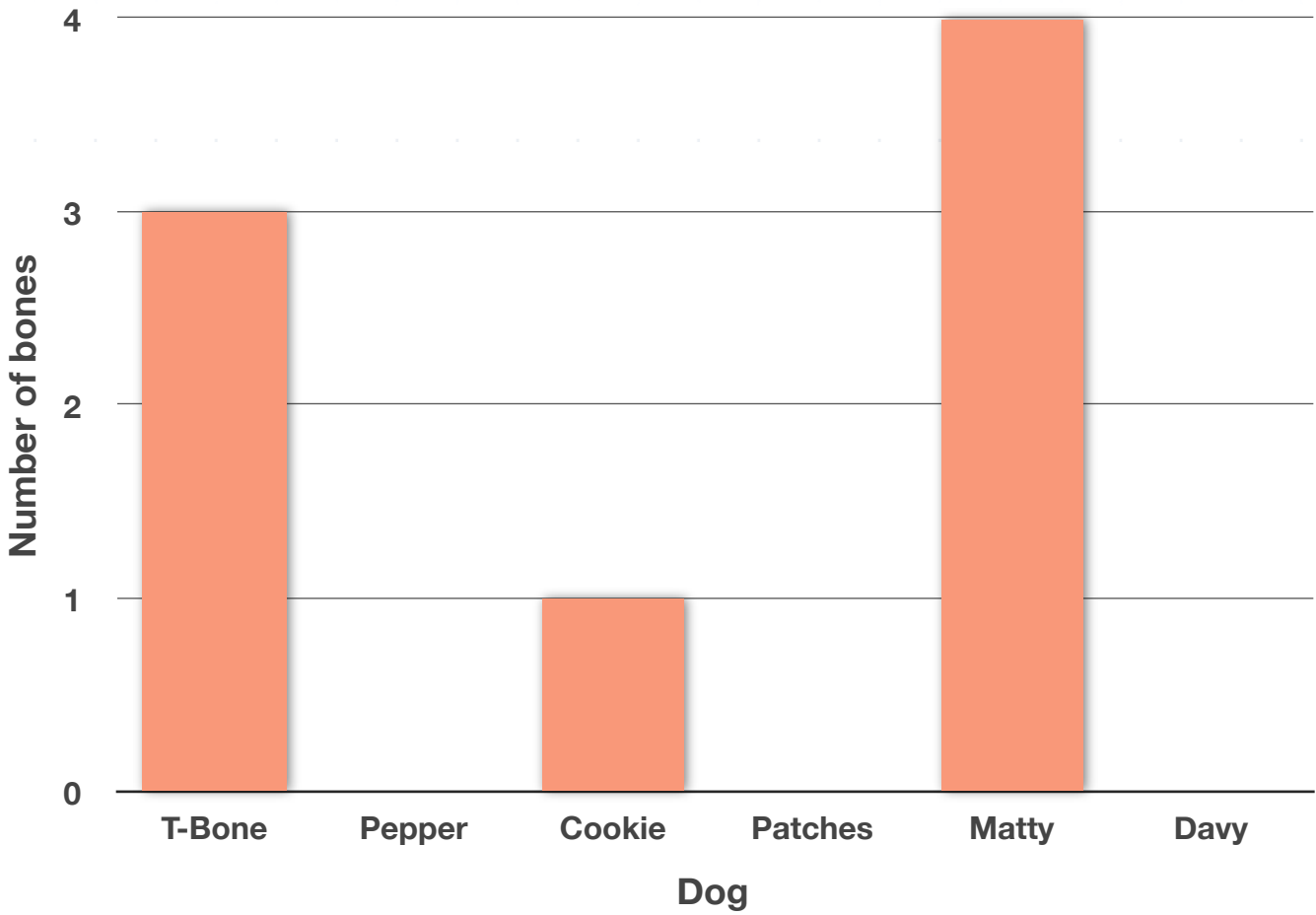
■ 6. A botany student wants to test the claim of a diaper company that their product may be used in a compost pile. He creates 12 identical gardens and plants a random selection of 7 tomato plants in each one. He plans to have a fellow student use traditional compost on 6 of the garden plots and the compost from the diapers on the other 6. He does this so he doesn't know which plot is which. He plans to check the tomato plants for disease every two days for a month, and record the number of tomato plants with disease after each check. Would this experiment result in a one-way data table? Why or why not?



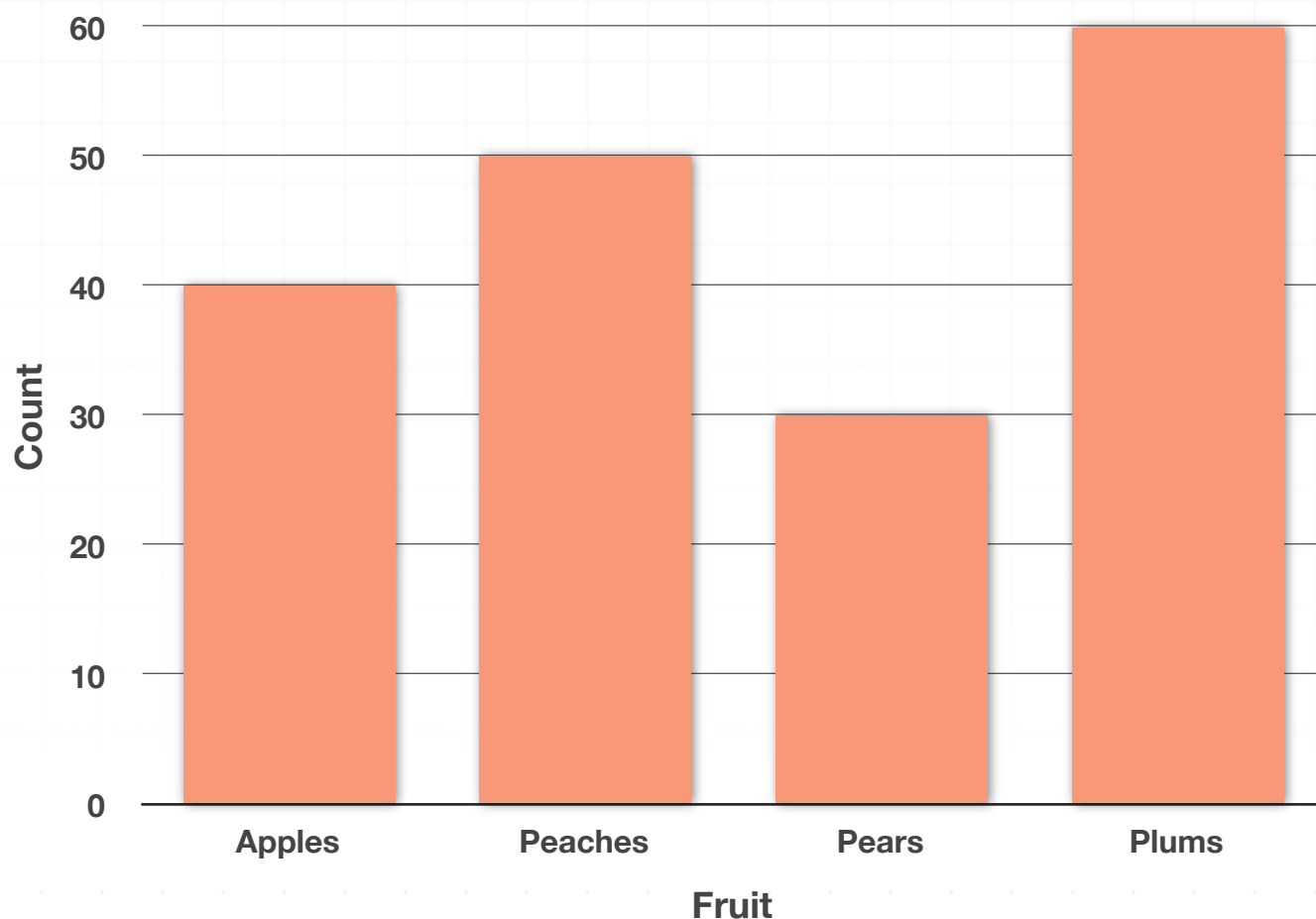
BAR GRAPHS AND PIE CHARTS

■ 1. Both the bar graph and the table have missing information about the number of bones each dog consumed at doggie daycare. Use the graph and table together to fill in the missing pieces.

Dog	Number of bones
T-Bone	
Pepper	1
Cookie	
Patches	5
Matty	
Davy	2

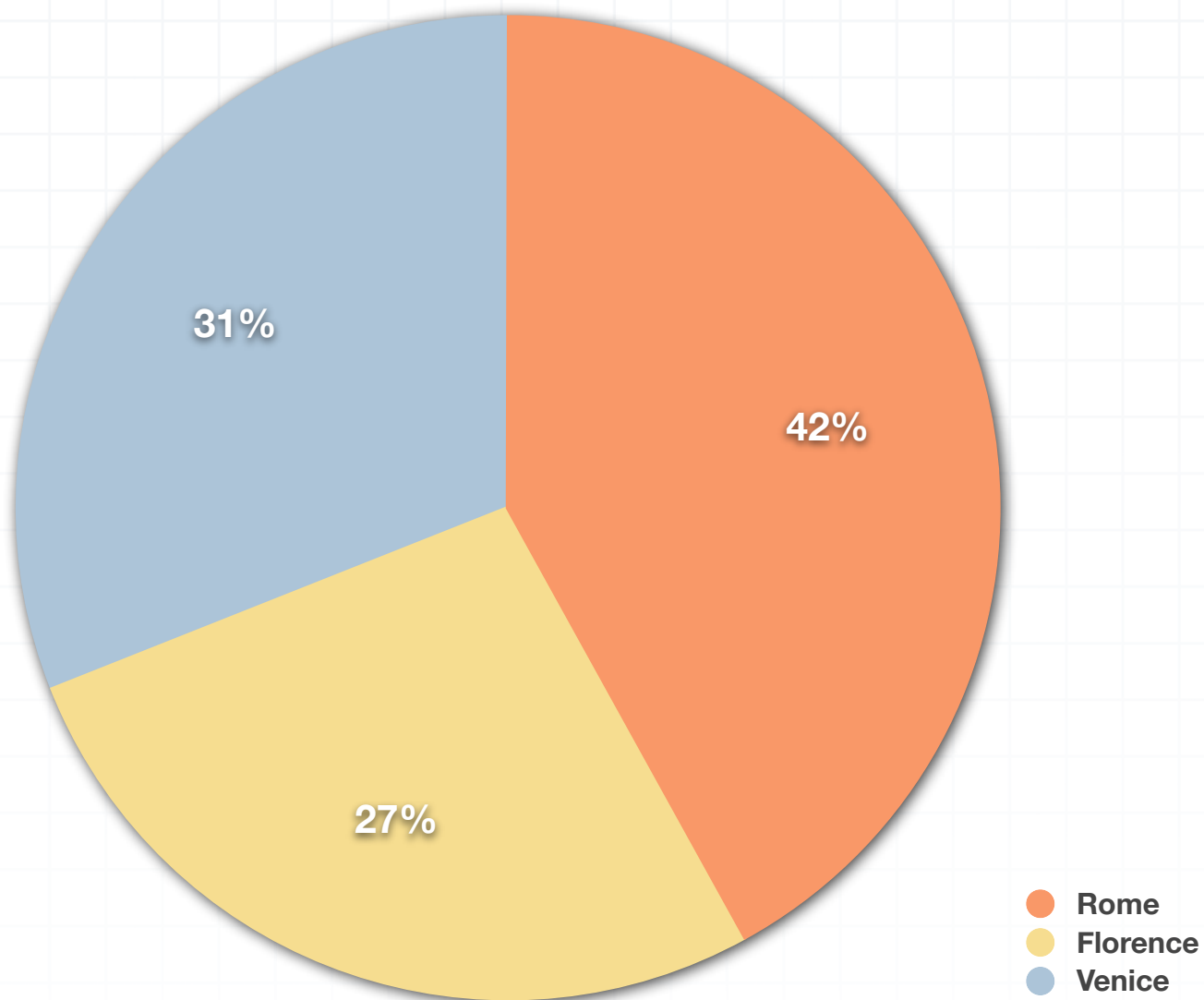


- 2. Eric's class went on a trip to an orchard. At the end of the trip they counted how many pieces of fruit came from each type of tree and graphed it in the bar graph shown below. Use the bar graph to create a pie chart of the data.



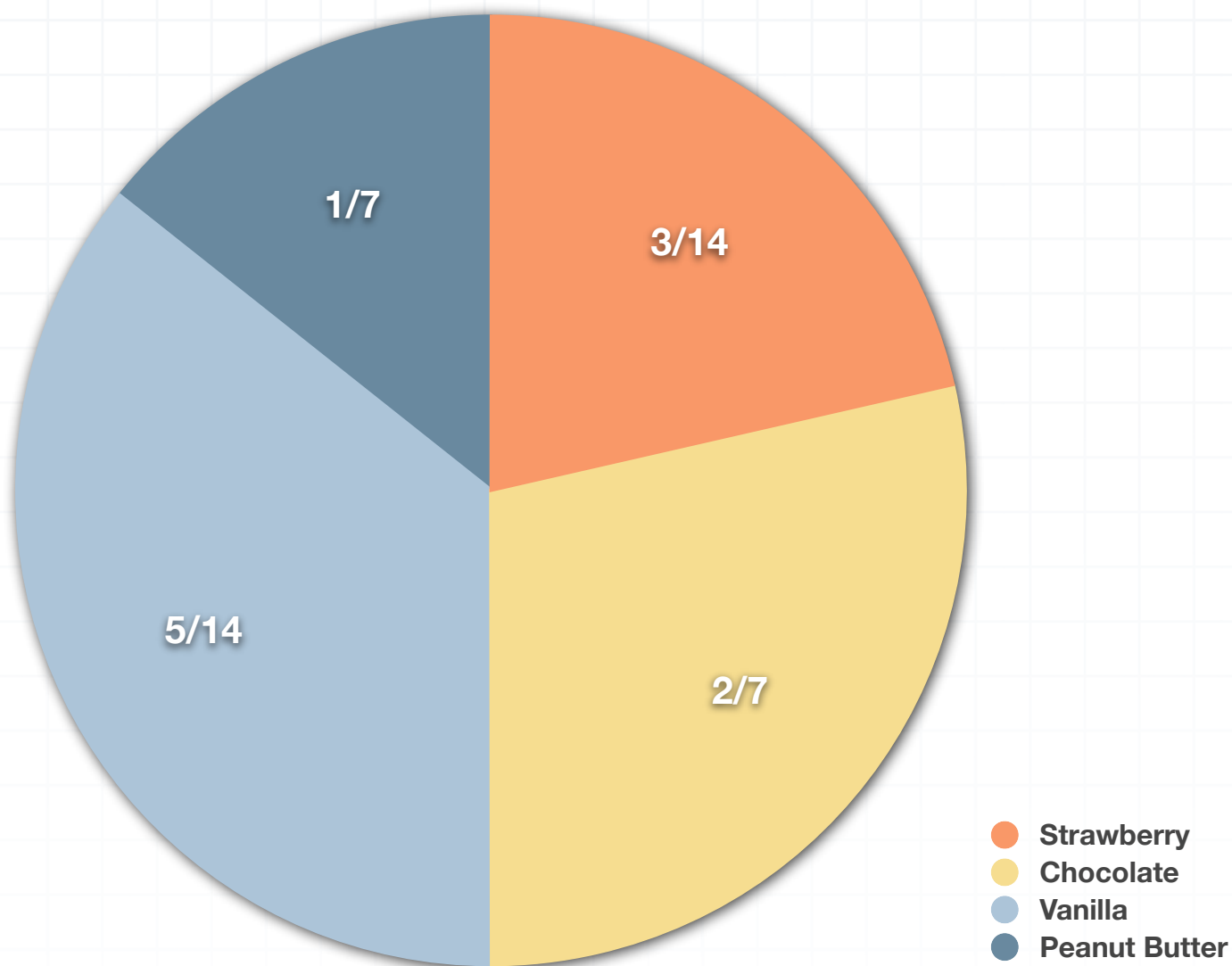
- 3. A tourist company took a survey of 600 clients and asked them which Italian city they were most interested in visiting. How many clients said they wanted to visit Rome?





■ 4. The pie chart shows how many ice cream cones of each flavor were sold. Assuming 280 total ice cream cones were sold in August, convert the pie chart to a bar graph.





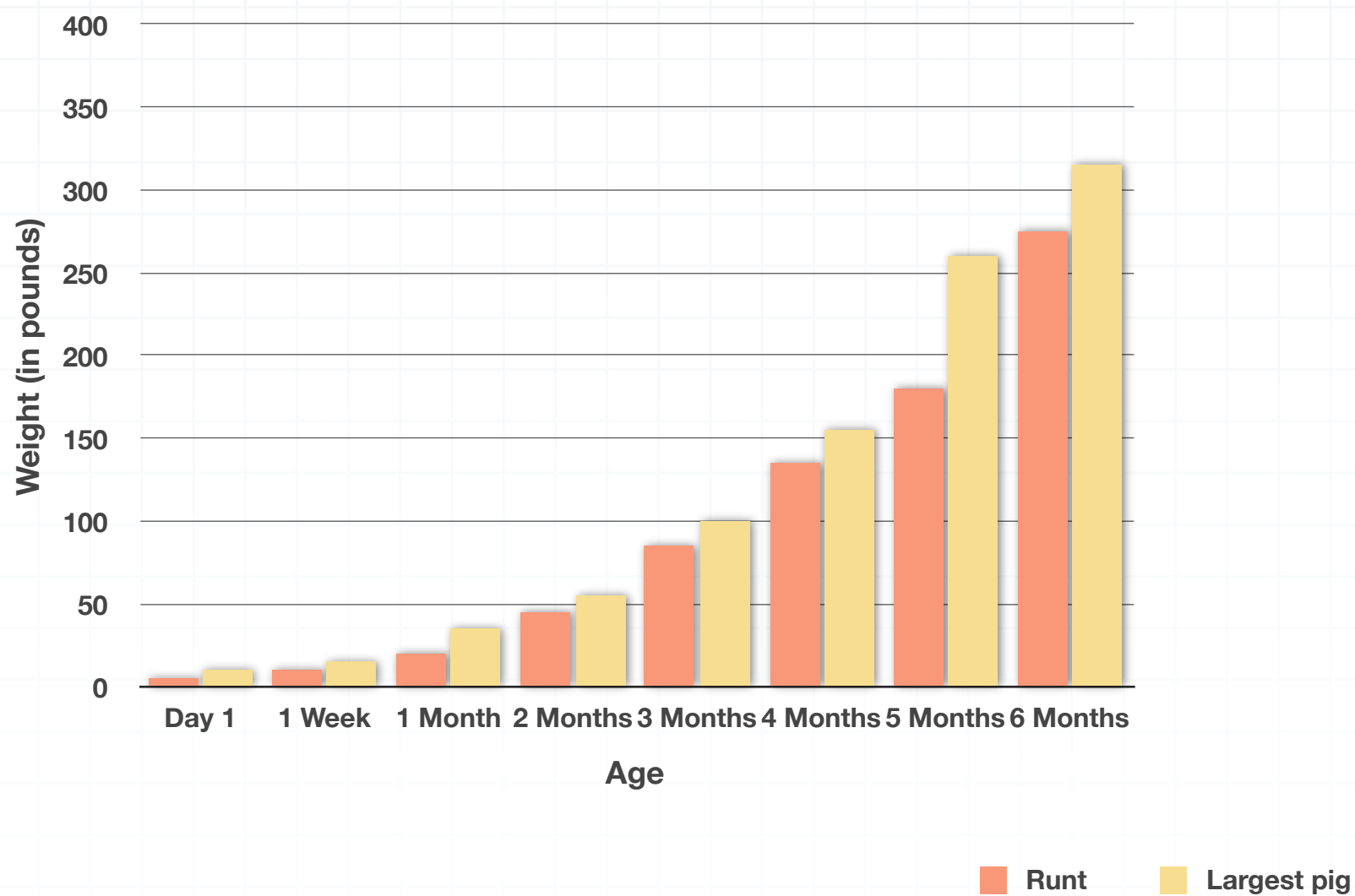
■ 5. A company is analyzing the results from a recent survey about why people left their employment. The results are shown in the data table below. In general, is a bar graph or a pie chart a better choice to display the data? Why?



Reasons for leaving job	
Reduced job duties	30%
Company restructuring	15%
Too much travel time	12%
Looking for more opportunity	11%
Need more personal time	9%
Poor expected company growth	8%
Job was contract or short term	8%
Need more of a challenge	5%
Other	2%

■ 6. The comparison bar graph shows the growth of two pigs over their first 6 months of life. Which pig grew the most between 4 and 5 months?





LINE GRAPHS AND OGIVES

- 1. Bethany started a sit-up program so that she can do 200 sit-ups in a day. At the end of week 6 she'll have completed 1,685 sit-ups. Create an ogive of the data.

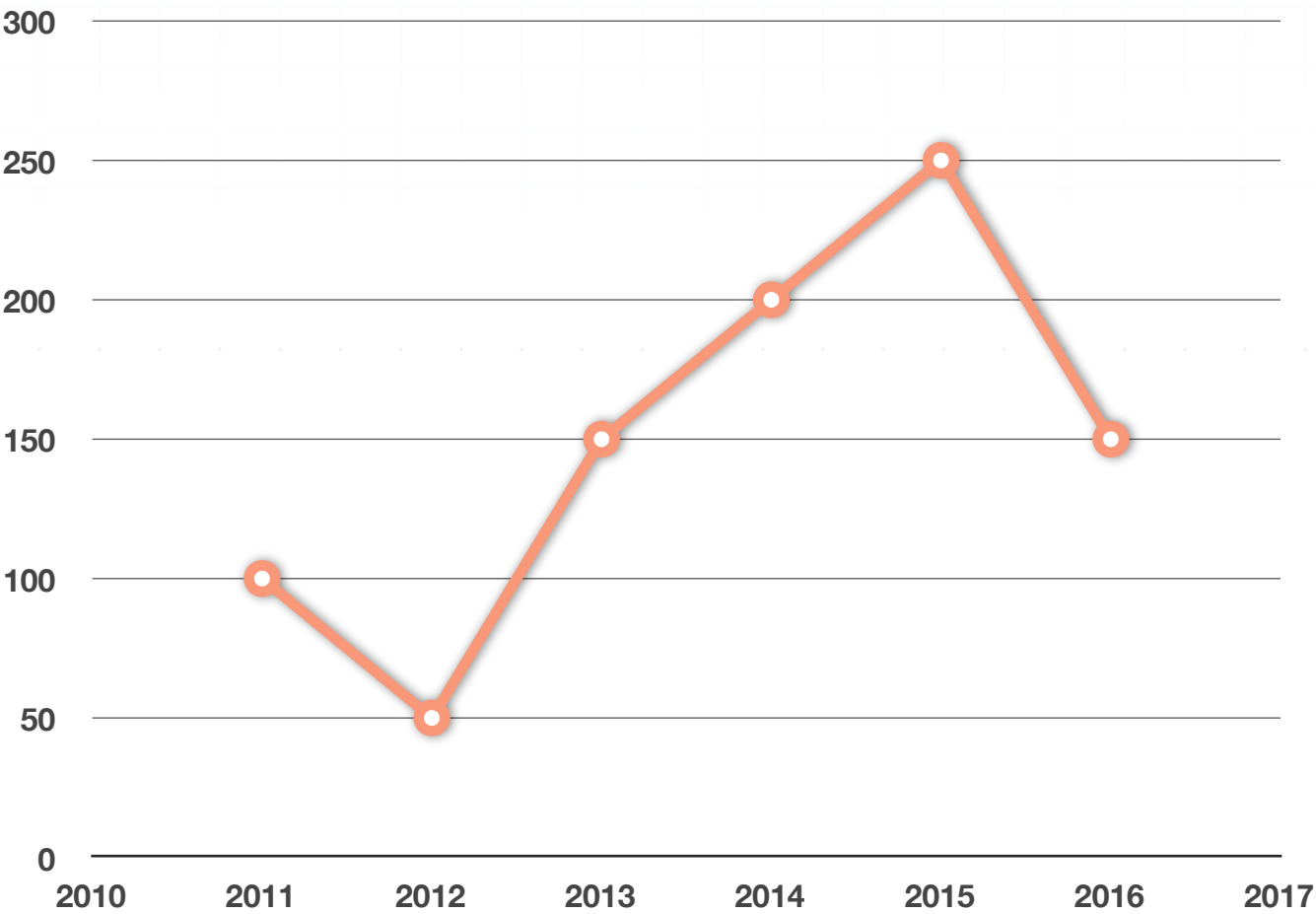
Week	Number of sit-ups
Week 1	350
Week 2	455
Week 3	600
Week 4	540
Week 5	1,275
Week 6	1,685

- 2. The table shows passengers by year for Buster's Bus Service. Create a line graph of the data in the table.



Year	Passengers
2011	1,000
2012	500
2013	1,500
2014	2,000
2015	2,500
2016	1,500

3. Between what two consecutive years was there the largest increase in car sales?

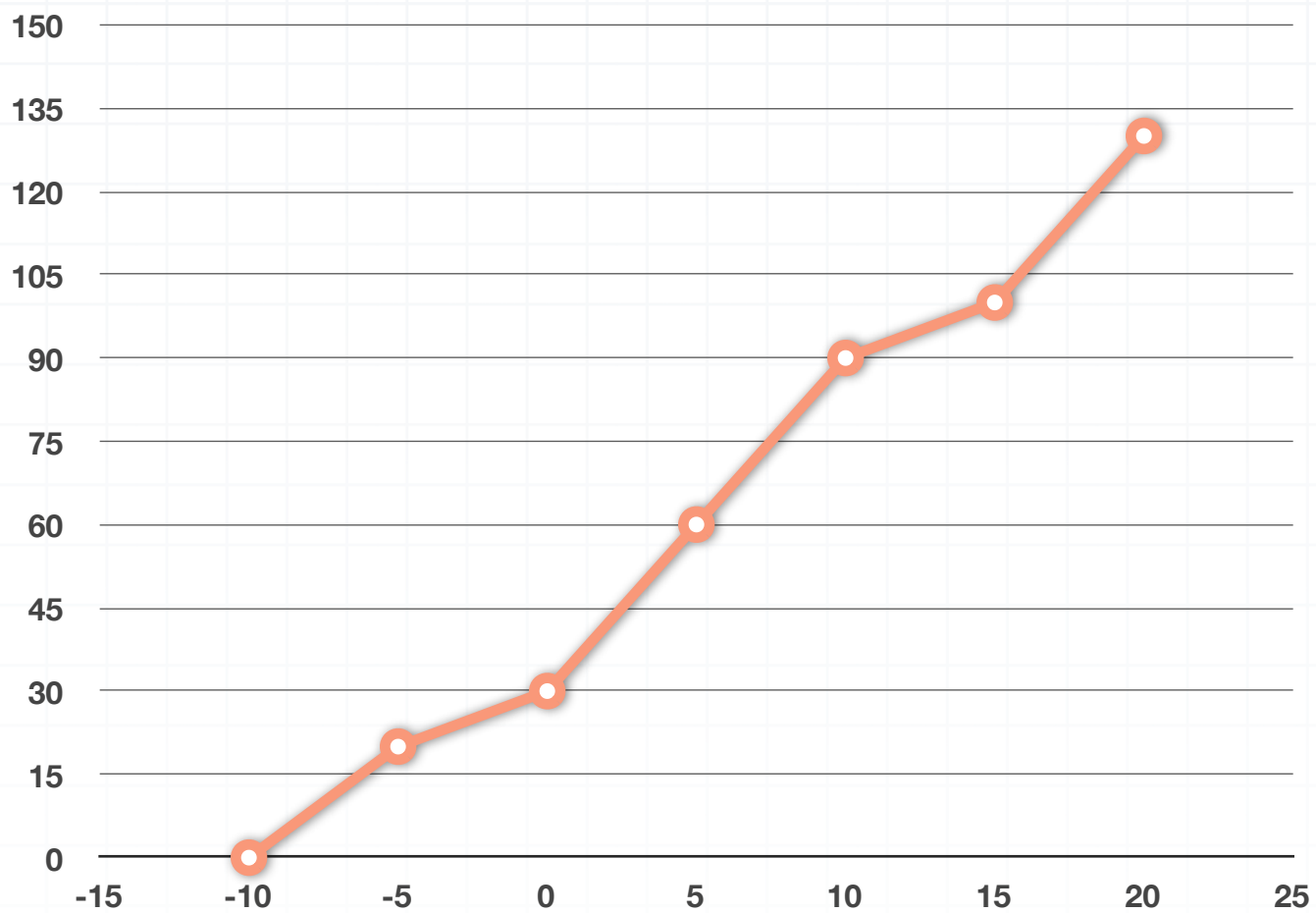


- 4. Mrs. Moore gave her students a midterm exam, then she created this ogive of the 45 exam scores. How many students got a score between 70 % and 90 % ?



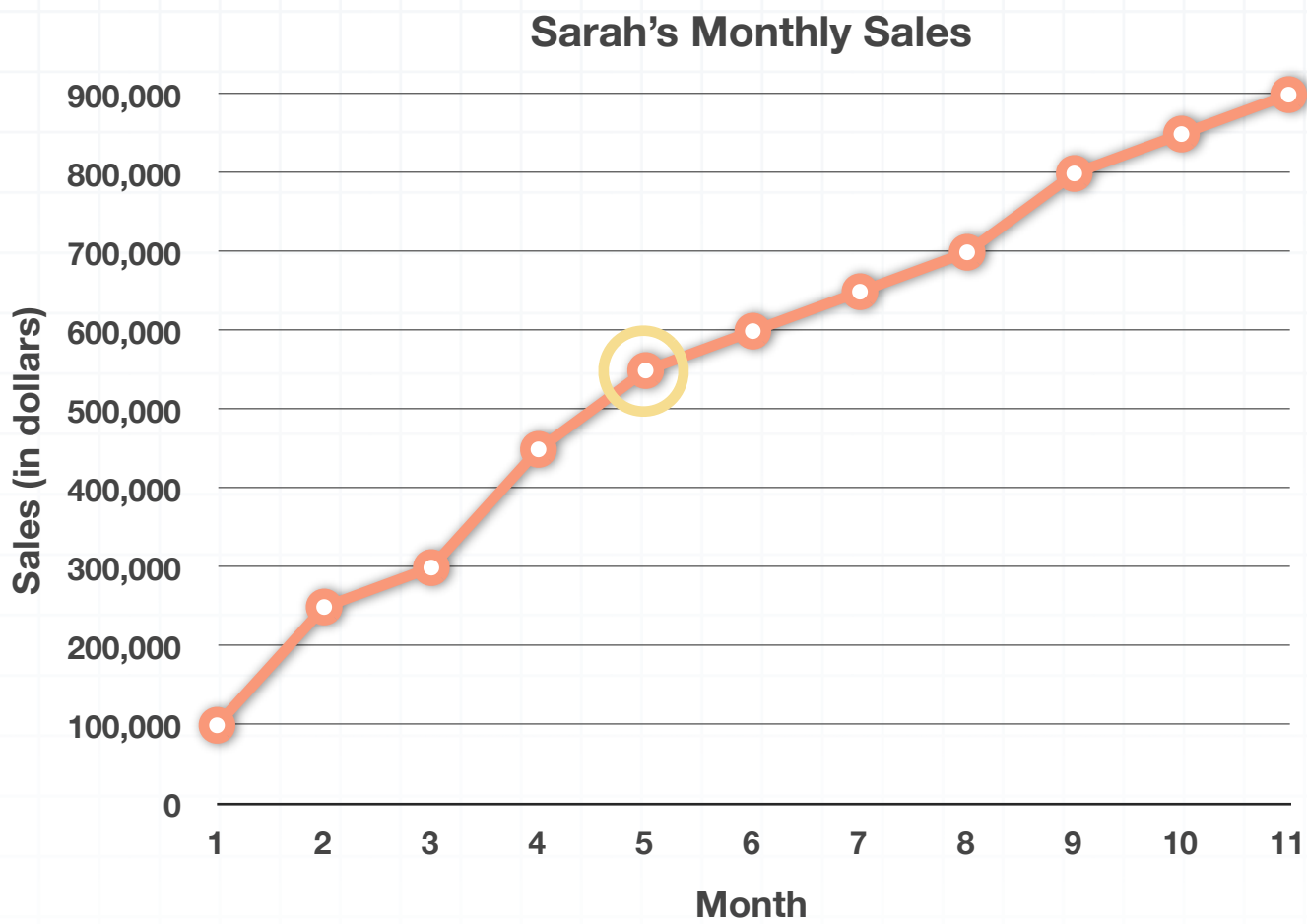
- 5. Draw the line graph that corresponds to the ogive below.





■ 6. Sarah's monthly sales to date are shown in the ogive. What is the meaning of the circled point?





TWO-WAY TABLES

- 1. Create a comparison bar graph for the two-way table.

Favorite pet	Fish	Cat	Dog	Other
1st grade	8	15	7	9
2nd grade	13	10	12	5

- 2. A pizza parlor wants to know if the age range of their customers affects pizza preferences. The pizza parlor asks each customer two questions:

1. Which type of pizza is your favorite: pepperoni, cheese, supreme or veggie?
2. What is your age range: Under 18, or 18 and over?

The results of the survey are as follows:

Of the 50 customers who prefer pepperoni pizza, 25 are under 18.

Of the 20 customers who prefer cheese pizza, 18 are under 18.

Of the 30 customers who prefer supreme pizza, 24 are over 18.

Of the 25 customers who prefer veggie pizza, 19 are over 18.



Which type of table, one-way or two-way, can be created from the data that the pizza parlor is collecting? Create the best type of frequency table for the data.

■ 3. An elementary school creates the following two-way table. What is the best name for the row variable and what is the best name for the column variable?

	Walk	School	Day care	Carpool
Pre-	1	10	20	26
First	5	12	14	19
Second	10	22	5	15
Third	8	33	3	10

■ 4. Decide whether a comparison bar graph or comparison line graph would be better at displaying the data in the two-way table, then create the graph.

		Method of transportation			
		Walk	School	Day care	Carpoo
Grade in school	Pre-	1	10	20	26
	First	5	12	14	19
	Second	10	22	5	15
	Third	8	33	3	10



■ 5. Eric creates a survey asking students who ate a snack in the morning between classes if they felt sleepy or not. Given his survey results below, create a two-way data table for Eric’s survey.

Sna	Y	Y	N	N	N	N	Y	N	Y	N	Y	Y	N	Y	N
Slee	Y	Y	Y	N	N	N	N	Y	Y	N	Y	Y	N	N	Y

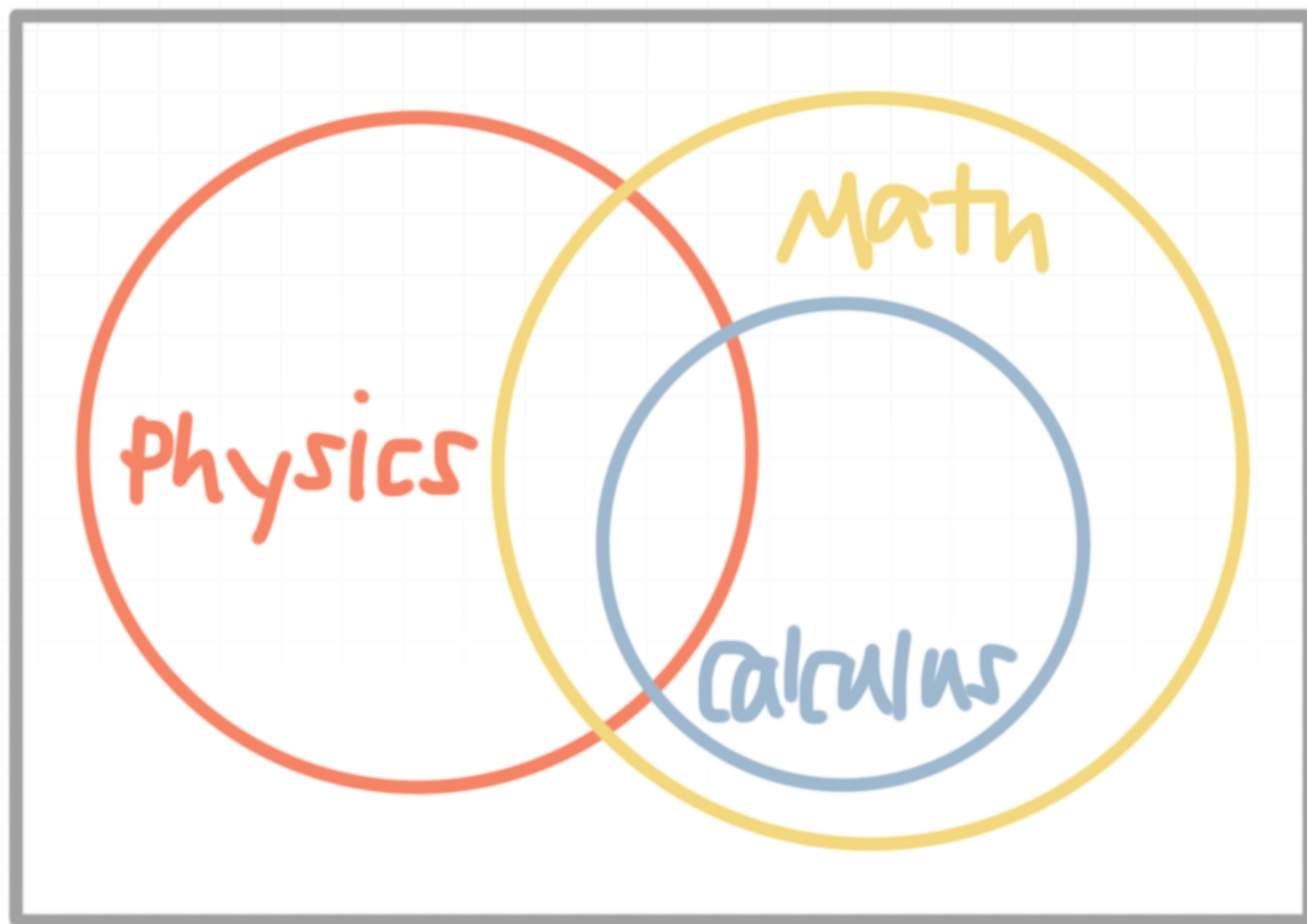
■ 6. Is a comparison line graph an appropriate visual display for the data table, which shows monthly rainfall (in inches) for Dallas, Texas, January - August? Why or why not? If it’s an appropriate display, create a comparison line graph. If it’s not an appropriate display for the data, create a comparison bar graph.

	2015	2016	2017
January	3.62	1.04	4.39
February	2.96	2.20	2.33
March	2.53	2.67	1.06
April	5.56	4.60	3.38
May	16.96	6.25	0.70
June	3.95	3.60	8.44
July	0.92	3.89	4.12
August	0.46	4.42	4.24



VENN DIAGRAMS

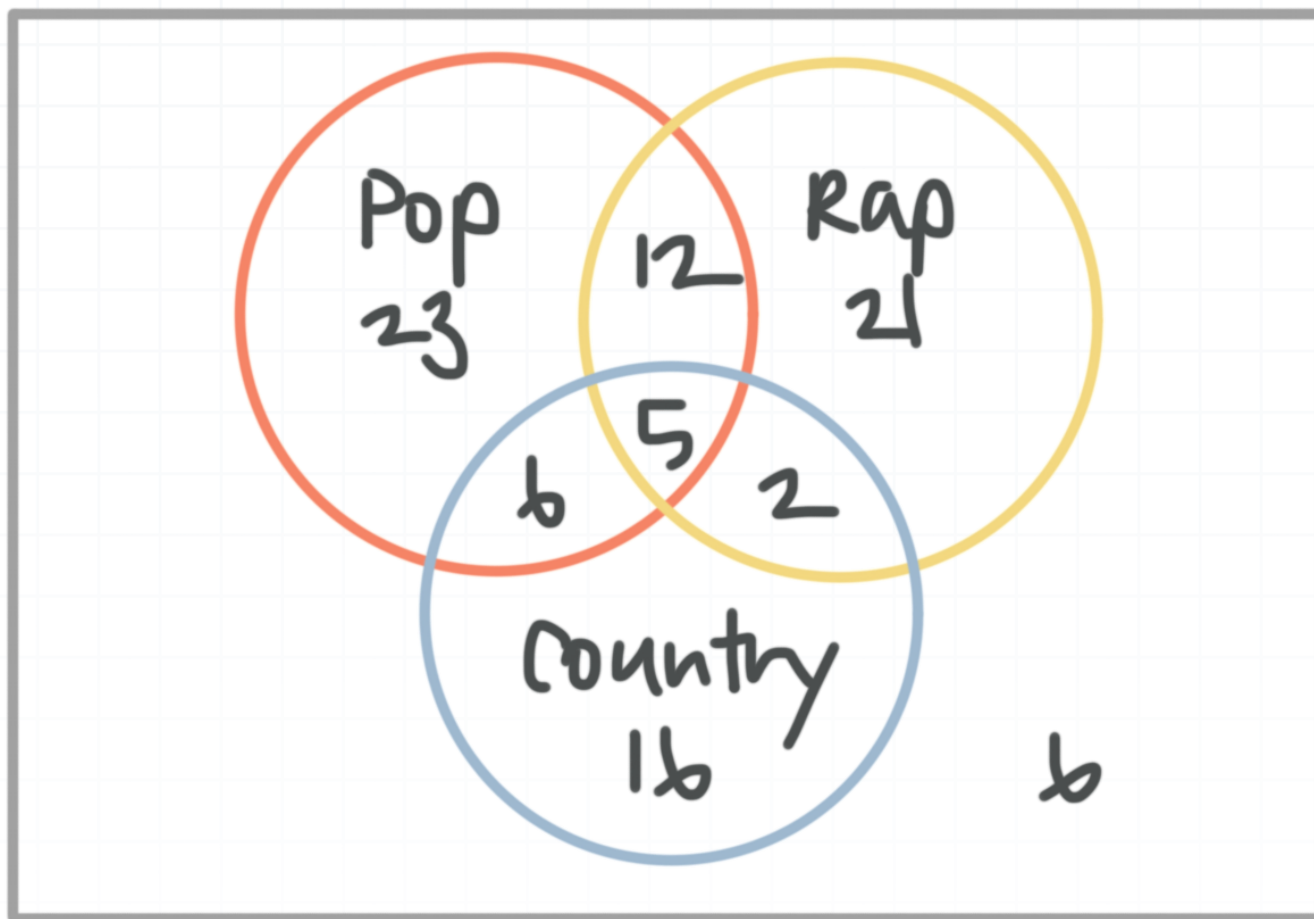
- 1. What does the Venn diagram show about how Calculus is related to Physics and Mathematics?



- 2. Draw the Venn diagram for the number of humans in a room and the number of frogs in a room, if the room has 12 frogs and 15 humans.
- 3. Students at Green Bow High School conducted a survey during lunch time to see what kind of music the students at the school liked. They recorded their results in a Venn diagram. How many students participated



in the survey? What percentage of the students who participated did not like Pop Music?



- 4. A survey team is collecting data on a type of minnow that lives where a river meets the sea. They place nets in the river, where the river and sea meet and where there is only sea. They count the minnows caught in each net. What percent of the minnows were living in the brackish water? Brackish water is water that's a combination of fresh and saltwater.





■ 5. Fill in the Venn diagram using the following information.

18 people's favorite exercise was swimming.

13 people's favorite exercise was running.

10 people only liked weight lifting.

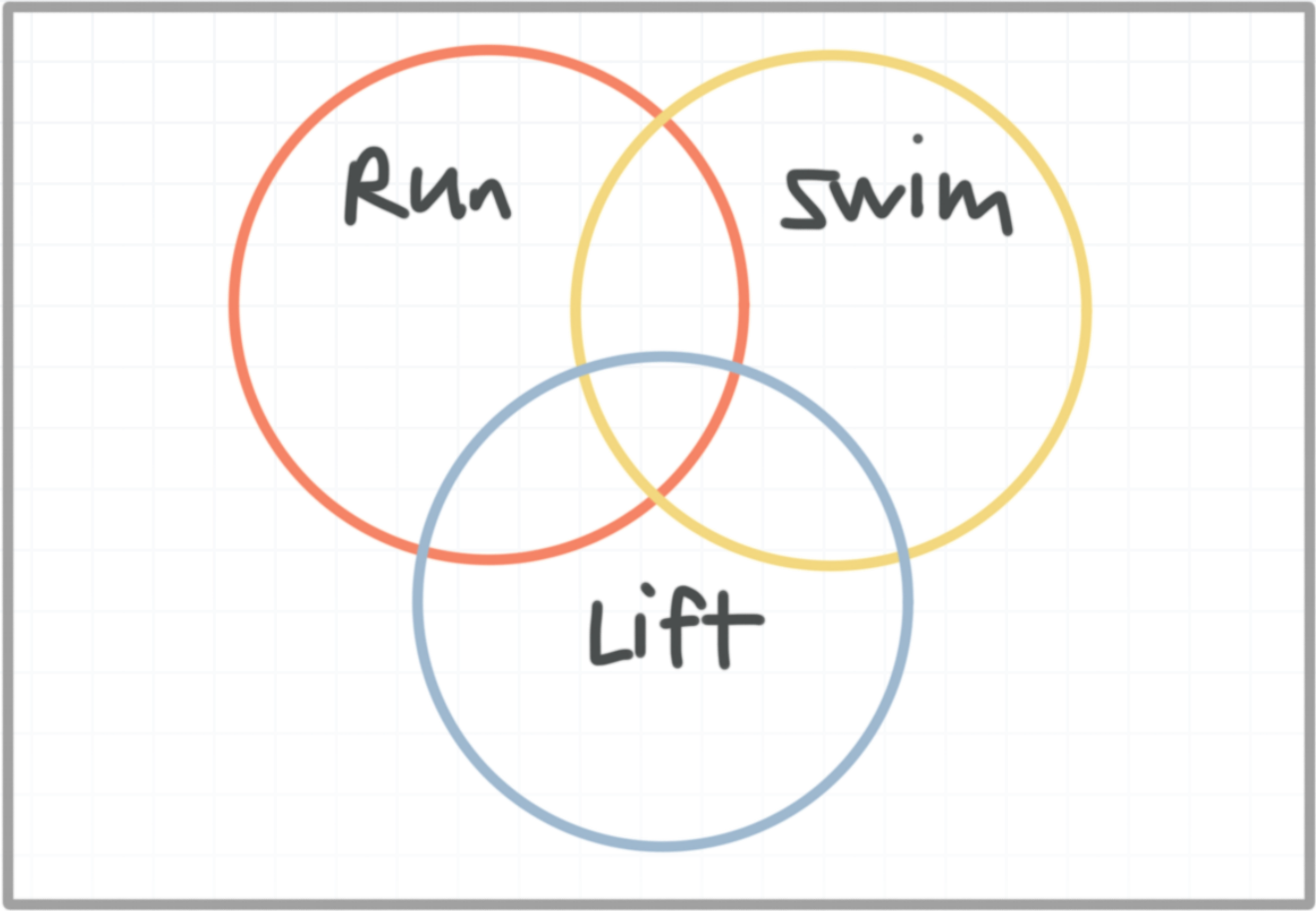
5 people liked swimming and weight lifting equally.

4 people liked running and weight lifting equally, but not swimming.

5 people liked running and swimming equally, but not weight lifting.

2 people liked all three equally.





6. Eric creates a survey asking students who ate a snack in the morning between classes if they felt sleepy or not. He organizes his survey results into a two-way data table. Draw a Venn diagram for Eric’s survey results.

		Do you feel sleepy?		
		Yes	No	Total
Did you eat a snack?	Yes	5	2	7
	No	3	5	8
	Total	8	7	15



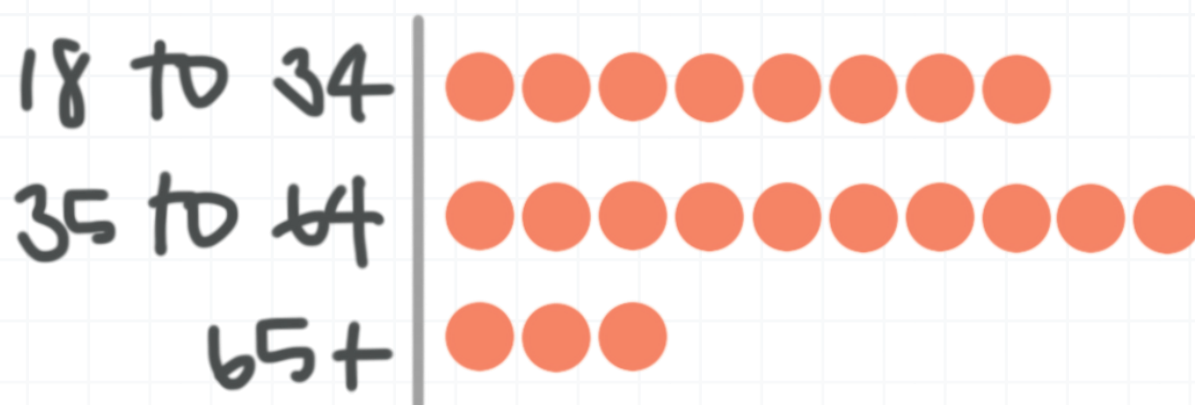
FREQUENCY TABLES AND DOT PLOTS

- 1. The frequency table shows the number of seed packets sold by each child during a pre-school fundraiser. Create a dot plot from the frequency table.

Name	Packets sold
Ivan	5
Stacy	6
Vanessa	3
Josh	8
Jamie	5
Kelly	7
Billy	10
Cassie	5
Tim	7
Kate	3

- 2. The dot plot shows the age of people who bought a bag of kale at a grocery store. Create a frequency table from the dot plot.





- 3. The following data shows the number of red marbles drawn in a class lottery. Create a frequency table for the data.

0, 0, 0, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 5, 5, 5, 7, 7

- 4. The following data shows the favorite color of the students in Sebastian's kindergarten class. Create a frequency table for the data.

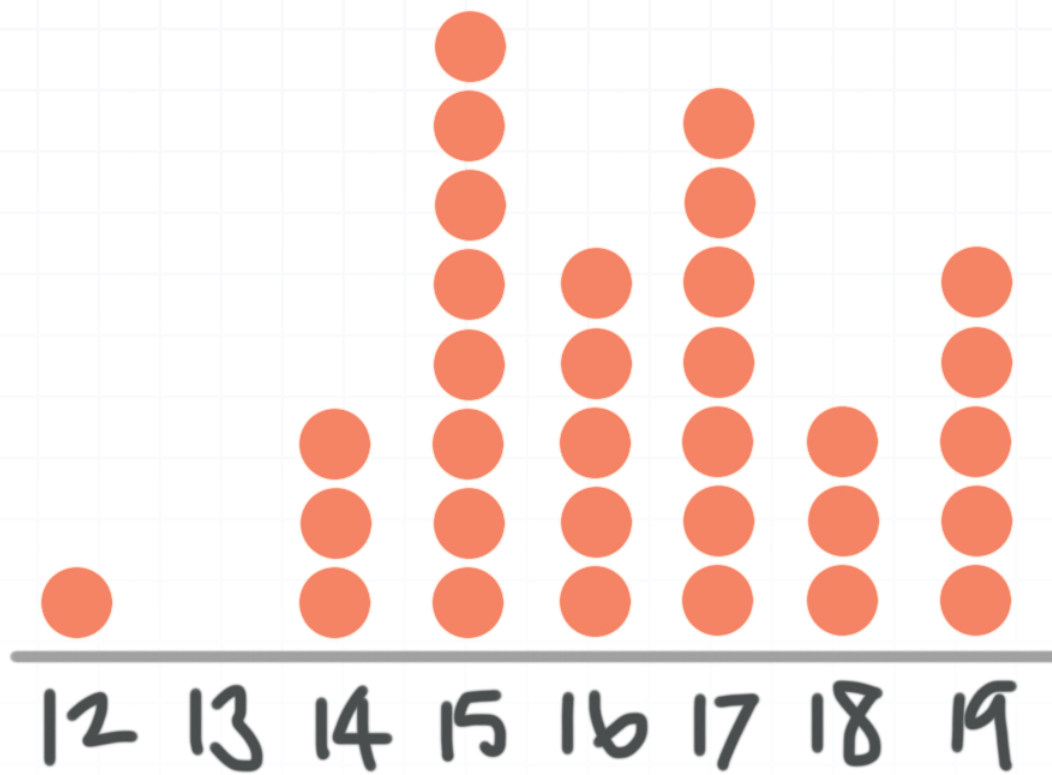
pink, pink, pink, pink, purple, purple, blue, blue, blue, blue, blue, red, red, red, yellow, orange, orange, green, green, green, black

- 5. Kevin watches birds from his window and records what kind he sees. Create a dot plot from the data.

chickadee, redbird, redbird, redbird, chickadee, sparrow, sparrow, sparrow, sparrow, blue jay, crow, crow, redbird, chickadee, sparrow, sparrow, blue jay



■ 6. The dot plot shows the ages of people in a lifeguard class at the local recreation center. How many people are enrolled in the class who are either 16, 17, or 18 years old?



RELATIVE FREQUENCY TABLES

- 1. Blake is surveying students in his class (made up of juniors and seniors) about whether or not they play video games on a daily basis. What type of relative frequency table is shown? Finish filling in the table.

	Play at least one video game daily	Don't play any video games daily	Total
Junior	23%		75%
Senior		14%	
Total			100%

- 2. Create the row-relative frequency table for the frequency table below displaying 9th grade students who participate in an after school activity, and then answer the question: What percent of female 9th grade students do not participate in an after school activity?

	Participate	Don't participate
Male	62	40
Female	57	38



- 3. Create the column-relative frequency table for this data table and then answer the question: What percentage of those who participate in an after school activity are male?

	Participate	Don't participate
Male	62	40
Female	57	38

- 4. Create the total-relative frequency table for the data, and then answer this question: Carl is in charge of creating an activity for the students in his college dorm. If Carl wants the highest possible turnout, which activity should he choose? Why?

	Movie	Bowling	Pizza Party
Male	20	40	55
Female	35	50	62

- 5. A city hall is looking into a dangerous intersection that has caused many bicycle accidents over the past month, due to rerouted traffic. They have counted the number of bicycle accidents and put them into a frequency table like the one below. Create the relative frequency table for the data and answer the following question: What day had the highest percentage of bicycle accidents?



Day of the week	Number of crashes
Sunday	13
Monday	10
Tuesday	8
Wednesday	6
Thursday	2
Friday	11
Saturday	14

■ 6. Addie took a poll of the children in her neighborhood. She found that 15 of them watch 2 hours or more of cartoons per day. Out of the 15 that watch 2 hours or more, 10 watched the cartoons on a device other than the television. There were also 12 children who watched less than 2 hours of cartoons per day. For those 12 children, 2 of them watched cartoons on a device other than a television. Construct a two-way table to summarize the data and then construct a total-relative frequency table for the data.



JOINT DISTRIBUTIONS

■ 1. To study the relationship between votes for a new park and people who have children, a community group surveyed voters. What percentage of those surveyed had children? Is this part of the joint, conditional, or marginal distribution?

	For	Against	No opinion
Children	125	50	30
No children	40	150	60

■ 2. To study the relationship between votes for a new park and people who have children, a community group surveyed voters. What percentage of those surveyed were for the park and had children? Is this part of the joint, conditional, or marginal distribution?

	For	Against	No opinion
Children	125	50	30
No children	40	150	60

■ 3. To study the relationship between votes for a new park and people who have children, a community group surveyed voters. What percentage of those with no children had no opinion? Is this part of the joint, conditional, or marginal distribution?



	For	Against	No opinion
Children	125	50	30
No children	40	150	60

■ 4. Carl is in charge of creating an activity for the students in his college dorm, and he records their preferences by activity and gender. What percentage of the female students prefer pizza? To answer the question, should we use a marginal, joint, or conditional distribution?

	Movie	Bowling	Pizza Party
Male	20	40	55
Female	35	50	62

■ 5. A pharmaceutical company is testing heart burn as a side effect of its new pain reliever. What conclusions can we draw from the marginal distributions of the study?

	Pain reliever	Placebo	Total
Minor heartburn	4	171	175
Major heartburn	102	25	127
No heartburn	10,568	10,478	21,046
Total	10,674	10,674	21,348



- 6. Consider the same data as the previous question. What do the conditional distributions (given the participant experienced minor heartburn, major heartburn, or no heartburn) tell us about the study?

	Pain reliever	Placebo	Total
Minor heartburn	4	171	175
Major heartburn	102	25	127
No heartburn	10,568	10,478	21,046
Total	10,674	10,674	21,348



HISTOGRAMS AND STEM-AND-LEAF PLOTS

■ 1. A doctor recorded the weight of all the babies that visited her clinic last week. How many babies weighed no more than 24 pounds?

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

1 | 5 = 15

■ 2. The stem plot shows the number of clothing pieces on each rack at a clothing store. Create a histogram from the stem plot, and use buckets of size 10.

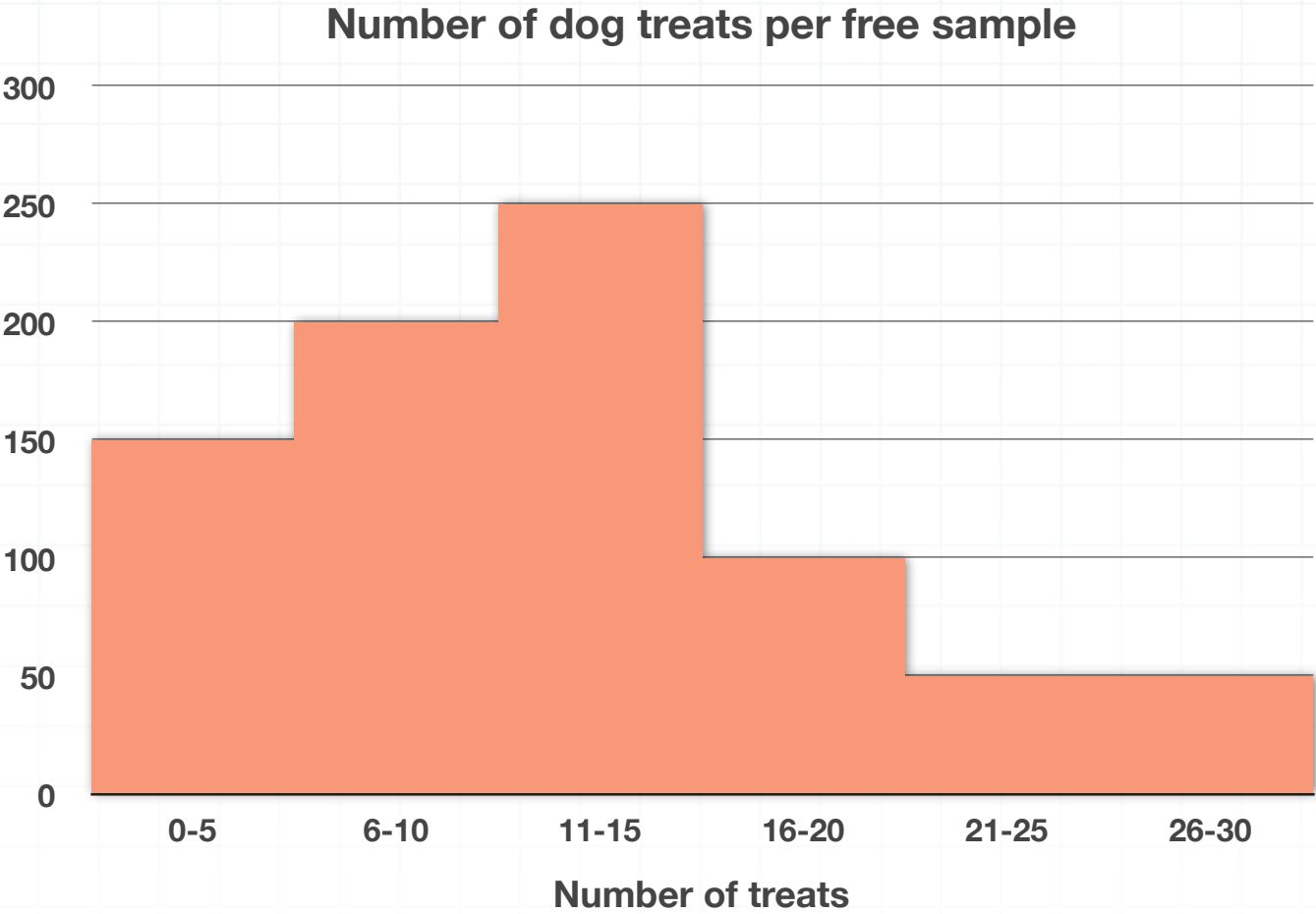


1	0 1 2 8
2	8 8 8
3	2 6 8 9
4	4 4 4
5	2 6
6	0

$$1 | 0 = 10$$

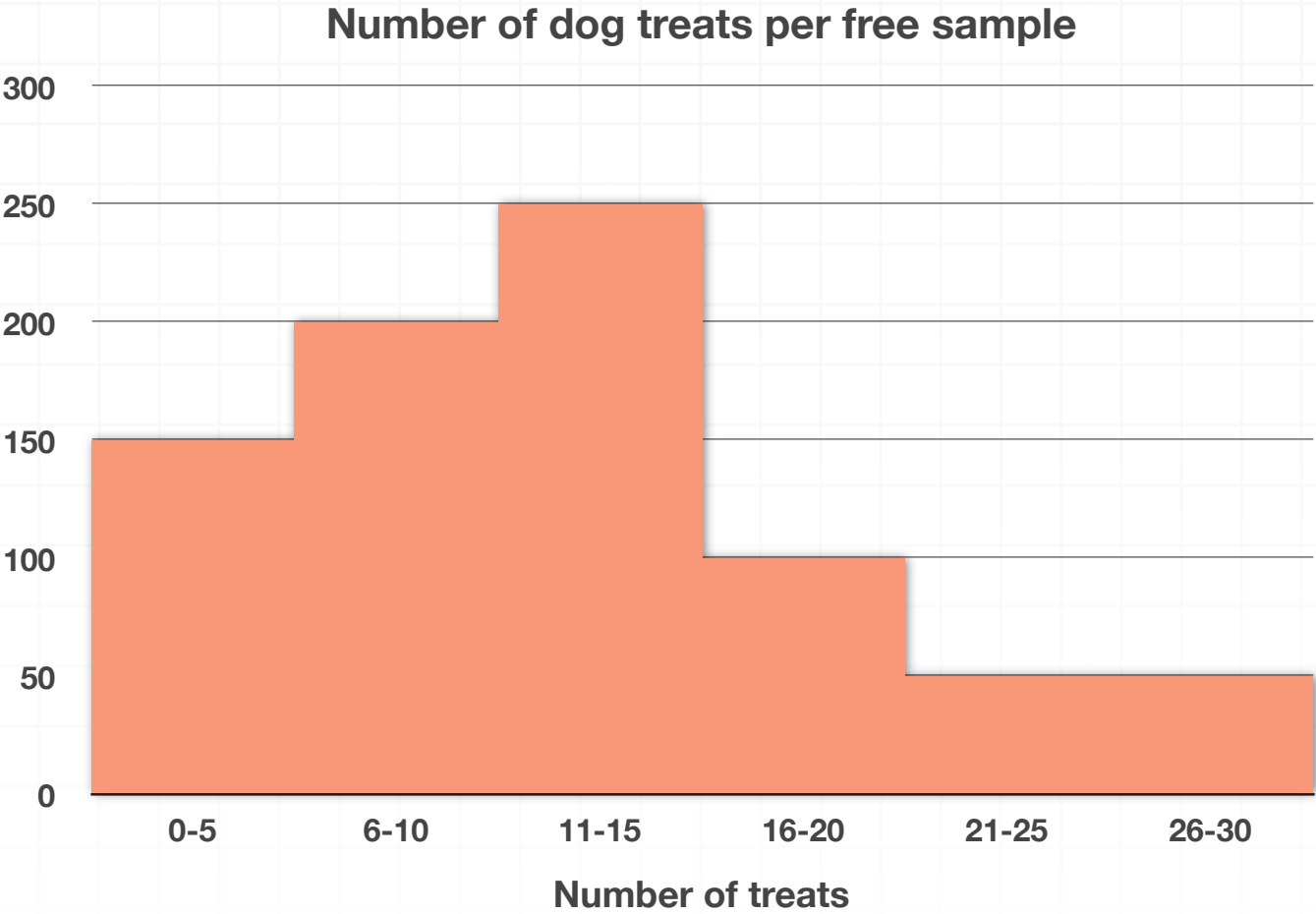
- 3. Is it possible to create a stem-and-leaf plot from a histogram? Why or why not?
- 4. A company mails out packets of dog treat samples based on a consumer's previous dog food purchases. How many times did the company mail a packet of 11 – 15 treats?





■ 5. A company mails out packets of dog treat samples based on a consumer’s previous dog food purchases. How many packets of dog treat samples did the company give out?





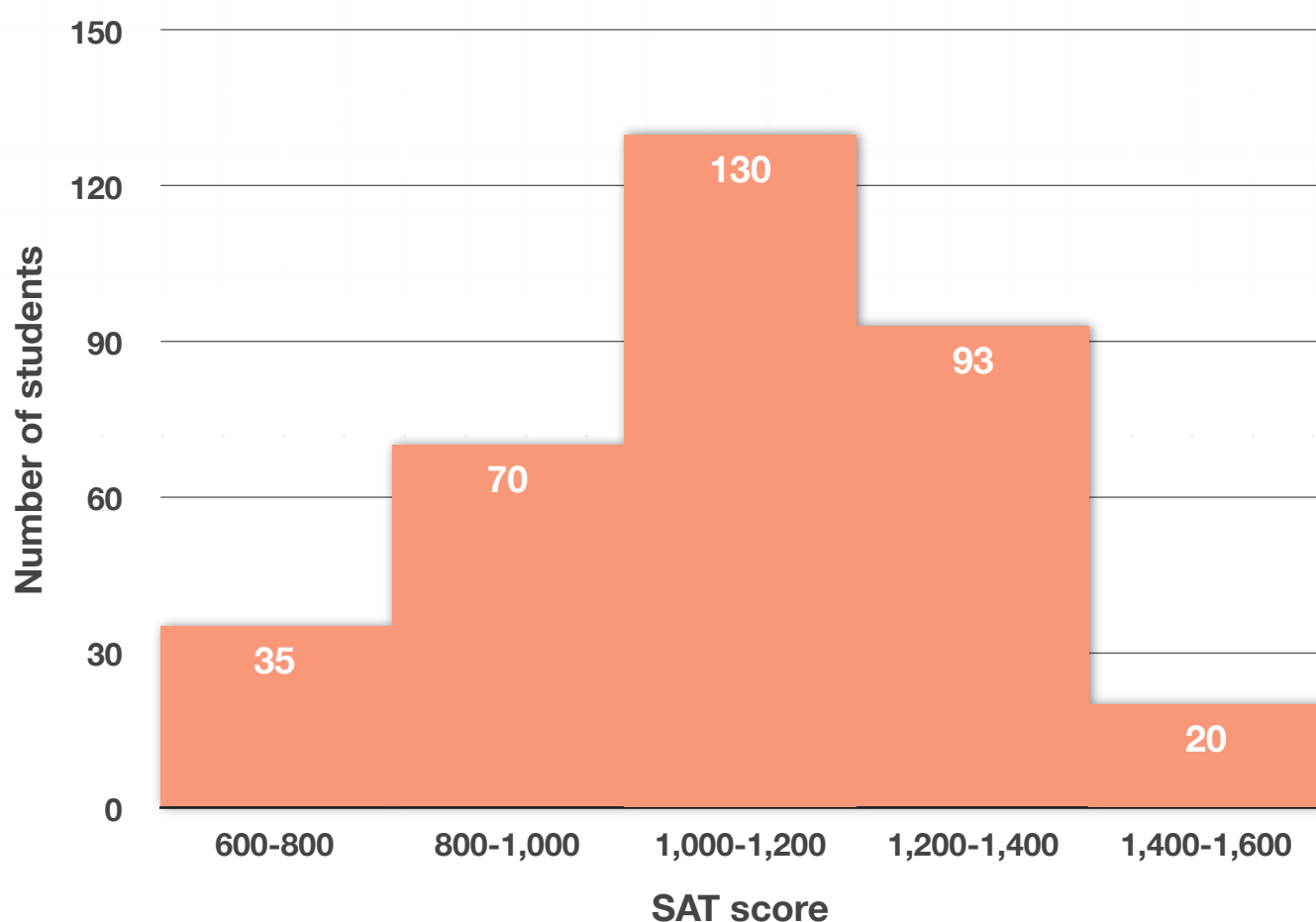
■ 6. Create a stem-and-leaf chart from the list of student test scores.

60, 65, 80, 80, 81, 82, 88, 89, 90, 97, 98, 100, 100



BUILDING HISTOGRAMS FROM DATA SETS

- 1. If the range of the data set is 36 and we want to divide it into 5 class intervals, which of the following would be the most appropriate class width?
- 2. Based on the histogram showing the distribution of the SAT scores for students at a local high school, what number of students scored between 1,000 and 1,400?



- 3. If we set the first two classes for the data set below as 0 – 7 and 7 – 14, how many data points will fall into the first interval?



7, 3, 4, 12, 23, 34, 2, 13, 21, 8, 7

- 4. Considering the table below, what is the midpoint of the class that includes the smallest number of the students?

Exam score	Number of students
90 - 99	25
80 - 89	54
70 - 79	64
60 - 69	8

- 5. A literature teacher asked 50 of his students how many hours they spent reading last week, then recorded his results in a table. What class width did he use?

Hours spent reading	Number of students
0 - 3	25
4 - 7	54
8 - 11	64

- 6. A math teacher asks 25 of her students how many hours they spent on math homework last week. Given the responses below, build a histogram with 6 bins that displays the data.



4, 3, 5, 1, 0, 12, 11, 6, 4, 2, 13, 3, 7, 12, 9, 8, 10, 22, 13, 4, 5, 20, 1, 0, 7



