| Teaching Point:	Mathematicians can interpret a histogram to represent a data set.
Big Idea:	Mathematicians use statistics to accurately summarize and analyze data.
Standards Addressed:	6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. 6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
Materials Needed:	Copies of PST, CW, ET, LW, visual displaying histogram
Source:	Engage NY Module 6 Lesson 4

Agenda (60 minutes total)

1. PST and Discussion (32 minutes)
2. Practice (20 minutes)
3. Closing (8 minutes)

PROBLEM SOLVING TASK:

Directions: Your teacher is about to explain a new way to display data called a histogram. Your job is to take notes on the histogram below to help you understand all the parts of the histogram and what it shows.

The histogram below shows the ages of voters in Cambridge, MA during the 2008 presidential election (when Barack Obama was first elected as president!)
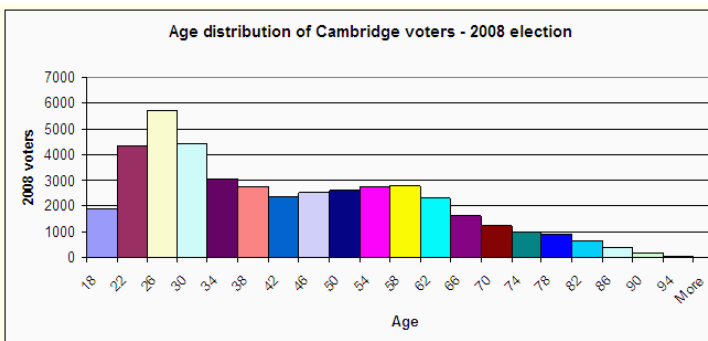
DISCUSSION:

Teacher explanation of the histogram that students should write down on their PST:

- **A histogram is a graph that represents the number of data values falling in an interval with a bar.** Histograms are kind of like a combination of a bar graph and a dot plot.
- **The horizontal axis shows the intervals. In this case, it's the age of the voters in Cambridge.**
- What's the first range you see on this histogram? (18-22) What does that mean? (ages between 18 and up to, but not including 22) Note: This is tricky for kids. You might ask one more follow up question, like, "What ages are represented in the 78-82 interval?" (78, 79, 80, 81…but NOT 82…82 is in the next category.) It looks like the intervals overlap, but make sure you know that 22 is included in the 22-26 group. Some histograms just list the intervals that way, which can be confusing.
- **The vertical axis shows the frequencies (how many data values are in the interval).** They show us frequency on a scale on the y-axis, like on a dot plot, but instead of showing how often individual numbers occur, they show us the frequency of ranges of numbers by having intervals on the x-axis.
- **So, about how many voters were between 18-22 years old?** (Just under 2,000 voters)
- **Do we know exactly how m any of those voters were 18 vs. 21?** (No! This is a flaw of histograms.)
- Each interval should be the same width, and the bars should touch each other.
- **Why do the bars touch each other in the histogram but not in a bar graph?** Bar graphs bars do not touch because they represent separate categories (e.g. if we wanted to show how many students owned different types of pets), but histogram bars do touch because they represent adjacent sets of numbers that cover an entire range of values together (e.g. if we wanted to show how many students had pets weighing 0-3 pounds, 4-7 pounds, etc.). A bar graph shows us

Part 2:
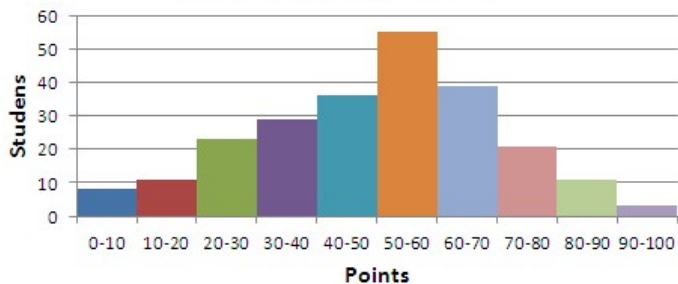
1) What does the x-axis of this histogram represent? **The points scored on the test**

2) What does the y-axis of this histogram represent? **The number of students who had a particular score**

3) Which interval would a score of 80 fall into? **The 80-90 interval**

4) About how many total students took the space unit test? **Estimates between 200-215 or so**

5) About how many students scored between 70-80 on the space unit test? **20 students**

6) What was more common: a student scoring below 20 or a student scoring above 70? **A student scoring above 70**

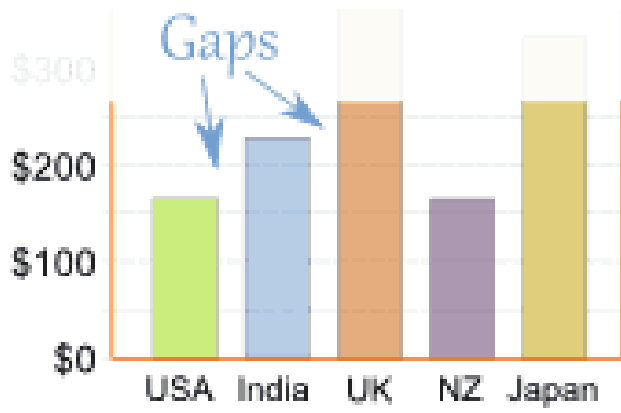7) What did a typical 8th grade student score on this test? **Between 50-60**

categories on the x-axis, whereas a histogram has a number line on the x-axis. **Show examples of each (attached)**

Big Picture questions:
- **Why might you prefer to summarize the data using a histogram rather than a dot plot for this data set?** There would be WAY too many dots on a dot plot, and it would be hard to read.
- **What information is lost when you use a histogram instead of a dot plot?** In a dot plot, you can see individual values. In a histogram, you can only see the total number of values in an interval.
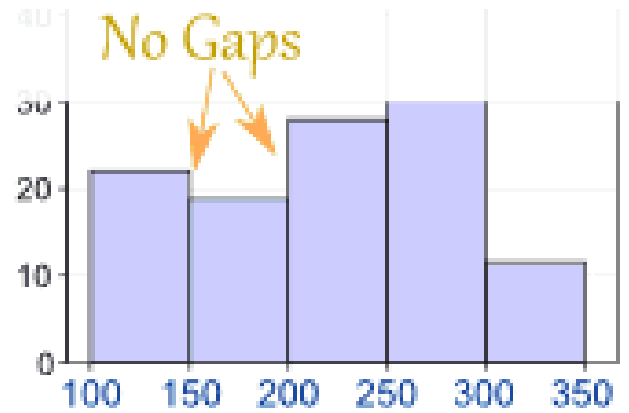
Once students have taken notes and answered questions on Part 1, have them flip their PSTs over to answer questions about the histogram on the back. Go over answers when you've finished.

End Goal: Scholars should be able to interpret different histograms. (Tomorrow we will create them.)

Gaps

$300
$200
$100
$0

USA India UK NZ Japan

← *Categories* →

Bar Graph

No Gaps

40
30
20
10
0

100 150 200 250 300 350

← *Number Ranges* →

Histogram

Lesson 6.4 - Problem Solving Task

Directions: Your teacher is about to explain a new way to display data called a histogram. Your job is to take notes on the histogram below to help you understand all the parts of the histogram and what it shows.

The histogram below shows the ages of voters in Cambridge, MA during the 2008 presidential election (when Barack Obama was first elected as president!)

Age distribution of Cambridge voters - 2008 election
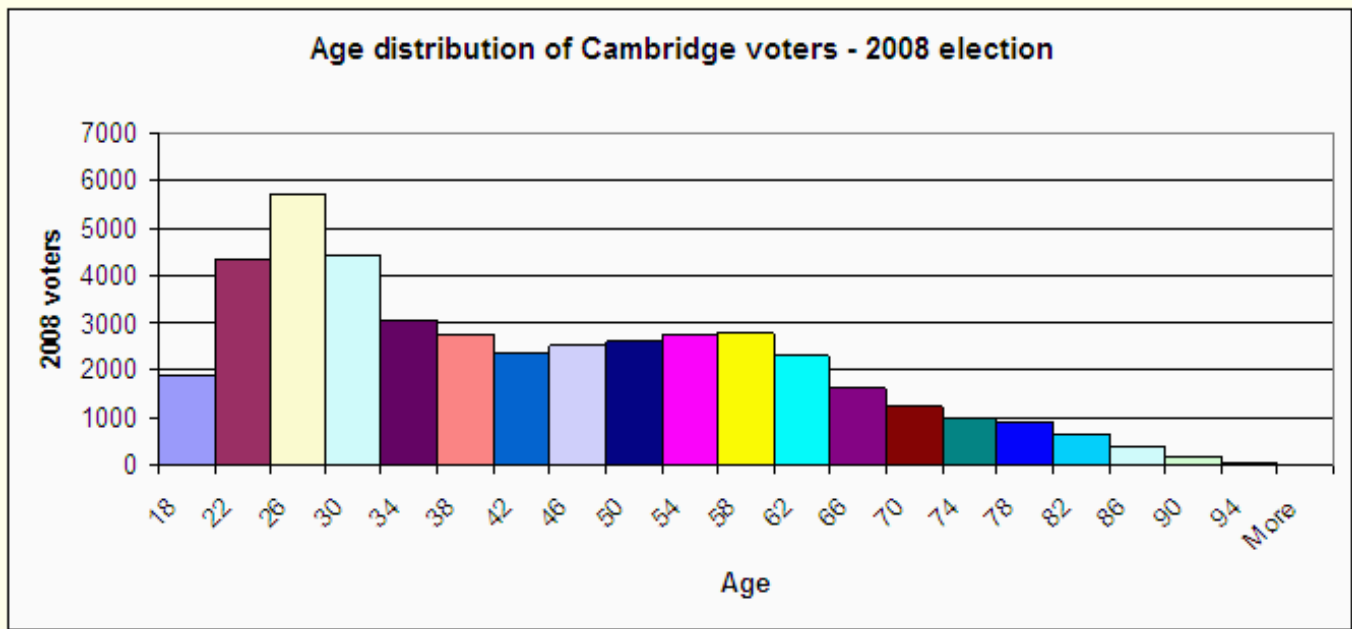
1) What's the first range you see on this histogram?

2) What ages are represented in the 78-82 interval?

3) About how many voters were between 18-22 years old?

Part 2:

The histogram below shows the results of a space unit test taken by the 9th graders at Gregson High School. Use the histogram to answer questions below.
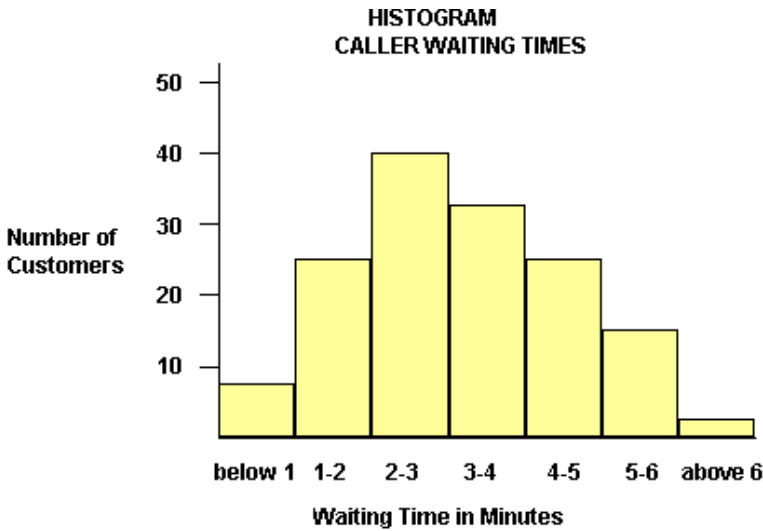
Results on the 9th Grade Space Unit Test
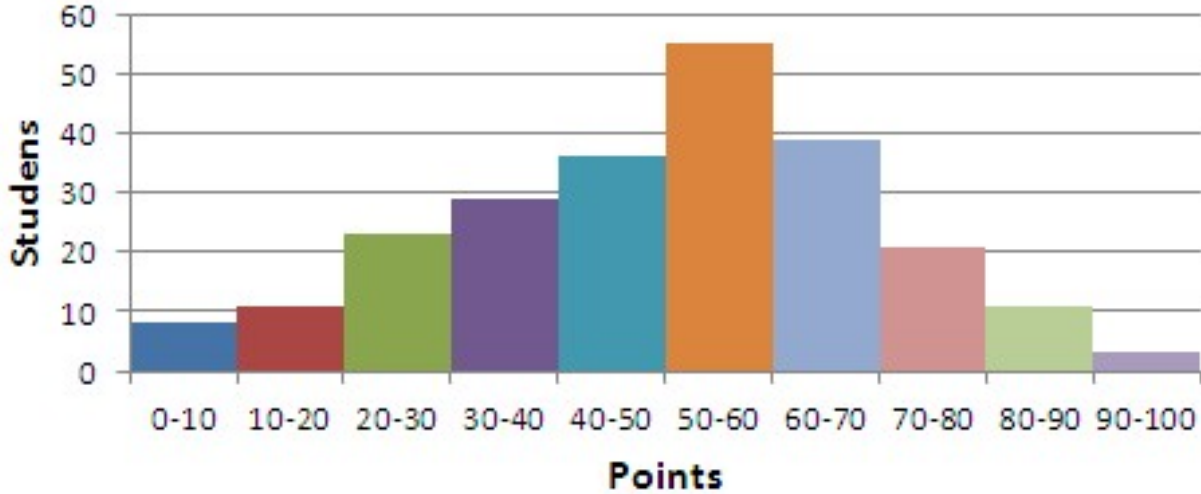
1) What does the x-axis of this histogram represent?

2) What does the y-axis of this histogram represent?

3) Which interval would a score of 80 fall into?

4) About how many total students took the space unit test?

5) About how many students scored between 70-80 on the space unit test?

6) What was more common: a student scoring below 20 or a student scoring above 70?

7) What did a typical 8th grade student score on this test?

Lesson 6.4 – Independent Practice

1. The histogram below shows the caller wait times for AT&T customers.

**HISTOGRAM
CALLER WAITING TIMES**

Number of Customers

50
40
30
20
10

below 1   1-2   2-3   3-4   4-5   5-6   above 6

Waiting Time in Minutes

a) What does the x-axis represent in this histogram?

b) What does the y-axis represent in this histogram?

c) Which interval would a wait time of 5:00 minutes fall into?

d) About how many customers had to wait less than two minutes?

e) About how many customers had to wait at least four minutes?

f) If you called AT&T right now, how many minutes would you expect to have to wait?

2) The histogram below shows the duration of Old Faithful eruptions.
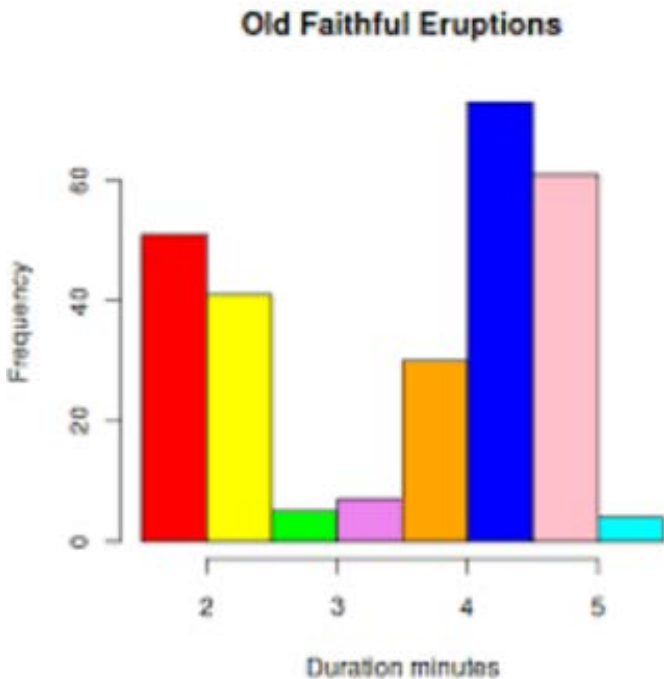
a) What does "duration" mean in this histogram?

Old Faithful Eruptions

Frequency

60
40
20
0

2   3   4   5

Duration minutes

b) What is the most common duration of eruptions?

c) About how many times did the eruption last less than 3 minutes?

d) Is someone asked you to describe the duration of Old Faithful's eruptions, what would you say?

Review:

1) Solve the following problems. The answers are found in the answer box below. There are five questions below, and six answers in the box. When you are done with the five problems, and you have double checked your work, write the answer that was not used in the space below. You MUST show all work.

A. Solve for x: $2x + 4 = 16$

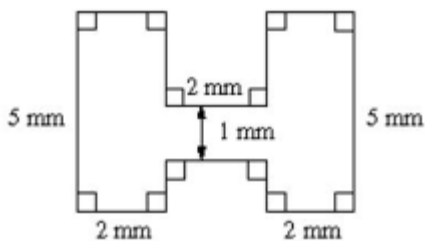C. $4 \div 1 \bullet (5 - (3 - 2)) \div 2$

B. $2\frac{3}{4} \div \frac{1}{4}$

D. Volume of a cube with side length 4

E. GCF of 30 and 60

ANSWER BOX:			
6	96		30
8		6	11

ANSWER NOT USED:

2) Determine the area of the composite figure.

Lesson 6.4 - Exit Ticket

1) The following histogram shows ages of the actresses whose performances have won in the Best Leading Actress category at the annual Academy Awards (Oscars).
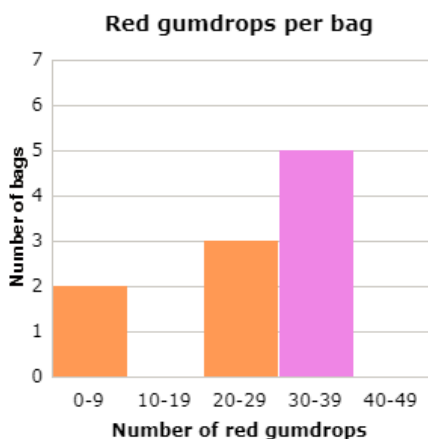
Histogram of Age
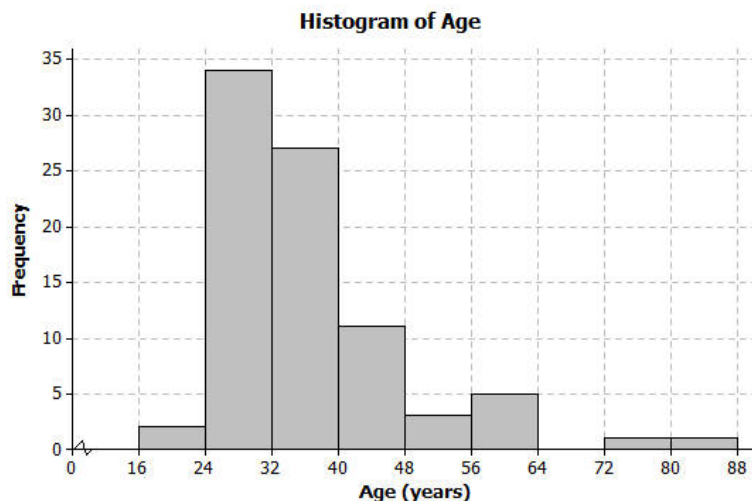
a. Which age interval contains the most actresses? How many actresses are represented in that interval?

b. How would you describe a typical age of an actress who won the award?

c. An age of 72 would be included in which interval?

A machine dispensed red gumdrops into bags of various sizes.   2)

Red gumdrops per bag

Are there fewer bags that had 0-9 red gumdrops or bags that had 40-49 red gumdrops?

Name: _____

Lifework 6.4

1) A food magazine published a listing of local restaurant ratings.

   a. How many restaurants did the food magazine survey?

   b. Which rating range was achieved by the most restaurants?

   c. Are there more restaurants that earned a rating of 6-10 or 11-15?

   d. What are some possibly ratings for the restaurants in the second column?

   e. What is this type of graph called?

Restaurant ratings
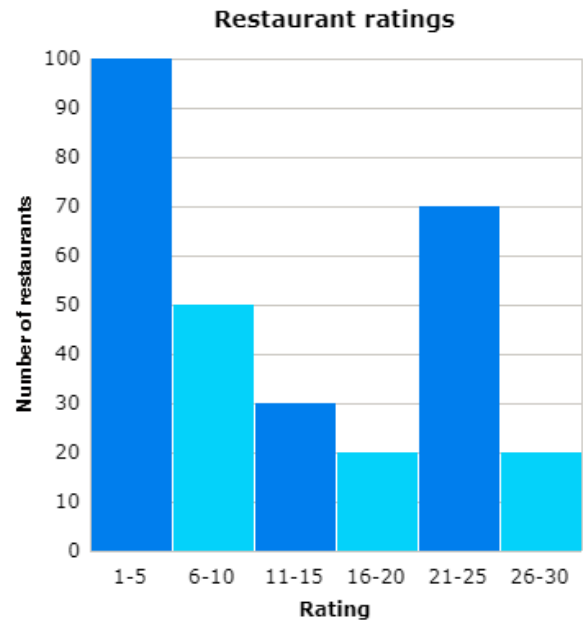
2) Look at the data and accompanying histogram below. Does the histogram match the data? If not, where is the error? Be specific.

Rotten tomatoes per barrel
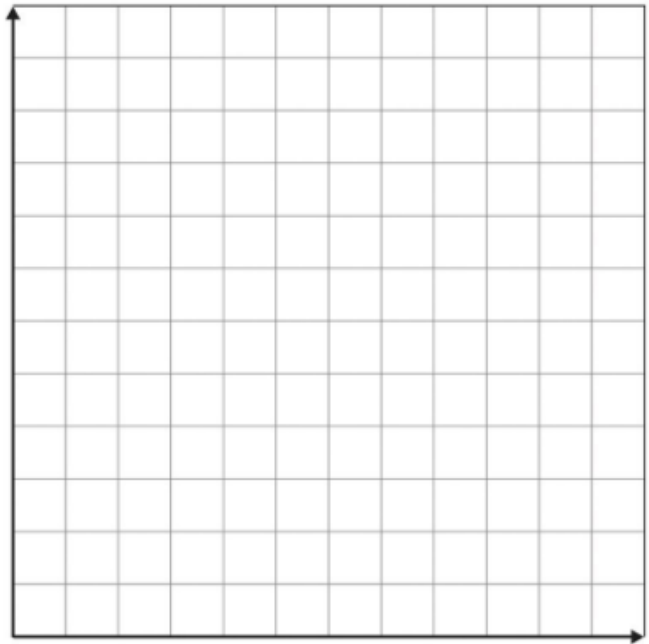
| 15 | 18 | 23 | 27 | 23 | 32 | 45 | 17 | 15 | 32 |

Rotten tomatoes per barrel
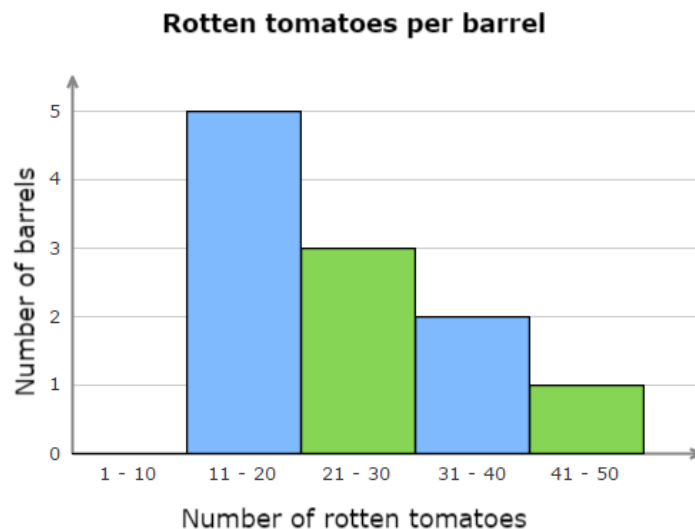
3) Josie is making berry muffins for the bake sale. For every cup of raspberries she puts into the batter, she adds three cups of blueberries.

    a. Create a ratio table to show possible amounts of berries in Josie's muffins.
    b. Graph the ratio on the graph below.

    c. Write an equation to express how many raspberries **r** would be in a batch of muffins with **b** blueberries

4) The following are Ben's monthly savings account totals. Which month had the biggest change in Ben's bank account? How do you know? Explain using mathematical thinking.

January	- $327
February	- $411
March	+ $383
April	- $355