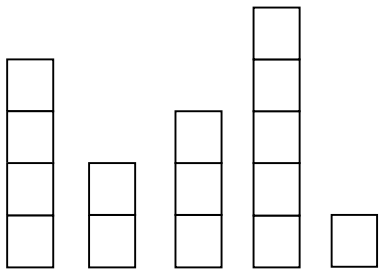
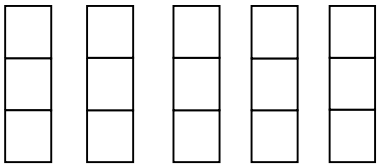
Date _____

Warm-Up

CST/CAHSEE:	Review:
41. The box below shows the number of kilowatt-hours of electricity used last month at each of the houses on Harris Street. 620, 570, 570, 590, 560, 640, 590, 590, 580 **What is the mode of these data?** **A** 560 **B** 580 **C** 590 **D** 640	Evaluate the expression. Justify your answer. $123 \div 3$
Current:	**Other:**
Draw a picture to show an even number of boxes in each of the 5 groups to determine the mean of the data set. 	Identify the outlier in the following data set. Write a sentence about why you think it is an outlier. $\{1,2,1,3,4,1,5,6,15\}$

<u>Today's Objective/Standards:</u> Students will calculate the mean for data sets given using multiple approaches, with and without including outliers.

Warm-Up: Debriefed

CST/CAHSEE:	Review:
41. The box below shows the number of kilowatt-hours of electricity used last month at each of the houses on Harris Street. 620, 570, 570, 590, 560, 640, 590, 590, 580 **What is the mode of these data?** **A** 560 **B** 580 **C** 590 **D** 640	Evaluate the expression. Justify your answer. $123 \div 3$ $= \frac{90}{3} + \frac{30}{3} + \frac{3}{3}$ $= 30 + 10 + 1$ $= 41$
Current:	**Other:**
Draw a picture to show an even number of boxes in each of the 5 groups to determine the mean of the data set.  The mean is 3.	Identify the outlier in the following data set. Write a sentence about why you think it is an outlier. $\{1,2,1,3,4,1,5,6,2,15\}$ The outlier of the data set is 15. 15 is the outlier in this data set because it is much greater in value than the other pieces of data in the set. It is not representative of the tendency of the other data in the set.

What Does "Mean" Mean?

CA Content Standards: Grade 5 SDAP 1.1, Grade 6 SDAP 1.1, Grade 6 SDAP 1.2, Grade 6 SDAP 1.3

Objective: Students will be able to understand the concept of mean and compute the mean within a given set of data using multiple approaches.

Example 1 (We Do): Find the mean of the data set $\{2,4,8,2\}$

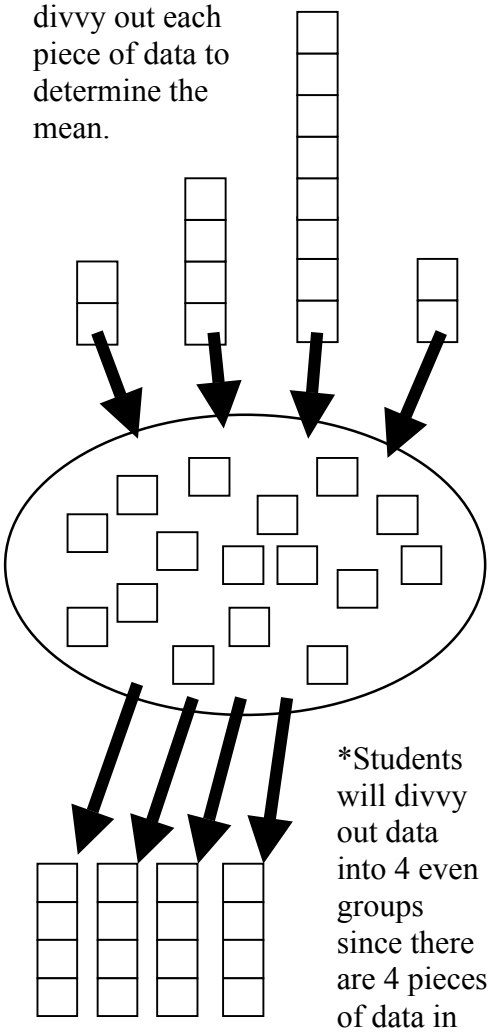
Concrete/Build It

***Do not have students draw constructed model.**

$\{2,4,8,2\}$

*Students will construct the data set above with cubes.

*Students will decompose data and place in a group. They will divvy out each piece of data to determine the mean.



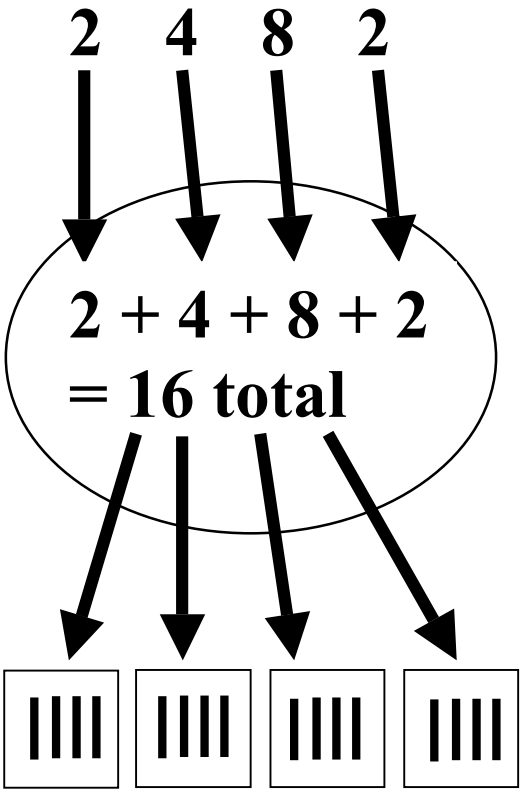
*Students will divvy out data into 4 even groups since there are 4 pieces of data in the set.

The mean is 4.

Semi-concrete/Draw It

$\{2,4,8,2\}$

*Students will show what they built using numbers to represent each piece of data. Write in student notes.



The mean is 4.

*Students will divvy out the sum of the data set by making tally marks one at a time in each box to show the mean. Have students brainstorm what the traditional algorithm for finding mean is:
"Is there a more efficient way to calculate the mean? Describe what you think it is to your partner."
(Find the sum of the data in a data set and divide the sum by the number of pieces of data in the set).

Traditional

$\{2,4,8,2\}$

$$\frac{2+4+8+2}{4}$$

$$= \frac{6+10}{4}$$

$$= \frac{16}{4}$$

$$= 4$$

The mean is 4.

"In this example, why did we divvy out to 4 groups?

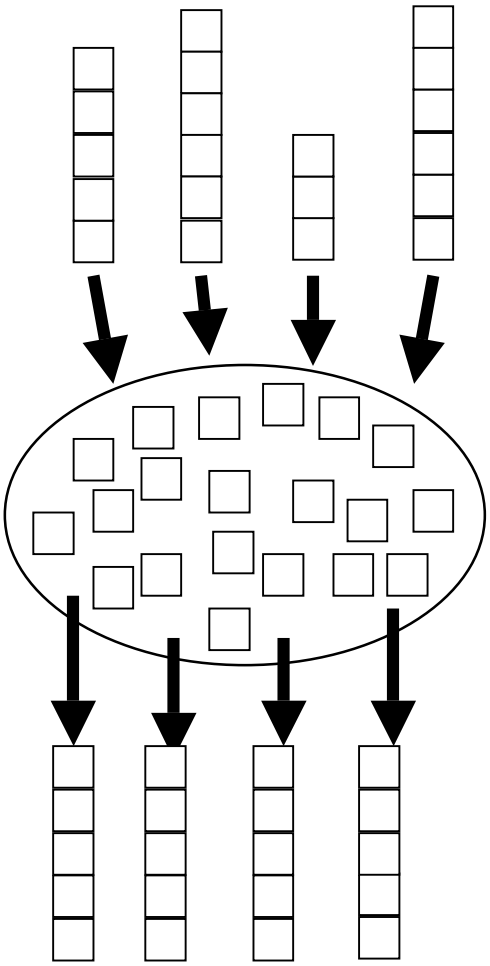
Possible student answer:

(We divvied into 4 groups because we have 4 pieces of data in the data set.)

You Try #1: Find the mean of the data set $\{5,6,3,6\}$

Concrete/Build It

$\{5,6,3,6\}$



The mean is 5.

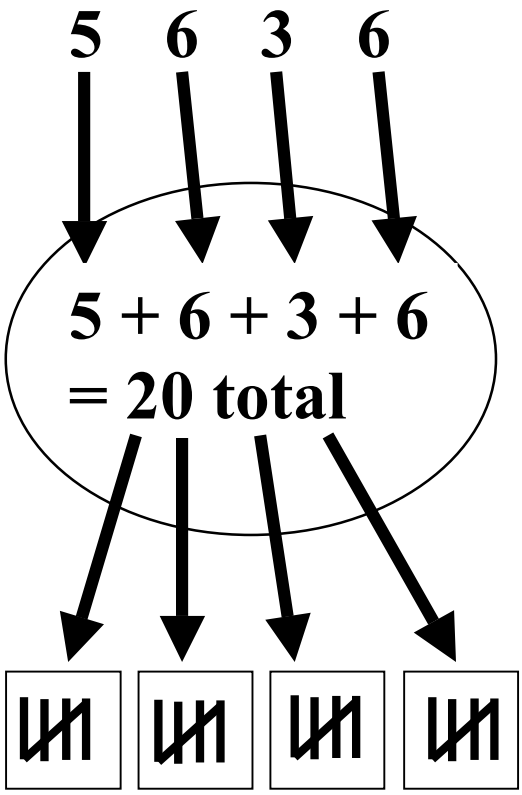
"Why is the mean in this example greater than the mean in example 1?"

(The mean is greater in this example because the pieces of data are larger and the sum of the data is greater.)

Semi-concrete/Draw It

$\{5,6,3,6\}$

*Students will show what they built using numbers to represent each piece of data. Students will record in notes.



The mean is 5.

Traditional

$\{5,6,3,6\}$

$$\frac{5+6+3+6}{4}$$

$$= \frac{8+12}{4}$$

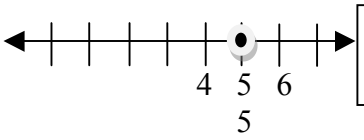
$$= \frac{20}{4}$$

$$= 5$$

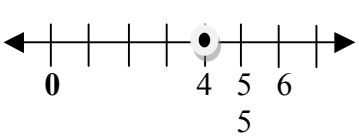
The mean is 5.

* Move students away from concrete approach. Have students Identify the outlier in the following data set.

"Please discuss what you think the outlier is in the data set with your partner. Tell him/her why you think it is the outlier."
(The outlier is 0 because it is not representative of the other pieces of data in the set. It is not representative because it is much less in value than the other pieces of data in the set.)



Mean= 5 without outlier.



Mean = 4 Including the outlier 0.

*Have students predict how the outlier will affect the mean.
(It will **decrease** the mean for two reasons: (1) The outlier is much less than the other pieces of data in the set. (2) The outlier is another piece of data in the set, so the sum of the data set will be divided by 5, not 4).

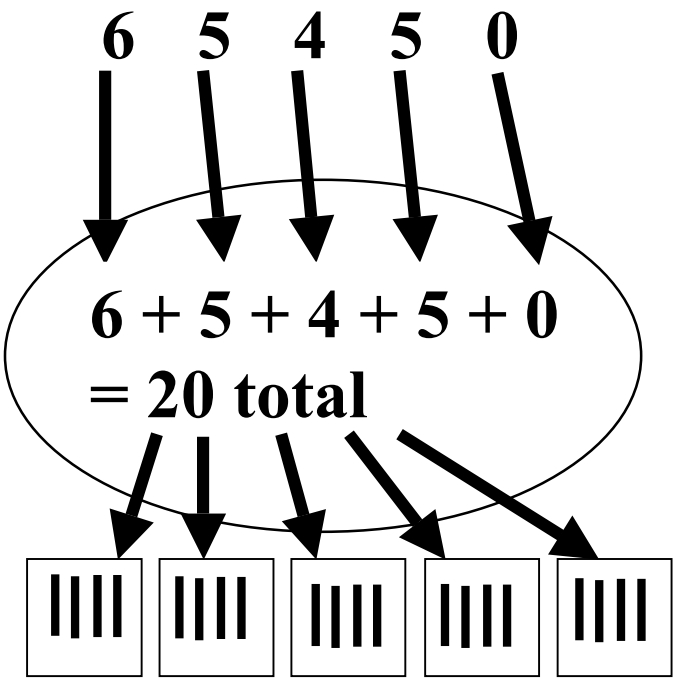
Example 2 (I Do): Find the mean of the data set $\{6,5,4,5,0\}$

* Move students away from concrete approach. Have students Identify the outlier in the following data set.

"Please discuss what you think the outlier is in the data set with your partner. Tell him/her why you think it is the outlier."
(The outlier is 0 because it is not representative of the other pieces of data in the set. It is not representative because it is much less than the other pieces of data in the set.)

*Have students predict how the outlier will affect the mean.
(It will **decrease** the mean for two reasons: (1) The outlier is much less than the other pieces of data in the set. (2) The outlier is another piece of data in the set, so the sum of the data set will be divided by 5, not 4).

Semi-concrete/Draw It



The mean is 4.

*Point out that the sum of the data is the same as the sum in the previous example.

*Have students review their predictions. "What happened to the mean?"
(The mean decreased by 1 when adding the outlier 0 to the data set)

*Have students discuss why they think the mean decreased.

Traditional

$$\frac{6+5+4+5+0}{5}$$

*Point out that the sum of the data set is being divided by 5 since there are 5 pieces of data including 0.

$$= \frac{6+4+5+5+0}{5}$$

$$= \frac{10+10+0}{5}$$

$$= \frac{20}{5}$$

$$= 4$$

The mean is 4.

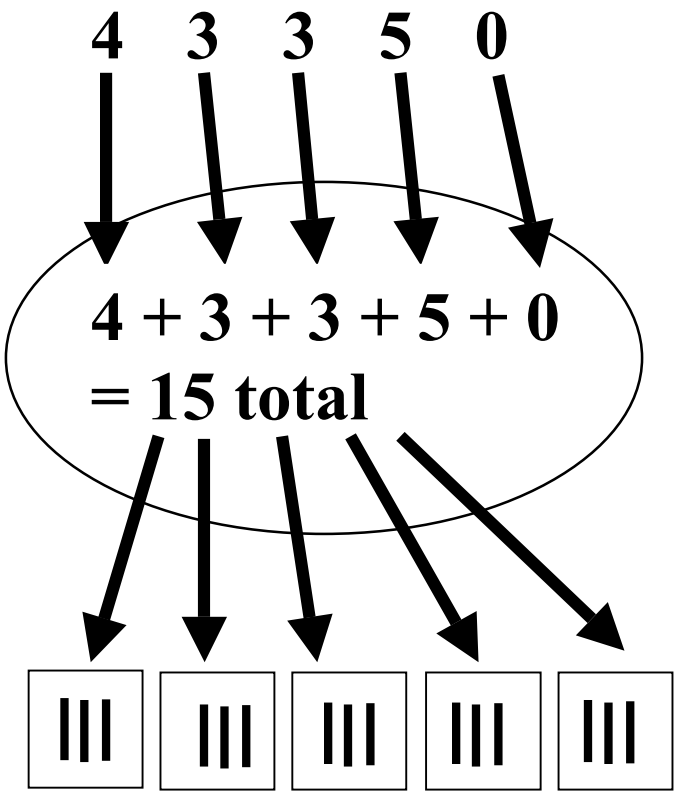
"Why do you think the mean decreased when we added the outlier 0 to the data set?"
(The mean decreased with the inclusion of the outlier because the total sum was divided into 5 equal groups, not 4.)

"Why else may have the outlier 0 decreased the mean instead of increasing it?"
(0 is less than the other pieces of data, so it caused the mean to decrease.)

You Try #2: Find the mean of the data set $\{4,3,3,5,0\}$

Semi-concrete/Draw It

$\{4,3,3,5,0\}$



The mean is 3.

Traditional

$\{4,3,3,5,0\}$

$$\frac{4+3+3+5+0}{5}$$

$$= \frac{4+1+2+3+5+0}{5}$$

$$= \frac{5+5+5+0}{5}$$

$$= \frac{15}{5}$$

$$= 3$$

The mean is 3.

*Have students predict what they think would happen to the mean if the outlier was much greater than all the other pieces of data in the data set.
(The mean would increase because the sum of all the pieces of data would be greater.)

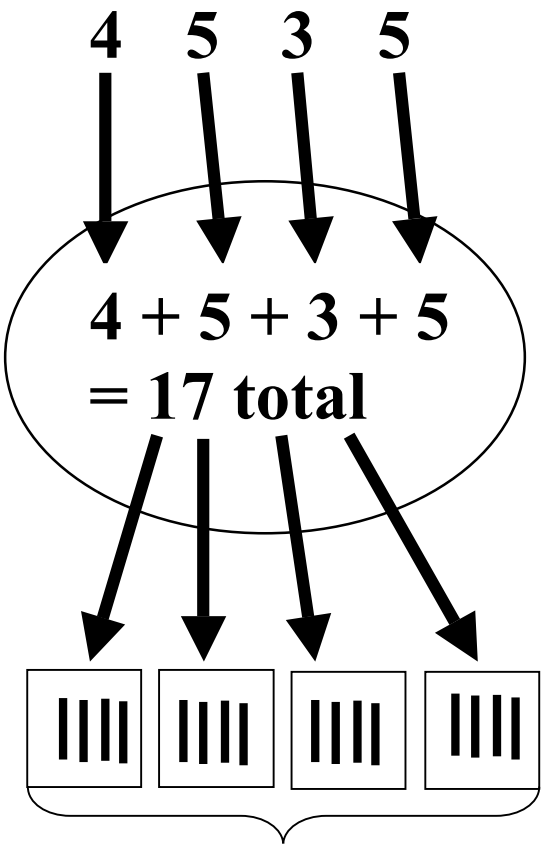
*Have students discuss what they think would happen to the mean if the sum of the data set cannot be evenly divided by the number of pieces of data in the set.

"What do you think will happen if the sum of the data cannot be divided evenly by the number of data in the set?"
(The mean will not be represented as a whole number.)

Example 3 (I Do): Find the mean of the data set $\{4,5,3,5\}$

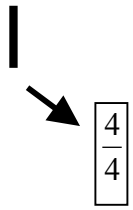
Semi-concrete/Draw It

$\{4,5,3,5\}$



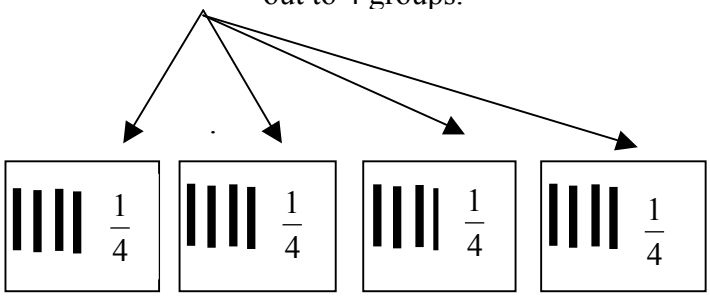
*Point out to students that 17 is not divisible by 4 evenly. There will be 1 whole remaining.

16 can be divvied out evenly.



"Why did I use fourths to represent the equivalent form of 1? What else could I use?" (Eighths, twelfths…)

*As long as it can be divvied it out to 4 groups.



The mean is $4\frac{1}{4}$.

Traditional

$\{4,5,3,5\}$

$$\frac{4+5+3+5}{4}$$

$$= \frac{5+5+4+3}{4}$$

$$= \frac{10+7}{4}$$

$$= \frac{17}{4}$$

"Is 17 divisible by 4 evenly?" (No)

"How will this affect the mean?" (The mean will not be a whole number.)

$$= \frac{16}{4}+\frac{1}{4}$$

$$= 4\frac{1}{4}$$

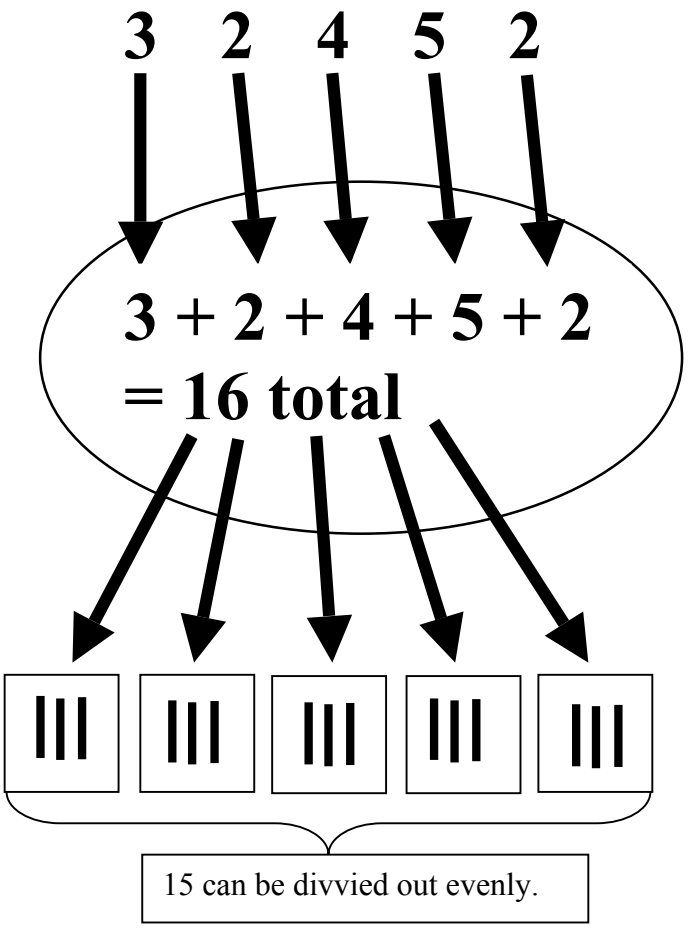
*Point out to students that the remaining whole was divvied out to the 4 groups, so each group has $\frac{1}{4}$ of the whole.

The mean is $4\frac{1}{4}$.

You Try #3: Find the mean of the data set $\{3,2,4,5,2\}$

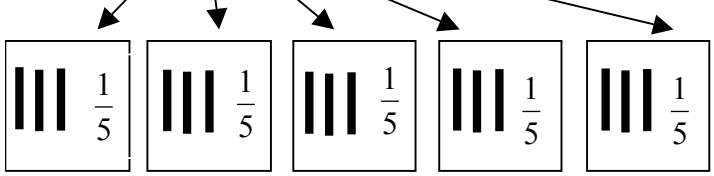
Semi-concrete/Draw It

$\{3,2,4,5,2\}$



= 1 whole remains that will be divvied out to 5 groups.

$\frac{5}{5}$ Re-write as an equivalent form of 1.



The mean is $3\frac{1}{5}$.

Traditional

$\{3,2,4,5,2\}$

$$\frac{3+2+4+5+2}{5}$$

$$= \frac{5+5+5+1}{5}$$

$$= \frac{15+1}{5}$$

$$= \frac{15}{5}+\frac{1}{5}$$

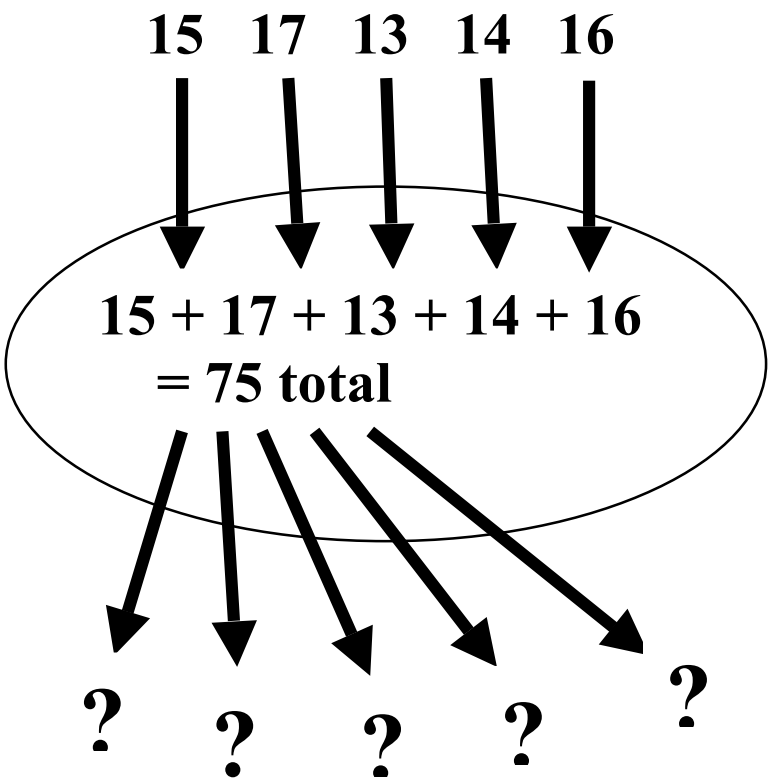
$$= 3\frac{1}{5}$$

The mean is $3\frac{1}{5}$.

Example 4 (We Do): Find the mean of the data set $\{15,17,13,14,16\}$

Semi-concrete/Draw It

$\{15,17,13,14,16\}$



"What's the drawback to divvying out larger data sets one-by-one?"

*Possible answer:
(Too much time to divvy out, easy to make minor errors when counting…etc.)

*Point out that using the traditional approach is more efficient than the divvying out method for larger sets of data.

Traditional

$\{15,17,13,14,16\}$

$$\frac{15+17+13+14+16}{5}$$

$$= \frac{15+30+30}{5}$$

$$= \frac{15+60}{5}$$

$$= \frac{15+50+10}{5}$$

$$= \frac{15}{5}+\frac{50}{5}+\frac{10}{5}$$

$$= 3+10+2$$

$$= 15$$

*Encourage students to divide by using decomposition. Remind students that they may choose to decompose in a different way.

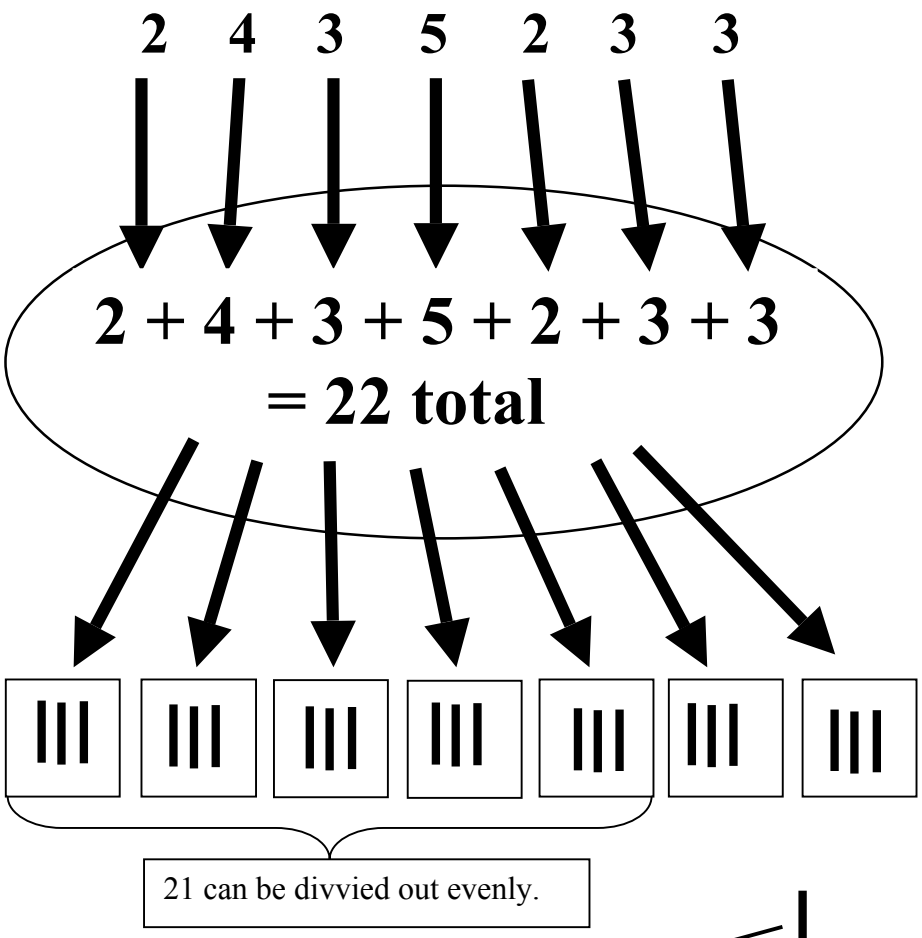
The mean is 15.

Exit Problem:

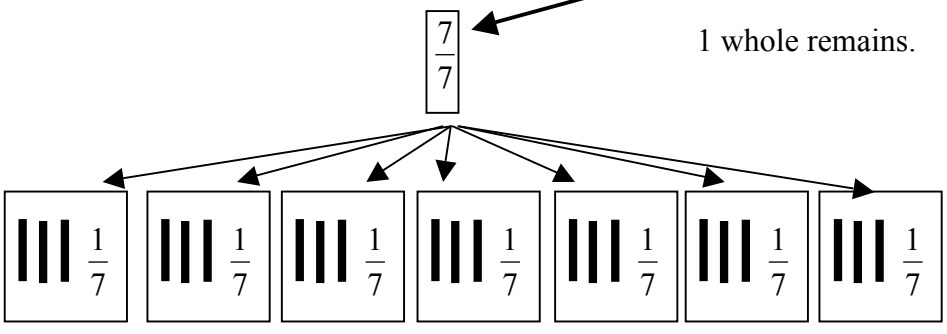
Have students independently solve the following problem to show what they learned from the lesson.

Find the mean of the following data set. Use the approach that works best for you.

$\{2,4,3,5,2,3,3\}$



1 whole remains.



The mean is $3\frac{1}{7}$.

$$\frac{2+4+3+5+2+3+3}{7}$$

$$= \frac{6+3+7+6}{7}$$

$$= \frac{7+2+7+6}{7}$$

$$= \frac{7+7+1+7}{7}$$

$$= \frac{21}{7}+\frac{1}{7}$$

$$= 3\frac{1}{7}$$

The mean is $3\frac{1}{7}$.