Unit 8, Lesson 9: Interpreting the Mean as Fair Share

Let's explore the mean of a data set and what it tells us.

9.1: Close to Four

Use the digits 0–9 to write an expression with a value as close as possible to 4. Each digit can be used only one time in the expression.
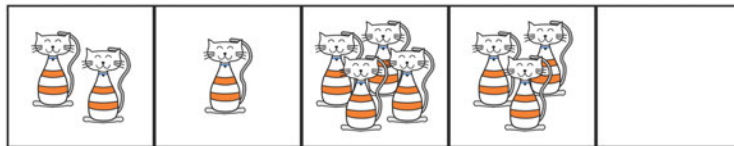
$$\left(\boxed{} + \boxed{} + \boxed{} + \boxed{} \right) \div 4$$

9.2: Spread Out and Share

m.openup.org/1/6-8-9-2

1. The kittens in a room at an animal shelter are placed in 5 crates.

   a. The manager of the shelter wants the kittens distributed equally among the crates. How might that be done? How many kittens will end up in each crate?

   b. The number of kittens in each crate after they are equally distributed is called the **mean** number of kittens per crate, or the **average** number of kittens per crate. Explain how the expression $10 \div 5$ is related to the average.

   c. Another room in the shelter has 6 crates. No two crates has the same number of kittens, and there is an average of 3 kittens per crate. Draw or describe at least two different arrangements of kittens that match this description.
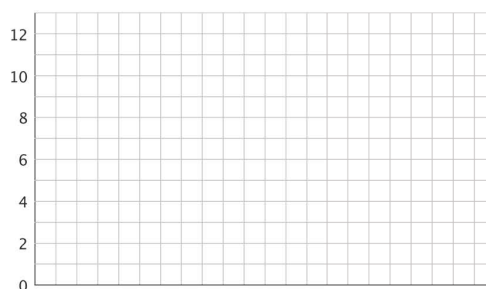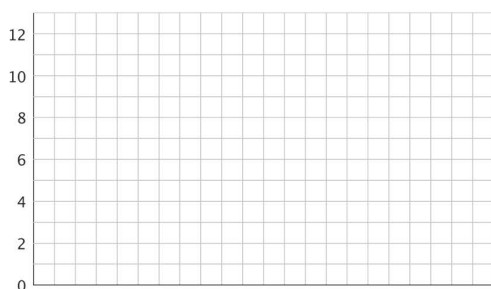
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2. Five servers were scheduled to work the number of hours shown in the table. They decided to share the workload, so each one would work equal hours.

	server A	server B	server C	server D	server E
hours worked	3	6	11	7	4

a. On the grid on the left, draw 5 bars whose heights represent the hours worked by servers A, B, C, D, and E.

b. Think about how you would rearrange the hours so that each server gets a fair share. Then, on the grid on the right, draw a new graph to represent the rearranged hours. Be prepared to explain your reasoning.

c. Based on your second drawing, what is the average or mean number of hours that the servers will work?

d. Explain why we can also find the mean by finding the value of $31 \div 5$.

e. Which server will see the biggest change to work hours? Which server will see the least change?

Are you ready for more?

Server F, working 7 hours, offers to join the group of five servers, sharing their workload. If server F joins, will the mean number of hours worked increase or decrease? Explain how you know.

9.3: Getting to School

1. For the past 12 school days, Mai has recorded how long her bus rides to school take in minutes. The times she recorded are shown in the table.

9	8	6	9	10	7	6	12	9	8	10	8

a. Find the mean for Mai's data. Show your reasoning.

b. In this situation, what does the mean tell us about Mai's trip to school?

2. For 5 days, Tyler has recorded how long his walks to school take in minutes. The mean for his data is 11 minutes.

a. Without calculating, predict if each of the data sets shown could be Tyler's. Explain your reasoning.

data set A	11	8	7	9	8
data set B	12	7	13	9	14
data set C	11	20	6	9	10
data set D	8	10	9	11	11

b. Determine which data set is Tyler's. Explain how you know.

Lesson 9 Summary

Sometimes a general description of a distribution does not give enough information, and a more precise way to talk about center or spread would be more useful. The **mean**, or **average**, is a number we can use to summarize a distribution.

We can think about the mean in terms of "fair share" or "leveling out." That is, a mean can be thought of as a number that each member of a group would have if all the data values were combined and distributed equally among the members.

The table and diagram show how many liters of water are in each of five bottles.
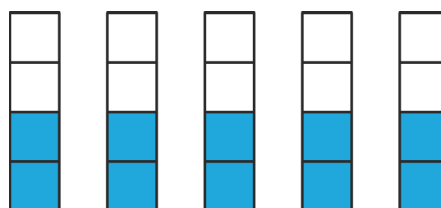
1	4	2	3	0
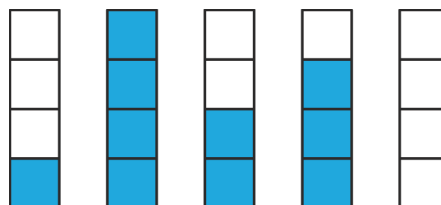
To find the mean, first we add up all of the values, which we can think of as putting all of the water together:
$1 + 4 + 2 + 3 + 0 = 10$.

To find the "fair share," we divide the 10 liters equally into the 5 containers:
$10 \div 5 = 2$.

Suppose the quiz scores of a student are 70, 90, 86, and 94. We can find the mean (or average) score by finding the sum of the scores $(70 + 90 + 86 + 94 = 340)$ and dividing the sum by four $(340 \div 4 = 85)$. We can then say that the student scored, on average, 85 points on the quizzes.

In general, to find the mean of a data set with n values, we add all of the values and divide the sum by n.

Lesson 9 Glossary Terms

- mean

- average

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1. A preschool teacher is rearranging four boxes of playing blocks so that each box contains an equal number of blocks. Currently Box 1 has 32 blocks, Box 2 has 18, Box 3 has 41, and Box 4 has 9.

   Select **all** the ways he could make each box have the same number of blocks.

   A. Remove all the blocks and make four equal piles of 25, then put each pile in one of the boxes.
   B. Remove 7 blocks from Box 1 and place them in Box 2.
   C. Remove 21 blocks from Box 3 and place them in Box 4.
   D. Remove 7 blocks from Box 1 and place them in Box 2, and remove 21 blocks from Box 3 and place them in Box 4.
   E. Remove 7 blocks from Box 1 and place them in Box 2, and remove 16 blocks from Box 3 and place them in Box 4.

2. In a round of mini-golf, Clare records the number of strokes it takes to hit the ball into the hole of each green. She said that, if she redistributed the strokes on different greens, she could tell that her average number of strokes per hole is 3.

2	3	1	4	5	2	3	4	3

   Explain how Clare is correct.

3. Three sixth-grade classes raised $25.50, $49.75, and $37.25 for their classroom libraries. They agreed to share the money raised equally. What is each class's equal share? Explain or show your reasoning.

4. In her English class, Mai's teacher gives 4 quizzes each worth 5 points. After 3 quizzes, she has the scores 4, 3, and 4. What does she need to get on the last quiz to have a mean score of 4? Explain or
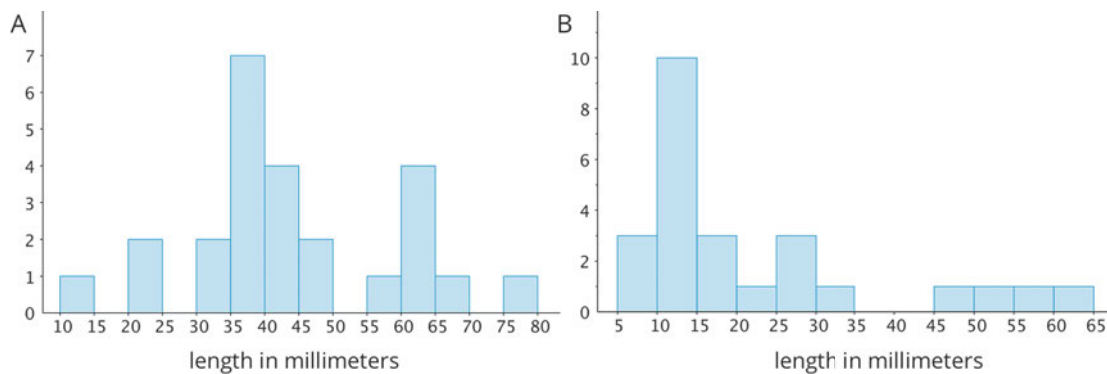
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show your reasoning.

5. An earthworm farmer examined two containers of a certain species of earthworms so that he could learn about their lengths. He measured 25 earthworms in each container and recorded their lengths in millimeters.

Here are histograms of the lengths for each container.

a. Which container tends to have longer worms than the other container?

b. For which container would 15 millimeters be a reasonable description of a typical length of the worms in the container?

c. If length is related to age, which container had the most young worms?

(from Unit 8, Lesson 7)

6. Diego thinks that $x = 3$ is a solution to the equation $x^2 = 16$. Do you agree? Explain or show your reasoning.

(from Unit 6, Lesson 15)