Unit 8, Lesson 9

Mean

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

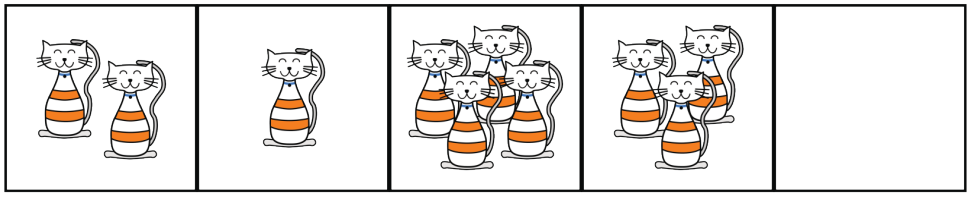
9.1 Close to Four

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.

$(\square + \square + \square + \square) \div 4$

9.2 Spread Out and Share

1. The stuffed toy kittens in a preschool room are placed in 5 boxes.



   a. The preschool teacher wants the kittens distributed equally among the boxes. How might that be done? How many kittens will end up in each box?

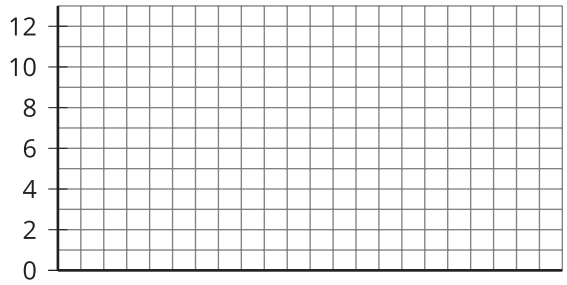
   b. The number of kittens in each box after they are equally distributed is called the **mean** number of kittens per box, or the **average** number of kittens per box. Explain how the expression $10 \div 5$ is related to the average.

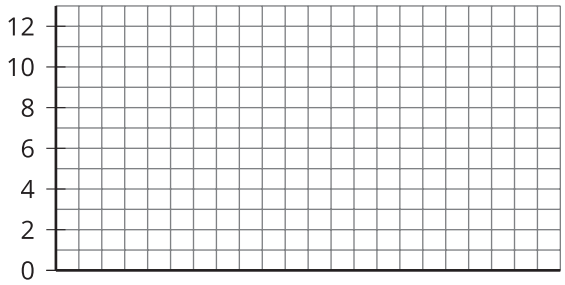
c. Another preschool room has 6 boxes. No 2 boxes have the same number of kittens, and there is an average of 3 kittens per box. Draw or describe at least 2 different arrangements of kittens that match this description.

2. Five servers are scheduled to work the number of hours shown. They decide to share the workload, so each one would work equal hours.

   Server A: 3 Server B: 6 Server C: 11 Server D: 7 Server E: 4

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





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

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

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

   d. 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

For the past 12 school days, Mai has recorded how long her bus rides to school take in minutes.

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

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

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

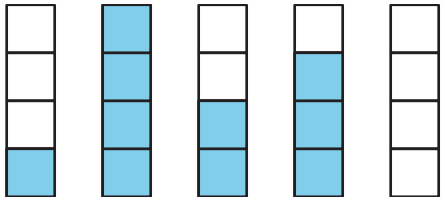
3. For 5 days, Tyler has recorded how long his walks to school take in minutes. The mean for his data is 11 minutes. Without calculating, predict if each of the data sets shown could be Tyler's. Explain your reasoning.
   - Data set A: 11, 8, 7, 9, 8
   - Data set B: 12, 7, 13, 9, 14
   - Data set C: 11, 20, 6, 9, 10
   - Data set D: 8, 10, 9, 11, 11

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 for the center 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.

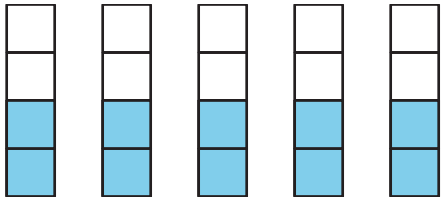
For example, suppose there are 5 containers, each of which has a different amount of water: 1 liter, 4 liters, 2 liters, 3 liters, and 0 liters.



To find the mean, first we add up all of the values. We can think of this 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: $10 \div 5 = 2$.



The mean is useful when each unit of measurement has equal importance. For example, it may make sense to find the mean score of assignments of the same importance, such as all quizzes. If some grades are more important, it may not make sense to find the mean. For example, it may not make sense to find the mean score when there are 6 short homework assignments and one major essay.

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.