Lesson 7 Decimal Numbers

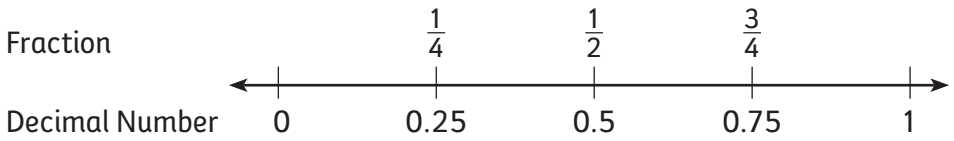
Problem Solving: Drawing Box-and-Whisker Plots

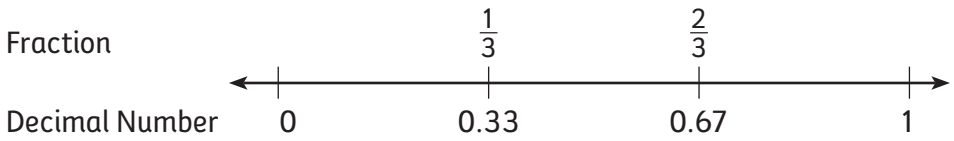
Decimal Numbers

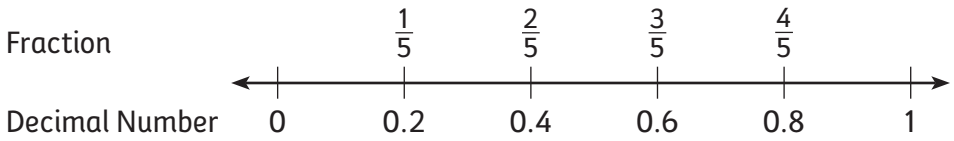
Vocabulary
rational number

How are decimal numbers like fractions?

We have learned a lot about fractions in this unit. We will now focus on decimal numbers. Fractions and decimal numbers are both **rational numbers**. These are numbers that can be written as fractions. We can think about fractions and decimal numbers as different names for the same location on the number line.







We use decimal numbers because they are easier to work with than fractions. Imagine if you had to add the following three fractions together.

$$\frac{3}{5} + \frac{4}{10} + \frac{14}{15}$$

The answer, $\frac{58}{30}$, is a large fraction that is difficult to understand. We know that it is bigger than 1 because $\frac{30}{30} = 1$. But how much bigger is it?

Understanding this problem is easier if we convert the fractions to decimal numbers and then add them.

How do we convert fractions to decimal numbers?

Example 1 shows how to convert fractions to decimal numbers and then round them to the hundredths place.

Example 1

Convert the fractions to decimal numbers and solve the problem.

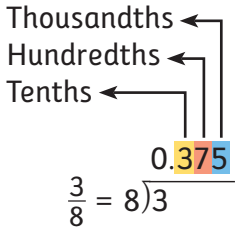
$$\frac{3}{5} + \frac{4}{10} + \frac{14}{15}$$

To get the decimal numbers, we divide the fractions.

$$5\overline{)3} = 0.6 \qquad 10\overline{)4} = 0.4 \qquad 15\overline{)14} = 0.93$$

Fractions	$\frac{3}{5}$	+	$\frac{4}{10}$	+	$\frac{14}{15}$	=	$\frac{58}{30}$
Decimal numbers	**0.6**	**+**	**0.4**	**+**	**0.93**	**=**	**1.93**

When we convert fractions to decimal numbers, we change the fraction into the base-10 system. Each place value for a decimal number is a power of 10.



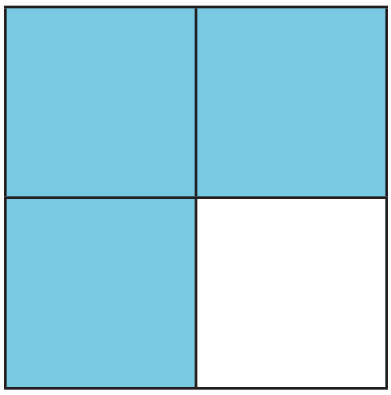
Finally, it is important to remember that when we convert fractions into decimal numbers, the numbers still have the same value or quantity. The fraction and the decimal number are equivalent.

Example 2

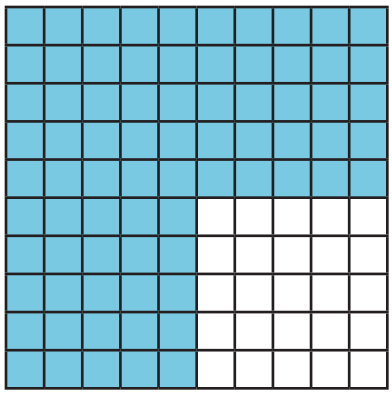
Use area models to show that $\frac{3}{4}$ and 0.75 are equivalent.

$$\frac{3}{4} = 4\overline{)3} = 0.75$$

$\frac{3}{4}$



0.75



Part	3	75
Whole	4	100

Both fractions and decimal numbers are part-to-whole relationships.

The models show that $\frac{3}{4}$ and 0.75 have the same area.

Apply Skills
Turn to ***Interactive Text***, page 18.

mBook Reinforce Understanding
Use the ***mBook Study Guide*** to review lesson concepts.

Problem Solving: Drawing Box-and-Whisker Plots

How do we create box-and-whisker plots?

The method for creating box-and-whisker plots is simple. It involves medians. Let's look at another event at Sports Day—the high jump. Here is how everyone did.

Student	Height (in inches)
Brittany	45
Joshua	49
Autumn	50
Marcus	53
Erica	54
Oscar	54
Ryan	55
Pablo	56
Amber	57
Tracey	58
Mikaela	60
Lamar	62
DeAnne	64
Seth	64
Paige	65

median = 56

We start with the median and divide the list into two groups. The first group is the group below, or lower than, the median. The second group is the group above, or higher than, the median. We find the median of each of these groups.

Group 1	
Student	**Height (in inches)**
Brittany	45 ← **min**
Joshua	49
Autumn	50
Marcus	53 ← **median for group 1 (lower) = 53**
Erica	54
Oscar	54
Ryan	55
Pablo	56 ← **median for the whole group = 56**

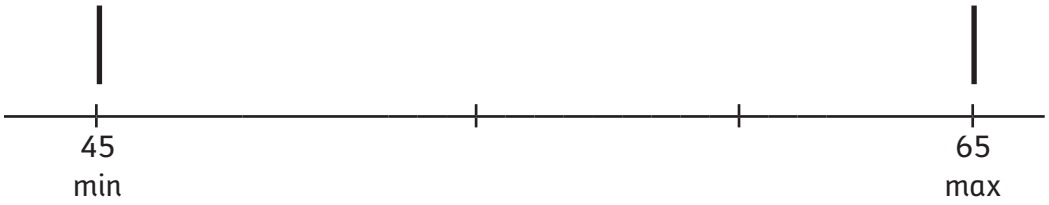
Group 2	
Student	**Height (in inches)**
Amber	57 ← **min**
Tracey	58
Mikaela	60
Lamar	62 ← **median for group 2 (upper) = 62**
DeAnne	64
Seth	64
Paige	65 ← **max**

Now we are ready to draw the box-and-whisker plot. Follow these four steps.

Steps for Drawing a Box-and-Whisker Plot

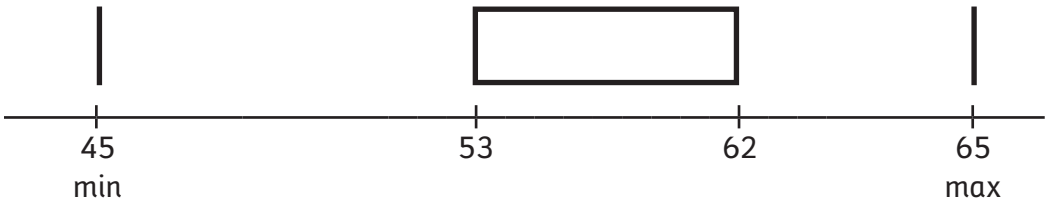
STEP 1

Draw vertical lines for the min and the max.



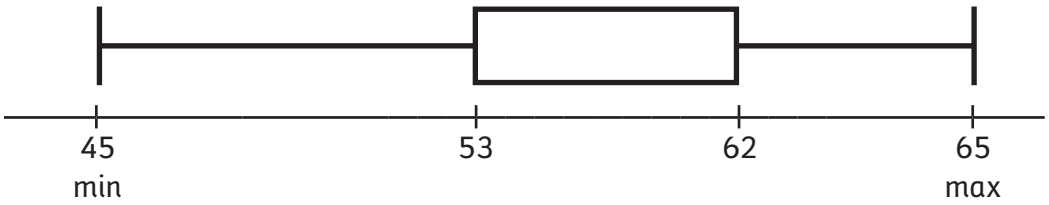
STEP 2

Use the lower and upper median numbers to make the sides of the box. Draw the rest of the box.



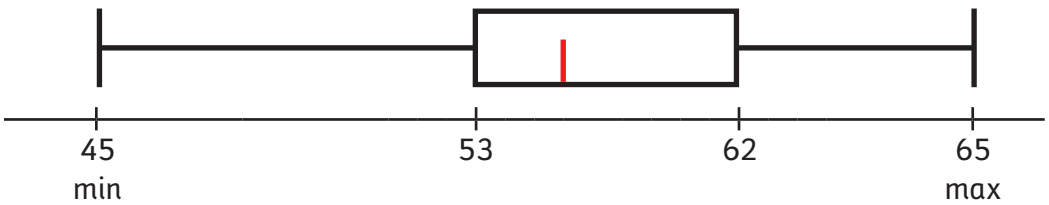
STEP 3

Draw horizontal lines that connect the min and the max to the box.



STEP 4

Put a mark for the median of the entire group of numbers in the box.



Remember, the whisker on the left of the box contains the lowest $\frac{1}{4}$ of the numbers. The box represents the middle $\frac{1}{2}$ of the numbers, and the whisker on the right contains the highest $\frac{1}{4}$ of numbers. In this example, the numbers stand for different heights that students jumped.

Once we have the box-and-whisker plot, we can make sense of all the high jumps.

- Erica jumped 54 inches. She is near the bottom of the middle half of numbers. She also isn't that far below the median of 56.
- Her friend DeAnne jumped much higher. She is near the top of the highest $\frac{1}{4}$ of heights. DeAnne is well above the median.
- Finally, Pablo jumped 56 inches. He is near the center of the middle group of numbers and right on the median.

Problem-Solving Activity
Turn to ***Interactive Text***, page 19.

Reinforce Understanding
Use the ***mBook Study Guide*** to review lesson concepts.

Homework

Activity 1

Convert the fractions to decimal numbers.

1. $\frac{1}{2}$
2. $\frac{4}{5}$
3. $\frac{3}{4}$
4. $\frac{1}{4}$
5. $\frac{2}{3}$
6. $\frac{3}{8}$

Activity 2

Select the best answer for each of the questions about decimal numbers.

1. The decimal number 0.35 has a 3 in the tenths place and a 5 in the _____ place.
   - **(a)** thousands
   - **(b)** hundredths
   - **(c)** thousandths

2. We can check that $\frac{4}{5} = 0.8$ by doing this computation on the calculator.
   - **(a)** $4 \div 5$
   - **(b)** $4 + 5$
   - **(c)** $4 \cdot 5$

3. The decimal number 0.87 is the same as what fraction?
   - **(a)** $\frac{8}{7}$
   - **(b)** $\frac{87}{10}$
   - **(c)** $\frac{87}{100}$

4. What are the fraction/decimal number equivalents for "three hundredths"?
   - **(a)** $0.3 = \frac{3}{10}$
   - **(b)** $0.03 = \frac{3}{100}$
   - **(c)** $0.003 = \frac{3}{1{,}000}$

Homework

Activity 3

Look at the data. Imagine how it would look in a box-and-whisker plot. Answer the questions about the data and how it would be arranged in the plot.

Data Set: 45, 34, 55, 87, 62, 79, 39, 75, 95

1. What number represents the median of this data? Is this the same as or different than the actual midpoint of the data?
2. Write a number that falls in the lower $\frac{1}{4}$.
3. What is the min?
4. Write a number that falls in the upper $\frac{1}{4}$.
5. What is the max?

Activity 4 • Distributed Practice

Solve.

1. $120 \div 12$
2. $437 + 223$
3. $15 \cdot 8$
4. $601 - 379$
5. $\frac{3}{4} + \frac{1}{8}$
6. $\frac{7}{9} - \frac{1}{3}$
7. $\frac{5}{11} \cdot \frac{1}{2}$
8. $\frac{3}{4} \div \frac{1}{8}$
9. $\frac{4}{5} \div \frac{1}{5}$
10. $\frac{5}{9} - \frac{1}{6}$