Grade 8 Mathematics
Number and Number Relations: Lesson 2

Read aloud to the students the material that is printed in **boldface type** inside the boxes. Information in regular type inside the boxes and all information outside the boxes should **not** be read to students. Possible student responses are included in parentheses after the questions.

NOTE: The directions read to students may depend on the available materials. Read only those parts of the lesson that apply to the materials you are using.

Any directions that ask you to do something, such as to turn to a page or to hand out materials to students, will have an arrow symbol (⇨) by them.

Purpose of Lesson 2:

- In this lesson, the tutor and the students will
  - ✓ recognize or compute decimal equivalents of fractions;
  - ✓ recognize or compute the percent equivalent of decimal fractions;
  - ✓ relate fraction, decimal, and percent equivalents for halves, thirds, fourths, fifths, eighths, and tenths; and
  - ✓ recognize decimal equivalents.

Equipment/Materials Needed:

- Copies of Student Sheets 3 – 5
- Paper and pencils.
- Calculator (Optional)

Preparations before beginning Lesson 2:

- Run off one copy of Student Sheets 3 – 5 for each student.
- Have paper and pencils available.
- Have the calculator available if you choose to use it.

Lesson2: Number and Number Relations

Say:

Remember that in the last lesson, we looked at fractions. Fractions allow us to show parts of numbers. Today, we will look at decimals. Decimals also give us a way to show parts of numbers. Decimals are fractions that have denominators of 10, 100, 1000, and so on. When we say a decimal, it sounds just like a fraction; but when we write a decimal, we write it differently.

⇨ Write $\frac{1}{10}$ on a sheet of paper.

Say:

Read the fraction. (one–tenth) **To write this fraction as a decimal, we write .1 or 0.1. The period is a *decimal point.* It is better to write the 0 in front of the decimal to show that there is no whole number part.**

⇨ Give Student Sheet 3 to the students. Have them do problems 1 and 2.
Answers: See below:

Say:

Answers:

1) $\frac{2}{10}$; 0.2 2) $\frac{1}{10}$; 0.1 **(You can say that $\frac{1}{10}$ and 0.1 are equivalent. *Equivalent* means the two numbers name the same amount.)**

Say:

Sometimes we divide figures into 100 parts. When we divide a figure into 100 parts, we show *hundredths*.

⇨ Write $\frac{18}{100}$ on a sheet of paper.

Say:

Tell me this fraction in words. (eighteen hundredths) **As a decimal, 18/100 would be written as 0.18. Let's look at problems 3 and 4 on Sheet 3.**

3) $\frac{15}{100}$; 0.15 4) $\frac{73}{100}$; 0.73

⇨ Give Student Sheet 4 to the students. Answers:
1) 20/100; 0.20 2) 2/100; 3) 2/10; 0.2 4) 12/100; 0.12

Say:

Do you remember how two fractions could look different, but name the same amount? They were called equivalent fractions. Examples of equivalent fractions are 1/2 and 2/4. Decimals can look different too, but still be equivalent. Can you find two equivalent decimals on Sheet 4? (0.20 and 0.2 are equivalent.) **Write a decimal equivalent to 0.4.** (0.40) **Writing decimals in different ways will help you when you start adding and subtracting decimals.**

Say:

We don't want to have to draw a picture every time we want to know the decimal amount for a fraction and we don't have to. To change from a fraction to a decimal, we simply divide the numerator by the denominator. This process works because a fraction is a way of showing division.

⇨ Write 4/5 on the board.
Show this problem.

```
   .8
5 | 4.0
    4 0
  --------
      0
```

Say:

When we divide 5 into 4, we have to add a decimal and a zero to the 4. Then 5 divides into 4.0, .8 times. We could do this division on a calculator also. Enter 4 into the calculator. Then press ÷ 5. We get 0.8. I want you to find the decimals for the following fractions: 1/2, 5/8, 5/10, 2/3

⇨ Write 1/2, 5/8, 5/10, 2/3.
Answers: 0.5, 0.625, 0.5, 0.66… On the last one, (2/3), if the students do this calculation on the calculator, they will see either 0.6666667 or 0.6666666. They can either round off and put 0.67 or use 0.66… or they can write it as a repeating decimal, $0.\overline{6}$.

Say:

Sometimes, we need to change a mixed number into a decimal. We can use the same process as above. Remember that $5\frac{3}{4}$ is the same as $5 + \frac{3}{4}$.

To write $5\frac{3}{4}$ as a decimal, we write the 5 down and then divide 3 by 4.

We get 5.75. Tell me the decimals for these mixed numbers, $10\frac{1}{5}$ and $8\frac{1}{4}$. (10.2 and 8.25)

Say:

Let's look back at our problem of $5 + \frac{3}{4}$. We said that this problem was the same as 5 + 3 ÷ 4. What answer did we get for 5 + 3 ÷ 4? (5.75) **What is the answer to 3 ÷ 4 + 5?** (5.75) **Why do we get the same answer for both problems?** (Because of order of operations. Division is a higher operation than addition, so we do that operation first.) **The following is the agreed-upon order for performing several operations:**

1. If parentheses are used, perform the operations inside the parentheses first.

2. Perform all multiplication and division next. Start on the left.

3. Perform all addition and subtraction next, again in order from left to right.

⇨ Write these problems on the board.

1) $4 + 8 \div 2$ 2) $3(6 + 3) - 1$ 3) $6 + 5(3 + 1)$

Say:

Work each problem. Be able to defend your choice of the order in which you performed the operations.

Answers: 1) 8; divide first, then add. 2) 26; add 6 + 3 because these numbers are inside the parentheses; then multiply by 3; finally subtract 1. 3) 26; add 3 + 1 because these numbers are inside the parentheses; multiply by 5; add 6.

You need to be careful when using calculators. Some calculators have the order of operations built into them; others don't. You can use a problem such as, 4 + 8 ÷ 2, to check. If the calculator does use the correct order, your answer will be 8. If it does not use the correct order, your answer will be 6.

⇨ Give this problem to the students.

Say:

At the swim meet, Walter scored a 9.05. How would you read this decimal? (9 and 5 hundredths) **Decimals use place value just as whole numbers do. The numbers to the left of the decimal are the whole numbers; the numbers to the right are the parts of the whole numbers, or the fractional parts**.

⇨ Draw a chart like the one below on your paper. Place the number *9.05* in it.

Tens	Ones		Tenths	Hundredths	Thousandths
	9	**.**	**0**	**5**	

Say:

To read the decimal: 1) Read the whole number part, if there is one. 2) Read the decimal point as "and." 3) Read the numbers to the left as though they were a whole number. 4) Say the place value of the last digit. So 9.05 would be read as nine and five hundredths.

⇨ Write the following numbers on the board. 2.64; 15.6; 10.02; 80.003

Say:

Write each number in your chart. How would you read each number? (two and sixty-four hundredths; fifteen and 6 tenths; ten and 2 hundredths; eighty and 3 thousandths)

⇨ Give Student Sheet 5 to the students. Have them work problems 1 – 4 and discuss the answers.

Answers:

1) One and fifteen hundredths 2) One hundredth

3) 0.4 4) 2.02

Say:

When we divide a figure into 100 parts, we can talk about percents. A *percent* is a part of a hundred. Craig took a test that had 100 problems. The test was worth 100 points; so if I say "Craig scored 90% on his test," he correctly answered 90 out of 100 problems.

Look back at Student Sheet 3. How could we name 3 and 4 as percents?

3. 15% 4. 73%

Let's look at Student Sheet 4. What are the percents for each of these problems? 1) 20% 2) 2% 3) 20% 4) 12%
How did you decide that the answer in problem 3 was 20%? It was broken into 10 parts, not 100. (I knew that 0.2 is equivalent to 0.20, so it had to equal 20%.) **How are the percent answers similar to the decimal answers?** (The digits are the same.) **How are they different?** (The decimals have decimal points and the percent values have percent signs.) **What is the decimal for 43%?** (0.43) **What is the percent for 0.56?** (56%)

The percent sign means "per hundred." The sign, *%*, is actually the number 100 with the 1 written between the 2 zeros. To change from a decimal to a percent, multiply by 100 and add a percent sign. The reason that we multiply by 100 is that 56 hundredths is really 56 per hundred or 56 over 100. To change from a percent to a decimal, divide by 100 and remove the percent sign.
Write a percent for 0.46 and 1.22. (46%, 122%) **Write a decimal for 3% and 254%.** (0.03 and 2.54)

There are some percent and fraction equivalents that you should memorize.

50% = $\frac{1}{2}$ **25% =** $\frac{1}{4}$ **75% =** $\frac{3}{4}$ $\frac{1}{3}$ **=** $33\frac{1}{3}$**%**

Say:

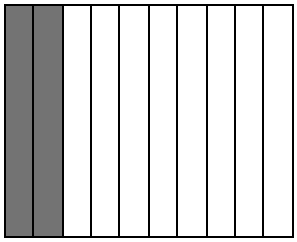
Let's look at the rest of Sheet 5. Work problems 5 – 10. We will discuss them. Answers:
5) 0.7; 70% 6) 5/100 or 1/20; 5% 7) 50/100 or 5/10 or 1/2; 0.50
8) 0.125; 12.5% 9) $1\frac{3}{10}$; 130% 10) $2\frac{5}{10}$ or $2\frac{1}{2}$; 2.50
Work problems 11 – 15.
11) 30% because 1/4 is 25%. 12) 29% = .290 so it is larger
13) 0.1; 1/10; 0.10 14) 15/100 or 3/20 15) 20%

⇨ Have one student summarize today's lesson. The students should understand that fractions, decimals, and percents can all be used to name the same amount.

Student Sheet 3 (Number: Lesson 2)

What amount is shaded? Write a fraction and a decimal for each amount.

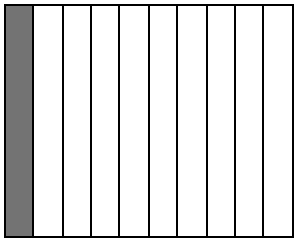
1.



_____ _____

Fraction **Decimal**

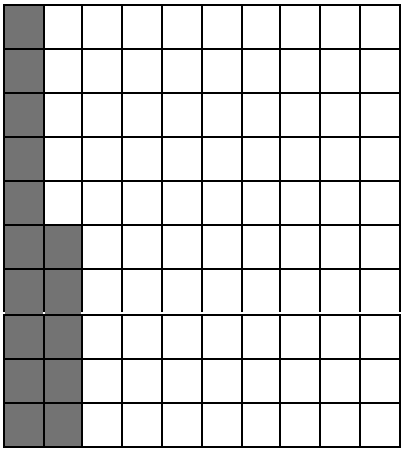
2.



_____ _____

Fraction **Decimal**

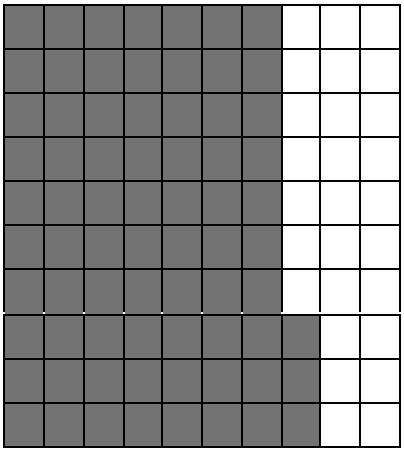
3.



_____ _____

Fraction **Decimal**

4.



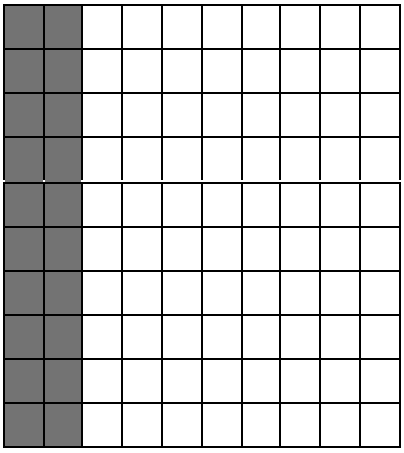
_____ _____

Fraction **Decimal**

Student Sheet 4 (Number: Lesson 2)

Write the fraction and decimal shown by each amount.

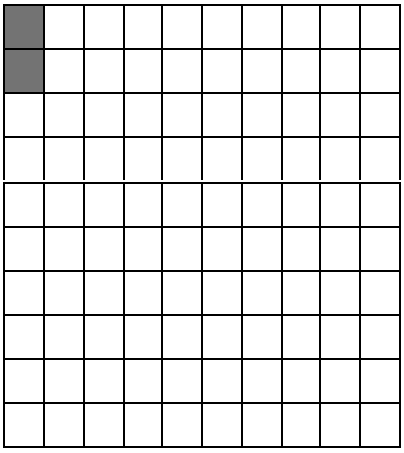
1.



_____ _____

Fraction **Decimal**

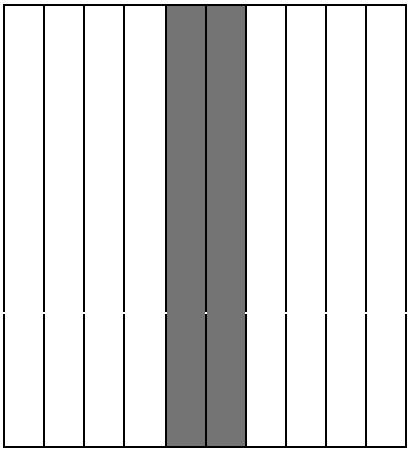
2.



_____ _____

Fraction **Decimal**

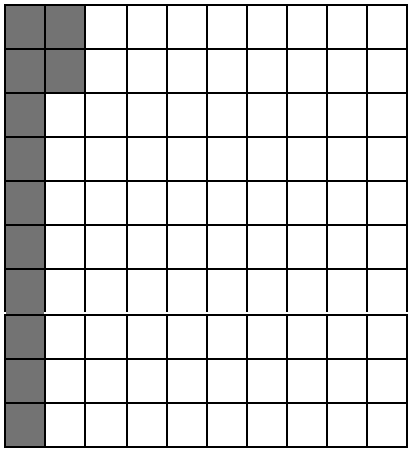
3.



_____ _____

Fraction **Decimal**

4.



_____ _____

Fraction **Decimal**

Student Sheet 5 (Number: Lesson 2)

Write the number words for each of the following decimal numbers.

1. 1.15

2. 0.01

Write the decimal for each of the following number words.

3. four-tenths

4. two and two hundredths

Fill in the missing parts in the table.

	Fraction/Mixed Number	**Decimal**	**Percent**
5.	$\frac{7}{10}$		
6.		0.05	
7.			50%
8.	$\frac{1}{8}$		
9.		1.3	
10.			250%

11. Which is larger, $\frac{1}{4}$ or 30%?

12. Which is larger 29% or 0.286?

13. Which of the following are equal to 10%?

    0.1 10 $\frac{1}{10}$ 0.10 1

14. The label on a fruit drink says "15% real fruit." What fractional part is real fruit?

15. At the nuts and bolts factory, $\frac{1}{5}$ of the bolts have been found to be defective? What percent are defective?