

5 mins Unit 4, Lesson 5: Say It with Decimals

5.1: Notice and Wonder: Fractions to Decimals

1 min think
1 min pair
1 min whole
class
discussion

Notice

Going to look @ a collection of decimal expansions - think of at least one thing you notice, one thing you wonder or have a question about.

Wonder

Different fractions have different numbers of digits / place values

Some decimals almost repeat, except for the last digit

Some decimals repeat

Some decimals don't repeat

Do some decimals really finish after a digit / place value, or do they keep going?

Why are some decimals shorter than others?

Are there any fractions that only have one digit / place value after the decimal?

- Share responses
- ask students if agree / disagree
- explain alternative ways of thinking
- if students don't bring up rounding, ask students to discuss

BARTLETT

Check dividend vs. divisor

NAME _____

DATE _____

PERIOD _____

10-15 mins

5.2: Repeating Decimals

quiet work
3-5 mins

1. Use long division to express each fraction as a decimal.

$$\frac{9}{25} = 0.36$$

"repeating" or "non-terminating"
1-2 mins, compare first digits second
 $\frac{11}{30} = 0.\overline{36}$

2-3 mins, quiet work
 $\frac{4}{11} = 0.\overline{36}$

use e.g.
 $\frac{7}{8}$

terminating

$$\begin{array}{r} 0.875 \\ 8 \overline{) 7.000} \\ \underline{-0} \\ 70 \\ \underline{-64} \\ 60 \\ \underline{-56} \\ 40 \\ \underline{-40} \\ \hline \emptyset \end{array}$$

use e.g. $\frac{1}{12}$ or $0.58\overline{3}$

never results in remainder
 \emptyset

$$\begin{array}{r} 0.58333 \\ 12 \overline{) 7.00000} \\ \underline{-0} \\ 70 \\ \underline{-60} \\ 100 \\ \underline{-96} \\ 40 \\ \underline{-36} \\ 40 \\ \underline{-36} \\ 40 \\ \underline{-36} \\ \hline 4 \end{array}$$

→ follow with whole class discussion

2. What is similar about your answers to the previous question? What is different?

All 3 of them have some two digits in tenths, and hundredths place, but second two repeat, first is terminating

3. Use the decimal representations to decide which of these fractions has the greatest value. Explain your reasoning.

$\frac{11}{30}$ is largest → 6 in thousandths place $0.36\overline{6}$

$$\frac{4}{11} = 0.3636$$

$$\frac{9}{25} = 0.3600$$

Are you ready for more?

One common approximation for π is $\frac{22}{7}$. Express this fraction as a decimal. How does this approximation compare to 3.14?

discuss strategies + place value

3.142857 is closer to π than 3.14 is.

NAME _____

DATE _____

PERIOD _____

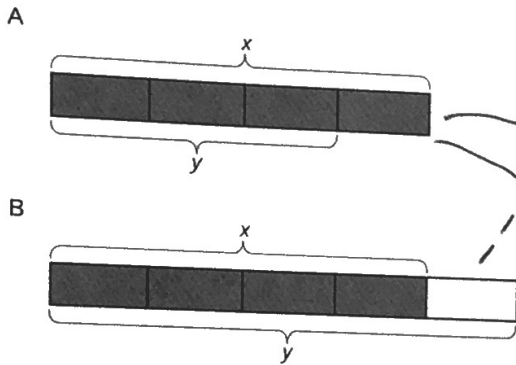
10-15 mins

5 mins quiet work time

5.3: More and Less with Decimals

1. Match each diagram with a description and an equation.

Diagrams:



Descriptions:

- An increase by $\frac{1}{4}$
- An increase by $\frac{1}{3}$
- An increase by $\frac{2}{3}$
- A decrease by $\frac{1}{5}$
- A decrease by $\frac{1}{4}$

Equations:

$y = 1.6x$

$y = 1.3x$

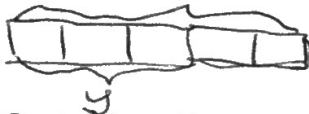
$y = 0.75x$ **A**

$y = 0.4x$

$y = 1.25x$ **B**

2. Draw a diagram for one of the unmatched equations.

eg. An increase by $\frac{2}{3}$



$y = \frac{3}{5}x$ or $y = 0.6x$

5.4: Card Sort: More Representations

Your teacher will give you a set of cards that have proportional relationships represented 2 different ways: as descriptions and equations. Mix up the cards and place them all face-up.

Take turns with a partner to match a description with an equation.

1. For each match you find, explain to your partner how you know it's a match.
2. For each match your partner finds, listen carefully to their explanation, and if you disagree, explain your thinking.
3. When you have agreed on all of the matches, check your answers with the answer key. If there are any errors, discuss why and revise your matches.

NAME _____

DATE _____

PERIOD _____

Unit 4, Lesson 6: Increasing and Decreasing

"% less than"
"% more than"

5 mins Let's use percentages to describe increases and decreases.

6.1: Improving Their Game

Sometimes helpful to think of multiplicative

Here are the scores from 3 different sports teams from their last 2 games.

increase rather than additive.

Look @ a table - one thing noticed, one thing wondered

sports team	total points in game 1	total points in game 2
football team	22	30
basketball team	100	108
baseball team	4	12

~36% or $\cdot(1.4)$
+8% or $\cdot(1.1)$
+200% or $\cdot(3)$

1. What do you notice about the teams' scores? What do you wonder?

Notice - basketball had most points
baseball team's score was 3 times as much as in game 1

WONDER

Each team improved by 8 points

2. Which team improved the most? Explain your reasoning.

poll - students who said baseball - explain

Baseball improved the most. 8-point increase tripled their score.

10 mins 3 mins quiet work time #1 & 2, pair-share, whole class

6.2: More Cereal and a Discounted Shirt

percent increase

1. A cereal box says that now it contains 20% more. Originally, it came with 18.5 ounces of cereal. How much cereal does the box come with now?

Q: Did it increase or decrease?

22.2 oz of cereal

$$\frac{18.5}{1} \cdot \frac{20}{100} = \frac{370}{100} = 3.7 \text{ oz increase}$$

$$\begin{array}{r} 18.5 \\ + 3.7 \\ \hline 22.2 \end{array}$$



$$(18.5) \cdot (0.2) \quad \begin{array}{r} 18.5 \\ \times 0.2 \\ \hline 22.2 \end{array}$$

The cereal box now has 120% as many ounces.

NAME _____ DATE (12/01) PERIOD _____ 80%

Other methods: #1 (18.5) * (1.2) #2 (18.5) * (0.8)

2. The price of a shirt is \$18.50, but you have a coupon that lowers the price by 20%. What is the price of the shirt after using the coupon?

\$14.80

$$\begin{array}{r} 18.50 \\ \times 0.2 \\ \hline 3.70 \end{array}$$

$$\begin{array}{r} 18.50 \\ - 3.70 \\ \hline 14.80 \end{array}$$

\$3.70 decrease



double number line!

80% of original price

5 mins 6.3: Using Tape Diagrams

1. Match each situation to a diagram. Be prepared to explain your reasoning.

a. Compared with last year's strawberry harvest, this year's strawberry harvest is a 25% increase.

Diagram A 100% + 25% = 125%

b. This year's blueberry harvest is 75% of last year's.

Diagram B 75% of 100% $\frac{75}{100}$

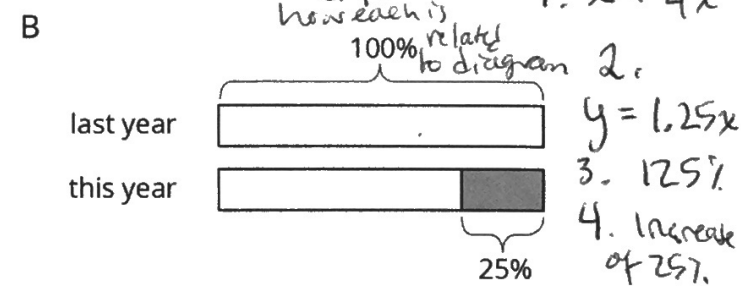
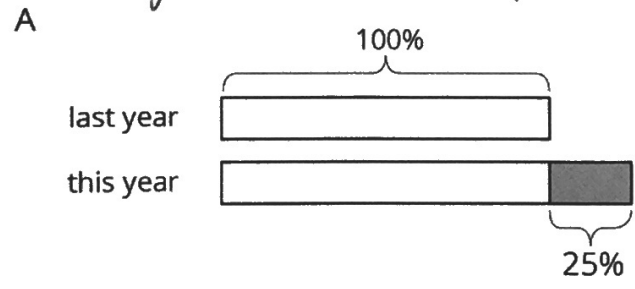
c. Compared with last year, this year's peach harvest decreased 25%.

Diagram B 100% - 25% = 75%

d. This year's plum harvest is 125% of last year's plum harvest.

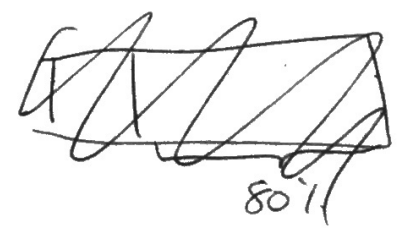
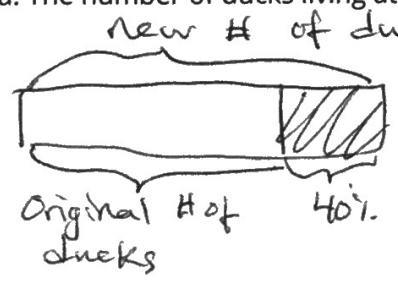
Diagram A 125% of 100%

LAUNCH!
Show students



2. Draw a diagram to represent these situations.

a. The number of ducks living at the pond increased by 40%.

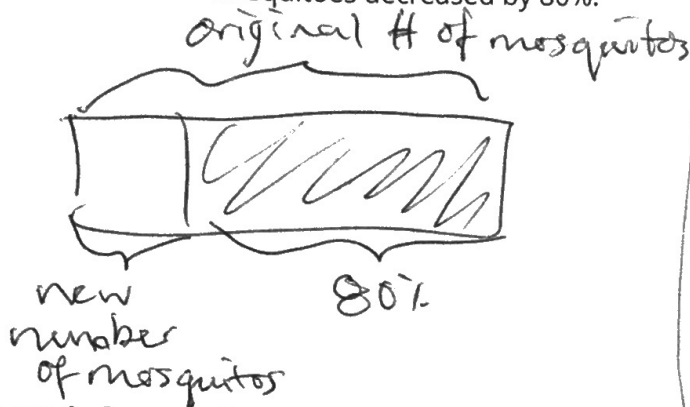


NAME _____

DATE _____

PERIOD _____

b. The number of mosquitoes decreased by 80%.



Are you ready for more?

What could it mean to say there is a 100% decrease in a quantity? Give an example of a quantity where this makes sense.

It means the quantity is now \emptyset

Q: If amount of fruit increases by 40%, what percent of original do you have?

(140%)

(60%)

Q: Decreases by 40%?

OPTIONAL

6.4: Agree or Disagree: Percentages

Do you agree or disagree with each statement? Explain your reasoning.

1. Employee A gets a pay raise of 50%. Employee B gets a pay raise of 45%. So Employee A gets the bigger pay raise.

Agree if both make same amount of money.

Disagree if Employee A makes enough less than B.

2. Shirts are on sale for 20% off. You buy two of them. As you pay, the cashier says, "20% off of each shirt means 40% off of the total price."

Disagree. Still 20% off total.

shirt A

0.2a

shirt B

0.2b

0.2a + 0.2b

or 0.2(a+b)

only one 20% decrease

NAME _____

DATE _____

PERIOD _____

Lesson 5 Summary

Long division gives us a way of finding decimal expansions for fractions.

For example, to find a decimal expansion for $\frac{9}{8}$, we can divide 9 by 8.

So $\frac{9}{8} = 1.125$.

$$\begin{array}{r} 1.125 \\ 8 \overline{)9.000} \\ \underline{8} \\ 10 \\ \underline{8} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

Sometimes it is easier to work with the decimal expansion of a number, and sometimes it is easier to work with its fraction representation. It is important to be able to work with both. For example, consider the following pair of problems:

- Priya earned x dollars doing chores, and Kiran earned $\frac{6}{5}$ as much as Priya. How much did Kiran earn?
- Priya earned x dollars doing chores, and Kiran earned 1.2 times as much as Priya. How much did Kiran earn?

Since $\frac{6}{5} = 1.2$, these are both exactly the same problem, and the answer is $\frac{6}{5}x$ or $1.2x$.

When we work with percentages in later lessons, the decimal representation will come in especially handy.

Lesson 5 Glossary Terms

- repeating decimal - an infinite decimal expansion that eventually repeats the same sequence of digits over and over again. The repeated sequence is indicated by a line (macron, or diacritic) above the repeating digits.

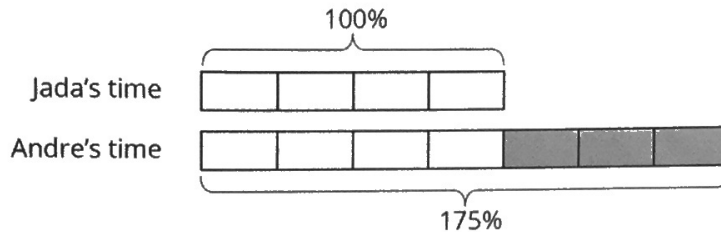
NAME _____

DATE _____

PERIOD _____

Lesson 6 Summary

Imagine that it takes Andre $\frac{3}{4}$ more than the time it takes Jada to get to school. Then we know that Andre's time is $1\frac{3}{4}$ or 1.75 times Jada's time. We can also describe this in terms of percentages:



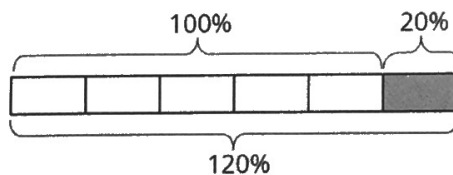
We say that Andre's time is 75% more than Jada's time. We can also see that Andre's time is 175% of Jada's time. In general, the terms **percent increase** and **percent decrease** describe an increase or decrease in a quantity as a percentage of the starting amount.

For example, if there were 500 grams of cereal in the original package, then "20% more" means that 20% of 500 grams has been added to the initial amount, $500 + (0.2) \cdot 500 = 600$, so there are 600 grams of cereal in the new package.



We can see that the new amount is 120% of the initial amount because

$$500 + (0.2) \cdot 500 = (1 + 0.2)500$$



Lesson 6 Glossary Terms

- percentage increase
- percentage decrease

given an initial amount, and a final amount which is larger than the initial amount, the % increase is the difference expressed as a percentage of the initial amount.

given an initial amount, and a final amount which is smaller than the initial amount, the % decrease is the difference expressed as a percentage of the initial amount.