

Dividing Fractions

Unit 9 Overview: 8 lessons

Students divide with unit fractions two ways. A unit fraction divided by a whole number cuts a part into equal pieces: on an area model, $\frac{1}{2} \div 3$ is one of 6 equal pieces of the whole, so $\frac{1}{6}$. A whole number divided by a unit fraction asks how many fit: there are 10 tenths in every whole, so $6 \div \frac{1}{10} = 60$. Students check every division by multiplying, find missing numbers and write equations for division stories. In some states the unit goes on to dividing a fraction by a fraction with common denominators, fractions as decimals and back (thirds, eighths and the factors of 100), comparing and ordering fractions, mixed numbers and decimals on one number line, and percents as parts of 100. Ask “is the answer more or less than the number I started with?” every day.

THE UNIT, DAY BY DAY

Day 1	Pre-Check	What students already know, before the first lesson.
Day 2	9.1 A unit fraction divided by a whole number	I can divide a unit fraction by a whole number.
Day 3	9.2 A whole number divided by a unit fraction	I can divide a whole number by a unit fraction.
Day 4	9.3 Check by multiplying	I can use multiplication to check a division.
Day 5	9.4 Fraction division stories	I can solve stories that divide with unit fractions.
Day 6	9.5 A fraction divided by a fraction ★	I can divide fractions and mixed numbers.
Day 7	9.6 Fractions as decimals and back ★	I can write fractions as decimals and back.
Day 8	9.7 Compare and order on a number line ★	I can compare and order fractions and decimals.
Day 9	9.8 Percents as parts of 100 ★	I can show percents as parts of 100.
Day 10	Unit Review	The review, to go over together.
Day 11	Unit Test	Form A; Form B (other numbers) is for a retest.

★ Taught in 5th grade in some states. Skip these lessons if yours teaches them in another grade; animalmath.com/standards shows your state's list.

GET READY FOR THE UNIT

- Paper strips and squares to fold, cut into halves to twelfths, several of each for every pair
- Grid paper for area models, and number lines from 0 to 3 in halves, thirds, fourths and fifths
- Measuring cups (1 cup and $\frac{1}{4}$ cup) and dried beans to act out stories
- Hundred grids, plenty of them, and colored pencils for decimals and percents
- Whiteboards and dry erase markers

HOW EACH LESSON GOES

- 1. Warm up** (5 min)
- 2. Teach** (10 min)
- 3. Try it together** (10 min)
- 4. Practice** (15 min)
- 5. Exit ticket** (5 min): a quick check on the lesson.

Each lesson page ends with the Animal Math sheets, makers, tools and quizzes for it. “Sheet 3” is the third worksheet of a pack; a color pack prints each sheet again in black and white.

CHECKING AS YOU GO

PRINTABLE	Pre-Check: Day 1, with a key	EXIT TICKET	Exit Tickets: one a lesson, two to a page
PRINTABLE	Unit Review: the day before the test	PRINTABLE	Unit Test: Forms A and B, with keys



Dividing Fractions

Lesson 9.1: A unit fraction divided by a whole number

GOAL

Students divide a unit fraction by a whole number on an area model: they shade the unit fraction, cut every part of the whole into as many pieces as the divisor, and name one piece as a part of the whole ($\frac{1}{2} \div 3 = \frac{1}{6}$). The quotient is smaller than the fraction they started with.

About 45 minutes

I can divide a unit fraction by a whole number.

THE LESSON

- 1 Warm up** (5 min) Fold a paper square in half, then fold the half in thirds. What part of the whole square is one small piece? ($\frac{1}{6}$: a third of a half.)
- 2 Teach** (10 min) Draw a rectangle cut into 2 columns and shade one: $\frac{1}{2}$. Share the half equally among 3 friends: draw lines across to cut every column into 3 pieces. The whole now has 6 equal pieces, and one friend's share is one of them: $\frac{1}{2} \div 3 = \frac{1}{6}$. Then $\frac{1}{2} \div 5$: cut every column into 5 pieces, 10 in all, so each share is $\frac{1}{10}$. The more people share, the smaller each piece.
Say: "I cut every part of the whole, not just the shaded one, so I can see what part of the whole one piece is."
- 3 Try it together** (10 min) Pairs fold and shade paper squares for $\frac{1}{3} \div 3$ and $\frac{1}{5} \div 2$, count the pieces in the whole and write each division. Then they say why both answers are less than the fraction they started with.
- 4 Practice** (15 min) Students shade one piece of the shaded part and count the pieces in all, then divide and check by multiplying, on sheet 2 of Dividing Unit Fractions and Whole Numbers.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 9.1** and circle a face beside the "I can" line. On question 1, look for one small piece of the shaded column shaded and $\frac{1}{20}$; $\frac{4}{5}$ means the numerator was multiplied, and 20 means the division was turned around, so ask how many pieces the whole has now. On question 2, look for $\frac{1}{12}$ and $\frac{1}{18}$; $\frac{1}{8}$ or $\frac{1}{9}$ means the numbers were added.

Need help? Fold a strip in half, then in thirds: count all the pieces.

Ready for more? Show why $\frac{1}{2} \div 4$ and $\frac{1}{4} \div 2$ give the same answer.

GET READY

- Paper squares to fold
- Grid paper and colored pencils
- Whiteboards and markers

WORDS TO USE

unit fraction: one equal part of a whole, like $\frac{1}{3}$

divide: cut into equal groups or equal pieces

area model: a rectangle cut into equal parts that shows the whole

ASK

- How many pieces is the whole cut into now?
- What part of the whole is one piece?
- Is the answer more or less than the fraction you started with? Why?

WATCH FOR

Writes $\frac{1}{2} \div 3 = \frac{3}{2}$ or $\frac{3}{6}$. Draw it: sharing a half among 3 makes each share smaller than a half.

Writes $\frac{1}{2} \div 3 = 6$. That is how many sixths make 1. Ask: what part of the whole does one friend get?

Counts only the pieces of the shaded part. Cut every column the same way and count all the pieces of the whole.

ON ANIMAL MATH

PRINTABLE

Dividing Unit Fractions and Whole Numbers: sheet 2

QUIZ

Multiplying and Dividing Fractions Quiz: the Divide Unit Fractions level

EXIT TICKET

5th Grade Dividing Fractions Exit Tickets: Exit Ticket 9.1

Dividing Fractions

Lesson 9.2: A whole number divided by a unit fraction

GOAL Students divide a whole number by a unit fraction by asking how many of the fraction fit: there are 5 fifths in each whole, so 60 fifths in 12, and $12 \div \frac{1}{5} = 60$. They show it with jumps on a number line and with strips, and see that the quotient is larger than the whole number.

About 45 minutes

I can divide a whole number by a unit fraction.

THE LESSON

- 1 Warm up** (5 min) How many quarters make a dollar? How many make 11 dollars? Students say how they know.
- 2 Teach** (10 min) Draw a number line from 0 to 1 in fifths. Start at 0 and jump $\frac{1}{5}$ at a time to 1, counting the jumps: 5 jumps, so $1 \div \frac{1}{5} = 5$. Every whole holds 5 fifths, so 12 wholes hold $12 \times 5 = 60$: $12 \div \frac{1}{5} = 60$. Then $11 \div \frac{1}{3}$: 3 thirds in each whole, so 33. With no line, $9 \div \frac{1}{10}$: 10 tenths in each whole, so 90 in all.
Say: "Dividing by a unit fraction asks how many of that fraction fit. Each whole holds as many as the denominator says."
- 3 Try it together** (10 min) Pairs lay sixths along a 1 whole strip, then find $6 \div \frac{1}{6}$ by counting the sixths in each whole. They draw the jumps of $\frac{1}{8}$ from 0 to 1, then find $7 \div \frac{1}{8}$. Last, they find $10 \div \frac{1}{12}$ with no picture and explain how they knew.
- 4 Practice** (15 min) Students draw the jumps or count the parts, then divide and check, on sheet 3 of Dividing Unit Fractions and Whole Numbers.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 9.2** and circle a face beside the "I can" line. On question 1, look for 15 jumps of $\frac{1}{5}$ and 15; $\frac{3}{5}$ means a fifth of 3 was found instead of how many fifths fit. On question 2, look for 20 and 24; $\frac{1}{20}$ or $\frac{1}{24}$ means the division was turned around, and $\frac{5}{4}$ or $\frac{4}{6}$ means the student multiplied by the fraction.

Need help? Start with 1 whole: lay paper fifths along a strip and count them, then add one whole at a time.

Ready for more? How many eighths are in 8? In 12? Write the rule you see.

GET READY

- Number lines from 0 to 3 in halves, thirds, fourths and fifths
- Paper strips cut into unit fractions
- Whiteboards and markers

WORDS TO USE

how many fit: how many of the fraction make the whole number

jump: one move along the number line, the size of the unit fraction

quotient: the answer to a division

ASK

- How many of the fraction are in 1 whole?
- How many wholes are there?
- Is the answer more or less than the whole number? Why?

WATCH FOR

Writes $12 \div \frac{1}{5} = 12/5$. That is 12 times $\frac{1}{5}$. Ask: how many fifths fit in 12? Count the fifths in each whole.

Writes $12 \div \frac{1}{5} = 1/60$. The pieces are fifths. Count how many fifths there are, not how big one share is.

Counts the tick marks instead of the jumps. Start at 0 and count each jump as it lands.

ON ANIMAL MATH

PRINTABLE

Dividing Unit Fractions and Whole Numbers: sheet 3

QUIZ

Multiplying and Dividing Fractions Quiz: the Divide Unit Fractions level

EXIT TICKET

5th Grade Dividing Fractions Exit Tickets: Exit Ticket 9.2

Dividing Fractions

Lesson 9.3: Check by multiplying

GOAL Students check a division with a unit fraction by multiplying: the quotient times the divisor must give the number they divided ($1/2 \div 3 = 1/6$, because $1/6 \times 3 = 1/2$). They use the same link to find a missing number in a division.

About 45 minutes

I can use multiplication to check a division.

THE LESSON

- 1 Warm up** (5 min) Write the fact family for $24 \div 6 = 4$. How does $4 \times 6 = 24$ check the division?
- 2 Teach** (10 min) Write $1/2 \div 3 = 1/6$ and check it: $1/6 \times 3 = 3/6 = 1/2$, the number we divided. Then $3 \div 1/2 = 6$: check, $6 \times 1/2 = 6/2 = 3$. Now a missing number: $1/6 \div \square = 1/36$. What times $1/36$ gives $1/6$? $6 \times 1/36 = 6/36 = 1/6$, so the box is 6. And $\square \div 1/5 = 10$: $10 \times 1/5 = 2$, so the box is 2.
Say: "Division and multiplication undo each other. If my quotient times the divisor gives the number I divided, my answer is right."
- 3 Try it together** (10 min) Pairs divide $1/4 \div 2$ and check it by multiplying. Then they find the missing numbers in $\square \div 1/10 = 70$ and $1/12 \div \square = 1/60$, each with a multiplication.
- 4 Practice** (15 min) Students write the division each model shows, circle the division a model shows, and find missing numbers with the multiplication beside them on sheet 4 of Dividing Unit Fractions and Whole Numbers.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 9.3** and circle a face beside the "I can" line. On question 1, look for 18 and $18 \times 1/6 = 3$ (either order); $1/18$ means the division was turned around and $3/6$ that 3 was multiplied by $1/6$, and either way the check will not give 3. On question 2, look for 6 and 9; 30 means the denominator was copied, and 81 means 27 was multiplied by 3, not by $1/3$.

Need help? Use a fact family triangle with $1/6$, 3 and $1/2$ at the corners, and say the four facts.

Ready for more? Write a division with a unit fraction whose check is $1/6 \times 6 = 1$. Then write another one.

GET READY

- Whiteboards and markers
- The number lines and paper strips of the last two lessons
- Fact family triangle cards

WORDS TO USE

check: multiply the quotient by the divisor to get back the number you divided

divisor: the number you divide by

missing number: the number a box stands for

ASK

- What do you multiply to check?
- Did the check give back the number you divided?
- What number times $1/36$ makes $1/6$?

WATCH FOR

Checks $3 \div 1/2 = 6$ with 6×3 . Multiply the quotient by the divisor, $1/2$, not by the number you divided.

Puts 36 in the box of $1/6 \div \square = 1/36$. Check it: $1/36 \times 36$ is 1, not $1/6$. Try 6.

Thinks a check that does not match means the check is wrong. Fix the division, then check again.

ON ANIMAL MATH

PRINTABLE

Dividing Unit Fractions and Whole Numbers: sheet 4

QUIZ

Multiplying and Dividing Fractions Quiz: the Divide Unit Fractions level

EXIT TICKET

5th Grade Dividing Fractions Exit Tickets: Exit Ticket 9.3

Dividing Fractions

Lesson 9.4: Fraction division stories

GOAL Students solve division stories with unit fractions: they decide whether a fraction is being shared (half a watermelon cut into 5 equal slices) or how many parts fit (smoothies of $\frac{1}{4}$ cup from 2 cups), draw a model, write a division equation and answer with the unit.

About 45 minutes

I can solve stories that divide with unit fractions.

THE LESSON

- 1 Warm up** (5 min) Act it out: fill a 1 cup measure with a $\frac{1}{4}$ cup scoop. How many scoops? How many for 2 cups?
- 2 Teach** (10 min) Read: Ana has 2 cups of yogurt. Each smoothie uses $\frac{1}{4}$ cup. How many smoothies can she make? Ask: is a part being shared, or are we counting how many fit? How many fit: $2 \div \frac{1}{4} = 8$ smoothies. Then: Half a watermelon is cut into 5 equal slices. What part of the whole watermelon is one slice? Sharing: $\frac{1}{2} \div 5 = \frac{1}{10}$ of the watermelon. Draw each story before dividing.
Say: "I ask: how many parts fit, or how big is each share? Then I write the division."
- 3 Try it together** (10 min) Pairs draw and solve two story cards: $\frac{1}{3}$ pound of raisins split equally into 2 snack bags ($\frac{1}{3} \div 2 = \frac{1}{6}$ pound), and a 2 mile relay with legs of $\frac{1}{5}$ mile ($2 \div \frac{1}{5} = 10$ legs). Each pair tells another pair which story was sharing.
- 4 Practice** (15 min) Students write equations and solve the stories on sheet 5 of Dividing Unit Fractions and Whole Numbers, then on sheet 4 of Fraction Word Problems for 5th Grade. Early finishers try its sheet 5.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 9.4** and circle a face beside the "I can" line. On question 1, look for 16 servings; $\frac{1}{16}$ means the division was turned around, so ask how many eighths are in 2 pounds. On question 2, look for $\frac{1}{24}$ pound; 24 means the student counted how many fit when the story shares.

Need help? Act the story out with cups and beans, or fold paper.

Ready for more? Write one story for $\frac{1}{2} \div 4$ and one for $4 \div \frac{1}{2}$.

GET READY

- Measuring cups (1 cup and $\frac{1}{4}$ cup) and dried beans
- Story cards
- Whiteboards and markers

WORDS TO USE

share: cut a part into equal pieces

how many fit: count the parts that make an amount

equation: a number sentence with =

ASK

- Is the story sharing a part, or asking how many fit?
- Should the answer be bigger or smaller?
- What unit goes with your answer?

WATCH FOR

Turns the smoothie division around, with $\frac{1}{4}$ first. The 2 cups are being split into scoops: $2 \div \frac{1}{4}$.

Answers $\frac{1}{10}$ slices for the watermelon story. Each slice is $\frac{1}{10}$ of the watermelon.

Multiplies because the story says "each". Draw it before choosing the operation.

ON ANIMAL MATH

PRINTABLE

Dividing Unit Fractions and Whole Numbers: sheet 5

PRINTABLE

Fraction Word Problems for 5th Grade: sheets 4-5

QUIZ

Multiplying and Dividing Fractions Quiz: the Word Problems level

EXIT TICKET

5th Grade Dividing Fractions Exit Tickets: Exit Ticket 9.4

Dividing Fractions

Lesson 9.5: A fraction divided by a fraction

GOAL Students divide a fraction by a fraction by asking how many of the divisor fit: they rename both fractions with one denominator and divide the numerators ($2/3 \div 1/6$ is $4/6 \div 1/6 = 4$), divide mixed numbers the same way, and write each answer in simplest form.

About 45 minutes

★ Taught in 5th grade in some states

I can divide fractions and mixed numbers.

THE LESSON

- 1 Warm up** (5 min) How many sixths are in 1? In $1/2$? In $2/3$? Students check with the strips.
- 2 Teach** (10 min) Lay $2/3$ of a strip on a strip cut into sixths: it covers 4 sixths, so $2/3 \div 1/6 = 4$. With no strip, rename: $2/3 = 4/6$, and 4 sixths $\div 1$ sixth = 4. Then $3/4 \div 1/2$: rename $1/2$ as $2/4$, so 3 fourths $\div 2$ fourths = $3/2 = 1\frac{1}{2}$. A half fits once, and half of another. Mixed numbers: $2\frac{1}{4} \div 3/4$ is $9/4 \div 3/4 = 3$.
Say: "I write both fractions with the same denominator. Then I divide the numerators, the same as counting how many of the divisor fit."
- 3 Try it together** (10 min) Pairs use strips to find $5/6 \div 1/3$ ($5/6 \div 2/6 = 2\frac{1}{2}$) and $1\frac{1}{2} \div 1/3$ ($9/6 \div 2/6 = 4\frac{1}{2}$), write each in simplest form and check by multiplying: $2\frac{1}{2} \times 1/3 = 5/6$.
- 4 Practice** (15 min) No Animal Math sheet divides a fraction by a fraction, so this lesson is hands-on: students build each division with strips and record it, then write their own and solve them: rename, divide the numerators, simplify. Sheet 3 of Dividing Unit Fractions and Whole Numbers, the nearest sheet, makes a warm up: how many unit fractions fit in a whole number.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 9.5** and circle a face beside the "I can" line. On question 1, look for 6, the shaded eighths counted; $3/32$ means the student multiplied. On question 2, look for $1\frac{1}{4}$ ($5/4$) and $3\frac{1}{3}$ ($10/3$); $4/5$ or $3/10$ means the division was turned around, so ask how many of the divisor fit.

Need help? Start with divisors that are unit fractions, and lay the strips on top of each other.

Ready for more? Find $3/4 \div 3/8$ and $3/8 \div 3/4$. Why is one answer more than 1 and the other less?

GET READY

- Paper strips the same length, cut into halves, thirds, fourths, sixths and eighths
- Colored pencils
- Whiteboards and markers

WORDS TO USE

common denominator: one denominator both fractions can be written with

how many fit: how many of the divisor make the fraction you divide

simplest form: a fraction whose top and bottom have no common factor but 1

ASK

- What denominator can both fractions use?
- How many of the divisor fit in the fraction?
- Will the answer be more or less than 1? How can you tell before dividing?

WATCH FOR

Multiplies the fractions: $3/4 \div 1/2 = 3/8$. Ask how many halves fit in $3/4$. Lay the strips: more than one.

Divides the numerators without a common denominator. Rename first, so the pieces are the same size.

Divides only the fraction parts of a mixed number. Change the mixed number to a fraction first: $2\frac{1}{4}$ is $9/4$.

ON ANIMAL MATH

PRINTABLE

Dividing Unit Fractions and Whole Numbers: sheet 3, the nearest sheet

EXIT TICKET

5th Grade Dividing Fractions Exit Tickets: Exit Ticket 9.5

Dividing Fractions

Lesson 9.6: Fractions as decimals and back

GOAL

Students write fractions as decimals by renaming them as hundredths

($7/25 = 28/100 = 0.28$) or with eighths of 0.125 ($3 \frac{1}{8} = 3.125$), see that thirds never end ($1/3 = 0.333\dots$), and write decimals as fractions in simplest form, such as $0.72 = 18/25$.

About 45 minutes

★ Taught in 5th grade in some states

I can write fractions as decimals and back.

THE LESSON

- 1 Warm up** (5 min) What fraction of a dollar is a dime? Students write it as a fraction and as a decimal.
- 2 Teach** (10 min) Write $7/25$ with 100 at the bottom: $25 \times 4 = 100$, so multiply the top by 4 too: $28/100 = 0.28$. Eighths do not make hundredths, but $1/8 = 0.125$, so $3 \frac{1}{8} = 3.125$. Thirds: share a hundred grid by 3, 33 squares each and one left over, and it never comes out even: $1/3 = 0.333\dots$, the 3s going on forever. Back the other way: $0.72 = 72/100 = 18/25$.
Say: "To write a fraction as a decimal, I make tenths, hundredths or thousandths. To go back, I write the decimal over 10, 100 or 1,000 and simplify."
- 3 Try it together** (10 min) Pairs write $27/50$, $3 \frac{7}{8}$ and $3 \frac{1}{3}$ as decimals (0.54, 3.875 and 3.333...), then 0.76, 0.96 and 2.25 as fractions in simplest form. Each pair shades a hundred grid to check one of them.
- 4 Practice** (15 min) Students write fractions as hundredths and decimals on sheet 1 of Fractions, Decimals and Percents, eighths and thirds on sheet 2 and decimals as fractions on sheet 3, then match equal fractions and decimals at the top of sheet 4 (its number lines are for the next lesson).
- 5 Exit ticket** (5 min) Students do **Exit Ticket 9.6** and circle a face beside the "I can" line. On question 1, look for 0.85 and 2.125; 0.17 means the numerator was written as the decimal, and 2.18 means the eighth was read as a digit. On question 2, look for $11/25$ and $3 \frac{3}{4}$; $44/100$ or $3 \frac{75}{100}$ is the right amount but not in simplest form.

Need help? Shade the fraction on a hundred grid and count the squares.

Ready for more? Which is greater, $1/3$ or 0.33? How do you know?

GET READY

- Hundred grids
- A number line from 0 to 1 in eighths, with decimals under the marks
- Whiteboards and markers

WORDS TO USE

hundredths: 100 equal parts of a whole: 0.28 is 28 hundredths

simplest form: a fraction whose top and bottom have no common factor but 1

repeating decimal: a decimal whose digits go on and on, like 0.333...

ASK

- What do you multiply by to make hundredths?
- How much is one eighth as a decimal?
- Is your fraction in simplest form? How do you know?

WATCH FOR

Writes $7/25$ as 0.725 or 0.07. Make hundredths first: $28/100$, then write 28 hundredths.

Writes $3 \frac{1}{3}$ as 3.3. Shade a grid for the third: 30 squares is not quite a third. The 3s go on: 3.333...

Writes 0.72 as $72/10$. Read it aloud: 72 hundredths. The bottom is 100.

ON ANIMAL MATH

PRINTABLE

Fractions, Decimals and Percents: sheets 1-3, and the top of sheet 4

QUIZ

Decimals Quiz: the Tenths and Hundredths level

EXIT TICKET

5th Grade Dividing Fractions Exit Tickets: Exit Ticket 9.6

Dividing Fractions

Lesson 9.7: Compare and order on a number line

GOAL Students mark fractions, mixed numbers and decimals on one number line by writing them all the same way, then compare and order them: $0.9 < 1\frac{1}{5} < 17/10$.

I can compare and order fractions and decimals.

About 45 minutes
★ Taught in 5th grade in some states

THE LESSON

- 1 Warm up** (5 min) Is $7/12$ more or less than $1/2$? Is 0.45 ? How do you know?
- 2 Teach** (10 min) Draw a number line from 0 to 2 in tenths. To mark $1\frac{1}{5}$, write it in tenths: $1\frac{2}{10}$, so it goes 2 ticks past 1. Mark 0.9 one tick before 1, and $17/10$ at $1\frac{7}{10}$. Read the order from left to right: $0.9 < 1\frac{1}{5} < 17/10$. Off the line, write each number as a decimal: $7/8 = 0.875$ and $9/10 = 0.9$, so $0.86 < 7/8 < 9/10$.
Say: "To compare numbers written different ways, I write them all the same way, as decimals or with one denominator. On a number line, the greater number is farther right."
- 3 Try it together** (10 min) Pairs order 2.4, $2\frac{3}{8}$ and $2\frac{1}{2}$ from least to greatest, writing each as a decimal first. Then they compare $1\frac{3}{4}$ and 1.7 and explain which is greater.
- 4 Practice** (15 min) Students mark and order on sheet 4 of Decimal Place Value to Thousandths, name the points at the foot of sheet 4 of Fractions, Decimals and Percents, and order on sheet 5 of Comparing and Ordering Fractions.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 9.7** and circle a face beside the "I can" line. On question 1, look for A at 1.5, B at 1.8 and C at 1.3; a C off the line means $13/10$ was not read as $1\frac{3}{10}$. On question 2, look for $5/8 < 2/3 < 0.7$; $2/3$ before $5/8$ means the bigger denominator was taken as the bigger fraction, and 0.7 first means the decimal was taken as smallest, so write all three as decimals.

Need help? Shade hundred grids for each number and line them up.

Ready for more? Find a fraction and a decimal between $2\frac{3}{8}$ and 2.4.

GET READY

- Number lines from 0 to 3 in tenths
- Hundred grids
- Number cards with fractions, mixed numbers and decimals

WORDS TO USE

compare: decide which number is greater

order: put numbers from least to greatest

benchmark: a number we know well, like $1/2$ or 1, to compare with

ASK

- How can you write these numbers all the same way?
- Is it more or less than $1/2$? Than 1?
- Where would it go on the number line?

WATCH FOR

Thinks $0.86 > 9/10$ because 86 is more than 9. Write $9/10$ as a decimal first: 0.9, or 0.90.

Thinks $7/8 > 9/10$ because eighths are bigger than tenths. Each is one piece short of 1, and a tenth is the smaller piece. Write both as decimals.

Marks $17/10$ between 0 and 1. Ten tenths make 1: 17 tenths is 1 and 7 tenths.

ON ANIMAL MATH

- PRINTABLE** **Decimal Place Value to Thousandths:** sheet 4
- PRINTABLE** **Fractions, Decimals and Percents:** sheet 4, the number lines
- PRINTABLE** **Comparing and Ordering Fractions:** sheet 5
- TOOL** **Number Line:** Start 0, End 2, Interval 0.1 (tenths only)
- QUIZ** **Decimal Place Value Quiz:** the Compare and Order level
- EXIT TICKET** **5th Grade Dividing Fractions Exit Tickets:** Exit Ticket 9.7

Dividing Fractions

Lesson 9.8: Percents as parts of 100

GOAL Students see a percent as a number of hundredths: 48% is 48 out of 100, so $48\% = 48/100 = 12/25 = 0.48$. They shade percents on hundred grids and write fractions with factors of 100 as percents ($21/25 = 84/100 = 84\%$).

About 45 minutes

★ Taught in 5th grade in some states

I can show percents as parts of 100.

THE LESSON

- 1 Warm up** (5 min) How many pennies make a dollar? What part of a dollar are 3 pennies? 30 pennies?
- 2 Teach** (10 min) Shade 48 squares of a hundred grid: 48 out of 100, so 48%. Write it as a fraction, $48/100$, simplified by 4 to $12/25$, and as a decimal, 0.48. The whole grid is 100%. Then a fraction as a percent: $21/25$, multiply the top and bottom by 4 to make $84/100$, so 84%. Fifths: $2/5 = 40/100 = 40\%$, and $4/5 = 80\%$.
Say: "Percent means out of 100. I make hundredths, and the top number is the percent."
- 3 Try it together** (10 min) Pairs shade 9% and 90% on two grids and say why they look so different. Then they write $13/20$ and $1/25$ as percents and check each on a grid.
- 4 Practice** (15 min) Students shade grids and write percents as fractions and decimals, read the bars, and fill in the table on sheet 5 of Fractions, Decimals and Percents.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 9.8** and circle a face beside the "I can" line. On question 1, look for 36% and $9/25$; 64% means the white squares were counted, and $36/100$ is the right amount but not in simplest form. On question 2, look for 68% and 46%; 17% or 23% means the numerator was copied without making hundredths.

Need help? Count the shaded squares by columns of 10, then by ones.

Ready for more? Max got 23 of 25 questions right on a quiz. What percent did he get right?

GET READY

- Hundred grids and colored pencils
- A dollar bill and pennies
- Whiteboards and markers

WORDS TO USE

percent: per hundred: out of 100

%: the sign for percent

hundredths: 100 equal parts of a whole

ASK

- How many hundredths is it?
- What do you multiply by to make 100 at the bottom?
- Is it more or less than half?

WATCH FOR

Writes 9% as 0.9. Nine squares, not nine columns: a zero holds the tenths place, 0.09.

Writes $21/25$ as 21%. Make hundredths first: $84/100$.

Thinks a percent can only be shaded on a grid of 100. Shade a bar cut into tenths: each tenth is 10%.

ON ANIMAL MATH

PRINTABLE

Fractions, Decimals and Percents: sheet 5

EXIT TICKET

5th Grade Dividing Fractions Exit Tickets: Exit Ticket 9.8