

Place Value and Decimals

Unit 1 Overview: 7 lessons

Students see that each place is worth ten times the place to its right and one tenth of the place to its left, from the millions to the thousandths. They write powers of ten with exponents, multiply and divide whole numbers and decimals by 10, 100 and 1,000 by moving every digit, and read and write thousandths in standard, word and expanded form, with decimals and with fractions. Then they compare and order decimals to thousandths and round them to the nearest whole number, tenth and hundredth. Place value opens the year because adding, subtracting, multiplying and dividing decimals all stand on it. Lesson 1.5 (one number many ways, and 0.1, 0.01 and 0.001 more or less) is for the states that teach it in 5th grade.

THE UNIT, DAY BY DAY

Day 1	Pre-Check	What students already know, before the first lesson.
Day 2	1.1 Ten times as much, one tenth as much	I can tell how a digit's value changes from place to place.
Day 3	1.2 Powers of ten with exponents	I can write powers of ten with exponents.
Day 4	1.3 Times and divided by 10, 100 and 1,000	I can multiply and divide decimals by powers of ten.
Day 5	1.4 Thousandths in every form	I can read and write decimals to thousandths.
Day 6	1.5 One number many ways ★	I can rename decimals and find a place value more or less.
Day 7	1.6 Compare and order decimals	I can compare and order decimals to thousandths.
Day 8	1.7 Round decimals	I can round decimals to a whole number, tenth or hundredth.
Day 9	Unit Review	The review, to go over together.
Day 10	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

- A place value chart from the millions to the thousandths on chart paper, and one for each student in a sheet protector
- Base-ten blocks: a flat as 1 whole, a rod as a tenth, a small cube as a hundredth
- Hundred grids, and a meter stick marked in centimeters and millimeters
- Digit cards 0 to 9, and decimal cards for comparing and ordering
- Blank number line strips with ten equal jumps, and whiteboards

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



Place Value and Decimals

Lesson 1.1: Ten times as much, one tenth as much

GOAL Students see that each place is worth 10 times the place to its right and $1/10$ of the place to its left, in whole numbers to the millions and in decimals to thousandths.

About 45 minutes

I can tell how a digit's value changes from place to place.

THE LESSON

- 1 Warm up** (5 min) Show a flat, a rod and a small cube. If the flat is 1 whole, what is a rod worth? A cube?
- 2 Teach** (10 min) Write 2.222 in the chart. The first 2 after the point is worth 0.2, the next 0.02: 0.2 is 10 times 0.02, and 0.02 is $1/10$ of 0.2. In 3,300,000 the first 3 is worth 10 times the second. Then $10 \times 0.028 = 0.28$: each digit moves one place left. And $1/10$ of 4,800,000 = 480,000: each digit moves one place right.
Say: "One place to the left, a digit is worth 10 times as much. One place to the right, $1/10$ as much."
- 3 Try it together** (10 min) Pairs build 6.666 with digit cards, write what each 6 is worth, and write a "10 times" and a " $1/10$ of" sentence about two 6s side by side. Then they find 10×0.57 and $1/10$ of 5,200,000.
- 4 Practice** (15 min) Students do sheet 1 of Decimal Place Value to Thousandths; sheet 1 of Place Value to Millions is the same work with whole numbers, for review. Early finishers write a number with a digit worth 100 times the same digit two places to its right.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 1.1** and circle a face beside the "I can" line. On question 1, look for 0.45 and 270,000; 0.0045 or 27,000,000 means the digits moved the wrong way. On question 2, look for 0.4 (or 4 tenths) and 10; 0.04 means the first 4 was read as hundredths, and $1/10$ means the two 4s were compared the wrong way round.

Need help? Build the number with base-ten blocks and trade one block for 10 of the next smaller one to show $1/10$ of it.

Ready for more? Write a number with four 3s, each worth 10 times the 3 to its right.

GET READY

- A place value chart from the millions to the thousandths
- Base-ten blocks: a flat, a rod and a small cube
- Digit cards 0 to 9

WORDS TO USE

ten times as much: worth 10 of it: $10 \times 0.3 = 3$

one tenth of: one of 10 equal parts of it: $1/10$ of 3 is 0.3

ASK

- What is each digit worth?
- Which digit is worth more, and how many times as much?
- Which way do the digits move for $1/10$ of a number?

WATCH FOR

Mixes up which digit is worth more. The digit farther to the left is always worth more.

Writes 10×0.028 as 0.0280. A zero on the end changes nothing. Move each digit one place left: 0.28.

Writes a digit for its value: 6 for the 6 in the hundredths place. Say the place too: 6 hundredths, 0.06.

ON ANIMAL MATH

PRINTABLE

Decimal Place Value to Thousandths: sheet 1

PRINTABLE

Place Value to Millions: sheet 1, for review

MAKER

Expanded Form: Number Range 6-digit (100,000-999,999), whole numbers

QUIZ

Decimal Place Value Quiz: the Thousandths level

EXIT TICKET

5th Grade Place Value and Decimals Exit Tickets: Exit Ticket 1.1

Place Value and Decimals

Lesson 1.2: Powers of ten with exponents

GOAL Students write powers of ten with exponents, $10^3 = 10 \times 10 \times 10 = 1,000$, multiply whole numbers by powers of ten and find a missing exponent.

About 45 minutes

I can write powers of ten with exponents.

THE LESSON

- 1 Warm up** (5 min) Students find 10×10 and $10 \times 10 \times 10$ on whiteboards and count the zeros in each answer.
- 2 Teach** (10 min) Write $10 \times 10 \times 10 = 1,000$ and the short way, 10^3 : 10 is the base and the exponent, 3, counts the tens. Make a table: $10^1 = 10$, $10^2 = 100$, $10^3 = 1,000$; the exponent counts the zeros too. Then $64 \times 10^3 = 64 \times 1,000 = 64,000$, the 64 with 3 zeros. Last, $170 \times 10^2 = 17,000$: 170 has a zero of its own, and 10^2 adds two more.
Say: "The exponent tells how many tens are multiplied. It is also the number of zeros after the 1."
- 3 Try it together** (10 min) Pairs play power match with the cards. Then they find 9×10^3 and 140×10^2 , and the exponent that makes $8,100 = 81$ times a power of ten.
- 4 Practice** (15 min) Students write powers three ways, multiply and find the missing exponents on sheet 1 of Multiplying and Dividing by Powers of Ten. Early finishers write 10 to the 9th power in standard form and find its name.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 1.2** and circle a face beside the "I can" line. On question 1, look for 4 and 100,000; 3 means the $\times$ signs were counted, and 50 means the exponent was read as a factor (10×5). On question 2, look for 250,000 and 2; 25,000 means the zero of 250 was lost, and 100 means the power was written in place of its exponent.

Need help? Write each power out as tens multiplied, then multiply two at a time and count the zeros.

Ready for more? Is 20×10^2 more than, less than or the same as 2×10^3 ? Explain with the zeros.

GET READY

- Power match cards: 10^2 , 10×10 , 100, 10^3 , $10 \times 10 \times 10$ and 1,000
- Whiteboards and markers

WORDS TO USE

exponent: the small raised number; it tells how many 10s are multiplied

power of ten: 10 multiplied by itself, like $10^2 = 100$

base: the number being multiplied, 10 in 10^3

ASK

- What does the exponent tell you?
- How many zeros does 10^3 have? Why?
- How many zeros will 170×10^2 have?

WATCH FOR

Reads 10^3 as $10 \times 3 = 30$. The exponent counts tens multiplied: write $10 \times 10 \times 10$.

Forgets the zeros the number already has: 170×10^2 as 1,700. Count the zeros of 170, then add the exponent: 3 zeros.

Gives 1,000 an exponent of 4, counting the 1. Only the zeros count: 10^3 .

ON ANIMAL MATH

PRINTABLE

Multiplying and Dividing by Powers of Ten: sheet 1

MAKER

Multiplication Fact Drills: Times Tables: Multiples of 10, 100 and 1,000 (the zeros, no exponents)

QUIZ

Decimal Place Value Quiz: the Powers of Ten level

EXIT TICKET

5th Grade Place Value and Decimals Exit Tickets: Exit Ticket 1.2



Place Value and Decimals

Lesson 1.3: Times and divided by 10, 100 and 1,000

GOAL Students multiply and divide by 10, 100 and 1,000, and by 10^1 , 10^2 and 10^3 : times, every digit moves one place left for each 10; divided, one place right.

About 45 minutes

I can multiply and divide decimals by powers of ten.

THE LESSON

- 1 Warm up** (5 min) What is 10 times 4 hundredths? What is $1/10$ of 4 tens? Students show both in the chart.
- 2 Teach** (10 min) Write 2.67 in the chart and multiply by 100: each digit moves two places left, so 2 ones become 2 hundreds: 267. Then $35.8 \div 10 = 3.58$: each digit moves one place right. For $3 \div 1,000$, zeros hold the empty places: 0.003. With exponents, $0.415 \times 10^2 = 41.5$ and $82 \div 10^3 = 0.082$. And 1.9 times 10 to what power is 1,900? Three places, so 10^3 .
Say: "Times 10, 100 or 1,000, the digits move left, one place for each zero. Divided, they move right."
- 3 Try it together** (10 min) Pairs fill in a pattern table: 0.86 times 10^1 , 10^2 and 10^3 , and 470 divided by 10^1 , 10^2 and 10^3 . Then they find the exponent that turns 2.8 into 280.
- 4 Practice** (15 min) Students do sheets 2 and 3 of Multiplying and Dividing by Powers of Ten (arrows in the chart first), then the tables and missing numbers on sheet 4. Early finishers write three problems with the answer 2.09.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 1.3** and circle a face beside the "I can" line. On question 1, look for 67 and 0.052; 6.7 means too few places, and 520 means 5.2 was multiplied. On question 2, look for 2 and 3; 100 and 1,000 mean the power was written in place of its exponent.

Need help? Write the number in a place value chart and draw an arrow for each digit before writing the answer.

Ready for more? Which is greater, 6.2×10^2 or $62,000 \div 10^3$? Explain with the places the digits move.

GET READY

- A place value chart from the thousands to the thousandths
- Whiteboards and markers

WORDS TO USE

multiply by 10: every digit moves one place to the left

divide by 10: every digit moves one place to the right

placeholder zero: a zero that holds an empty place, as in 0.003

ASK

- Which way do the digits move, and how many places?
- Will the answer be greater or less than the number?
- How does the exponent tell you how many places?

WATCH FOR

Puts a zero on the end: 2.67×10 as 2.670. Move every digit one place left: 26.7.

Moves the digits the wrong way when dividing. Ask first: should the answer be greater or less?

Leaves out the zeros that hold places: $3 \div 1,000$ as 0.3. Count the moves: tenths, hundredths, thousandths.

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PRINTABLE

Multiplying and Dividing by Powers of Ten: sheets 2-4

QUIZ

Decimal Place Value Quiz: the Powers of Ten level

EXIT TICKET

5th Grade Place Value and Decimals Exit Tickets: Exit Ticket 1.3



Place Value and Decimals

Lesson 1.4: Thousandths in every form

GOAL Students read and write decimals to thousandths in standard, word and expanded form, with decimals and with fractions. A thousandth is $\frac{1}{10}$ of a hundredth.

About 45 minutes

I can read and write decimals to thousandths.

THE LESSON

- Warm up** (5 min) Students write 0.1 and 0.01 as fractions. What would $\frac{1}{10}$ of a hundredth be?
- Teach** (10 min) Cut a small square of a hundred grid into 10 strips: each is a thousandth, 0.001. Write 3.128 in the chart and read it: three and one hundred twenty-eight thousandths. Expanded, it is $3 + 0.1 + 0.02 + 0.008$, or $3 \times 1 + 1 \times \frac{1}{10} + 2 \times \frac{1}{100} + 8 \times \frac{1}{1000}$. In 1.604 the 0 holds the hundredths, so that place is left out: $1 + 0.6 + 0.004$.
Say: "And" is the decimal point. I read the digits after it as one number and name the last place."
- Try it together** (10 min) Pairs write 9.275 in word form and both expanded forms, then write "twelve and six thousandths" and $20 + 0.5 + 0.007$ in standard form.
- Practice** (15 min) Students do sheet 2 of Decimal Place Value to Thousandths, then the zooming number lines at the top of sheet 3; sheets 1 and 4 of Tenths and Hundredths are a warm up for anyone unsure of tenths and hundredths. Early finishers write 0.375 as a fraction, in words and in expanded form.
- Exit ticket** (5 min) Students do **Exit Ticket 1.4** and circle a face beside the "I can" line. On question 1, look for eight and fifty-nine thousandths; "fifty-nine hundredths" means the last place was misnamed, and "eight point zero five nine" reads digits, not a number. On question 2, look for 43.052; 43.52 means the empty tenths place was left out.

Ready for more? Write 0.4, 0.40 and 0.400 in words. Why are they equal?

GET READY

- A hundred grid with one small square cut into 10 thin strips
- A place value chart to the thousandths

WORDS TO USE

thousandth: one of 1,000 equal parts; 0.001

word form: the number in words; "and" is the point

expanded form: the sum of what each digit is worth

ASK

- What is the last place, and what does it tell you to say?
- Why does 1.604 need a zero?

WATCH FOR

Says "and" at every place. Only the point is "and".

Writes eight thousandths as 0.8. Count three places after the point: 0.008.

Writes $3 + 0.1 + 0.02 + 0.008$ as $3 + 1 + 2 + 8$. Name each digit's place, then what it is worth.

Need help? Write the number in a place value chart and read each digit's value from its column.

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PRINTABLE

Decimal Place Value to Thousandths: sheet 2, and the number lines at the top of sheet 3

PRINTABLE

Decimals: Tenths and Hundredths: sheets 1 and 4, as a warm up

MAKER

Expanded Form: Number Range Decimals to Thousandths; Expanded Form Decimals, Multiply by Place Value or Fractions

QUIZ

Decimal Place Value Quiz: the Word and Expanded Form level

EXIT TICKET

5th Grade Place Value and Decimals Exit Tickets: Exit Ticket 1.4

Place Value and Decimals

Lesson 1.5: One number many ways

GOAL

Students name one decimal in tenths, hundredths and thousandths ($3.8 = 38$ tenths = 380 hundredths = 3,800 thousandths), and find 0.1, 0.01 and 0.001 more or less, trading when a digit is 9 or 0.

About 45 minutes

★ Taught in 5th grade in some states

I can rename decimals and find a place value more or less.

THE LESSON

- 1 **Warm up** (5 min) How many tenths make 1 whole? Hundredths make 1 tenth? Thousandths make 1 hundredth?
- 2 **Teach** (10 min) Build 3.8 with blocks: 3 flats and 8 rods. Trade the flats for rods: 38 rods, so $3.8 = 38$ tenths. Each rod is 10 hundredths, so it is also 380 hundredths, and 3,800 thousandths: write it to the place you want and read it, 3.80 is 380 hundredths. Then 0.01 more than 2.495: 10 hundredths trade for 1 tenth, 2.505. And 0.1 less than 5.064: trade 1 one for 10 tenths, 4.964.
Say: "To rename a decimal, I write it to the place I need and read it as a number of that unit. For 0.1 more or less, I change the tenths digit and trade when I have to."
- 3 **Try it together** (10 min) Pairs rename 0.6 as tenths, hundredths and thousandths, and 12.5 as tenths and hundredths. Then they fill in a table: 0.001, 0.01 and 0.1 more and less than 4.909.
- 4 **Practice** (15 min) Students finish sheet 3 of Decimal Place Value to Thousandths: the other names and the table of 0.001, 0.01 and 0.1 more or less (the number lines at the top go with the lesson before). Early finishers count on by thousandths from 0.995 to 1.005.
- 5 **Exit ticket** (5 min) Students do **Exit Ticket 1.5** and circle a face beside the "I can" line. On question 1, look for 61 and 930; 6.1 or 93 means the number was not read to the unit asked. On question 2, look for 6.094, 6.092, 6.103 and 5.993; 6.0103 means 9 + 1 was written in one place, and 6.993 means tenths were made without taking a one away.

Ready for more? How many thousandths are in 10? Write 10 as tenths, as hundredths and as thousandths.

GET READY

- Base-ten blocks: a flat as 1 whole, a rod as a tenth, a small cube as a hundredth
- A place value chart for each student

WORDS TO USE

rename: write the same number in another unit

0.01 more: one more hundredth: the hundredths digit goes up by 1

trade: swap 10 of one place for 1 of the place to its left, or 1 for 10

ASK

- How many hundredths are in 3.8? How do you know?
- Which digit changes when you add 0.01?
- What happens when that digit is a 9?

WATCH FOR

Renames 3.8 as 38 hundredths. Write it to hundredths, 3.80, then read it: 380 hundredths.

Writes 0.01 more than 2.495 as 2.4910. Each place holds one digit. 10 hundredths make 1 tenth.

Need help? Build the number with base-ten blocks and make each trade with the blocks before writing the new number.

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PRINTABLE

Decimal Place Value to Thousandths: sheet 3

EXIT TICKET

5th Grade Place Value and Decimals Exit Tickets: Exit Ticket 1.5



Place Value and Decimals

Lesson 1.6: Compare and order decimals

GOAL Students compare decimals to thousandths: line up the points, write zeros so both have the same places, and compare from the left, then order sets of decimals.

About 45 minutes

I can compare and order decimals to thousandths.

THE LESSON

- 1 Warm up** (5 min) On the Number Line tool from 4 to 5 by tenths, mark 4.3 and 4.8. Which is greater?
- 2 Teach** (10 min) Write 0.7 and 0.698. Some say 0.698 is greater because 698 is more than 7. Write 0.7 as 0.700: 700 thousandths and 698 thousandths, so $0.7 > 0.698$. The tenths differ first. Then $2.315 < 2.32$: the hundredths differ first. Last, order 3.45, 3.405, 3.5 and 3.054: 3.054, 3.405, 3.45, 3.5.
Say: "I line up the points and compare from the left. The first place where the digits differ decides."
- 3 Try it together** (10 min) Pairs compare 4.7 and 4.69, 6.3 and 6.30, and 8.007 and 8.07, then order 1.25, 1.205, 1.2 and 1.052 and explain the order to another pair.
- 4 Practice** (15 min) Students do sheet 4 of Decimal Place Value to Thousandths; sheet 5 of Tenths and Hundredths is a step back to hundredths. Early finishers write three decimals between 2.31 and 2.32.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 1.6** and circle a face beside the "I can" line. On question 1, look for $<$ and then $>$; a sign the other way means the decimal with more digits was taken as the greater one. On question 2, look for 5.032, 5.23, 5.3; the reverse order means the digits after the point were read as whole numbers.

Need help? Write the numbers in a chart, one under another, with zeros in the empty places, and compare column by column.

Ready for more? Four runners' times were 12.45, 12.405, 12.5 and 12.045 seconds. Which time won the race? Put the times in order.

ON ANIMAL MATH

PRINTABLE

Decimal Place Value to Thousandths: sheet 4

PRINTABLE

Decimals: Tenths and Hundredths: sheet 5, a step back

MAKER

Greater Than / Less Than: Number Range Decimals to Thousandths

TOOL

Number Line: Start 4, End 5, Interval 0.1 (tenths only)

QUIZ

Decimal Place Value Quiz: the Compare and Order level

EXIT TICKET

5th Grade Place Value and Decimals Exit Tickets: Exit Ticket 1.6

GET READY

- Decimal cards for ordering
- The Number Line tool on the board

WORDS TO USE

equivalent decimals: decimals for the same amount: $2.6 = 2.60$

greater than ($>$): the open side faces the greater number

less than ($<$): the point faces the smaller number

ASK

- Where do the digits first differ?
- How do zeros on the end help?
- Where would 0.698 go on a line from 0.69 to 0.70?

WATCH FOR

Thinks more digits means greater: $2.315 > 2.32$. Write both to thousandths: 315 and 320 thousandths.

Lines up the numbers on the right. Line up the decimal points: tenths under tenths.

Calls 8.007 and 8.07 equal. Name the place of each 7.

Place Value and Decimals

Lesson 1.7: Round decimals

GOAL Students round decimals to the nearest whole number, tenth and hundredth: they find the two numbers it is between, then look at the digit to the right of the rounding place.

About 45 minutes

I can round decimals to a whole number, tenth or hundredth.

THE LESSON

- 1 **Warm up** (5 min) Round 7,382 to the nearest hundred. Which digit did you look at?
- 2 **Teach** (10 min) Draw a line from 6.2 to 6.3 in hundredths and place 6.274: it is past the halfway mark, 6.25, so it rounds to 6.3. The rule: underline the tenths digit and look at the digit to its right, 7: round up. To the nearest hundredth, look at the 4: 6.27. To the nearest whole number: 6. Then 4.98 to the nearest tenth: 10 tenths make a one, so 5.0.
Say: "The digit just to the right of the place tells me: 5 or more, round up; 4 or less, it stays."
- 3 **Try it together** (10 min) Pairs round 3.681 and 0.437 to the nearest whole number, tenth and hundredth, then 7.965 to the nearest hundredth and tenth, and say why both round up.
- 4 **Practice** (15 min) Students do the number lines, the table and the circling on sheet 5 of Decimal Place Value to Thousandths. Early finishers round 9.999 to the nearest whole number, tenth and hundredth.
- 5 **Exit ticket** (5 min) Students do **Exit Ticket 1.7** and circle a face beside the "I can" line. On question 1, look for 8, 8.4 and 8.36; 8.3 means the digits were cut off. On question 2, look for 3.0 (or 3), 0.8 and 7.1; 2.10 means the 10 tenths were not traded, 0.9 means 0.849 was rounded twice, and 7.0 means the halfway number was rounded down.

Need help? Draw a number line from the tenth below to the tenth above and mark the halfway point first.

Ready for more? A time rounds to 12.4 seconds. What could it be in hundredths? Find the least and the greatest.

GET READY

- Blank number line strips
- Highlighters to mark the rounding place

WORDS TO USE

round: find the nearest whole number, tenth or hundredth

between: the two tenths on each side, like 6.2 and 6.3

halfway: the middle, like 6.25; it rounds up

ASK

- Which two tenths is it between?
- Which digit tells you which way to round?
- Why write 5.0, not just 5, when you round to tenths?

WATCH FOR

Rounds in steps: 0.347 to 0.35, then to 0.4.

Look only at the digit just right of the place: 0.3.

Writes 4.98 to the nearest tenth as 4.10. Ten tenths make a one: 5.0.

Looks at the wrong digit. Underline the rounding place, then point to the digit just to its right.

ON ANIMAL MATH

PRINTABLE

Decimal Place Value to Thousandths: sheet 5

MAKER

Rounding Numbers: Round to Nearest Tenth (or Nearest Whole Number, Nearest Hundredth)

QUIZ

Decimal Place Value Quiz: the Round Decimals level

EXIT TICKET

5th Grade Place Value and Decimals Exit Tickets: Exit Ticket 1.7