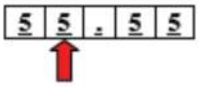
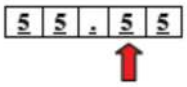
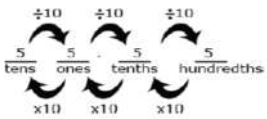
GRADE 5 - MODULE 3 - PLACE VALUE

Big Idea
A quantity can be represented and compared numerically based on the base-ten place value system.
Vocabulary
decimal, tenths, hundredths, thousandths, place value, patterns with place value, powers of ten, exponent, expanded form, comparisons/compare, greater than, less than, equal to, ‹, ›, =, round
Prior Learning
In earlier grades students developed whole number place value understanding and compared whole numbers using the symbols >, <, and = to record the comparisons. Students rounded multi-digit whole numbers to any place value.
Essential Questions
• How can we compare/contrast numbers? • What patterns can be identified in the placement of decimal points when multiplying or dividing using powers of 10? • How can I represent digits in place value through multiplication in powers of 10? • How can you explain the relationship between any two places in a decimal? • What is the procedure in writing a value in expanded form? • Using a model, justify the comparison of two decimals. • How does multiplying or dividing a whole number by a power of 10 affect the product? • What are different ways one can interpret a value of a number? • When comparing decimals, at what place value should you start?
Competencies
• Students will identify place value. • Students will compare decimals to thousandths. • Students will round decimals to any place within thousandths. • Students will represent a decimal using an area model (10 × 10 grid) and connect to fractional notation. • Students will represent a decimal using a linear model, i.e., meter stick. • Students will place a decimal on a number line and justify its location. • Students will use decimal notation for fractions with denominators of 10, 100, and 1000. • Students will read and write multi-digit numbers to the thousandths place using standard, written and expanded form. • Students will compare decimals by reasoning about their size and justify the comparison with models. • Students will record decimal comparisons using appropriate mathematical symbols (>, < and =). • Students will use place value understanding to round decimals to any place. • Students will use whole-number exponents to denote powers of 10.
Misconceptions
• Students may think that when comparing values, the number with more digits has the greater value. While this is true for whole numbers, it is not true for decimals. With whole numbers, a 5-digit number is always greater that a 1-, 2-, 3-, or 4-digit number. However, with decimals a number with one decimal place may be greater than a number with two or three decimal places. • Students may confuse the meaning of the decimal point. When reading a decimal the word “and” is used to indicate that separation. • Students may confuse the place value patterns of whole numbers and decimals.
Resources from The Key Elements to Mathematics Success - KEMS Grade 5 for Building the Conceptual Understanding of this Module
LESSON 4 – PLACE VALUE AND PATTERNS Additional Activities: Quiz – T97-T99; Place Value and Patterns- Chain Reaction - T997 LESSON 5 – READ AND WRITE DECIMALS TO THE THOUSANDTHS PLACE WITH EXPANDED FORM Additional Activities: Quiz – T125-127; Read and Write Decimals to the Thousandths Place with Expanded Form- Scavenger Hunt T998-T999

LESSON 6 – COMPARE AND ROUND DECIMALS TO THOUSANDTHS–
Additional Activities: Quiz – T163; Compare and Round Decimals to Thousandths– Scavenger Hunt T1000

Mathematics Content Standard	Examples
5.NBT.1 Explain the patterns in the place value system from one million to the thousandths place. • Explain that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. • Explain patterns in products and quotients when numbers are multiplied by 1,000, 100, 10, 0.1, and 0.01 and/or divided by 10 and 100.	Students use base ten blocks, pictures of base ten blocks, and interactive images of base ten blocks to manipulate and investigate the place value relationships and the magnitude of numbers. Before considering the relationship of decimal fractions, students express their understanding that in multi-digit whole numbers, a digit in one place represents 10 times what it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left. Example: A student thinks, "I know that in the number 5555, the 5 in the tens place (5555) represents 50 and the 5 in the hundreds place (5555) represents 500. So a 5 in the hundreds place is ten times as much as a 5 in the tens place or a 5 in the tens place is $\frac{1}{10}$ of the value of a 5 in the hundreds place. Base on the base-10 number system digits to the left are times as great as digits to the right; likewise, digits to the right are 1/10th of digits to the left. For example, the 8 in 845 has a value of 800 which is ten times as much as the 8 in the number 782. In the same spirit, the 8 in 782 is 1/10th the value of the 8 in 845. To extend this understanding of place value to their work with decimals, students use a model of one unit; they cut it into 10 equal pieces, shade in, or describe $\frac{1}{10}$ of that model using fractional language ("This is 1 out of 10 equal parts. So it is $\frac{1}{10}$". I can write this using $\frac{1}{10}$ or 0.1"). They repeat the process by finding $\frac{1}{10}$ of a $\frac{1}{10}$ (e.g., dividing $\frac{1}{10}$ into 10 equal parts to arrive at $\frac{1}{100}$ or 0.01) and can explain their reasoning, "0.01 is $\frac{1}{10}$ of $\frac{1}{10}$ thus is $\frac{1}{100}$ of the whole unit." In the number 55.55, each digit is 5, but the value of the digits is different because of the  placement. The 5 that the arrow points to is $\frac{1}{10}$ of the 5 to the left and 10 times the 5 to the right. The 5 in the ones place is $\frac{1}{10}$ of 50 and 10 times five tenths.  The 5 that the arrow points to is $\frac{1}{10}$ of the 5 to the left and 10 times the 5 to the right. The 5 in the tenths place is 10 times five hundredths. 
Questions for 5.NBT.1	

1. Wallace and Logan were arguing about the size of 2 numbers. Wallace thought eight-tenths was ten times larger than eight-hundredths. Logan thought eight-hundredths was ten times larger than eight-tenths. Who is correct?

2. Danny and Terry were playing a game where they drew digits and placed them on a game board. Danny built the number 247. Terry built the number 724.

3. Which of the following values shows a number with a 7 that is $\frac{1}{10}$ of the value of the 7 in the number 8745?

A. 874.5 B. 87.45 C. 8.745 D. 0.8745

4. What is the value of the 5 in both of the numbers below?

1459 _____ 1549_____

Explain the relationship between the two values represented by the 5.

5. Write an odd number that is greater than 10,000 but less than 14,000.

6. Write the number that is 10 times smaller than 100. _____

Write the number that is 10 times smaller than 40. _____

Write the number that is 10 times larger than 40. _____

7. Explain the relationship between the two 8's in the number 9,885.

8. Write the number that is 10 times smaller than 90. _____

Write the number that is 10 times smaller than 130. _____

Write the number that is 10 times larger than 80. _____

Answer Key for Questions for 5.NBT.1

1. Wallace is correct. Eight-tenths (0.8) is ten times larger than eight-hundredths (0.08)

2. The 2 in Danny's number is 10 ten times larger than the 2 in Terry's number.
The 4 in Terry's number is 10 times smaller than the 4 in Danny's number.

3. A. 874.5

4. 5 tens, or 50 5 hundreds, or 500

5. Answers will vary. Ex: 12,951

6. 10 is 10 times smaller than 100. 4 is 10 times smaller than 40. 400 is 10 times larger than 40.

7. Answers may vary.
Ex: The 8 in the hundreds place represents 800, while the 8 in the tens place represents 80.

8. Write the number that is 10 times smaller than 90. 9
Write the number that is 10 times smaller than 130. 13
Write the number that is 10 times larger than 80. 800

Tasks for 5.NBT.1

*Teacher Note: Please read the Commentary section for the Illustrative Math Tasks. Some tasks will be instructional requiring more teacher modeling and direction. Others will provide the opportunity for students to demonstrate their knowledge of a concept.

Illustrative Math Task: Kipton's Scale
https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/1/tasks/1562

Illustrative Math Task: Tenths and hundredths
https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/1/tasks/1800
Illustrative Math Task: Which Number Is It?
https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/1/tasks/1799
Illustrative Math Task: Millions and Billions of People

https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/1/tasks/1931
Illustrative Math Task: Millions and Billions of People

https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/1/tasks/1931

Illustrative Math Task: Marta's Multiplication Error
https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/2/tasks/1524
Illustrative Math Task: Multiplying Decimals by Ten
https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/2/tasks/1620

Extra Questions for Warm-ups and Homework for 5.NBT.1

1. Barbie is working on her math homework. The last problem she has to complete is question about expanded form. She is given the number written in expanded form and has to write the standard form. What is the value below written in standard form?$(1 \times 10) + (8 \times 1) + (0 \times 0.1) + (7 \times 0.01)$

2. Is the following statement true or false about the number below? Explain your answer.

5774

The 7 in the hundreds place is 10 times greater than the value of the 7 in the tens place.

3. What is the relationship between the two 5's in the number 455,721?

4. Write the number that is 10 times smaller than 100. _____

5. Write the number that is 10 times smaller than 40. _____

6. Write the number that is 10 times larger than 40. _____

Mathematics Content Standard	**Examples**
5.NBT.3 Read, write, and compare decimals to thousandths. • Write decimals using base-ten numerals, number names, and expanded form. • Compare two decimals to thousandths based on the value of the digits in each place, using >, =, and < symbols to record the results of comparisons.	Expanded form is included to build upon work in 5.NBT.1 and deepen students' understanding of place value. Students build on their understanding and connect their prior experiences with using decimal notation. They use concrete models and number lines to extend this understanding to decimals to the thousandths. Models may include base ten blocks, place value charts, grids, pictures, drawings, manipulatives, technology-based, etc. They read decimals using fractional language and write decimals in fractional form, as well as in expanded notation. This investigation leads them to understanding equivalence of decimals (0.8 = 0.80 = 0.800). e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (\frac{1}{10}) + 9 \times (\frac{1}{100}) + 2 \times (\frac{1}{1000})$. Example: Some equivalent forms of 0.72 are: $\frac{72}{100}$ $\frac{70}{100} + \frac{2}{100}$ $\frac{7}{10} + \frac{2}{100}$ 0.720 $7 \times (\frac{1}{10}) + 2 \times (\frac{1}{100})$ $7 \times (\frac{1}{10}) + 2 \times (\frac{1}{100}) + 0 \times (\frac{1}{1000})$ $0.70 + 0.02$ $\frac{720}{1000}$

	Students need to understand the size of decimal numbers and relate them to common benchmarks such as 0, 0.5 (0.50 and 0.500), and 1. Comparing tenths to tenths, hundredths to hundredths, and thousandths to thousandths is simplified if students use their understanding of fractions to compare decimals. Example: Comparing 0.25 and 0.17, a student might think, "25 hundredths is more than 17 hundredths". They may also think that it is 8 hundredths more. They may write this comparison as 0.25 > 0.17 and recognize that 0.17 < 0.25 is another way to express this comparison. Comparing 0.207 to 0.26, a student might think, "Both numbers have 2 tenths, so I need to compare the hundredths. The second number has 6 hundredths and the first number has no hundredths so the second number must be larger. Another student might think while writing fractions, "I know that 0.207 is 207 thousandths (and may write $\frac{207}{1000}$). 0.26 is 26 hundredths (and may write $\frac{26}{100}$) but I can also think of it as 260 thousandths ($\frac{260}{1000}$). So, 260 thousandths is more than 207 thousandths.

Questions for 5.NBT.3

1. Write the following decimals in standard form:

A. Twenty-seven and fourteen hundredths _____

B. Thirteen and eight thousandths_____

C. Two and five hundred sixty-one thousandths_____

2. Mike's teacher asked him to write 987.654 in expanded notation. Mike wrote 900 + 80 + 7 + 0.6 + 0.50 + 0.400

Is Mike correct? Explain your thinking.

3. Write the number that is represented by the following expanded form:

(7 x 10) + (2 x 1) + (3 x 0.1) + (2 x 0.01)

4.

A number greater than 40 with a 5 in the tenths place	
A number between 200 and 300 with a 7 in the thousandths place and a 2 in the hundredths place	
A number greater than 18.55 and less than 18.6	

5. Name a number that is greater than $34\frac{1}{2}$ where the value of the digit in the thousandths place is greater than 5.

6. Which of the following expressions shows the value of 356.34 written in expanded notation?

A. $(3 \times 100) + (5 \times 10) + (6 \times 1) + (3 \times \frac{1}{10}) + (4 \times \frac{1}{100})$

B. $(3 \times 10) + (5 \times 1) + (3 \times \frac{1}{10}) + (4 \times \frac{1}{100})$

C. $(3 \times 1{,}000) + (5 \times 100) + (6 \times 10) + (3 \times \frac{1}{10}) + (4 \times \frac{1}{100})$

D. $(3 \times 100) + (5 \times 100) + (6 \times 10) + (4 \times \frac{1}{10}) + (3 \times \frac{1}{100})$

7. Which of the following expressions shows the value of 207.58 written in expanded notation?

A. $(2 \times 100) + (7 \times 1) + (5 \times \frac{1}{10}) + (8 \times \frac{1}{100})$

B. $(2 \times 10) + (7 \times 1) + (5 \times \frac{1}{10}) + (8 \times \frac{1}{100})$

C. $(2 \times 1{,}000) + (7 \times 100) + 8 \times \frac{1}{10}) + (5 \times \frac{1}{100})$

D. $(2 \times 100) + (7 \times 100) + (8 \times \frac{1}{10}) + (8 \times \frac{1}{100})$

8. Which of the following answer choices are true statements?

A. 44. 3 > 43.4 B. 18.9 < 1.89 C. 47.7 > 4.77 D. 65.20 = 65.02

9. Which of the following answer choices is NOT a true statement?

A. 134.9 > 13.49 B. 54.0 < 540 C. 28.08 > 28.80 D. 147.17 = 147.17

10. Which of the following answer choices is a true statement?

A. 67.49 > 67.94 B. 100.09 < 100.90 C. 23.66 > 23.60 D. 511.01 = 511.10

11. The track team held a practice race on Friday. The following times were recorded:

Student	Time
Kia	2.165 seconds
Tamekia	2.156 seconds
Kelis	2.144 seconds
Ariana	2.15 seconds

Which of the following lists of names is in the correct order from the fastest time to the slowest time?

A. Kia, Tamekia, Kelis, Ariana

B. Kia, Tamekia, Ariana, Kelis

C. Kelis, Ariana, Tamekia, Kia

D. Ariana, Kelis, Tamekia, Kia

12. Johnny, Kevin, and Sam all play on a little league baseball team. Johnny's batting average is 0.445. Kevin's batting average is 0.332, and Sam's batting average is 0.25. Which answer shows the batting averages in order from least to greatest?

A. 0.445, 0.332, 0.25 B. 0.332, 0.445, 0.25 C. 0.25, 0.332, 0.445 D. 0.25, 0.445, 0.332

13. The table below shows the results of the Men's 100 Meter Freestyle Final at the London 2012 Olympics. Put the countries in order from first to last place.

Country	Time (in seconds)
Australia	45.53
Brazil	47.92
Canada	47.8
Cuba	48.04
France	47.84
Netherlands	47.88
Russia	48.44
United States	47.52

14. Use one of the following symbols to make the statement below true. Explain the strategy that you use to compare the two values.

< > =

143.450_____143.54

15. Name a number that is greater than 75.5 where the value of the digit in the thousandths place is greater than 5.

16. Use the <, >, or = symbol to compare the two decimals. Explain the strategy that you used to compare the decimals.

3.65 _____ 3.015

17. Write >, <, or = in the circle to compare the decimals. Explain your thinking.

78.170 ◯ 78.17

Answer Key for Questions for 5.NBT.3

1. A. 27.14 B. 13.008 C. 2.561

2. No, the hundredths and thousandths are incorrect.
Correct answer should be 900 + 80 + 7 + 0.6 + 0.05 + 0.004

3. (7 × 10) + (2 × 1) + (3 × 0.1) + (2 × 0.01) = 72.32

4. Answers will vary
Ex: 45.5
250.927
18.57

5. Answers will vary.
Ex: 37.847

6. A. $(3 \times 100) + (5 \times 10) + (6 \times 1) + (3 \times \frac{1}{10}) + (4 \times \frac{1}{100})$

7. A. $(2 \times 100) + (7 \times 1) + (5 \times \frac{1}{10}) + (8 \times \frac{1}{100})$

8. A. 44.3 > 43.4 **C. 47.7 > 4.77**

9. C. 28.08 > 28.80

10. B. 100.09 < 100.90 **C. 23.66 > 23.60**

11. C. Kelis, Ariana, Tamekia, Kia

12. C. 0.25, 0.332, 0.445

13. Australia, United States, Canada, France, Netherlands, Brazil, Cuba, Russia

14. 143.450___<___143.54
Explanations will vary.
Ex: Since the whole number place values are the same, start with the tenths place. The 5 is greater than the 4, so 143.54 is larger than 143.450.

15. Answers will vary.
Ex: 154.248

16. 3.65 > 3.015
The number in the tenths place in 3.65 is larger than the number in the tenths place in 3.015.

17. 78.170 = 78.17
The last zero in 78.170 is not necessary and can be removed.

Tasks for 5.NBT.3

*Teacher Note: Please read the Commentary section for the Illustrative Math Tasks. Some tasks will be instructional requiring more teacher modeling and direction. Others will provide the opportunity for students to demonstrate their knowledge of a concept.

Illustrative Math Task: Placing Thousandths on the Number Line
https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/3/tasks/1803
Illustrative Math Task: Comparing Decimals on the Number Line
https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/3/tasks/1802
Illustrative Math Task: Drawing Pictures to Illustrate Decimal Comparisons
https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/3/tasks/1801

Extra Questions for Warm-ups and Homework for 5.NBT.3

1. Write the decimal 149.876 using expanded form and number names

2. Write the following value in expanded form. 4562.806

3. Michael has 4 pieces of wood. The lengths of the pieces of wood are 3.35 inches, 3.46 inches, 3.01 inches, and 3.33 inches long. Write the lengths in order from shortest to longest.

4. Use the following symbols to compare the decimals: <, >, =
13.04_____13.4 12.7_____12.70 25.172_____25.127 109.67_____109.76

5. Josie has saved $34.15 for her field trip. Her friend Tanya has saved $34.51. Which girl has saved the most money? Use a place value chart to explain your answer.

Mathematics Content Standard	Examples
5.NBT.7	

~~Compute and solve real-world problems with multi-digit whole numbers and decimal numbers.~~
~~• Add and subtract decimals to thousandths using models, drawings or strategies based on place value.~~
~~• Multiply decimals with a product to thousandths using models, drawings, or strategies based on place value.~~
~~• Divide a whole number by a decimal and divide a decimal by a whole number, using repeated subtraction or area models. Decimals should be limited to hundredths.~~
• Use estimation strategies to assess reasonableness of answers.

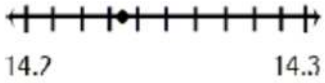
This standard requires students to use estimation strategies to determine if an answer is reasonable. For example:

- When adding 3.6 + 1.7, a student may estimate the sum to be larger than 5 because 3.6 is more than 3 ½ and 1.7 is more than 1 ½.
- When subtracting 5.4 – 0.8, a student may estimate the answer to be a little more than 4 because a number less than 1 is being subtracted.
- When multiplying 6 × 2.6, a student may estimate an answer between 12 and 18 because 6 × 2 = 12 and 6 × 3 = 18. Another student may give an estimate of about 15 because 2.6 is about halfway between 2 and 3 and 15 is halfway between 12 and 18.

Students should go beyond simply applying an algorithm or procedure for rounding, but instead, have a deep understanding of place value and number sense and be able to explain and reason about the answers they get when they round. Students should have numerous experiences using a number line to support their work with rounding.

Example1: Round 14.235 to the nearest tenth.

Students recognize that the possible answer must be in tenths thus, it is either 14.2 or 14.3. They then identify that 14.235 is closer to 14.2 (14.20) than to 14.3 (14.30).

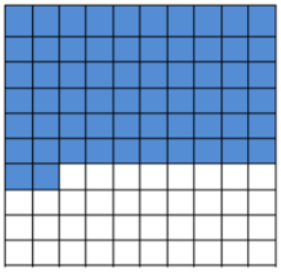


Students should use benchmark numbers to support this work. Benchmarks are convenient numbers for comparing and rounding numbers. 0., 0.5, 1, 1.5 are examples of benchmark numbers.

Example 2: Which benchmark number is the best estimate of the shaded amount in the model below? Explain your thinking.

Questions for 5.NBT.7

1. My number, rounded to the nearest tenth place is 6.4. Justify your answer.



What might my number be? _____

2. The number 9.37 rounded to the nearest tenth is 9.4. Is the correct? Why or why not?

3. Which of the following decimals would round to 15.6 when rounded to the nearest tenth?

A. 15.57 B. 15.7 C. 14.6 D. 15.49 E. 15.63

4. Round the number below to tenths. 87.459 Round the number below to hundredths. 87.459

Are the two rounded values equal? If not, explain why.

5. Select 3 numbers that round to 7.5 when rounded to the nearest tenth.

7.41 7.53 7.46 7.49 6.49 7.51

6. Which is greater: 1.07 or 1.70 ? _____Explain your answer.

7. In a relay race, each runner runs 200 yards. The individual times are below. Round each person's time to the nearest tenth and to the nearest second.

Team A		**Round to the nearest tenth.**	**Round to the nearest second.**
Sarah	19.54 seconds		
Lisette	20.07 seconds		
Bridget	19.46 seconds		
Monica	19.44 seconds		

Answer Key for Questions for 5.NBT.7

1. Answers will vary
Ex: 6.362

2. Yes, since the number in the hundredths place is a 7, it would cause the number in the tenths place to round up.

3. A. 15.57
E. 15.63

4. 87.459 rounded to tenths is 87.5.
87.459 rounded to hundredths is 87.46.
The two rounded values are not equal.
(Explanations will vary.)

5. Answers can include:
7.53 7.49 7.46 7.51

6. 1.07 < 1.70
The number in the tenths place is larger in 1.70 than in 1.07.

7.

Team A		**Round to the nearest tenth**	**Round to the nearest second**
Sarah	**19.54 seconds**	**19.5**	**20**
Lisette	**20.07 seconds**	**20.1**	**20**
Bridget	**19.46 seconds**	**19.5**	**19**
Monica	**19.44 seconds**	**19.4**	**19**

Tasks for 5.NBT.7

*Teacher Note: Please read the Commentary section for the Illustrative Math Tasks. Some tasks will be instructional requiring more teacher modeling and direction. Others will provide the opportunity for students to demonstrate their knowledge of a concept.

Illustrative Math Task: Rounding to Tenths and Hundredths
https://tasks.illustrativemathematics.org/content-standards/5/NBT/A/4/tasks/1804

Extra Questions for Warm-ups and Homework for 5.NBT.7

1. Select 3 numbers that round to 3.5 when rounded to the nearest tenth.

3.48	3.59	3.52
3.61	3.39	3.54

2. My number rounded to the nearest tenth place is 12.7.

What might my number be? _____ Justify your answer.

3. Gary and Joe were working on a math assignment. They were rounding a list of numbers to the nearest hundredth. They came to the last problem which was the number 15.565.

Gary said that if the value was rounded to the nearest hundredth, it was 15.60. Joe said that the value rounded to the nearest hundredth was 15.57. Which student was correct and why?

4. Round the following number to the nearest hundredth. 415.762

Works Referenced in the Development of the Module	
Common Core State Standards Initiative www.corestandards.org	Ohio Department of Education http://education.ohio.gov/Topics/Learning-in-Ohio/Mathematics
Illustrative Mathematics Project https://illustrativemathematics.org/	North Carolina Math Tools for Teachers https://tools4ncteachers.com/
Mathematics Assessment Project https://www.map.mathshell.org/index.php	Smarter Balanced Assessment Consortium https://smarterbalanced.org/
PARCC http://parcconline.org/	Utah Education Network https://www.uen.org/core/math/
NOYCE Foundation: https://www.insidemathematics.org/	