TEKS Cluster: Representation and Comparison of Whole Numbers

2.2 **Number and operations.** The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value.

Connected Knowledge and Skills 2.7

Representation of Whole Numbers

Readiness Standards

2.2(B) use standard, word, and expanded forms to represent numbers up to 1,200

Supporting Standards

2.2(A) use concrete and pictorial models to compose and decompose numbers up to 1,200 in more than one way as a sum of so many thousands, hundreds, tens, and ones

Comparison of Whole Numbers

Readiness Standards

2.2(D) use place value to compare and order whole numbers up to 1,200 using comparative language, numbers, and symbols (>, <, or =)

Supporting Standards

2.2(C) generate a number that is greater than or less than a given whole number up to 1,200

2.2(E) locate the position of a given whole number on an open number line

2.2(F) name the whole number that corresponds to a specific point on a number line

2.7(B) use an understanding of place value to determine the number that is 10 or 100 more or less than a given number up to 1,200

TEKS Scaffold

TEKS	Student Expectation
3.2(A)	compose and decompose numbers up to 100,000 as a sum of so many ten thousands, so many thousands, so many hundreds, so many tens, and so many ones using objects, pictorial models, and numbers, including expanded notation as appropriate (R)
2.2(B)	**2.2 Number and operations.** The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to: **(B) use standard, word, and expanded forms to represent numbers up to 1,200**
1.2(C)	use objects, pictures, and expanded and standard forms to represent numbers up to 120 (R)
K.2(I)	compose and decompose numbers up to 10 with objects and pictures (R)

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Content Builder (see Appendix for Tree Diagram)

- Use standard form to represent numbers up to 1,200
- Use word form to represent numbers up to 1,200
- Use expanded form to represent numbers up to 1,200

Instructional Implications

As students begin representing numbers through 1,200 using base ten blocks [see 2.2(A)], their understanding should also be associated with writing numbers in standard form (e.g., 827), word form (e.g., eight hundred twenty-seven), and expanded form (e.g., 827 = 800 + 20 + 7). Base ten block representation allows students to focus on the value of each digit and support the understanding of the place value system (e.g., eight flats represent the value 800; two ten longs represent the value of 20; seven unit cubes represent the value of 7; 800 + 20 + 7 = 827). Since Grade 2 introduces the thousands period, it is essential to explain the use of the comma to separate the periods (e.g., 1,243: the comma separates the ones/unit period from the thousands period). In representing numbers in word form, be sure to emphasize the correct use of the hyphen (e.g., twenty-three).

Learning from Mistakes

Students may make the following mistakes:

- Incorrectly using the word “and” to represent numbers in words (e.g., 345 is represented as “three hundred forty-five,” not “three hundred and forty-five”)
- Not using the hyphen when representing numbers in words (e.g., 345 is written as “three hundred forty five”)
- Confusing the place value a digit is in with its value (e.g., when asked the value of the 4 in 345, students respond “in the tens place or 4” instead of 40)
- Confusing the terms digit and number

Academic Vocabulary

expanded form
place value
- ones
- tens
- hundreds
- thousands

standard form
word form

2.2(A)

2.2 Number and operations. The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to:

(A) use concrete and pictorial models to compose and decompose numbers up to 1,200 in more than one way as a sum of so many thousands, hundreds, tens, and ones

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Academic Vocabulary

digit
place value
- ones
- tens
- hundreds
- thousands

Role in Concept Development

Supports

- 3.2(A) compose and decompose numbers up to 100,000 as a sum of so many ten thousands, so many thousands, so many hundreds, so many tens, and so many ones using objects, pictorial models, and numbers, including expanded notation as appropriate
- 2.2(B) use standard, word, and expanded forms to represent numbers up to 1,200

Connection/ Relevance

The use of concrete objects (base ten blocks) and pictorial models to represent numbers through 1,200 supports students' conceptual understanding of the magnitude of numbers and the relationship between the place values. This knowledge extends to relating those visual representations to expanded notation, supporting the comparing/ordering of numbers, and developing addition/subtraction place value algorithms.

When to Teach

- Before/Prerequisite to 3.2(A)
- With 2.2(B)

Instructional Implications

Through the use of base ten blocks, students begin to visually understand the magnitude of numbers (e.g., the thousand cube is ten times more than the hundred flat, the hundred flat is ten times more than the ten long; the hundred flat is ten times smaller than the thousand cube, the ten long is ten times smaller than the hundred flat, etc.). Students need to understand that the digit in the number represents its place value, which is different from the value of the number (e.g., in the number 124, the digit two is in the tens place represented by two ten longs, but it is valued at 20). Numbers should be represented in more than one way (e.g., the number 589 can be represented as the sum of 5 hundreds, 8 tens, and 9 ones; or 4 hundreds, 18 tens, and 9 ones; or 5 hundreds, 7 tens, and 19 ones). This understanding lends itself to regrouping in subtraction (e.g., 589 – 192 = ___; 589 would have to be regrouped into 4 hundreds, 18 tens, and 9 ones). Composing and decomposing numbers should also include working with compatible numbers (124 can be decomposed to 50 + 50 + 20 + 4).

Learning from Mistakes

Students may make the following mistakes:
- Misunderstanding the procedure for counting on with hundreds, tens, and ones (e.g., given 11 flats, 3 longs, and 2 unit cubes, student counts 1100, 10, 20, 30, 1, 2 instead of 1100, 1110, 1120, 1130, 1131, 1132)

2.2(D) Readiness

Subcluster: Comparison of Whole Numbers

TEKS Scaffold

TEKS	Student Expectation
3.2(D)	compare and order whole numbers up to 100,000 and represent comparisons using the symbols >, <, or = (R)
2.2(D)	**2.2 Number and operations.** The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to: **(D) use place value to compare and order whole numbers up to 1,200 using comparative language, numbers, and symbols (>, <, or =)**
1.2(G)	represent the comparison of two numbers to 100 using the symbols >, <, or = (R)
K.2(H)	use comparative language to describe two numbers up to 20 presented as written numerals (R)

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Content Builder (see Appendix for Tree Diagram)

- Use place value to compare numbers up to 1,200 using:
  - comparative language
  - numbers
  - symbols (>, <, =)
- Use place value to order numbers up to 1,200 using:
  - comparative language
  - numbers
  - symbols (>, <, =)

Instructional Implications

As students compare the value of numbers, they need to demonstrate their understanding of place value (e.g., the number 342 is greater than 226 because the digit 3 in 342 means there are 3 hundreds which is a value of 300. However, the first digit 2 in 226 means there are only 2 hundreds and has a value of 200). Using expanded notation (e.g., 300 + 40 + 2 is greater than 200 + 20 + 6) helps students grasp this concept. Students compare two numbers using the correct academic vocabulary (e.g., 342 is greater than 226). It is important for students to recognize the inverse comparison statement as well (e.g., 226 is less than 342). The use of the comparative language is critical before moving to the symbolic representation.

It is important for students to recognize how their language can be communicated using symbols (>, <, =). It is critical that students do not learn how to read each of the symbols using a trick to remember directionality of the symbols (e.g., the alligator's mouth eats the bigger number). Encourage students to write and articulate two comparison statements during activities (e.g., 342 > 226 and 226 < 342).

The standard also has students ordering three or more numbers from least to greatest or greatest to least. The use of open number lines [see 2.2(E)/(F)] allows students to order more efficiently. The increase in the value of numbers from left to right on a number line can be associated to ordering from least to greatest; the decrease of numbers from right to left on a number line can be associated to ordering from greatest to least.

Learning from Mistakes

Students may make the following mistakes:

- Relying on a trick to determine the direction of an inequality sign and not reading comparison symbols correctly (e.g., the alligator's mouth eats the bigger number)
- Viewing a comparison statement and its inverse as two different comparison statements (e.g., thinking 456 > 412 is a different comparison than 412 < 456)
- Confusing the place value a digit is in with its value (e.g., when asked the value of the 4 in 345, students respond "in the tens place or 4" instead of 40)
- Confusing the terms "digit" and "number"

Academic Vocabulary

> (greater than)
< (less than)
= (equal to)
greatest to least
least to greatest

2.2(C) **2.2 Number and operations.** The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to:

(C) generate a number that is greater than or less than a given whole number up to 1,200

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Academic Vocabulary

greater than
less than

Role in Concept Development

Supports

- 3.2(D) compare and order whole numbers up to 100,000 and represent comparisons using the symbols >, <, or =
- 2.2(D) use place value to compare and order whole numbers up to 1,200 using comparative language, numbers, and symbols (>, <, or =)

Connection/ Relevance

Generating a number greater than or less than a given whole number allows students to focus on the value of various digits in a number before moving to the abstract use of comparison symbols (<, >, =).

When to Teach

- Before/Prerequisite to 3.2(D)
- With 2.2(D)

Instructional Implications

As students become more confident using the place value system through use of base-ten blocks [2.2(A)] and expanded notation [2.2(B)], instruction should include students generating a number “greater than” or “less than” a given whole number. Students should be able to explain that the position of each digit in a numeral determines the magnitude of a given number (e.g., given the number 437, students understand that the digit four represents the number of hundred flats and its value is 400; the digit three represents the number of ten longs and its value is 30). It is important for students to demonstrate their understanding of this concept before they begin abstractly comparing two given numbers [2.2(D)] so students can demonstrate understanding of place value.

Learning from Mistakes

Students may make the following mistakes:

- Misunderstanding that the position of the digit determines its value (e.g., mistaking 1,006 for one hundred six or writing 1008 when asked to record one hundred eight)

2.2(E) **2.2 Number and operations.** The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to:

(E) locate the position of a given whole number on an open number line

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Academic Vocabulary

place value

Role in Concept Development

Supports

- 3.2(D) compare and order whole numbers up to 100,000 and represent comparisons using the symbols >, <, or =
- 2.2(D) use place value to compare and order whole numbers up to 1,200 using comparative language, numbers, and symbols (>, <, or =)

Connection/ Relevance

Students can use number lines to compare/order numbers and develop their understanding of place value, the relative position of numbers, and magnitude of numbers. The use of this tool is a critical support mechanism.

When to Teach

Before/Prerequisite to 3.2(D), 2.2(D)

Instructional Implications

An open number line does not have landmark numbers defined, does not have to begin at zero, and should include the use of arrows on both ends of the number line to indicate that the numbers continue beyond what is marked.

Students apply their understanding of the place value system in relation to the relative position on an open number line. As students are given a specific number to locate on an open number line, begin to assess students' understanding of relative magnitude of numbers (e.g., students place the number 352 between 350 and 360; students place the number closer to 350 than 360) and the relative position of numbers (e.g., the number 350 would be indicated first and the number 360 indicated second on an open number line).

Learning from Mistakes

Students may make the following mistakes:

- Confusing the values of the tick marks on a number line between multiples of 10 and/or 100

2.2(F) **2.2 Number and operations.** The student applies mathematical process standards to understand how to represent and compare whole numbers, the relative position and magnitude of whole numbers, and relationships within the numeration system related to place value. The student is expected to:

(F) name the whole number that corresponds to a specific point on a number line

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Academic Vocabulary

place value

Role in Concept Development

Supports

- 3.2(D) compare and order whole numbers up to 100,000 and represent comparisons using the symbols >, <, or =
- 2.2(D) use place value to compare and order whole numbers up to 1,200 using comparative language, numbers, and symbols (>, <, or =)

Connection/ Relevance

Students can use number lines to compare/order numbers and develop their understanding of place value, the relative position of numbers, and magnitude of numbers. The use of this tool is a critical support mechanism.

When to Teach

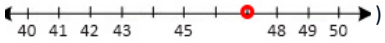
- Before/Prerequisite to 3.2(D)
- With 2.2(D)

Instructional Implications

In contrast to 2.2(E), students are provided a specific location identified on a given number line and asked to name the whole number representing its value. In conjunction with 2.2(E), this activity allows teachers to assess students' understanding of place value, the relative position of numbers, and the magnitude of numbers.

Learning from Mistakes

Students may make the following mistakes:

- Misinterpreting the unmarked location (no numerical label) of a point on a number line (e.g., 

)

2.7 Algebraic reasoning. The student applies mathematical process standards to identify and apply number patterns within properties of numbers and operations in order to describe relationships. The student is expected to:

2.7(B) **(A) use an understanding of place value to determine the number that is 10 or 100 more or less than a given number up to 1,200**

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Academic Vocabulary

10 less
10 more
100 less
100 more

Role in Concept Development

Supports

- 3.2(D) compare and order whole numbers up to 100,000 and represent comparisons using symbols >, <, or =
- 2.2(D) use place value to compare and order whole numbers up to 1,200 using comparative language, numbers, and symbols (>, <, or =)

Connection/ Relevance

Students begin identifying patterns in determining 10 or 100 more/less than a given number. Recognizing the change in the digits reinforces tens and hundreds place value. This standard reinforces place value in support of comparing and ordering whole numbers.

When to Teach

- Before/Prerequisite to 3.2(D)
- With 2.2(D)

Instructional Implications

Students must be able to determine 10 more/10 less or 100 more/100 less of a given number (e.g., ten more than 234 is 244; 100 less than 340 is 240). Instruction might begin with the use of a 100s chart to recognize the patterns of 10 more/10 less (e.g., using your 100s chart, what is 10 more than 23, or what is 10 less than 45?). As students move down a row to model ten more than a number, they should begin relating how the digit in the tens place is increasing by one with each move down a row in a column. As students move up a row in a column to model 10 less than a number, they should begin relating how the digit in the tens place is decreasing with each move up a row.

As students become proficient with addition and subtraction of ten, instruction can extend to 100 more/100 less.

According to 2.7, students also need to connect their findings through the use of properties of numbers and operations (e.g., ten more than 234 is 244 because 234 + 10 = ____; 200 +30 + 4 + 10 = ____; 200 + 30 + 10 + 4 = 200 + 40 + 4 = 244).

Learning from Mistakes

Students may make the following mistakes:

- Misunderstanding that the position of the digit determines its value (e.g., mistaking 1,006 for one hundred six; writing 1008 when asked to record one hundred eight)