STAAR
FIELD GUIDE
FOR TEACHERS

GRADE 4 LEVEL

MATH

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STAAR

The State of Texas of Assessment of Academic Readiness (STAAR) is based on the Texas Essential Knowledge and Skills (TEKS). Most of the state standards, if they are eligible for assessment in a multiple choice/short answer format, will be assessed on STAAR.

STAAR is designed as a **vertical** system. Just as the TEKS are structured in a vertically aligned manner, so is STAAR. Learning from one grade level is aligned with learning at the next grade level. Some skills are developed over the course of a student's educational career from kindergarten through high school, while other skills and learning may begin at a particular grade level and serve as the foundation for later learning. STAAR is an assessment of **academic** readiness.

STAAR is designed to ensure that teachers answer these questions:

- Did students learn what they were supposed to learn in the current year's grade?
- Are students ready for the next grade?
- And are they also ready for the grade after that?

So what's the big deal about that shift? Fundamentally, it requires that teachers relook at curriculum and instruction in a very different way than they have under previous assessment systems (TABS, TEAMS, TAAS, TAKS). Not only are teachers required to have a deep understanding of the content of the grade level they are teaching, but they must also be firmly grounded in how the content of that current grade level prepares students for subsequent grade levels. Overemphasis on grade level attainment ONLY may create a context where teachers in subsequent grade levels have to reteach foundational skills to accommodate for the gap created by the lack of appropriate emphasis earlier. It may require students to "unlearn" previous ways of conceptualizing content and essentially start all over.

STAAR: focus, clarity, depth

[The TEKS] are designed to prepare students to succeed in college, in careers and to compete globally. However, consistent with a growing national consensus regarding the need to provide a more clearly articulated K 16 education program that focuses on fewer skills and addresses those skills in a deeper manner, TEA has further refined the TEKS organization as follows.

STAAR is designed around three concepts: focus, clarity, and depth:

Focus: STAAR will focus on grade level standards that are critical for that grade level and the ones to follow

Clarity: STAAR will assess the eligible TEKS at a level of specificity that allow students to demonstrate mastery

Depth: STAAR will assess the eligible TEKS at a higher cognitive level and in novel contexts

STAAR: the assessed curriculum – readiness, supporting, and process standards

A key concept that underpins the design of STAAR is that all standards (TEKS) do not play the same role in student learning. Simply stated, some standards (TEKS) have greater priority than others - they are so vital to the current grade level or content area that they must be learned to a level of mastery to ensure readiness (success) in the next grade levels. Other standards are important in helping to support learning, to maintain a previously learned standard, or to prepare students for a more complex standard taught at a later grade.

By assessing the TEKS that are most critical to the content area in more rigorous ways, STAAR will better measure the academic performance of students as they progress from elementary to middle to high school. Based on educator committee recommendations, for each grade level or course, TEA has identified a set of readiness standards - the TEKS which help students develop deep and enduring understanding of the concepts in each content area. The remaining knowledge and skills are considered supporting standards and will be assessed less frequently, but still play a very important role in learning.

Readiness standards have the following characteristics:

- They are essential for success in the current grade or course.
- They are important for preparedness for the next grade or course.
- They support college and career readiness.
- They necessitate in-depth instruction.
- They address broad and deep ideas.

Supporting standards have the following characteristics:

- Although introduced in the current grade or course, they may be emphasized in a subsequent year.
- Although reinforced in the current grade or course, they may be emphasized in a previous year.
- They play a role in preparing students for the next grade or course but not a central role.
- They address more narrowly defined ideas.

STAAR assesses the eligible TEKS at the level at which the TEKS were written.

STAAR is a more rigorous assessment than TAKS (and TAAS, TEAMS, TABS before that). The level of rigor is connected with the cognitive level identified in the TEKS themselves. Simply stated, STAAR will measure the eligible TEKS at the level at which they are written.

The rigor of items will be increased by

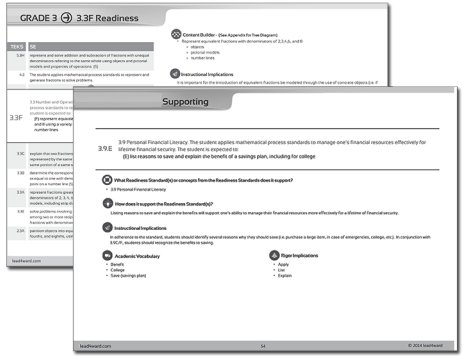
- assessing content and skills at a greater depth and higher level of cognitive complexity
- assessing more than one student expectation in a test item

The rigor of the tests will be increased by

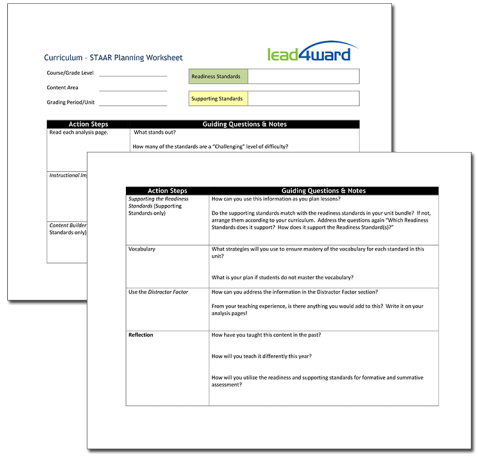
- assessing fewer, yet more focused, student expectations and assessing them multiple times and in more complex ways
- including a greater number of rigorous items on the test, thereby increasing the overall test difficulty

About the STAAR Field Guide for Teachers

The STAAR Field Guide for Teachers is designed as a tool to help teachers prepare for instruction. The tools and resources in this guide are designed to supplement local curriculum documents by helping teachers understand how the design and components of STAAR are connected to the scope and sequence of instruction. In order to help students attain even higher levels of learning as assessed on STAAR, teachers need to plan for increasing levels of rigor. This guide contains the following components:



STAAR Readiness and Supporting Standards Analysis Sheets - overviews of the nature of each readiness and supporting standard assessed on STAAR, designed to be used in planning to build teacher content knowledge and ensure that current grade level instruction reinforces previous learning and prepares students for future grade levels.



STAAR-Curriculum Planning Worksheet - a tool to organize the pages in this guide to be used in planning and professional development.

Steps to Success

1. Download the TEA Documents to add to your STAAR Teacher Field Guide
   - » STAAR Blueprint
   - » Assessed Curriculum Documents
   - » STAAR Test Design
   - » STAAR Reference Materials

2. Visit lead4ward.com/resources to download lead4ward resource materials to add to your STAAR Field Guide
   - » STAAR Snapshot
   - » TEKS Scaffold Documents
   - » IQ Released Tests
   - » Student Recording Sheets

3. Review the STAAR Snapshot for your course/grade level and content area
   - » Note the readiness standards
   - » With your team, explore why those TEKS are classified as readiness standards - and which criteria they meet
   - » Review the supporting standards and note any that may have played a larger role on TAKS

4. Review the components of the STAAR Readiness and Supporting Standards Analysis Sheets
   - » Use the samples on pages 6 and 7 to explore the analysis sheets
   - » Add additional information based on the discussion of the team

5. Create STAAR-Curriculum Planning Packets for each unit or grading period
   - » Collect either the Scope and Sequence document (if it includes the TEKS standards for each unit of instruction) OR Unit Plan documents (where the TEKS standards are bundled together into units of instruction)
   - » The STAAR Field Guide is arranged by standard type (readiness or supporting) in numeric order of the standards. You may need to photocopy certain pages/standards if they are repeated throughout multiple units
   - » Use the scope and sequence or unit plan documents to identify the TEKS taught in each unit/grading period
   - » Compile the STAAR Readiness and Supporting Standards Analysis Sheets that correspond to the TEKS in each unit/grading period
   - » After the pages/standards are sorted into their appropriate unit, create a method of organizing the documents (binder, folder, file, etc.).

6. Plan for instruction
   - » Collect the curriculum documents used for planning
   - » Use the STAAR - Curriculum Planning Worksheet as you plan each unit. The worksheet provides guiding questions and reflection opportunities to aid you in maximizing the material in the STAAR Field Guide
   - » Determine where the team needs additional learning
   - » Evaluate instructional materials
   - » Review the plan for appropriate levels of rigor

How to read STAAR Readiness Standards Analysis Pages

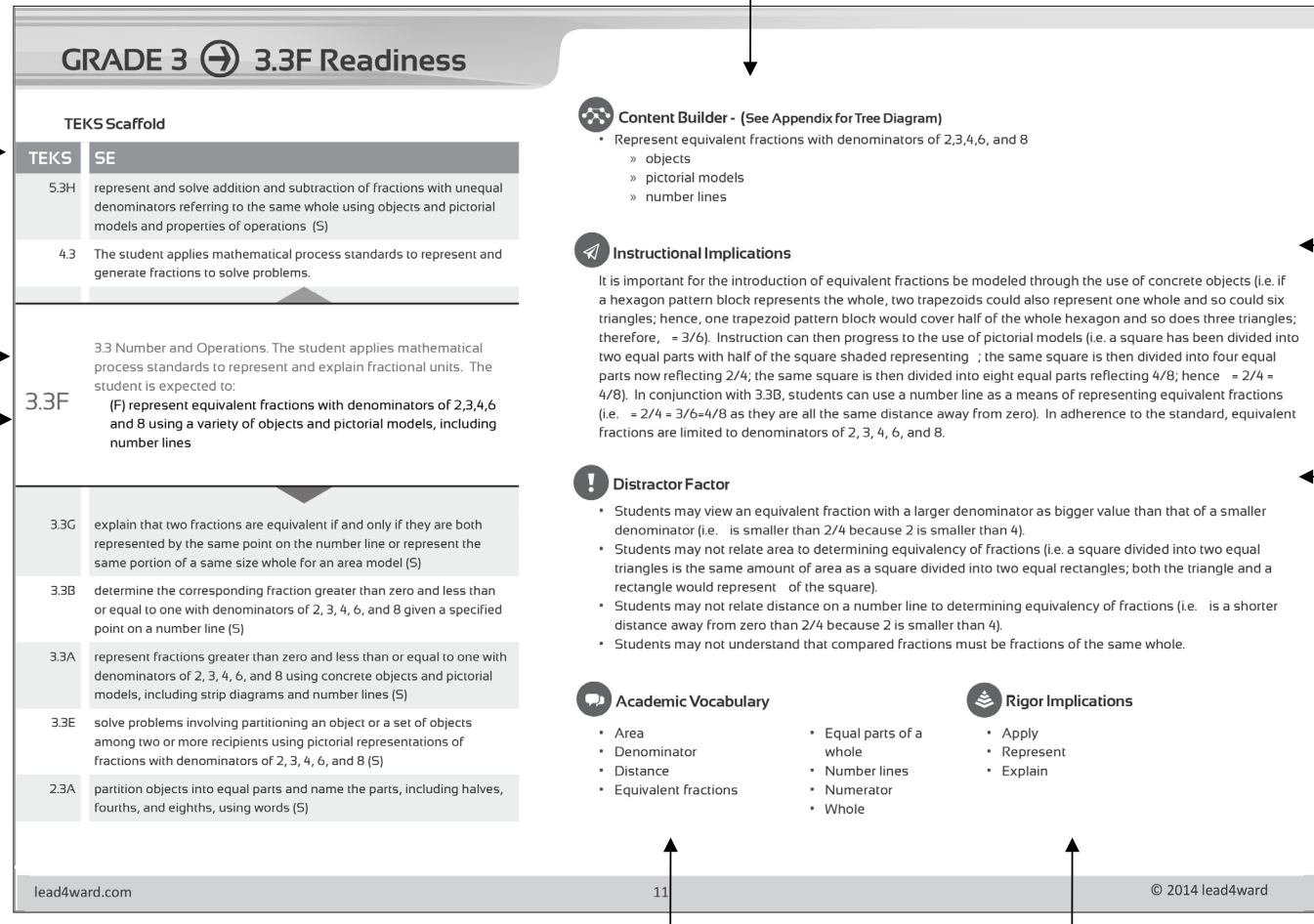
Standard and Indication of "Readiness" or "Supporting"

Content Builder
The basics of the content within the standard are extracted in a bulleted list. Describes multiple measurable parts in a standard - used to select and vary instructional materials.

TEKS Scaffold

Texas Essential Knowledge and Skills Statement

Student Expectation



GRADE 3 → 3.3F Readiness

TEKS Scaffold

TEKS	SE
5.3H	represent and solve addition and subtraction of fractions with unequal denominators referring to the same whole using objects and pictorial models and properties of operations (S)
4.3	The student applies mathematical process standards to represent and generate fractions to solve problems.
	3.3 Number and Operations. The student applies mathematical process standards to represent and explain fractional units. The student is expected to:
3.3F	(F) represent equivalent fractions with denominators of 2,3,4,6 and 8 using a variety of objects and pictorial models, including number lines
3.3G	explain that two fractions are equivalent if and only if they are both represented by the same point on the number line or represent the same portion of a same size whole for an area model (S)
3.3B	determine the corresponding fraction greater than zero and less than or equal to one with denominators of 2, 3, 4, 6, and 8 given a specified point on a number line (S)
3.3A	represent fractions greater than zero and less than or equal to one with denominators of 2, 3, 4, 6, and 8 using concrete objects and pictorial models, including strip diagrams and number lines (S)
3.3E	solve problems involving partitioning an object or a set of objects among two or more recipients using pictorial representations of fractions with denominators of 2, 3, 4, 6, and 8 (S)
2.3A	partition objects into equal parts and name the parts, including halves, fourths, and eighths, using words (S)

Content Builder - (See Appendix for Tree Diagram)
- Represent equivalent fractions with denominators of 2,3,4,6, and 8
  - objects
  - pictorial models
  - number lines

Instructional Implications

It is important for the introduction of equivalent fractions be modeled through the use of concrete objects (i.e. if a hexagon pattern block represents the whole, two trapezoids could also represent one whole and so could six triangles; hence, one trapezoid pattern block would cover half of the whole hexagon and so does three triangles; therefore, = 3/6). Instruction can then progress to the use of pictorial models (i.e. a square has been divided into two equal parts with half of the square shaded representing ; the same square is then divided into four equal parts now reflecting 2/4; the same square is then divided into eight equal parts reflecting 4/8; hence = 2/4 = 4/8). In conjunction with 3.3B, students can use a number line as a means of representing equivalent fractions (i.e. = 2/4 = 3/6=4/8 as they are all the same distance away from zero). In adherence to the standard, equivalent fractions are limited to denominators of 2, 3, 4, 6, and 8.

Distractor Factor
- Students may view an equivalent fraction with a larger denominator as bigger value than that of a smaller denominator (i.e. is smaller than 2/4 because 2 is smaller than 4).
- Students may not relate area to determining equivalency of fractions (i.e. a square divided into two equal triangles is the same amount of area as a square divided into two equal rectangles; both the triangle and a rectangle would represent of the square).
- Students may not relate distance on a number line to determining equivalency of fractions (i.e. is a shorter distance away from zero than 2/4 because 2 is smaller than 4).
- Students may not understand that compared fractions must be fractions of the same whole.

Academic Vocabulary
- Area
- Denominator
- Distance
- Equivalent fractions
- Equal parts of a whole
- Number lines
- Numerator
- Whole

Rigor Implications
- Apply
- Represent
- Explain

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Instructional Implication
Suggestions to modify instruction that support effectively teaching this standard.

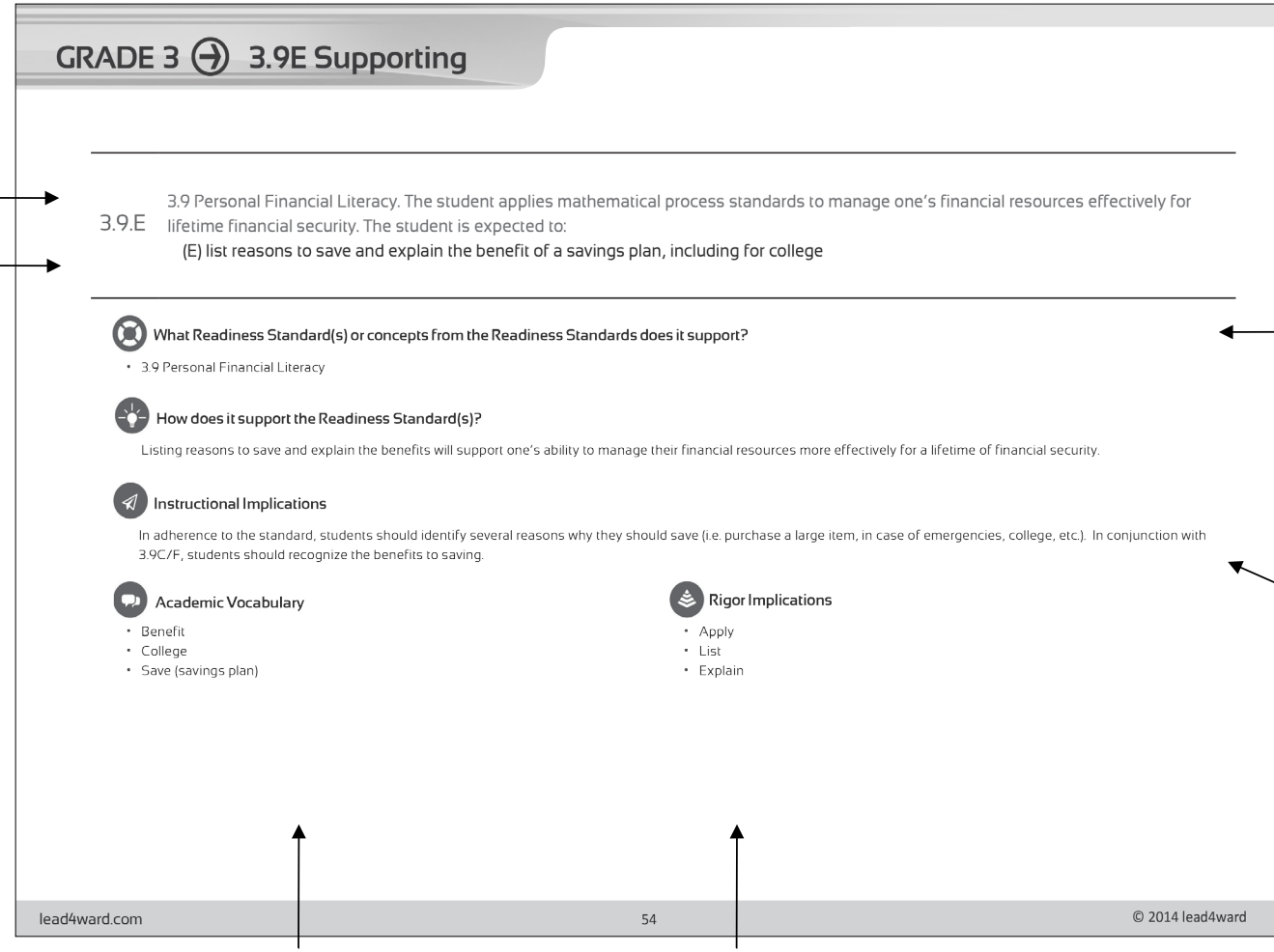
Distractor Factor
Alerts teachers to areas where students traditionally struggle, have misconceptions, or may need reinforcement. Common errors in learning.

Academic Vocabulary
Vocabulary words extracted directly from the standard and/or associated with the instruction of the content within the standard.

Rigor Implications
Uses the verb(s) from the Student Expectation to indicate the cognitive complexity of the standard.

How to read STAAR Supporting Standards Analysis Pages

Standard and Indication of "Readiness" or "Supporting"



Texas Essential Knowledge and Skills Statement

Student Expectation

Supporting the Readiness Standards - Most supporting standards support a readiness standard in the current grade level. This section discusses the relationships of the standards that are often taught together.

Instructional Implication
Suggestions to modify instruction that support effectively teaching this standard.

Academic Vocabulary
Vocabulary words extracted directly from the standard and/or associated with the instruction of the content within the standard.

Rigor Implications
Uses the verb(s) from the Student Expectation to indicate the cognitive complexity of the standard.

Curriculum - STAAR Planning Worksheet

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Course/Grade Level _____

Content Area _____

Grading Period/Unit _____

Readiness Standards	
Supporting Standards	

Action Steps	Guiding Questions & Notes
Read each analysis page.	What stands out? Do you have data on any of the standards that suggest whether the standard is a strength or a concern? How many of the standards are at a high level of rigor?
Instructional Implications	How will these implications inform your planning? How can you use this information to modify instruction?
TEKS Scaffolding	What concepts did students learn in the previous grade to prepare them? Do you have students who may struggle with those concepts? Look at how the students will use that concept in subsequent grades - will the way you teach it still apply in those grades?

Curriculum - STAAR Planning Worksheet (continued)

Action Steps	Guiding Questions & Notes
Content Builder (Readiness Standards only)	How many parts does this standard have? Which of the parts are new to your team or to the students? This content is important for students' future learning. How will you assess retention?
Supporting the Readiness Standards (Supporting Standards only)	How can you use this information as you plan lessons? Do the supporting standards match with the readiness standards in your unit bundle? If not, arrange them according to your curriculum. Address the questions again: "Which Readiness Standards does it support? How does it support the Readiness Standard(s)?"
Vocabulary	What strategies will you use to ensure mastery of the vocabulary for each standard in this unit? What is your plan if students do not master the vocabulary?
Use the *Distractor Factor*	How can you address the information in the Distractor Factor section? From your teaching experience, is there anything you would add to this? Write it on your analysis pages!
Reflection	How have you taught this content in the past? How will you teach it differently this year? How will you utilize the readiness and supporting standards for formative and summative assessment?

GRADE 4 → 4.2B Readiness

TEKS Scaffold

TEKS	SE
5.2A	represent the value of the digit in decimals through the thousandths using expanded notation and numerals (S)
4.2B	**4.2 Number and Operations.** The student applies mathematical process standards to represent, compare, and order whole numbers and decimals and understand relationships related to place value. The student is expected to: (B) represent the value of the digit in the whole numbers through 1,000,000,000 and decimals to the hundredths using expanded notation and numerals
4.2E	represent decimals, including tenths and hundredths, using concrete and visual models and money (S)
3.2A	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)
2.2B	use standard, word, and expanded forms to represent numbers up to 1,200 (R)
2.2A	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 (S)

Content Builder - (See Appendix for Tree Diagram)

- Represent the value of the digit in the whole numbers through 1,000,000,000
  - » expanded notation
  - » numerals
- Represent the value of the digit in tenths
  - » expanded notation
  - » numerals
- Represent the value of the digit in hundredths
  - » expanded notation
  - » numerals

Instructional Implications

In accordance with the standard, students must identify the place value position and represent the value in expanded notation (i.e. 452,638= 4 x 100,000 + 5 x 10,000 + 2 x 1,000 + 6 x 100 + 3 x 10 + 8 x 1). In conjunction with 4.2E/F, as students begin representing decimals with base ten blocks, instruction should related how to represent the values in expanded notation (i.e. if a hundred flat represents one whole then two hundred flats represents two wholes, three ten rods represent three-tenths and five unit cubes represent five-hundredths; 2 x 1 + 3 x 0.1 + 5 x 0.01). The operations of each of these values are not the instructional piece; it is only the representation of the number sentence to communicate the value of each representation that is the focus of this concept. Encourage students to represent a number in more than one way as a means of building flexibility with numbers (i.e. 2.35 can also be represented with two hundred flats, 2 tens rods and 15 unit cubes= 2 x 1 + 2 x 0.10 + 15 x 0.01 = 2 + 0.20 + 0.15). This understanding will lend itself to regrouping in subtraction (i.e. 2.35 - 1.29 = ___; 5 hundredths would have to be regrouped as 15 hundredths).

Distractor Factor

- Students may want to identify the hundredths place value as the oneths.
- Students may not understand the difference between the digit in a given place value and the value of the digit.
- Students may confuse the place value position for a given digit and the value of the digit.
- Students may confuse the value of the base ten blocks as they have been used to represent both whole numbers and fractional parts of a whole.

Academic Vocabulary

- Billions, millions, thousands, hundreds, tens, ones
- Decimals
- Digit
- Expanded notation
- Hundredths and tenths
- Numerals
- Place value

Rigor Implications

- Apply
- Represent
- Compare
- Order
- Understand

GRADE 4 → 4.2G Readiness

TEKS Scaffold

TEKS	SE
6.4G	generate equivalent forms of fractions, decimals, and percents using real-world problems, including problems that involve money (R)
5.3K	add and subtract positive rational numbers fluently (R)
4.2G	**4.2 Number and Operations.** The student applies mathematical process standards to represent, compare, and order whole numbers and decimals and understand relationships related to place value. The student is expected to: (G) relate decimals to fractions that name tenths and hundredths
4.3G	represent fractions and decimals to the tenths or hundredths as distances from zero on a number line (S)
4.2H	determine the corresponding decimal to the tenths or hundredths place of a specified point on a number line (S)
3.7A	represent fractions of halves, fourths, and eighths as distances from zero on a number line (S)
3.3B	determine the corresponding fraction greater than zero and less than or equal to one with denominators of 2, 3, 4, 6, and 8 given a specified point on a number line (S)

Content Builder - (See Appendix for Tree Diagram)

- Relate decimals to fractions that name tenths
- Relate decimals to fractions that name hundredths

Instructional Implications

In conjunction with 4.2E, as students represent decimals using base ten blocks and money, instruction can relate those visuals to fractions (i.e. if a hundred flat represents one whole, then a ten rod is one-tenth its value; if a hundred flat represents one whole, then a unit cube is one-hundredth its value; if it takes 10 dimes to make a dollar, then a dime is one-tenth the value of a dollar; if it takes 100 pennies to make a dollar, than a penny is one-hundredth the value of a dollar). Because base ten blocks can represent both whole numbers and fractional parts of the whole, it is important to vary the whole (i.e. if the hundred flat represents a whole, then the ten rod represents tenths and the unit cube represents hundredths. If the ten rod represents a whole then a hundred flat represents ten and a unit cube represents a tenth, etc.). In conjunction with 4.3G, number lines can also be used to relate decimals to fractions (i.e. 0.10 and 1/10 are the same distance away from zero on a number line). Instruction should relate how the proper articulation of decimal representation yields the fractional representation (i.e. 0.7; "seven tenths"; 7/10).

Distractor Factor

- Students may view the part to whole relationship as different values for decimals vs. fractional representations.
- Students may think the more digits in a decimal, the greater the value. For example, some students will think 0.05 is greater than 0.5.

Academic Vocabulary

- Decimal
- Expanded notation
- Fractions
- Hundredths
- Parts of a whole
- Place value
- Tenths
- Whole

Rigor Implications

- Apply
- Represent
- Compare
- Order
- Understand
- Relate

GRADE 4 → 4.3D Readiness

TEKS Scaffold

TEKS	SE
6.2D	order a set of rational numbers arising from mathematical and real-world contexts (R)
5.2B	compare and order two decimals to thousandths and represent comparisons using the symbols >, <, or = (R)
4.3D	**4.3 Number and Operations.** The student applies mathematical process standards to represent and generate fractions to solve problems. The student is expected to: (D) compare two fractions with different numerators and different denominators and represent the comparison using the symbols >, =, <
3.3H	compare two fractions having the same numerator or denominator in problems by reasoning about their sizes and justifying the conclusion using symbols, words, objects, and pictorial models (R)
2.3B	explain that the more fractional parts used to make a whole, the smaller the part; and the fewer the fractional parts, the larger the part (R)

Content Builder - (See Appendix for Tree Diagram)

- compare two fractions with different numerators and different denominators
- Represent the comparison of fractions using symbols >,=,<

Instructional Implications

Students will compare fractions with unlike denominators in a variety of ways (i.e. concrete objects, pictorially, number line, and the identity property). In conjunction with 4.3C, as students begin to understand how to employ the use of the multiplicative identity property to determine if two fractions are equivalent, instruction can extend its use to comparing fractions (i.e. 2/3 > 1/4 because 2/3 x 4/4 = 8/12 and 1/4 x 3/3 = 3/12 and 8/12>3/12). It is imperative that the pictorial representation relates to use of the identity property in order to move students from the concrete to abstract understanding. In adherence to the standards, students will only compare two fractions; they do not have to order three or more. Encourage students to state two comparison statements to ensure understanding (i.e. 2/3>1/4 and 1/4<2/3).

Distractor Factor

- Students may not understand that the compared fractions relate to the same whole.
- Students may not understand that larger denominators yield smaller parts of a whole; the smaller denominators yield larger parts of a whole.
- Students may not understand that creating an equivalent fraction does not change the fractional value.
- Students may not view the comparison statement 3/8<3/6 is the same as 3/6>3/8.
- Students that rely on a trick to determine directionality (i.e. the alligator's mouth eats the bigger number), may not be able to read comparison symbols correctly.

Academic Vocabulary

- Common Denominator
- Comparison symbol
- Denominator
- Equal to (=)
- Fractions
- Greater than (>)
- Less than (<)
- Numerator

Rigor Implications

- Apply
- Represent
- Generate
- Compare

GRADE 4 → 4.3E Readiness

TEKS Scaffold

TEKS	SE
5.3H	represent and solve addition and subtraction of fractions with unequal denominators referring to the same whole using objects and pictorial models and properties of operations (S)
4.3E	**4.3 Number and Operations.** The student applies mathematical process standards to represent and generate fractions to solve problems. The student is expected to: (E) represent and solve addition and subtraction of fractions with equal denominators using objects and pictorial models that build to the number line and properties of operations
3.3D	compose and decompose a fraction a/b with a numerator greater than zero and less than or equal to b as a sum of parts 1/b (S)
2.3C	use concrete models to count fractional parts beyond one whole using words and recognize how many parts it takes to equal one whole (S)

Content Builder - (See Appendix for Tree Diagram)

- Represent addition of fractions with equal denominators using
  - » objects
  - » pictorial models
  - » number lines
  - » properties of operations
- Represent subtraction of fractions with equal denominator using
  - » objects
  - » pictorial models
  - » number lines
  - » properties of operations
- Represent addition and subtraction of fractions with equal denominator
  - » objects
  - » pictorial models
  - » number lines
  - » properties of operations
- Solve addition of fractions with equal denominators
- Solve subtraction of fractions with equal denominators
- Solve addition and subtraction of fractions with equal denominators

Instructional Implications

In adherence to the standard, instruction is limited to the addition and subtraction of fractions with like denominators. In conjunction with 4.3B, students continue to use manipulatives and pictorial models to demonstrate their concrete understanding of addition/subtraction of fractions with like denominators. Instruction will move to the use of number lines (i.e. 5/4 + 1/4 can be represented beginning with a point on 5/4 then modeling the movement of one-fourth to the right, landing on 6/4 or 1 2/4 or 1 1/2 on the number line) and properties of operations (i.e. 5/4 + 1/4 = (4/4 + 1/4) + 1/4 = 4/4 + (1/4 + 1/4) = 1 + 2/4 = 1 2/4 or 1 1/2). Although the teacher may model the formal names of the properties (i.e. commutative, associative, distributive, etc.), students will only be asked to use the underlying concepts in order to solve addition problems.

Distractor Factor

- Students may want to add the numerators and denominators.
- Students may not understand that that adding and subtracting fractions as joining and separating parts of the same whole.

Academic Vocabulary

- Addition
- Difference
- Equal denominators
- Fractions
- Number line
- Properties of operations (Application Of)
- Subtraction
- Sum
- Whole

Rigor Implications

- Apply
- Represent
- Generate
- Solve

GRADE 4 → 4.4A Readiness

TEKS Scaffold

TEKS	SE
5.3K	add and subtract positive rational numbers fluently (R)
4.4A	**4.4 Number and Operations.** The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy. The student is expected to: (A) add and subtract whole numbers and decimals to the hundredths place using the standard algorithm
3.4A	solve with fluency one-step and two-step problems involving addition and subtraction within 1,000 using strategies based on place value, properties of operations, and the relationship between addition and subtraction (R)
3.4C	determine the value of a collection of coins and bills (S)
2.4C	solve one-step and multi-step word problems involving addition and subtraction within 1,000 using a variety of strategies based on place value, including algorithms (R)

Content Builder - (See Appendix for Tree Diagram)

- Add whole numbers and decimals using the standard algorithm
  - » tenths
  - » hundredths
- Subtract whole number and decimals using standard algorithm
  - » tenths
  - » hundredths
- Add and subtract whole number and decimals to tenths using the standard algorithm
  - » tenths
  - » hundredths

Instructional Implications

In conjunction with 4.2B/E, students will represent decimal values through the hundredths with concrete objects/pictorial models, apply their understanding of place value to identify the digit in each position, and employ the use of expanded notation to develop strategies when solving addition and subtraction decimal problems. These actions should parallel the introduction of the standard algorithm in order to move students from the concrete to the abstract learning. Be sure to vary the context of the problems.

Joining: Sarah had $2.50. Juan gave her $1.95. How much money does Sarah now have? Sarah had $2.50. Juan gave her some money. Now, Sarah has $4.43. How much money did Juan give Sarah? Sarah had some money. Juan gave her $1.95. Now Sarah has $4.43. How much money did Sarah have to begin with?

Separating: Sarah had $4.43. She lent Juan $2.50. How much money does Sarah now have? Sara had $4.43. She lent some money to Juan. Now Sarah has $1.95. How much money did she lend to Juan? Sarah had some money. She lent Juan $2.50 and she now has $1.95. How much money did Sarah have before lending Juan money?

Comparing: Juan has $1.95 and Sarah has $4.43. How much less money does Juan have than Sarah? If Juan has $2.50 less than Sarah, how much does Juan have if Sarah has $4.43? It will be critical that students employ the use of estimating prior to solving such problems in order to evaluate reasonableness of solutions (process standard 4.1B/C).

Distractor Factor

- Students may not align the appropriate place values when adding/subtracting decimals.
- Students may not understand adding and subtracting decimals as joining and separating parts of the same whole.

Academic Vocabulary

- Add
- Decimals
- Difference
- Digit
- Hundredths
- Place value
- Subtract
- Sum
- Tenths
- Whole

Rigor Implications

- Apply
- Develop
- Use
- Solve
- Add
- Subtract

GRADE 4 → 4.4H Readiness

TEKS Scaffold

TEKS	SE
6.3E	multiply and divide positive rational numbers fluently (R)
5.3G	solve for quotients of decimals to the hundredths, up to four-digit dividends and two-digit whole number divisors, using strategies and algorithms, including the standard algorithm (R)
5.3E	solve for products of decimals to the hundredths, including situations involving money, using strategies based on place-value understandings, properties of operations, and the relationship to the multiplication of whole numbers (R)
5.3C	solve with proficiency for quotients of up to a four-digit dividend by a two-digit divisor using strategies and the standard algorithm (S)
4.4H	**4.4 Number and Operations.** The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy. The student is expected to: (H) solve with fluency one- and two-step problems involving multiplication and division, including interpreting remainders
3.4K	solve one-step and two-step problems involving multiplication and division within 100 using strategies based on objects; pictorial models, including arrays, area models, and equal groups; properties of operations; or recall of facts (R)
3.5B	represent and solve one- and two-step multiplication and division problems within 100 using arrays, strip diagrams, and equations (R)

Content Builder - (See Appendix for Tree Diagram)

- Solve one-step problems involving multiplication
- Solve two-step problems involving multiplication
- Solve one-step problems involving division
- Solve two-step problems involving division
- Solve two-step problems involving multiplication and division
- Interpret remainders in division

Instructional Implications

In conjunction with 4.4D/4.4E, as students become more comfortable with the conceptual understanding of multiplication and division, instruction will move to a more abstract representation. In adherence to the standard, instruction should include one- and two-step problems (i.e. two steps with just multiplication; two steps with just division; one step with multiplication and one step with division.) Students need to interpret and apply the use of the remainder of division problems in different ways (i.e. There were 225 cupcakes. If 8 cupcakes fit on a plate, how many plates will be filled with cupcakes? How many cupcakes will be leftover not on a plate? How many plates would be needed for all of the cupcakes to fit on a plate?).

Distractor Factor

- Students may try to apply "key words" to select the appropriate operation instead of understanding the context of the problem.
- Students may not recognize a number sentence and its inverse as being equivalent (i.e. 42 ÷ 6 = ___ is the same things as 6 x ___ = 42).
- Students may not understand the context of a remainder in a real world division problem.

Academic Vocabulary

- Dividend
- Division
- Divisor
- Factor
- Multiplication
- Product
- Quotient
- Remainders

Rigor Implications

- Apply
- Develop
- Use
- Solve
- Interpret

GRADE 4 → 4.5A Readiness

TEKS Scaffold

TEKS	SE
6.9C	write corresponding real-world problems given one-variable, one-step equations or inequalities (S)
5.4B	represent and solve multi-step problems involving the four operations with whole numbers using equations with a letter standing for the unknown quantity (R)
4.5A	**4.5 Algebraic Reasoning.** The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to: (A) represent multi-step problems involving the four operations with whole numbers using strip diagrams and equation with a letter standing for the unknown quantity
3.5A	represent one- and two-step problems involving addition and subtraction of whole numbers to 1,000 using pictorial models, number lines, and equations (R)
3.5B	represent and solve one- and two-step multiplication and division problems within 100 using arrays, strip diagrams, and equations (R)
2.7C	represent and solve addition and subtraction word problems where unknowns may be any one of the terms in the problem (S)

Content Builder - (See Appendix for Tree Diagram)

- Represent multi-step problems involving the four operations with whole numbers using strip diagrams with a letter standing for the unknown quantity
- Represent multi-step problems involving the four operations with whole numbers using equations with a letter standing for the unknown quantity

Instructional Implications

In conjunction with 4.4A/D/F/H, students will represent +/-/x/÷ problems with an equation in which the unknown quantity is represented with a variable (letter). In adherence to the standard, the equation must be a multi-step problem involving a mixture of the four operations. The use of strip diagrams (part-part-whole mat) may support the understanding of how to represent such equations (i.e. The Wildcats basketball team scored 75 points. Michael scored 35 of the points by himself and the remaining points were made by Damon and Rayshawn. If Rayshawn and Damon scored the same number of points, how many points did each boy score?

Total Number of Points Scored by Wildcat's Team (whole) 75		
Michael's Points (part)	Damon's Points (part)	Rayshawn's Points (part)
35	P	P

75 = 35 + P + P where P= points). Encourage students to write more than one equation for every problem (i.e. 75 = 35 + P + P; 75 = 35 + 2P; (75 - 35) ÷ 2 = P).

Distractor Factor

- Students who do not have an understanding of the context of the problem may incorrectly represent the expression/equation (i.e. there are two times as many girls than boys in the classroom; 2 x B=G not 2 x G=B).
- Students may try to apply "key words" to select the appropriate operation instead of understanding the context of the problem.

Academic Vocabulary

- Addend
- Addition
- Difference
- Division
- Equation
- Factor
- Multiplication
- Product
- Strip diagram
- Subtraction
- Sum
- Variable (letter standing for the unknown quantity)

Rigor Implications

- Apply
- Develop
- Represent

GRADE 4 → 4.5B Readiness

TEKS Scaffold

TEKS	SE
6.9A	write one-variable, one-step equations and inequalities to represent constraints or conditions within problems (S)
5.4C	generate a numerical pattern when given a rule in the form y = ax or y = x + a and graph (R)
5.4D	recognize the difference between additive and multiplicative numerical patterns given in a table or graph (S)
4.5B	**4.5 Algebraic Reasoning.** The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to: (B) represent problems using an input-output table and numerical expressions to generate a number pattern that follows a given rule representing the relationship of the values in the resulting sequence and their position in the sequence
3.5E	represent real-world relationships using number pairs in a table and verbal descriptions (R)
2.7A	determine whether a number up to 40 is even or odd using pairing of objects to represent the number (S)

Content Builder - (See Appendix for Tree Diagram)

- Represent problems using input-output table to generate number pattern that follows a given rule
- Represent problems using numerical expression to generate number pattern that follows a given rule
- Represent the relationship of the values in the resulting sequence and their position in the sequence

Instructional Implications

In accordance to the standard, students should be given a real world situation (i.e. number of wheels on a tricycle) and asked to represent the number pattern in an input-output table (see below). Table representations should be both vertical and horizontal. Students also have to represent the pattern in a numerical expression (i.e. w = 3 x t). A process column (a.k.a. what's my rule) may be added to the input-output table to help support students with that understanding. Students should state two numerical expressions for every pattern (i.e. w= t x 3; t = w÷3).

Number of Tricycles	Process	Number of Wheels
0	0 X 3	0
1	1 X 3	3
2	2 X 3	6
3	3 X 3	9
4	4 X 3	12
5	5 X 3	15
t	t X 3	w

Distractor Factor

- Students may identify a pattern by comparing input to input values and/or output to output values instead of input to output values.
- Students may confuse a multiplicative pattern for an additive pattern as they view multiplication as repeated addition.
- Students may not recognize the equivalency of a numerical expression and its inverse (i.e. w = t x 3 is the same expression as t = w÷3).

Academic Vocabulary

- Input-output table
- Number pattern
- Numerical expressions
- Position
- Rule
- Sequence

Rigor Implications

- Apply
- Develop
- Represent
- Generate

GRADE 4 → 4.5D Readiness

TEKS Scaffold

TEKS	SE
6.8D	determine solutions for problems involving the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers
5.4H	represent and solve problems related to perimeter and/or area and related to volume (R)
4.5D	**4.5 Algebraic Reasoning. The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to: (D) solve problems related to perimeter and area of rectangles where dimensions are whole numbers**
4.5C	use models to determine the formulas for the perimeter of a rectangle (l+w+l+w or 2l+2w), including the special form for perimeter of a square (4s) and the area of a rectangle (l x w)
3.7B	determine the perimeter of a polygon or a missing length when given perimeter and remaining side lengths in problems (R)
3.6C	determine the area of rectangles with whole number side lengths in problems using multiplication related to the number of rows times the number of unit squares in each row (R)
2.9F	use concrete models of square units to find the area of a rectangle by covering it with no gaps or overlaps, counting to find the total number of square units, and describing the measurement using a number and the unit (S)
2.9E	determine a solution to a problem involving length, including estimating lengths (R)

Content Builder - (See Appendix for Tree Diagram)

- Solve problems related to perimeter having dimensions that are whole numbers
- Solve problems related to area rectangles having dimensions that are whole numbers
- Solve problems related to perimeter and area having dimensions that are whole numbers

Instructional Implications

Instruction should merge the concepts of area and perimeter to ensure understanding of the concepts (i.e. perimeter measuring the length around an object; area measuring the space inside an object). A variety of examples for students to understand the difference between area and perimeter should be applied such as the amount of paper needed to cover the bulletin board vs. the amount of border needed to decorate around the bulletin board. Be sure to vary the context of the problems. Given the dimensions of the rectangle, determine the area and perimeter; given the perimeter of a square, determine the area; given the area of a square, determine the perimeter; given the length of one side and the perimeter, determine the area; given the length of one side and the area, determine the perimeter. It is important for students to understand how linear measurements like perimeter are recorded in units and area is reflected in square units.

Distractor Factor

- Through the lens of a real world problem, students confuse when to apply the use of area vs. perimeter.
- Students may not apply the correct unit of measure when reflecting area (i.e. square inches) vs. perimeter (i.e. inches).

Academic Vocabulary

- Area
- Dimensions
- Length
- Perimeter
- Rectangles
- Square units
- Width
- Units

Rigor Implications

- Apply
- Develop
- Solve

GRADE 4 → 4.6D Readiness

TEKS Scaffold

TEKS	SE
6.8A	extend previous knowledge of triangles and their properties to include the sum of angles of a triangle, the relationship between the lengths of sides and measures of angles in a triangle, and determining when three lengths form a triangle (S)
5.5A	classify two-dimensional figures in a hierarchy of sets and subsets using graphic organizers based on their attributes and properties (R)
4.6D	**4.6 Geometry and Measurement.** The student applies mathematical process standards to analyze geometric attributes in order to develop generalizations about their properties. The student is expected to: (D) classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presences or absence of angles of a specified size
3.6A	classify and sort two- and three-dimensional figures, including cones, cylinders, spheres, triangular and rectangular prisms, and cubes, based on attributes using formal geometric language (R)
2.8C	classify and sort polygons with 12 or fewer sides according to attributes, including identifying the number of sides and number of vertices (R)

Content Builder - (See Appendix for Tree Diagram)

- Classify two-dimensional figures that have a
  - » presence or absence of parallel lines
  - » presence or absence of perpendicular lines
  - » presence or absence of angles of specified size

Instructional Implications

Students will compare/contrast the attributes (i.e. number of vertices, sides, angles) and absence and presence of various properties (i.e. parallel lines, perpendicular lines, angle sizes) of various two-dimensional figures. In adherence to the TEKS, students will be able to better classify various two-dimensional figures by developing generalizations about their properties such as all parallelograms can be called a quadrilateral because they have four sides and four angles, but cannot all be called a rectangle because not all parallelograms have four right angles; a trapezoid can be called a quadrilateral because it has four sides and four angles, but cannot be called a parallelogram because it only has one set of parallel sides; etc.

Distractor Factor

- When identifying intersecting lines, students may not realize that perpendicular lines are also called intersecting lines; they are just unique in that they form right angles.
- When identifying parallel lines, students may not understand that the lines do not have to be equal in length nor be shown directly above/below each other

Academic Vocabulary

- Angles
- Attributes
- Parallel lines
- Perpendicular lines
- Polygons
- Rhombus, parallelogram, trapezoid, rectangle, square, quadrilateral
- Sides
- Two-dimensional
- Vertex (vertices)

Rigor Implications

- Apply
- Develop
- Classify

GRADE 4 → 4.7C Readiness

TEKS Scaffold

TEKS	SE
6.8A	extend previous knowledge of triangles and their properties to include the sum of angles of a triangle, the relationship between the lengths of sides and measures of angles in a triangle, and determining when three lengths form a triangle (S)
5.5A	classify two-dimensional figures in a hierarchy of sets and subsets using graphic organizers based on their attributes and properties (R)
4.7C	**4.7 Geometry and Measurement.** The student applies mathematical process standards to solve problems involving angles less than or equal to 180 degrees. The student is expected to: (C) determine the approximate measures of angles in degrees to the nearest whole number using a protractor
4.7D	draw an angle with a given measure (S)
4.7B	illustrate degrees as the units used to measure an angle, where 1/360 of any circle is 1 degree and an angle that "cuts" n/360 out of any circle whose center is at the angle's vertex has a measure of n degrees. Angle measures are limited to whole numbers
4.7A	illustrate the measure of an angle as the part of a circle whose center is at the vertex of the angle that is "cut out" by the rays of the angle. Angle measures are limited to whole numbers
4.6C	apply knowledge of right angles to identify acute, right, and obtuse triangles (S)

Content Builder - (See Appendix for Tree Diagram)

- Determine the approximate measure of angles in degrees to the nearest whole number using a protractor

Instructional Implications

Just like a ruler can measure length in inches or a clock can measure time in minutes/hours or a scale can measure weight in pounds/ounces, a protractor can measure angles in degrees. Instruction should identify the different components of a protractor (i.e. inner scale, outer scale, center mark, zero edge). In conjunction with 4.6C, students should first identify a given angle as acute or obtuse and then estimate an angle measurement prior to actually measuring. Instruction should model how to place the center of the protractor on the vertex of the angle and align the zero edge of the protractor with one of the rays of the angle. Where the other ray crosses the protractor determines the measurement of the angle. Depending whether the given angle was previously identified as an acute or obtuse angle will determine whether to record the inner or outer angle measure reflected on the protractor.

Students should notice how the protractor represents a half of a circle or 180°. Just like a ruler will only measure lengths that are up to 12 inches, a protractor will only allow you to measure angles of 180°or less. The composing (i.e. an image of a 260° angle would have to be decomposed into two separate angles with each angle measurement added together) or decomposing (i.e. the measure of the inner angle could be subtracted from 360°) of angles would have to be applied to determine the measurement of an angle measuring more than 180°. Instruction should also include the use of images of a protractor and a given angle to determine the measure of the angle. Examples may or may not align to the zero edge of the protractor (i.e. an image of a protractor reflecting one ray aligning with the 50°unit of measure and the other ray aligning with the 130°unit of measure; 130° - 50° = 80°; angle measures 80°).

Distractor Factor

- If students are not identifying whether a measureable angle is acute or obtuse, they may read the wrong scale of the protractor.
- Students may have difficulty manipulating a protractor to align rays that may be rotated.
- Students may think the length of the rays relate to the size of the angle measure.

Academic Vocabulary

- Angle vertex
- Angles
- Center mark
- Degrees
- Inner scale
- Line
- Outer scale
- Protractor
- Ray
- Zero edge

Rigor Implications

- Apply
- Solve
- Determine

GRADE 4 → 4.8C Readiness

TEKS Scaffold

TEKS	SE
5.4B	represent and solve multi-step problems involving the four operations with whole numbers using equations with a letter standing for the unknown quantity (R)
4.8C	**4.8 Geometry and Measurement.** The student applies mathematical process standards to select appropriate customary and metric units, strategies, and tools to solve problems involving measurement. The student is expected to: (C) solve problems that deal with measurement of length, intervals of time, liquid volumes, mass, and money using addition, subtraction, multiplication, or division as appropriate
3.7B	determine the perimeter of a polygon or a missing length when given perimeter and remaining side lengths in problems (R)
3.7E	determine liquid volume (capacity) or weight using appropriate units and tools (S)
3.7C	determine the solutions to problems involving addition and subtraction of time intervals in minutes using pictorial models or tools such as a 15-minute event plus a 30-minute event equals 45 minutes (S)
3.4C	determine the value of a collection of coins and bills (S)
2.9E	determine a solution to a problem involving length, including estimating lengths (R)
2.9G	read and write time to the nearest one-minute increment using analog and digital clocks and distinguish between a.m. and p.m. (R)
2.5A	determine the value of a collection of coins up to one dollar (R)

Content Builder - (See Appendix for Tree Diagram)

- Solve problems using addition, subtraction, multiplication, or division involving
  - » length
  - » intervals of time
  - » liquid volumes
  - » mass
  - » money

Instructional Implications

In conjunction with 4.5A, students will not only be asked to represent multi-step word problems in a number sentence/equation, but they will be asked to solve the problems. In accordance to the standard, examples should include measurement of length (i.e. perimeter), intervals of time (i.e. elapsed time), liquid volumes (i.e. filling/dispensing of containers), mass (i.e. comparison of weight) and money (i.e. comparison of money). Such problems may include the addition/subtraction of fractions (see 4.3E/F), addition/subtraction of decimals (see 4.4A), multiplication of four-digit by one-digit whole numbers (see 4.4D), and division of a four-digit whole number divided by a one-digit whole number (see 4.4F). Instruction should include examples from both metric and customary units of measure.

Distractor Factor

- Students may not understand that calculating time is based on 60 minutes in an hour unlike our base-ten system when adding/subtracting whole numbers.
- Students may rely on "key words" to determine the operation instead of understanding the context of the problem.

Academic Vocabulary

- Addition
- Division
- Length
- Liquid volume
- Mass
- Measurement
- Money
- Multiplication
- Number sentence/equation
- Perimeter
- Subtraction
- Time

Rigor Implications

- Apply
- Select
- Solve

GRADE 4 → 4.9A Readiness

TEKS Scaffold

TEKS	SE
6.13A	interpret numeric data summarized in dot plots, stem-and-leaf plots, histograms, and box plots (R)
6.12A	represent numeric data graphically, including dot plots, stem-and-leaf plots, histograms, and box plots (S)
5.9A	represent categorical data with bar graphs or frequency tables and numerical data, including data sets of measurements in fractions or decimals, with dot plots or stem-andleaf plots (S)
5.9B	represent discrete paired data on a scatterplot (S)
4.9A	**4.9 Data Analysis.** The student applies mathematical process standards to solve problems by collecting, organizing, displaying, and interpreting data.The student is expected to: (A) represent data on a frequency table, dot plot or stem-and-leaf plot marked with whole numbers and fractions
3.8A	summarize a data se t with multiple categories using a frequency table, dot plot, pictograph, or bar graph with scaled intervals (R)
2.10B	organize a collection of data with up to four categories using pictographs and bar graphs with intervals of one or more (R)

Content Builder - (See Appendix for Tree Diagram)

- Representation of data including whole numbers and fractions using
  - » frequency table
  - » dot plot
  - » stem-and-leaf plot

Instructional Implications

According to the TEKS, students need to collect, organize and display their own data. Personalizing such activities will allow students to understand and make more sense of the data and summarize more appropriately. In accordance with the standard, data should be represented on a frequency table, dot plot, or stem-and-leaf plot. Instruction should begin with frequency tables and dot plots, as students will have had previous experience with those representations (see 3.8A). In adherence to the standard, those representations need to extend to include the use of fractional units. Students will need more support with the development of stem-and leaf plots. This type of graph will distribute the data by separating one place value from the other or the parts from the whole when working with fractions.

stem	leaf
9	0 4
8	3 4 5 7 9
7	0 2 2 9
6	5 8 9
5	3

8 | 4 = 84

The larger place value or the whole of a fraction is identified as the stem; the smaller place value or the part of the whole is called the leaf. It is important for students to provide a graph title and a key identifying the value of the stem and leaf (8|4=84).

Distractor Factor

- In using the stem-and-leaf plot, students may have difficulty determining what values represent the stem and leaf.
- In using the stem-and-leaf plot, students may not represent repeated values (i.e. math grades: 84, 56, 92, 84, 87, 91; students may only reflect 84 one time on the graph when the value of 84 needs to be recorded twice.
- When representing the same set of data vertically and horizontally, students may interpret the data as different because of the difference in the visual representations.

Academic Vocabulary

- Categories
- Data
- Dot plot
- Frequency table
- Whole numbers
- Graph titles
- Labels
- Scaled intervals
- Stem-and-leaf plot
- Fractions

Rigor Implications

- Apply
- Collect
- Organize
- Display
- Interpret
- Represent

STAAR
SUPPORTING
STANDARDS

4.2.A 4.2 Number and Operations. The student applies mathematical process standards to represent, compare, and order whole numbers and decimals and understand relationships related to place value. The student is expected to:

(A) interpret the value of each place-value position as ten times the position to the right as one-tenth of the value of the place to its left

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.2B represent the value of the digit in whole numbers through 1,000,000,000 and decimals to the hundredths using expanded notation and numerals
- 5.2B compare and order two decimals to thousands and represent comparison using the symbols >, <, or =

How does it support the Readiness Standard(s)?

This standard describes the mathematical relationship found in the base-10 place value system; this understanding will support students in identifying the value of each digit in a number in order to represent numbers in expanded notation and to effectively compare/order numbers.

Instructional Implications

As students represent numbers utilizing the base ten blocks, instruction should relate how the values of each place value position become ten times bigger as we move left on a place value chart (i.e. a ten rod is ten times larger than the ones units; the hundred flat is ten times larger than the ten rods). Students should also recognize how the values of each place value position become ten times smaller as we move right on a place value chart (i.e. a unit cube is one-tenth the size of a ten rod; a ten rod is ten times smaller than a hundred flat). Relating the value and representation of money may support students with understanding the relationship of related place values (i.e. if you had $1.00 and you wanted to make ten times more, you would have $10.00; if you have $10.00 and wanted to make ten times more, you would have $100.00; if you have $100.00 and you wanted to have ten times less, you would have $10.00; if you have $10.00 and wanted one-tenth as much, you would have $1.00).

Academic Vocabulary

- Place value
- Position
- One-tenth
- Ten-times

Rigor Implications

- Apply
- Represent
- Compare
- Order
- Understand
- Interpret

4.2.C 4.2 Number and Operations. The student applies mathematical process standards to represent, compare, and order whole numbers and decimals and understand relationships related to place value. The student is expected to:

(C) compare and order whole numbers to 1,000,000,000 and represent comparisons using symbols <, >, or =

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 5.2B compare and order two decimals to thousands and represent comparison using the symbols >, <, or =

How does it support the Readiness Standard(s)?

In Grade 2, students compared values through 1,200; grade 3, through 120,000; grade 4, through 1,000,000,000. This standard will continue to support students' knowledge of comparing and ordering of numbers which will extend to thousandths place value in grade 5.

Instructional Implications

As students compare the value of numbers, they need to be able to relate their understanding of place value (i.e. the number 5,342 is greater than 3,226 because the digit 5 in 5,342 means there are 5 thousands which is a value of 5,000; however, the digit 3 in 3,226 means there are only 3 thousands which is a value of 3,000). Students will compare two numbers using the correct academic vocabulary (i.e. 5,342 is greater than 3,226). It is important for students to recognize the inverse comparison statement as well (i.e. 3,226 is less than 5,342). Instruction should connect the comparative language to the symbols (>, <, =). It is critical that students understand how to correctly read each of the symbols not as a trick to remember directionality of the symbols (i.e. the alligator's mouth eats the bigger number). Encourage students to write and articulate two comparison statements during activities (i.e. 5,342>3,226 and 3,226<5,342). The standard also has students ordering three or more numbers from least to greatest or greatest to least. The use of open number lines will allow students to order more efficiently as numbers increase from left to right. Students can associate this with ordering from least to greatest; numbers decrease from right to left on a number line can be associated to ordering from greatest to least.

Academic Vocabulary

- Billions, millions, thousands, hundreds, tens, ones
- Digit
- Equal to (=)
- Greater than (>)
- Greatest to least
- Least to greatest
- Less than (<)
- Place value

Rigor Implications

- Apply
- Represent
- Compare
- Order
- Understand

4.2.D 4.2 Number and Operations. The student applies mathematical process standards to represent, compare, and order whole numbers and decimals and understand relationships related to place value. The student is expected to:
(D) round whole numbers to a given place value through the hundred thousands place

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.4A add and subtract whole numbers and decimals to the hundredths place using the standard algorithm
- 4.4H solve with fluency one-and two-step problems involving multiplication and division, including interpreting remainders

How does it support the Readiness Standard(s)?

As students will be asked to solve problems using all four operations, it will be important to estimate solutions prior to solving. Rounding is one way of estimating values; students will be able to evaluate if their solutions are reasonable.

Instructional Implications

Instruction should begin with skip counting by tens, hundreds, thousands, ten-thousands, and hundred-thousands for students to understand consecutive multiples. Students should represent these benchmark values through the use of an open number line. When students are given a specific number to locate on an open number line, teachers will begin to assess students' understanding of place value (i.e. students place the number 125,387 between 100,000 and 200,000), the relative position of numbers (i.e. the number 100,000 would be indicated first and the number 200,000 would be indicated second on the open number line), and the magnitude of numbers (i.e. students physically place the number 125,387 closer to 100,000 than 200,000). Students will apply this understanding to the rounding of whole numbers to the nearest 10, 100, 1,000, 10,000, and 100,000.

Academic Vocabulary

- Consecutive multiples
- Thousands, hundreds, tens, ones
- Number line
- Place value
- Round

Rigor Implications

- Apply
- Represent
- Compare
- Order
- Understand
- Round

4.2.E 4.2 Number and Operations. The student applies mathematical process standards to represent, compare, and order whole numbers and decimals and understand relationships related to place value. The student is expected to:
(E) represent decimals including tenths and hundredths, using concrete and visual models and money

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.2G relate decimals to fractions that name tenths and hundredths

How does it support the Readiness Standard(s)?

As students will be asked to relate decimals to fractions, it will be critical for them to have a visual representation for the value of a decimal. Relating decimals to money (i.e. a dime represents $0.10) will also support their understanding of the part to whole relationship in fractions (i.e. a dime represent 10/100 or 1/10 of a dollar).

Instructional Implications

Through the use of the base ten blocks, students will represent values of tenths and hundredths. It is imperative that instruction begin with defining the value of the whole (i.e. the hundred flat will represent one whole, the tens rod will represent tenths, and the unit cube will represent the hundredths). As base ten blocks can represent both whole numbers and fractional parts of the whole, it is important to vary the whole (i.e. if the hundred flat represents a whole, then the ten rod represents tenths and the unit cube represents hundredths; if the ten rod represents a whole then a hundred flat represents ten and a unit cube represents a tenth, etc.). In conjunction with 4.2A, connecting the value of each place value position as being ten times the position to the right and as one-tenth the value to the left. Connecting values of coins to the whole dollar may also support students with the representation of decimals and place value relationships (i.e. a dime $0.10 is ten times more than a penny $0.01; a dollar $1.00 is ten times more than a dime $0.10; a dime $0.10 is one-tenth the size of a dollar $1.00; a penny $0.01 is one-tenth the value of a dime $0.10).

Academic Vocabulary

- Decimals
- Hundredths
- Money denominations: penny, cent, dime, dollar
- Number line
- Part of the whole
- Place value
- Tenths
- Whole

Rigor Implications

- Apply
- Represent
- Compare
- Order
- Understand

4.2.F 4.2 Number and Operations. The student applies mathematical process standards to represent, compare, and order whole numbers and decimals and understand relationships related to place value. The student is expected to:
(F) compare and order decimals using concrete and visual models to hundredths

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 5.2B compare and order two decimals to thousandths and represent comparisons using the symbols >, <, or =

How does it support the Readiness Standard(s)?

Developing the conceptual understanding of the value of decimals through the lens of concrete/pictorial models in grade 4 will be critical for students to be able to compare and order decimals values abstractly in grade 5.

Instructional Implications

In adherence to the standard, comparing and ordering of decimals is through the use of concrete objects and/or pictorial models. In conjunction with 4.2B, as students compare the value of decimals they need to be able to relate their understanding of place value (i.e. 2.42 is less than 2.75 because the digit 4 in 2.42 means there are four tenths which is a value of 0.40; however, the digit 7 in 2.75 means there are seven tenths which is a value 0.70). Students will compare two decimal values using the correct academic vocabulary (i.e. 2.42 is less than 2.75). It is important for students to recognize the inverse comparison statement as well (i.e. 2.75 is greater than 2.42). Instruction should connect the comparative language to the symbols (>, <, =). It is critical that students understand how to correctly read each of the symbols not as a trick to remember directionality of the symbols (i.e. the alligator's mouth eats the bigger number). Encourage students to write and articulate two comparison statements during activities (i.e. 2.42<2.75 and 2.75>2.42). The standard also has students ordering three or more numbers from least to greatest or greatest to least. In conjunction with 4.2H, the use of number lines will allow students to order more efficiently. Numbers increase from left to right on a number line can be associated to ordering from least to greatest. Numbers decrease from right to left on a number line and can be associated to ordering from greatest to least.

Academic Vocabulary

- Decimals
- Digit
- Equal to (=)
- Greater than (>)
- Greatest to least
- Hundredths
- Least to greatest
- Less than (<)
- Place value
- Tenths

Rigor Implications

- Apply
- Represent
- Compare
- Order
- Understand

4.2.H 4.2 Number and Operations. The student applies mathematical process standards to represent, compare, and order whole numbers and decimals and understand relationships related to place value. The student is expected to:

(H) determine the corresponding decimal to the tenths or hundredths place of a specified point on a number line

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.2G relate decimals to fractions that name tenth and hundredths
- 5.2B compare and order two decimals to thousandths and represent comparisons using symbols >, <, or =

How does it support the Readiness Standard(s)?

Locating decimal values as a specific point on a number line will support students in comparing/ordering decimals in grade 5. In conjunction with 4.3G, as students identify decimal and fractional values on a number line they will begin to relate the equivalent values of tenths (0.10; 1/10) and hundredths (0.01; 1/100) as they fall on the same point on the number line.

Instructional Implications

Students will utilize number lines containing intervals that are divided equally between two whole numbers. Students will be asked to identify the decimal value of a point represented on a given number line. Students will need to determine the number of parts that make up the whole (the total number of intervals between two given whole numbers) to identify tenths or hundredths appropriately.

Academic Vocabulary

- Decimal
- Hundredths
- Number line
- Parts of a whole
- Tenths
- Whole

Rigor Implications

- Apply
- Represent
- Compare
- Order
- Understand
- Determine

4.3.A 4.3 Number and Operations. The student applies mathematical process standards to represent and generate fractions to solve problems. The student is expected to:

(A) represent a fraction a/b as a sum of fractions 1/b, where a and b are whole numbers and b>0, including when a>b

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

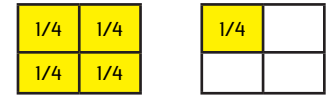
- 4.3E represent and solve addition and subtraction of fractions with equal denominators using objects and pictorial models that build to the number line and properties of operations

How does it support the Readiness Standard(s)?

As students represent fractions as the sum of unit fractions (i.e. given five out of four parts of a whole shaded, students represented shaded portion as 1/4 + 1/4 + 1/4 + 1/4 + 1/4 = 5/4), they will extend that understanding to adding fractions with like denominators (i.e. given the equation 3/4 + 2/4 = ___; 1/4 + 1/4 + 1/4 + 1/4 + 1/4 = 5/4).

Instructional Implications

Instruction should begin with students identifying the whole (i.e. a square has been divided into four equal parts; therefore, we will be working with denominators of four). In adherence to the standard, instruction should extend to fractions greater than one whole. Students should label each part of the whole with its appropriate unit fraction (i.e. if a square represents one whole, the each part of the whole represents one-fourth).



As students begin counting each portion of a given fraction (i.e. one-fourth, two-fourths, three-fourths, etc.), instruction can then relate a number sentence to those actions (i.e. 1/4 + 1/4 + 1/4 + 1/4 + 1/4 = 5/4). Students should understand that each part of the whole represents a unit fraction (i.e. 1/4) and as they count each unit fraction, they are orally stating its cumulative sum. Students will extend the sums of fractions in more than one way (see 4.3B).

Academic Vocabulary

- Denominator
- Equal parts
- Fraction
- Numerator
- Sum of fractions
- Unit fractions
- Whole

Rigor Implications

- Apply
- Represent
- Generate

4.3.B 4.3 Number and Operations. The student applies mathematical process standards to represent and generate fractions to solve problems. The student is expected to:

(B) decompose a fraction in more than one way into a sum of fractions with the same denominator using concrete and pictorial models and recording results with symbolic representations

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

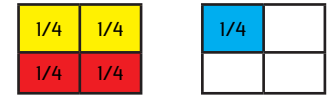
- 4.3E represent and solve addition and subtraction of fractions with equal denominators using objects and pictorial models that build to the number line and properties of operations

How does it support the Readiness Standard(s)?

As students decompose fractions as the sum of fractions with like denominators in more than one way (i.e. given five out of four parts of a whole shaded, students represent shaded portion as 1/4 + 1/4 + 1/4 + 1/4 + 1/4 =5/4; 4/4 + 1/4 = 5/4; 1 + 1/4 = 5/4; 2/4 + 2/4 + 1/4 = 5/4), they will extend that understanding to adding fractions with like denominators. This will include the use of whole numbers in addition of fractions.

Instructional Implications

In conjunction with 4.3A, as students represent improper fractions as sum of fractions (i.e. 5/4 = 1/4 + 1/4 + 1/4 + 1/4 + 1/4), instruction should extend the representation of those number sentences to more than one way (i.e. 5/4 = 2/4 + 2/4 + 1/4; 5/4 = 3/4 + 2/4; 5/4 = 4/4 + 1/4, etc.). It is imperative that instruction relate each component of the number sentence to the pictorial model as a means of moving students from the concrete to the abstract understanding (i.e. 5/4=2/4 + 2/4+ 1/4; students shade each portion of the area model a different color to represent the different addends of the equation).



In alignment with 4.3E, equations are limited to fractions with like denominators only. Instruction should include examples with whole numbers.

Academic Vocabulary

- Denominator
- Equations/Number sentences
- Fraction
- Numerator
- Sum of fractions

Rigor Implications

- Apply
- Represent
- Generate
- Decompose
- Record (represent)

4.3.C 4.3 Number and Operations. The student applies mathematical process standards to represent and generate fractions to solve problems. The student is expected to:

(C) determine if two given fractions are equivalent using a variety of methods

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.3D compare two fractions with different numerators and different denominators and represent the comparison using the symbols >, <, or =

How does it support the Readiness Standard(s)?

Determining if two fractions are equivalent will support students in being able to compare and order fractions with different denominators.

Instructional Implications

Instruction should include a variety of methods to determine if two fractions are equivalent. Begin with the use of manipulatives (i.e. if a hexagon pattern block represents one whole, then a trapezoid pattern block represents 1/2, and a triangle pattern block represents 1/6; one trapezoid = 3 triangles, therefore 1/2 = 3/6), extend to the pictorial models (i.e. a square divided into two, four, and eight equal parts reflect 1/2 being the same amount of area as 2/4, and 4/8), relate to number lines (i.e. 1/2, 2/4, 3/6, and 4/8 are all the same distances away from zero on a number line). It is imperative for instruction to progress from the concrete object to pictorial, before introducing the multiplicative identity property (a number multiplied by one will not change the value of the number). Instruction should relate the actions in the identity property to the visual (i.e. 1/2 x 1 = ____; 1/2 x 2/2 = 2/4 should be demonstrated through the use of a strip of a paper divided into two equal parts representing 1/2; folding that paper in half again does not change the length of the piece of paper but now divides the whole into four equal parts where 2/4 represents the same as 1/2).

Academic Vocabulary

- Distance
- Equal parts of a whole
- Equivalent fractions
- Identity property (Application Of)
- Number line
- Whole

Rigor Implications

- Apply
- Represent
- Generate
- Determine

4.3.F

4.3 Number and Operations. The student applies mathematical process standards to represent and generate fractions to solve problems. The student is expected to:

(F) evaluate the reasonableness of sums and differences of fractions using benchmark fractions 0, 1/4, 1/2, 3/4, and 1, referring to the same whole

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.3E represent and solve addition and subtraction of fractions with equal denominators using objects and pictorial models that build to the number line and properties of operations
- 5.3K add and subtract positive rational numbers fluently

How does it support the Readiness Standard(s)?

Through the use of benchmarking of fractions, students will be able to estimate prior to solving problems and determine if a solution is reasonable.

Instructional Implications

Although 4.3E limits the "solving" of addition and subtraction of fractions to that of like denominators, this standard addresses the ability to use benchmark fractions in "evaluating" the reasonableness of sums/differences of fractions that may or may not have like denominators. Instruction should include evaluating whether a given answer to unlike denominator problem is reasonable (i.e. If Marco has a water bottle filled with 16 ounces of water and he drank 4 1/6 ounces before lunch and 6 7/8 ounces after lunch, would be a reasonable to say he had about 2 ounces of water left in the bottle at the end of the day?). Students employ fractional benchmarks to determine reasonableness (i.e. When referencing 4 1/6 ounces of water, 1/6 is less than half which means Marco drank about 4 ounces in the morning. When referencing 6 7/8 ounces of water, 7/8 is more than half which means Marco drank about 7 ounces after lunch; Marco drank a total of 11 ounces of water which means there is about 5 ounces of water left in the bottle at the end of the day). Instruction should begin with students visually representing the fractional amounts with concrete objects, pictorial models, or the use of the number line to observe the positioning being closer to 0, 1/4, 1/2, 3/4, or 1. To support students with benchmarking to the nearest half and/or fourth, have them identify the total number of parts that make up a whole (i.e. in the fraction 3/8, eight is the denominator), determine half that amount of the denominator (i.e. half of 8 is 4; 3/8 is less than half) and determine a fourth by taking half of half (i.e. half of 8 is 4 and half of 4 is 2; 3/8 is more than 1/4).

Academic Vocabulary

- Benchmark fraction
- Difference
- Parts of a whole
- Reasonableness
- Sum
- Whole

Rigor Implications

- Apply
- Represent
- Generate
- Evaluate

4.3.G 4.3 Number and Operations. The student applies mathematical process standards to represent and generate fractions to solve problems. The student is expected to:

(G) represent fractions and decimals to the tenths or hundredths as distances from zero on a number line

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.2G relate decimals to fractions that name tenth and hundredths
- 5.2B compare and order two decimals to thousandths and represent comparisons using symbols >, <, or =

How does it support the Readiness Standard(s)?

Locating fractional and decimal values as a specific point on a number line will support students in comparing/ordering decimals in grade 5. When students identify decimal and fractional values on a number line, they will begin to relate the equivalent values of tenths (0.10; 1/10) and hundredths (0.01; 1/100) as they fall on the same point on the number line.

Instructional Implications

In adherence to the standard, instruction is limited to representing decimals to the tenths and hundredths on a number line. Students will utilize number lines containing intervals that are divided equally between zero and one whole. Students will be asked to represent a given decimal/fractional value on a number line.

Academic Vocabulary

- Decimals
- Distance
- Fractions
- Hundredths
- Number line
- Tenths

Rigor Implications

- Apply
- Represent
- Generate

4.4.B 4.4 Number and Operations. The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy. The student is expected to:
(B) determine products of a number and 10 or 100 using properties of operations and place value understanding

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.4H solve with fluency one- and two-step problems involving multiplication and division, including interpreting remainders

How does it support the Readiness Standard(s)?

Recognizing patterns in multiplying by 10 or 100 will support students in developing multiplication/division algorithms and being able to estimate products/quotients of multiplication/division problems.

Instructional Implications

Through the use of technology (calculators), students can begin to see a pattern when multiplying a one-digit number by ten and/or hundred (i.e. 1 x 10 = 10; 2 x 10=20, 3 x 10 = 30, etc.). The partial product strategy can also be applied to determine products of two-digit numbers and 10 and/or 100 (i.e. 64 x 10 = ___; (60 + 4) x 10 = (60 x 10) + (4 x 10) = 600 + 40 = 640). Instruction should also relate to how the place value chart becomes ten times larger when moving one position to the left or one-hundred times larger when moving two positions to the left. The automaticity of multiplying by 10 and 100 will be essential for the development of strategies/algorithms for multiplying multiple digit numbers (see 4.4D).

Academic Vocabulary

- One-digit number
- Patterns
- Place value
- Product
- Properties of operations
- Two-digit number

Rigor Implications

- Apply
- Develop
- Use
- Solve
- Determine

4.4.C 4.4 Number and Operations. The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy.The student is expected to: (C) represent the product of 2 two-digit numbers using arrays, area models, or equations , including perfect squares through 15 x 15

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.4H solve with fluency one-and two-step problems involving multiplication and division, including interpreting remainders

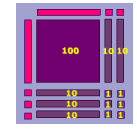
How does it support the Readiness Standard(s)?

It is critical for students to develop the conceptual understanding of multiplying two-digit numbers before moving to the abstract understanding of the standard algorithm. This supporting standard provides that development progression.

Instructional Implications

The intent of this standard is to build the conceptual knowledge of two-digit multiplication (i.e. 12 x 13 = ___). Students will use a variety of methods to represent their understanding:

Arrays:



12 x 13 = 100 + 50 + 6 = 156

Area models:

	10	+ 3
10	100	30
+ 2	20	6

12 x 13 = 100 + 30 + 20 + 6 = 156

Equations:

$$\begin{array}{rl} 12 & \\ \times\ 13 & \\ \hline 6 & = 2\times 3 \\ 30 & = 10\times 3 \\ 20 & = 10\times 2 \\ 100 & = 10\times 10 \\ \hline 156 & \end{array}$$

Encourage students to demonstrate their understanding in more than one way. In adherence to the standard, instruction should include examples of perfect squares where the two factors are the same value (i.e. 12 x 12). Through the use of arrays and/or area models, students will begin to relate why such examples are identified as perfect squares as the side lengths are equal.

Academic Vocabulary

- Area model
- Array
- Equation/Number sentence
- Factor
- Multiplication
- Perfect square
- Partial
- Product
- Two-digit number product

Rigor Implications

- Apply
- Develop
- Use
- Solve
- Represent

4.4.D 4.4 Number and Operations. The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy. The student is expected to:
(D) use strategies and algorithms, including the standard algorithm, to multiply up to a four-digit number by a one-digit number and to multiply a two-digit number by a two-digit number; strategies may include mental math, partial products, and the commutative, associative, and distributive properties

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.4H solve with fluency one-and two-step problems involving multiplication and division, including interpreting remainders

How does it support the Readiness Standard(s)?

It is critical for students to develop their flexibility with multiplying multi-digit numbers by employing different strategies before moving to the abstract understanding of the standard algorithm. This supporting standard provides that development progression.

Instructional Implications

In accordance with the standard, students are to use strategies to develop their conceptual understanding of four-digit times one digit multiplication and two-digit by two digit multiplication. The use of mental math, partial products, and operational properties will allow students to build their flexibility in the use of numbers (i.e. 23 x 12 = (20 + 3) x (10 + 2) = (20 x 10) + (20 x 2) + (3 x 10) + (3 x 2) = 200 + 40 + 30 + 6 = 276). It is imperative to relate those actions to the steps found in the standard algorithm in order to move students from the concrete to abstract understanding.

$$\begin{array}{r} 23 \\ \times\ 12 \\ \hline 46 \\ +\ 230 \\ \hline 276 \end{array}$$

(i.e. the partial products method multiplies the values of the digits; whereas, the traditional algorithm multiplies the digits within a given place value; students relate how multiplying 2 tens and 2 ones to yield a 4 in the tens place value of the traditional algorithm is the same thing as multiplying 20 x 2 to yield 40 in the partial products method).
Encourage students to demonstrate their understanding in more than one way. Although the teacher may model the formal names of the properties (i.e. commutative, associative, distributive, etc.), students will only be asked to "use" the underlying concepts in order to solve multiplication problems as outlined within the cognitive expectation of the standard.

Academic Vocabulary

- Algorithms
- Digit
- Mental math
- Multiplication
- Partial products
- Place value
- Properties
  - » Commutative property (Application Of)
  - » Associative property (Application Of)
  - » Distributive property (Application Of)
- Strategies

Rigor Implications

- Apply
- Develop
- Use
- Solve
- Multiply

4.4.E 4.4 Number and Operations. The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy. The student is expected to:
(E) represent the quotient of up to a four-digit whole number divided by a one-digit whole number using arrays, area models, or equations

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.4H solve with fluency one-and two-step problems involving multiplication and division, including interpreting remainders

How does it support the Readiness Standard(s)?

It is critical for students to develop the conceptual understanding of division of multi-digit numbers before moving to the abstract understanding of the standard algorithm. This supporting standard provides that development progression.

Instructional Implications

The intent of this standard is to build the conceptual knowledge of four-digit divided by one-digit whole numbers (i.e. 645 ÷ 5 = ___). In adherence to this standard, students represent the quotient using arrays and area models (see 4.4C for examples).
Equations (i.e. partial quotient)

3 | 384		
- 300		100
84		
- 30		10
54		
- 30		10
24		
- 24	+	8
0		128

In adherence to the standard, limit instruction to division of four-digit by one-digit.

Academic Vocabulary

- Area model
- Array
- Division
- Equations
- Partial Quotient
- Quotient

Rigor Implications

- Apply
- Develop
- Use
- Solve
- Represent

4.4.F 4.4 Number and Operations. The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy. The student is expected to:
(F) use strategies and algorithms, including the standard algorithm, to divide up to a four-digit dividend by a one-digit divisor

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.4H solve with fluency one- and two-step problems involving multiplication and division, including interpreting remainders

How does it support the Readiness Standard(s)?

It is critical for students to develop an efficient way to divide multi-digit numbers by a one-digit divisor. This learning will extend to interpreting the remainder in a division problem.

Instructional Implications

In adherence to the standard, instruction is limited to four-digit divided by a one-digit divisor. In conjunction with 4.4E, it is essential to relate the actions of the conceptual strategies to the standard algorithm. The partial quotient method uses the value of the numbers in the dividend; students determine the total number of equal groups that will divide into each value and then the total number of equal groups are added to determine the quotient. The traditional algorithm uses the digits in each place value to determine the total number of equal groups. The traditional algorithm moves through each place value one at a time, subtracting out the total number of equal groupings created. Encourage students to demonstrate their understanding in more than one way.

Academic Vocabulary

- Algorithm
- Dividend
- Divisor
- Quotient
- Remainder
- Strategy

Rigor Implications

- Apply
- Develop
- Use
- Solve
- Divide

4.4.G 4.4 Number and Operations. The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy. The student is expected to:
(G) round to the nearest 10, 100 or 1,000 or use compatible numbers, to estimate solutions involving whole numbers

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.4A add and subtract whole numbers and decimals to the hundredths place using the standard algorithm
- 4.4H solve with fluency one-and two-step problems involving multiplication and division, including interpreting remainders

How does it support the Readiness Standard(s)?

As students will be asked to solve problems using all four operations, it will be important to estimate solutions prior to solving. Rounding and the use of compatible numbers will support students in estimating solutions and evaluating reasonableness of solutions.

Instructional Implications

In conjunction with 4.4A, students will estimate solutions to addition and subtraction problems prior to solving for the exact answer. Students will employ the understanding of representing a number on a number line between two consecutive multiples of 10, 100, 1,000 (see 4.2D) as a means of estimating sums and differences (i.e. 679 - 344 = ____; 700 - 300 = 400 or 680 - 340 = 340). In adherence to the standard, the intent of rounding is to estimate a solution; therefore, employing a specific rounding rule is not necessary. Compatible numbers is another means for estimating solutions (i.e. 679 - 344 = ___; 675 - 350 = 325).

Academic Vocabulary

- Compatible numbers
- Estimate
- Nearest 10; 100; 1,000
- Round
- Solutions

Rigor Implications

- Apply
- Develop
- Use
- Solve
- Round
- Estimate

4.5.C 4.5 Algebraic Reasoning. The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to:

(C) use models to determine the formulas for the perimeter of a rectangle (l + w + l + w or 2l + 2w), including the special form for perimeter of a square (4s) and the area of a rectangle (l x w)

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.5D solve problems related to perimeter and area of rectangles where dimensions are whole numbers

How does it support the Readiness Standard(s)?

As students use models to develop the conceptual understanding of perimeter, this supporting standard builds on a student's flexibility with the various formula representations.

Instructional Implications

In adherence to the standard, students should manipulate concrete objects and associate those actions to their respective formulas (i.e. building a 4 by 6 array with color tiles, two side lengths of 4 and two side lengths of 6 yield a perimeter of 4 + 4 + 6 + 6 = 20 or (4 x 2) + (6 x 2) = 8 + 12 = 20). Instruction should connect how a square is also a rectangle and the formula for a rectangle can be used to solve for the perimeter of square (i.e. building a 6 by 6 array with color tiles yields a perimeter of 6 + 6 + 6 + 6 = 24 or (6 x 2) + (6 x 2)=24). As a square is a special type of rectangle where all four sides are equal in length, one could multiply its side length by four; hence, P=4s (i.e. building a 6 by 6 array yields a perimeter of 6 x 4 = 24).

Academic Vocabulary

- Area
- Dimensions
- Formulas
- Length
- Perimeter
- Rectangle
- Square
- Width

Rigor Implications

- Apply
- Develop
- Use
- Determine

4.6.A 4.6 Geometry and Measurement. The student applies mathematical process standards to analyze geometric attributes in order to develop generalizations about their properties. The student is expected to:
(A) identify points, lines, line segments, rays, angles, and perpendicular and parallel lines

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

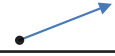
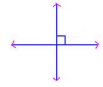
- 4.6D classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size

How does it support the Readiness Standard(s)?

In order for students to appropriately classify two-dimensional figures, identifying the attributes of points, lines, line segments, rays, angles, and perpendicular and parallel lines is critical.

Instructional Implications

In conjunction with 4.6D, students will need to understand the geometric attributes outlined in this standard in order to classify two-dimensional figures. In accordance to the TEKS, students need to be able to not only identify, but analyze the attributes of the various geometric terms.

Term	Example	Geometric Properties
Point		Specifies location; does not have length, width, or depth
Line		Has only one dimension of length; does not have width or depth; connects two points and continues on in both directions
Line Segment		Has only one dimension of length; does not have width or depth; two points (called endpoints) and all points between
Ray		Contains a point (endpoint) and extends one direction
Angle		A figure formed by two rays that share the same endpoint (vertex)
Perpendicular Lines		Two lines that intersect forming a 90 (right) angle
Parallel Lines		Two lines that never intersect

Academic Vocabulary

- Angles
- Geometric attributes
- Lines
- Line segments
- Parallel line
- Perpendicular line
- Points
- Rays

Rigor Implications

- Apply
- Develop
- Identify

4.6.B 4.6 Geometry and Measurement. The student applies mathematical process standards to analyze geometric attributes in order to develop generalizations about their properties. The student is expected to:

(B) identify and draw one or more lines of symmetry, if they exist, for a two-dimensional figure

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 6.8D determine solutions for problems involving the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prism where dimensions are positive rational numbers
- 6.8B model area formulas for parallelograms, trapezoids, and triangles by decomposing and rearranging parts of these shapes

How does it support the Readiness Standard(s)?

Identifying lines of symmetry for two-dimensional figures will support students in their future study of decomposing and rearranging their parts to model various formulas (i.e. a rectangle has a diagonal line of symmetry which yields two congruent triangles; therefore, the formula for a triangle is half of rectangle; A = 1/2 bh).

Instructional Implications

In adherence to the standard, students are to not only identify, but physically draw lines of symmetry. The standard limits the figures to two-dimensional; however, instruction should include regular  and irregular  two-dimensional shapes. Encourage student to identify/draw more than one line of symmetry should more exist. As outlined in the TEKS, students need to develop generalizations about lines of symmetry (i.e. lines of symmetry divide a figure into two congruent parts; corresponding points on each half are equidistant from the line of symmetry).

Academic Vocabulary

- Congruent
- Lines of symmetry
- Symmetry
- Two-dimensional

Rigor Implications

- Apply
- Develop
- Identify
- Draw

4.6.C 4.6 Geometry and Measurement. The student applies mathematical process standards to analyze geometric attributes in order to develop generalizations about their properties. The student is expected to:
(C) apply knowledge of right angles to identify acute, right, and obtuse triangles

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.6D classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size
- 4.7C determine the approximate measures of angels in degrees to the nearest whole number using a protractor

How does it support the Readiness Standard(s)?

Identifying the types of angles (acute, obtuse, and right) supports the classification of two-dimensional figures. Knowing the measurements of the different angle types will be important when using a protractor to measure angles.

Instructional Implications

In accordance with 4.6A, students identified perpendicular lines and described how the angles formed are 90°, right angles. As students begin measuring angles (see 4.7 C/D), they can begin to classify angles into three categories: acute (less than 90°), right (exactly 90°), and obtuse (greater than 90°). This knowledge of angle classification can then define various triangles: acute triangle (all angles measure less than 90°), right triangle (one angle measure 90°), and obtuse triangle (one angle measures more than 90°).

Academic Vocabulary

- Acute angles
- Obtuse angles
- Right angles

Rigor Implications

- Apply
- Develop

4.7.A 4.7 Geometry and Measurement. The student applies mathematical process standards to solve problems involving angles less than or equal to 180 degrees. The student is expected to:

(A) illustrate the measure of an angle as the part of a circle whose center is at the vertex of the angle that is "cut out" by the rays of the angle; angle measures are limited to whole numbers

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

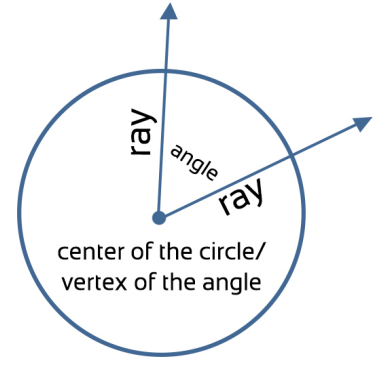
- 4.7C determine the approximate measures of angles in degrees to the nearest whole number using a protractor

How does it support the Readiness Standard(s)?

This supporting standard develops the understanding that an angle is a part of a circle that has been "cut out." The vertex of the angle will serve as a point of interest in using the protractor to measure angles accurately.

Instructional Implications

In conjunction with 4.6A, students should identify the point in middle of the circle that would be equal distance from that point to any point on the circle. This point would be identified as the center of the circle. The center of the circle will serve as the vertex of two rays. The center of the circle will serve as the common endpoint of two rays (or as the vertex of an angle). The part of the circle that is "cut out" by the rays is identified as the angle. In adherence to the standard, students should be able to illustrate such understanding.



Academic Vocabulary

- Center
- Measure of an angle
- Part of a circle
- Rays
- Vertex of an angle

Rigor Implications

- Apply
- Solve
- Illustrate

4.7.B	4.7 Geometry and Measurement. The student applies mathematical process standards to solve problems involving angles less than or equal to 180 degrees. The student is expected to: (B) illustrate degrees as the units used to measure an angle, where 1/360 of a circle is 1 degree and an angle that "cuts" n/360 out of any circle whose center is at the angle's vertex has a measure of n degrees; angle measures are limited to whole numbers

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.7C determine the approximate measures of angles in degrees to the nearest whole number using a protractor

How does it support the Readiness Standard(s)?

This supporting standard develops the understanding that a complete circle represents 360^{o}. Each angle unit represents 1/360 of a circle. Students will be apply this knowledge when using a protractor which represents a half of a circle measuring angles up to 180^{o}.

Instructional Implications

Just like length is measured in linear units, time is measured in seconds/minutes/hours, weight can be measured in pounds/ounces; angles have their own measurement units called degrees. Instruction could use the example of a 360 on a skateboard relates to 360° in a circle (i.e. a skateboarder turns a complete circle in air on the skateboard to perform a 360; the turn all the way around a circle measures 360°.). The vertex of the angle is the center of the circle (i.e. the point on which the skateboarder begins his rotation). Relating how far a rider turns his skateboard may support students with the understanding. In adherence to the standard, students must illustrate how each degree represents 1/360 of a circle; therefore, a 180 on a skateboard would actually represent 180/360 or a 1/2 a turn of a circle or 180°. Should a skateboarder only be able to turn his board a 90° angle means he/she completed a 90/360 turn or 1/4 of a complete circle.

Academic Vocabulary

- Angle
- Angle vertex
- Degrees
- 1/360 of a circle
- One degree

Rigor Implications

- Apply
- Solve
- Illustrate

4.7.D 4.7 Geometry and Measurement. The student applies mathematical process standards to solve problems involving angles less than or equal to 180 degrees. The student is expected to:

(D) draw an angle with a given measure

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.7C determine the approximate measures of angles in degrees to the nearest whole number using a protractor

How does it support the Readiness Standard(s)?

Drawing angles of a given measure will build the student's efficiency in the use of protractor.

Instructional Implications

In conjunction with 4.7C, instruction should extend from the measuring of angles using a protractor to drawing the angle. Instruction should begin with students identifying whether the given angle measurement is acute or obtuse. They should move on to drawing a ray, aligning the center of the protractor to what will become the vertex of the angle, aligning the zero edge of the protractor to the drawn edge, marking the given angle measurement (reminding students to refer to the appropriate unit marks for acute/obtuse angles), and drawing a ray from the center of the angle to the indicated mark.

Academic Vocabulary

- Angles
- Angle vertex
- Center mark
- Degrees
- Inner scale
- Outer scale
- Protractor
- Zero edge

Rigor Implications

- Apply
- Solve
- Draw

4.7.E 4.7 Geometry and Measurement. The student applies mathematical process standards to solve problems involving angles less than or equal to 180 degrees. The student is expected to:

(E) determine the measure of an unknown angle formed by two non-overlapping adjacent angles given one or both angle measures

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.7C determine the approximate measures of angles in degrees to the nearest whole number using a protractor

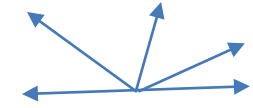
How does it support the Readiness Standard(s)?

As students will have to determine the approximate measure of angles greater than 180^0, determining the measure of adjacent angles may be necessary when using a protractor.

Instructional Implications

Instruction should define and provide examples and non-examples of non-overlapping adjacent angles. Adjacent angles are to be defined as two angles that do not overlap that share a common ray and a common point (vertex). Students should begin to visualize how two adjacent angles will yield a larger angle.

Non-overlapping adjacent angles can include more than two angles.



As students begin to determine the measure of an unknown angles, be sure to vary the context of the problems (i.e. two angle measurements given for the two adjacent angles, determine the measurement of the larger angle; given the measurement of the larger angle and one of the adjacent angles determine the measurement of the other adjacent angle. Given that the larger angle is a right angle and the measure of one of the adjacent angles, determine the measure of the other adjacent angle. Given the larger angle represents a half of a circle and the measures of one of the adjacent angles, determine the measure of the other adjacent angle). This understanding will begin to lay the foundation for supplementary and complementary angle measurements.

Academic Vocabulary

- Angles
- Adjacent angles
- Degrees
- Non-overlapping

Rigor Implications

- Apply
- Solve
- Determine

4.8.A 4.8 Geometry and Measurement. The student applies mathematical process standards to select appropriate customary and metric units, strategies, and tools to solve problems involving measurement. The student is expected to:
(A) identify relative sizes of measurement units within the customary and metric systems

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.8C solve problems that deal with measurement of length, intervals of time, liquid volume, mass and money using addition, subtraction, multiplication, or division as appropriate

How does it support the Readiness Standard(s)?

Measurement conversions may be a component of solving problems of length, liquid volume, and mass. Therefore, identifying the relative size of various customary and metric measures will support estimation and reasonableness of solutions.

Instructional Implications

In measurement, students need a point of reference to identify the relative size of measurement units. Benchmarks need to be provided for both customary and metric (i.e. an inch is about the length of the bend of my index finger, a centimeter is the length of a unit cube in the base ten blocks, a foot is the length of a ruler, a decimeter is the length of a ten rod in the base ten blocks). Relative size needs to be applied to length (i.e. an inch is about the length of the bend of my index finger), liquid volume (i.e. a gallon can relate to a jug of milk), and mass (one M&M candy is approximately one gram). This understanding will allow students to better estimate and/or apply reasonableness to solutions.

Academic Vocabulary

- Customary
- Length
- Liquid volume
- Mass
- Measurement units
- Metric
- Relative size

Rigor Implications

- Apply
- Select
- Solve
- Identify

4.8.B 4.8 Geometry and Measurement. The student applies mathematical process standards to select appropriate customary and metric units, strategies, and tools to solve problems involving measurement. The student is expected to:
(B) convert measurements within the same measurement system, customary or metric, from a smaller unit into a larger unit or a larger unit into a smaller unit when given other equivalent measures represented in a table

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.5B represent problems using an input-output table and numerical expressions to generate a number pattern that follows a given rule representing the relationship of the values in the resulting sequence and their position in the sequence
- 4.8C solve problems that deal with measurement of length, intervals of time, liquid volume, mass and money using addition, subtraction, multiplication, or division as appropriate

How does it support the Readiness Standard(s)?

Measurement conversions may be a component in solving problems of length, liquid volume, and mass. Through the use of tables, students will build their flexibility in moving between units.

Instructional Implications

In accordance to the standard, students will apply measurement conversions through the use of a table. In conjunction with 4.5B, students should employ the use of the process column (a.k.a. what's my rule) to better understand how units convert. Instruction should include both conversions from a smaller to a larger unit and a larger to a smaller unit.

Meters	Process	Kilometers
1	1 x 1,000	1,000
2	2 x 1,000	2,000
3	3 x 1,000	3,000
10	10 x 1,000	10,000
21	21 x 1,000	21,000

Ounces	Process	Pounds
160	160 ÷ 16	10
96	96 ÷ 16	6
64	64 ÷ 16	4
32	32 ÷ 16	2
16	16 ÷ 16	1

Instruction should include the conversion of customary (i.e. inches to feet; ounces to pounds) and metric (i.e. centimeters to meters; kilograms to grams). In conjunction with 4.8C, examples of measurement conversions should apply to length, liquid volume, and mass.

Academic Vocabulary

- Customary
- Equivalent measures
- Larger unit to smaller unit
- Measurements
- Metric
- Smaller unit to larger unit
- Table

Rigor Implications

- Apply
- Select
- Solve
- Convert

4.9.B 4.9 Data Analysis. The student applies mathematical process standards to solve problems by collecting, organizing, displaying, and interpreting data. The student is expected to:

(B) solve one- and two-step problems using categorical data in whole number, decimal, and fraction form in frequency table, dot plot, or stem-and-leaf plot

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.3E represent and solve addition and subtraction of fractions with equal denominators using objects and pictorial models that build to the number line and properties of operations
- 4.4A add and subtract whole numbers and decimals to the hundredths place using the standard algorithm
- 4.4H solve with fluency one- and two-step problems involving multiplication and division, including interpreting remainders

How does it support the Readiness Standard(s)?

This supporting standard merges the use of whole numbers, decimals, and fractions with various graph representations. Through the interpretation of data on a graph, students should be able to apply their ability to solve addition/subtraction of fractions and decimals and multiplication/division of whole numbers.

Instructional Implications

Instruction should vary the context of the problems being asked of the students (i.e. joining, separating, comparing, and distance). In adherence to the standard, whole number/ decimal/ and fractional data should be represented.

Academic Vocabulary

- Categorical data
- Decimal
- Dot plot
- Fraction
- Frequency table
- Stem-and-leaf plot
- Whole number

Rigor Implications

- Apply
- Collect
- Organize
- Display
- Interpret
- Solve

4.10.A 4.10 Personal Financial Literacy. The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security. The student is expected to:
(A) distinguish between fixed and variable expenses

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.10 Personal Financial Literacy

How does it support the Readiness Standard(s)?

Distinguishing between fixed and variable expenses will support one's ability to manage his or her financial resources more effectively for a lifetime of financial security.

Instructional Implications

Fixed expenses can be defined as those costs that do not change frequently, are consistent over time; costs that you do not have the ability to manipulate (i.e. rent, taxes). Variable expenses are those costs that change more frequently; costs that can be manipulated to be more or less (i.e. amount of money spent on gas, eating out, going to the movies). Instruction can merge content standards with the understanding of fixed and variable expenses (see 4.2C/F, 4.3E, 4.4A/D/F/G/H, 4.5A).

Academic Vocabulary

- Fixed expenses
- Variable expenses

Rigor Implications

- Apply
- Distinguish (compare/contrast)

4.10.B 4.10 Personal Financial Literacy. The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security. The student is expected to:
(B) calculate profit in a given situation

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.10 Personal Financial Literacy

How does it support the Readiness Standard(s)?

Calculating profit may support one's ability to manage his or her financial resources more effectively for a lifetime of financial security.

Instructional Implications

Instruction should define profit as the total amount earned from the sale of goods/services minus the amount spent (i.e. Natalie sold 5 charm bracelets for $20 each. She spent $25.50 on materials to make the bracelets. Natalie would have earned a profit of $74.50). Instruction can merge content standards with the understanding of profit in order to solve problems (see 4.2C/F, 4.3E, 4.4A/D/F/G/H, 4.5A).

Academic Vocabulary

- Profit

Rigor Implications

- Apply
- Calculate

4.10.C 4.10 Personal Financial Literacy. The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security. The student is expected to:
(C) compare advantages and disadvantages of various savings options

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.10 Personal Financial Literacy

How does it support the Readiness Standard(s)?

Comparing various savings plan options will support one's ability to manage his or her financial resources more effectively for a lifetime of financial security.

Instructional Implications

Students need to understand that there are different types of savings options available (i.e. regular savings accounts, certificates of deposit, money market funds, and savings bonds). In adherence to the standard, students should compare the advantages and disadvantages of the different types of savings plans (i.e. regular savings accounts do not require a lot of money to invest and you can withdraw funds at any time; however, the interest earned is less than a cd or money market account).

Academic Vocabulary

- Advantages
- Disadvantages
- Savings Options
  - » Savings accounts
  - » Certificates of deposit
  - » Money market funds
  - » Saving bonds

Rigor Implications

- Apply
- Compare

4.10.D 4.10 Personal Financial Literacy. The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security. The student is expected to:

(D) describe how to allocate a weekly allowance among spending, saving, including for college, and sharing

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.10 Personal Financial Literacy

How does it support the Readiness Standard(s)?

Describing how to allocate various funds will support one's ability to manage his or her financial resources more effectively for a lifetime of financial security.

Instructional Implications

In accordance with the standard, students need to understand how to manage his or her personal finances through the lens of a weekly allowance. Instruction should include a fair amount of spending, saving (including for college) and sharing.

Academic Vocabulary

- Allowance
- College savings
- Saving
- Sharing
- Spending
- Weekly

Rigor Implications

- Apply
- Describe

4.10.E 4.10 Personal Financial Literacy. The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security. The student is expected to:

(E) describe the basic purpose of financial institutions, including keeping money safe, borrowing money, and lending

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

- 4.10 Personal Financial Literacy

How does it support the Readiness Standard(s)?

Describing the basic purpose for financial institutions will support one's ability to manage their financial resources more effectively for a lifetime of financial security.

Instructional Implications

In accordance with the standard, students need to understand the basic purpose of a financial institution. Such establishments include banks, credit unions, financial investment firms, etc. These institutions allow us to make deposits in order to keep our money safe and act as a lender when borrowing money for large purchases (i.e. buying a car, house, and boat; opening a business, etc.).

Academic Vocabulary

- Financial institution
- Borrowing
- Lending

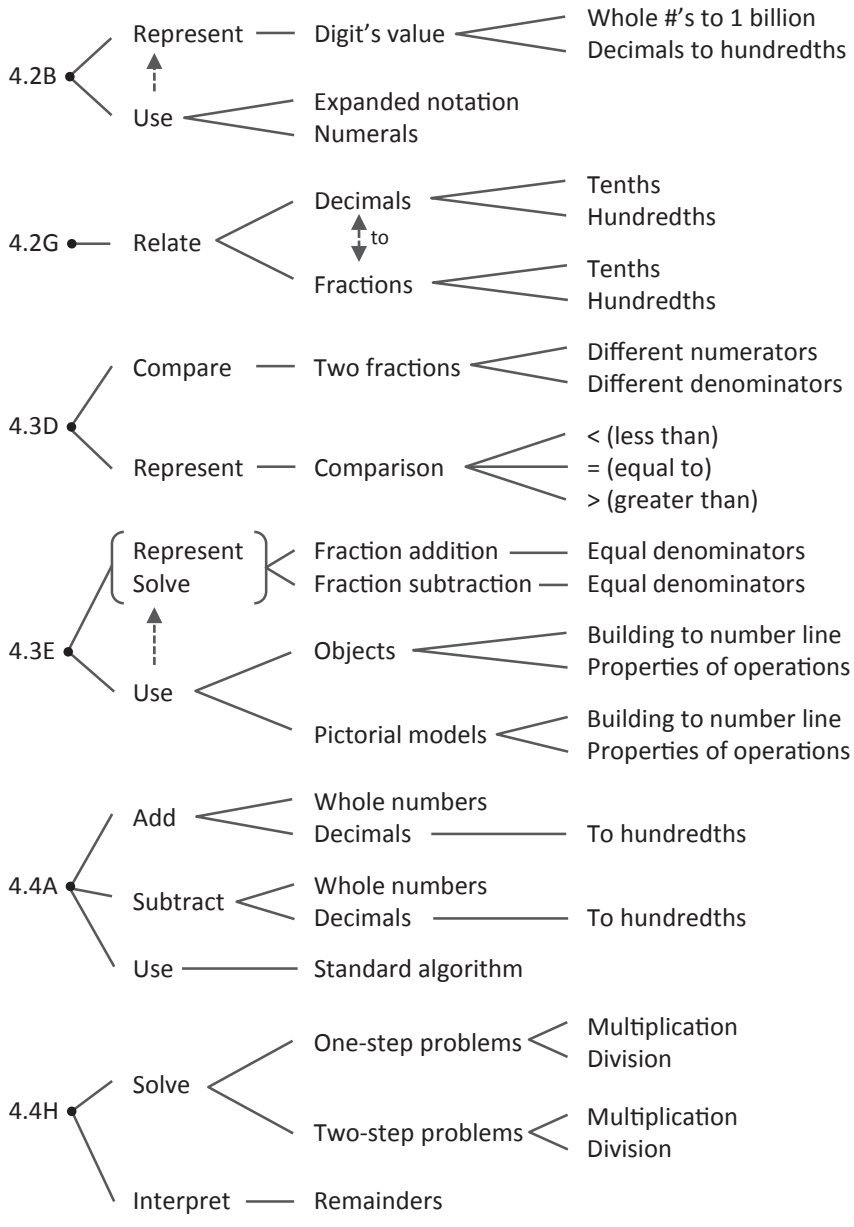
Rigor Implications

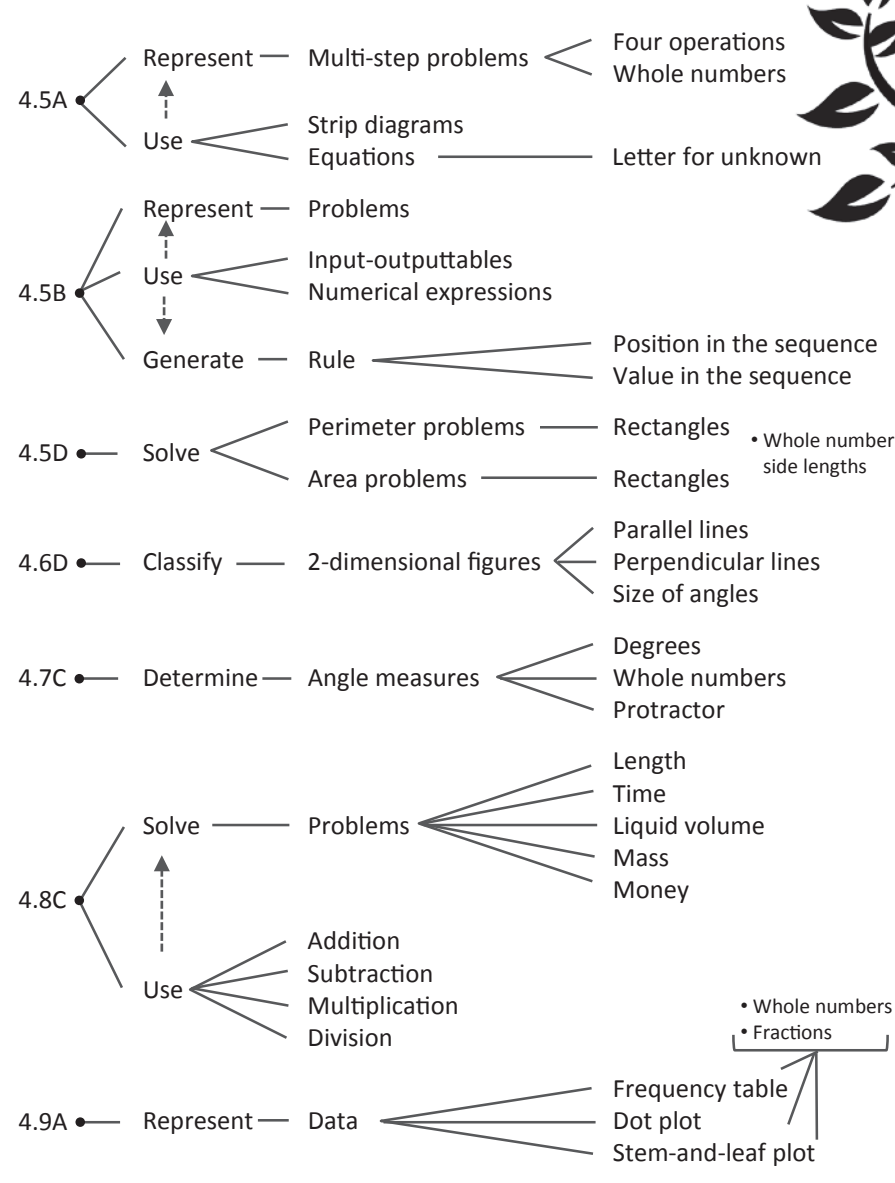
- Apply
- Describe

APPENDIX

TREE DIAGRAM

Grade 4 Math TEKS Tree - Readiness Standards





TEKS Student Expectations for implementation beginning 2014-2015.