5th Grade Texas Mathematics: Unpacked Content

What is the purpose of this document?

To increase student achievement by ensuring educators understand specifically what the new standards mean a student must know, understand and be able to do. This document may also be used to facilitate discussion among teachers and curriculum staff and to encourage coherence in the sequence, pacing, and units of study for grade-level curricula. This document, along with on-going professional development, is one of many resources used to understand and teach the new math standards.

What is in the document?

Descriptions of what each standard means a student will know, understand, and be able to do. The “unpacking” of the standards done in this document is an effort to answer a simple question “What does this standard mean that a student must know and be able to do?” and to ensure the description is helpful, specific and comprehensive for educators.

At A Glance:

New to 5th Grade:

- Concrete understanding of multiplying decimals from grade 7 to grade 5
- Added comparison symbols
- Added the use of expanded notation and numerals to represent decimals
- Added the use of standard algorithm for multiplying 3 digit by 2 digit
- Added the use of strategies for multi-digit division and the standard algorithm
- Extended the dividend to a four digit number
- Added the use of area models
- Added the types of strategies (ie: place value, properties of operations, and relationships of multiplication of whole numbers)
- Added concrete understanding of dividing decimals from grade 7 to grade 5
- Limited quotients to hundredths
- Limited the division of decimals to four digit dividends and two-digit whole numbers
- Added the use of objects and pictorial models including area models
- Added the addition and subtraction of fractions with unlike denominators (use of objects and pictorial models)
- Added the concrete understanding of multiplication of a whole number and a fraction (use of objects and pictorial models)
- Added the concrete understanding of division of a whole number and a fraction (use of objects and pictorial models)
- Added the addition and subtraction of positive rational numbers. Meaning of positive rational numbers.
- Added expressions and simplifying of expressions without exponents to include up to two levels of grouping.
- Added measuring in cubic units from grade 3/4
- Limited volume to rectangular prisms
- Limited lengths of sides to whole numbers
- Added the introduction and use of stem and leaf plots and dot plots
- Added use of ordered pairs found in an “input-output” table.
- Added discrete paired data on a scatterplot
- Added the detail of categorical and numerical data
- Added the use of data sets of measurements in fractions and decimals

Moved from 5th Grade:

- Moved the billions place value to grade 4
- Moved generating of equivalent fractions to grade 4 in order to compare fractions
- Moved finding of common denominators to compare fractions to grade 4
- Moved relating of decimals to fractions to grade 4
- Deleted the types of strategies to be used to estimate (ie: rounding and compatible numbers); however is applied through the process standards.
- Moved the interpretation of remainders to grade 4
- Moved the addition and subtraction of decimals to grade 4
- Limited the multiplication of decimals to the hundredths
- Moved addition and subtraction of decimals to grade 4
- Moved addition and subtraction of fractions with like denominators to grade 4
- Deleted the use of concrete objects and pictorial models for the identification of prime and composite numbers, however, it can be applied to process standards
- Moved the connecting of the area and perimeter models to their respective formulas to grade 4
- Added varying representations of the volume formula (ie: $V = l \times w \times h$; $V = s \times s \times s$; and $V = Bh$)
- Moved liquid volume (capacity) to grade 3 and grade 4
- Deleted the concept of temperature from curriculum, however, can be applied to math process standard
- Deleted picture or line graphs
- Moved experimental probability to grade 7
- Moved mean, median, and mode from grade 5 to grade 6

Instructional Implications for 2013-14:

- Rounding decimals to tenths or hundredths is a new TEK
- Students are expected to generate a numerical patter when given a rule in the form y=ax or y=x+a; And to recognize the difference between additive and multiplicative numerical patterns in a table or graph (moved from 6th grade)
- Describing meaning of parentheses and brackets is new
- Develop formulas for volume of rectangular prisms is new using concrete objects and models

Professional Learning Implications for 2013-14:

- Teachers will need to identify the gaps that will need to be addressed in the 2013-14 school year.
- Embed the process standards into instruction and application
- Identify academic vocabulary
- PD and resources regarding Personal Financial Literacy
- Initial learning of the teachers' grade level TEKS (teachers unpacking the TEKS at their grade level)
- Vertical study of the strands to know how the TEKS align and progress from 4th through 6th grade

Grade 5 Primary Focal Areas:

The Primary Focal Areas are designed to bring focus to the standards at each grade by describing the big ideas that educators can use to build their curriculum and to guide instruction. *(These areas can be found in the Introduction of each standard)*

1) solving problems involving all four operations with positive rational numbers
2) determining and generating formulas and solutions to expressions, and
3) extending measurement to area and volume

These focal areas are supported throughout the mathematical strands of number and operations, algebraic reasoning, geometry and measurement, and data analysis. In Grades 3-5, the number set is limited to positive rational numbers. In number and operations, students will apply place value and identify part-to-whole relationships and equivalence. In algebraic reasoning, students will represent and solve problems with expressions and equations, build foundations of functions through patterning, identify prime and composite numbers, and use the order of operations. In geometry and measurement, students will classify two-dimensional figures, connect geometric attributes to the measures of three-dimensional figures, use units of measure, and represent location using a coordinate plane. In data analysis, students will represent and interpret data.

Mathematical process standards

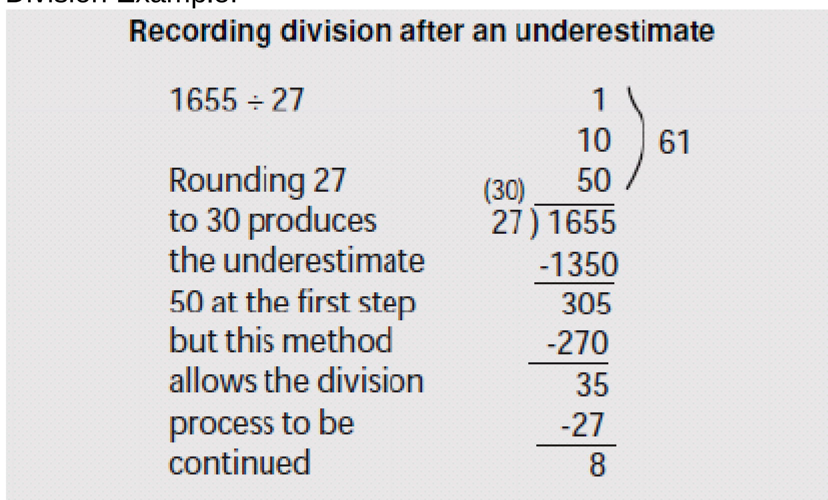
The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;
(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
(E) create and use representations to organize, record, and communicate mathematical ideas;
(F) analyze mathematical relationships to connect and communicate mathematical ideas; and
(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Numbers and Operations TEKS 5.2	**The student applies mathematical process standards to represent, compare, and order positive rational numbers and understand relationships as related to place value. The student is expected to:**
5.2(A) Represent the value of the digit in decimals through the thousandths using expanded notation and numerals;	The standard call for students to use expanded notation and numerals to represent and describe the value of the digit in decimals through the thousandths. For example, 27.756 is the same as 20 + 7 + 0.7 + 0.05 + 0.006 = 27.756 The value of the digit depends on its place in the number. Expanded notation is shown as a sum of each digit multiplied by its matching place value. For example let's consider the value of 6 in each of these number: 1. 27.056 The value of the 6 in this number is 6 thousandths. 2. 27.650 The value of the 6 in this number is 6 tenths. This standard builds of the expectations of 4th grade where students are expected to interpret the value of each place-value position as ten times the position to the right and one-tenth of the value of the place to its left.
5.2(B) Compare and order two decimals to thousandths and represent comparisons using the symbols >, <, or =; and	The standard call for students to use comparison symbols to compare and order decimals to thousandths. This allows a student to compare the value of the digits by using place value. For example, 0.02 compared to 0.006. A misconception would be that 0.006 is greater than 0.02. Students would know start with the largest place to the left to compare the number. Students should know the comparison symbols, what they mean and how to read them using a number line. Students should use benchmark numbers to support this work. Benchmarks are convenient numbers for comparing and rounding numbers. 0., 0.5, 1, 1.5 are examples of benchmark numbers.
5.2(C) Round decimals to tenths or hundredths.	The standard call for students to round decimals to tenths or hundredths. Students should use number lines to locate the decimals to conceptually understand where the numbers are located. Example: Round 14.235 to the nearest tenth. Students recognize that the possible answer must be

	in tenths thus, it is either 14.2 or 14.3. They then identify that 14.235 is closer to 14.2 (14.20) than to 14.3 (14.30).

<table>
<tr><th>Numbers and Operations TEKS 5.3</th><th>The student applies mathematical process standards to develop and use strategies and methods for positive rational number computations in order to solve problems with efficiency and accuracy. The student is expected to:</th></tr>
<tr><td>5.3(A) Estimate to determine solutions to mathematical and real-world problems involving addition, subtraction, multiplication, or division;</td><td>The standard call for students to round and use compatible numbers to estimate solutions. Students should know that purpose of estimating is the make the math easier.

Division Example:

</td></tr>
<tr><td>5.3(B) Use strategies and algorithms, including the</td><td>This standard refers to fluency which means accuracy (correct answer), efficiency (a reasonable amount of steps), and flexibility (using strategies such as the distributive property or breaking numbers apart also using</td></tr>
</table>

standard algorithm, to] multiply with fluency a three-digit number by a two-digit number using the standard algorithm;	strategies according to the numbers in the problem, 26 x 4 may lend itself to (25 x 4) + 4 where as another problem might lend itself to making an equivalent problem 32 x 4 = 64 x 2)). In fourth grade, students developed understanding of multiplication through using various strategies. While the standard algorithm is mentioned, alternative strategies are also appropriate to help students develop conceptual understanding. The size of the numbers should NOT exceed a three-digit factor by a two-digit factor. Describe how using the standard algorithm to solve 153 x 19 is both similar and different to solving 153 x 19 using an alternate strategy such as: ● (153 x 20) – 153 ● (100 x 10) + (50 x 10) + (3 x 10) + (100 x 9) + (50 x 9) + (3 x 9).

Examples of alternative strategies:
There are 225 dozen cookies in the bakery. How many cookies are there?

Student 1	Student 2	Student 3
225 x 12 I broke 12 up into 10 and 2. 225 x 10 = 2,250 225 x 2 = 450 2,250 + 450 = 2,700	225x12 I broke up 225 into 200 and 25. 200 x 12 = 2,400 I broke 25 up into 5 x 5, so I had 5 x 5 x12 or 5 x 12 x 5. 5 x12= 60. 60 x 5 = 300 I then added 2,400 and 300 2,400 + 300 = 2,700.	I doubled 225 and cut 12 in half to get 450 x 6. I then doubled 450 again and cut 6 in half to get 900 x 3. 900 x 3 = 2,700.

Draw a array model for 225 x 12…. 200 x 10, 200 x 2, 20 x 10, 20 x 2, 5 x 10, 5 x 2

225 x 12

	200	20	5
10	2,000	20 0	50
2	400	40	10

2,000
400
200
40
50
+ 10
2,700

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<td>5.3(C) Use strategies and algorithms, including the standard algorithm, to] solve with proficiency [fluency] for quotients of up to a four-digit dividend by [and] a two-digit divisor using strategies and the standard algorithm;</td>
<td>
This standard references various strategies for division. Division problems can include remainders. Even though this standard leads more towards computation, the connection to story contexts is critical. Make sure students are exposed to problems where the divisor is the number of groups and where the divisor is the size of the groups. In fourth grade, students' experiences with division were limited to dividing by one-digit divisors. This standard extends students' prior experiences quotients of whole numbers with up to four-digit dividends and two-digit divisors, using with strategies, illustrations, and explanations. When the two-digit divisor is a "familiar" number, a student might decompose the dividend using place value.
Describe how using the standard algorithm to solve 1,716 ÷ 16 is both similar and different to solving 1,716 ÷16 using an alternate strategy such as:
Example:
There are 1,716 students participating in Field Day. They are put into teams of 16 for the competition. How many teams get created? If you have left over students, what do you do with them?
Student 1
1,716 divided by 16
There are 100 16's in 1,716.
1,716 – 1,600 = 116
I know there are at least 6 16's.
116 - 96 = 20
I can take out at least 1 more 16.
20 - 16 = 4
There were 107 teams with 4 students left over. If we put the extra students on different team, 4 teams will have 17 students.
Student 2
1,716 divided by 16.
There are 100 16's in 1,716.
Ten groups of 16 is 160. That's too big.
Half of that is 80, which is 5 groups.
I know that 2 groups of 16's is 32.
I have 4 students left over.
<table>
<tr><td>1716
-1600</td><td>100</td></tr>
<tr><td>116
-80</td><td>5</td></tr>
<tr><td>36
-32</td><td>2</td></tr>
<tr><td>4</td><td></td></tr>
</table>
Student 3
1,716 ÷ 16 =
I want to get to 1,716
I know that 100 16's equals 1,600
I know that 5 16's equals 80
1,600 + 80 = 1,680
Two more groups of 16's equals 32, which gets us to 1,712
I am 4 away from 1,716
So we had 100 + 6 + 1 = 107 teams
Those other 4 students can just hang out
Student 4
How many 16's are in 1,716?
We have an area of 1,716. I know that one side of my array is 16 units long. I used 16 as the height. I am trying to answer the question what is the width of my rectangle if the area is 1,716 and the height is 16. 100 + 7 = 107 R 4
<table>
<tr><td></td><td>100</td><td>7</td></tr>
<tr><td>16</td><td>100 x 16 = 1,600</td><td>7 x 16 =112</td></tr>
<tr><td></td><td>1,716 - 1,600 = 116</td><td>116 - 112 = 4</td></tr>
</table>
<u>Other alternate strategies:</u>
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Expanded Notation

Using expanded notation 2682 ÷ 25 = (2000 + 600 + 80 + 2) ÷ 25

Using understanding of the relationship between 100 and 25, a student might think ~

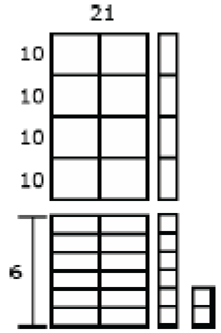
- I know that 100 divided by 25 is 4 so 200 divided by 25 is 8 and 2000 divided by 25 is 80.
- 600 divided by 25 has to be 24.
- Since 3 x 25 is 75, I know that 80 divided by 25 is 3 with a reminder of 5.
  (Note that a student might divide into 82 and not 80)
- I can't divide 2 by 25 so 2 plus the 5 leaves a remainder of 7.
- 80 + 24 + 3 = 107. So, the answer is 107 with a remainder of 7.

Using an equation that relates division to multiplication, 25 x *n* = 2682, a student might estimate the answer to be slightly larger than 100 because s/he recognizes that 25 x 100 = 2500.

Base Ten Models

Example: 968 ÷ 21

Using base ten models, a student can represent 962 and use the models to make an array with one dimension of 21. The student continues to make the array until no more groups of 21 can be made. Remainders are not part of the array.



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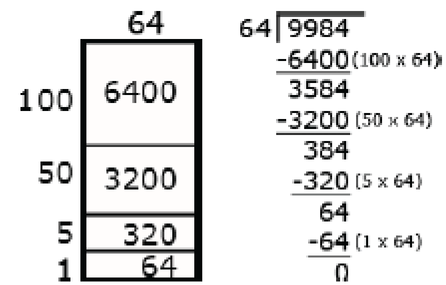
Area Model (repeated subtraction)

Example: 9984 ÷ 64
An area model for division is shown below. As the student uses the area model, s/he keeps track of how much of the 9984 is left to divide.



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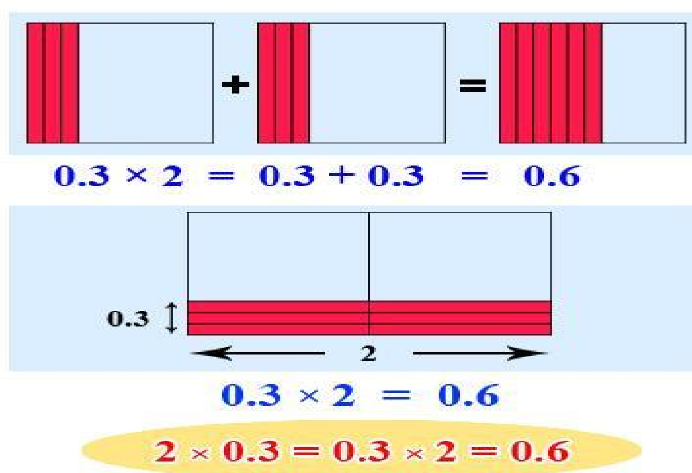
<tr>
<td>5.3(D) represent multiplication of decimals with products to the hundredths using objects and pictorial models, including area models;</td>
<td>

This standard builds on the work from fourth grade where students are introduced to decimals and compare them. In fifth grade, students begin multiplying decimals. This work should focus on concrete models and pictorial representations, rather than relying solely on the algorithm. The use of symbolic notations involves having students record the answers to computations (2.25 x 3= 6.75), but this work should not be done without models or pictures. This standard includes students’ reasoning and explanations of how they use models, pictures, and strategies.

Example 1:



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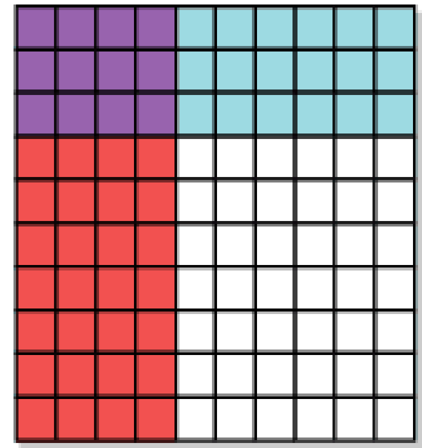
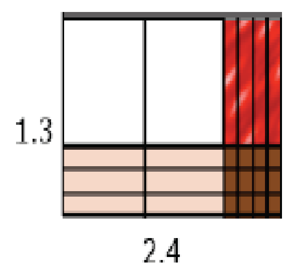
Example 2:

$0.3 \times 0.4 = 0.12$



Example 3:

An area model can be useful for illustrating products.



$$\begin{array}{r} 2.4 \\ \times\ 1.3 \\ \hline .12 \\ .60 \\ .40 \\ +\ 2.00 \\ \hline 3.12 \end{array}$$

Students should be able to describe the partia displayed by the area model.

For example,

"3/10 times 4/10 is 12/100.

3/10 times 2 is 6/10 or 60/100.

1 group of 4/10 is 4/10 or 40/100.

1 group of 2 is 2."

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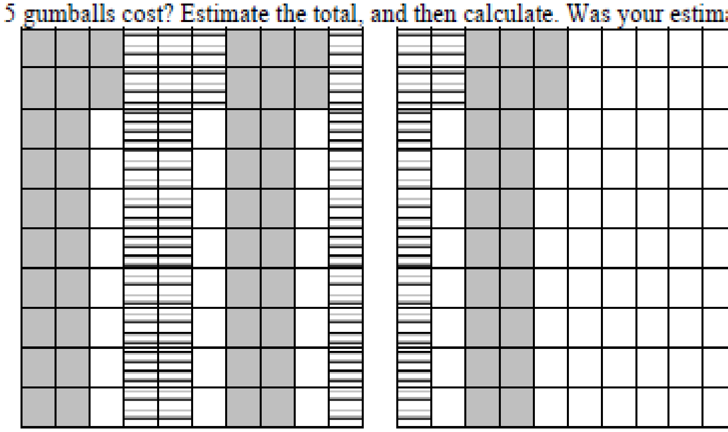
<td>5.3(E) solve for products of decimals to the hundredths, including situations involving money, using strategies based on place-value understandings, properties of operations, and the relationship to the multiplication of whole numbers;</td>
<td>This standard builds on the work from fourth grade where students are introduced to decimals and compare them. In fifth grade, students begin multiplying decimals. This work should focus on concrete models and pictorial representations, rather than relying solely on the algorithm. The use of symbolic notations involves having students record the answers to computations (2.25 x 3= 6.75), but this work should not be done without models or pictures. This standard includes students’ reasoning and explanations of how they use models, pictures, and strategies.

Examples:
6 x 2.4
A student might estimate an answer between 12 and 18 since 6 x 2 is 12 and 6 x 3 is 18. Another student might give an estimate of a little less than 15 because she figures the answer to be very close, but smaller than 6 x 2½ and think of 2½ groups of 6 as 12 (2 groups of 6) + 3 (½ of a group of 6).

A gumball costs $0.22. How much do 5 gumballs cost? Estimate the total, and then calculate. Was your estimate close?

I estimate that the total cost will be a little more than a dollar. I know that 5 20’s equal 100 and we have 5 22’s.
I have 10 whole columns shaded and 10 individual boxes shaded. The 10 columns equal 1 whole. The 10 individual boxes equal 10 hundredth
tenth. My answer is $1.10.
My estimate was a little more than a dollar, and my answer was $1.10. I was really close.</td>
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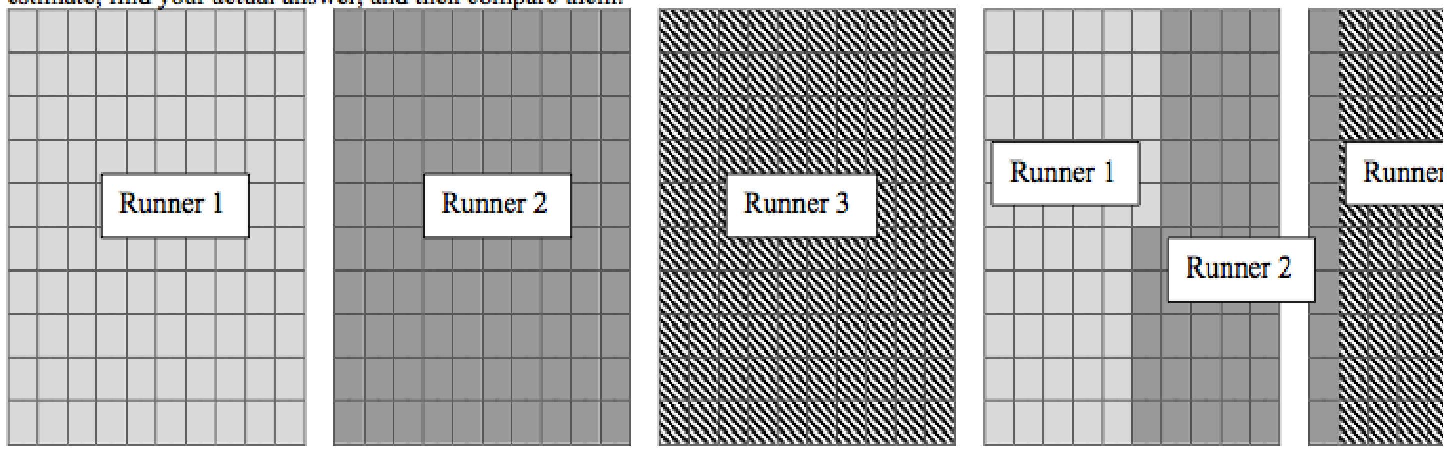
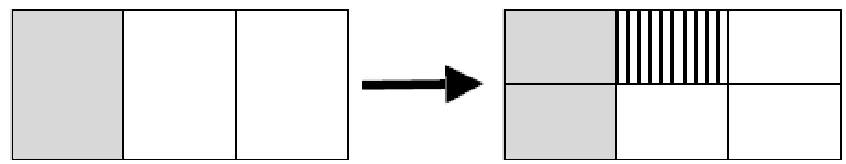
</table>

5.3(F) represent quotients of decimals to the hundredths, up to four-digit dividends and two-digit whole number divisors, using objects and pictorial models, including area models;	This standard builds on the work from fourth grade where students are introduced to decimals and compare them. In fifth grade, students begin adding, subtracting, multiplying and dividing decimals. This work should focus on concrete models and pictorial representations, rather than relying solely on the algorithm. The use of symbolic notations involves having students record the answers to computations (2.25 x 3= 6.75), but this work should not be done without models or pictures. This standard includes students' reasoning and explanations of how they use models, pictures, and strategies. Example of division: finding the number in each group or share. Students should be encouraged to apply a fair sharing model separating decimal values into equal parts such as $2.4 \div 4 = 0.6$  Example of division: finding the number of grou Joe has 1.6 meters of rope. He has to cut pieces o are 0.2 meters long. How many can he cut?

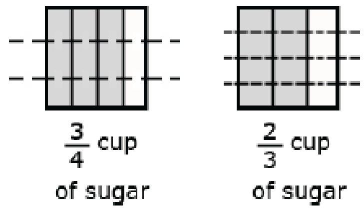
	Example of Division: A relay race lasts 4.65 miles. The relay team has 3 runners. If each runner goes the same distance, how far does each team member run? estimate, find your actual answer, and then compare them.  My estimate is that each runner runs between 1 and 2 miles. If each runner went 2 miles, that would be a total of 6 miles which is too hi runner ran 1 mile, that would be 3 miles, which is too low. I used the 5 grids above to represent the 4.65 miles. I am going to use all of the first 4 grids and 65 of the squares in the 5th grid. I have t
5.3(G) 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	Describe how using the standard algorithm to solve 23.05 ÷ 5 is both similar and different to solving 2,305 ÷ 5.

5.3(H) 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;	This standard builds on the work in fourth grade where students add fractions with like denominators. In fifth grade, the example provided in the standard has students find a common denominator by finding the product of both denominators. For 1/3 + 1/6, a common denominator is 18, which is the product of 3 and 6. This process should be introduced using visual fraction models (area models, number lines, etc.) to build understanding before moving into the standard algorithm to find the least common denominator. Students need to be able to add and subtract with both fractions and mixed numbers. Students should apply their understanding of equivalent fractions and their ability to rewrite fractions in an equivalent form to find common denominators. They should know that multiplying the denominators will always give a common denominator but may not result in the smallest denominator. **Addition Models:** ***Example 1*** Example: 1/3 + 1/6  1/3 is the same as 2/6 I drew a rectangle and shaded 1/3. I knew that if I cut every third in half then I would have sixths. Based on my pictu 1/3 equals 2/6. Then I shaded in another 1/6 with stripes. I ended up with an answer of 3/6, which is equal to 1/2. On the contrary, based on the algorithm that is in the example of the Standard, when solving 1/3 + 1/6, multiplying 3 and 6 gives a common denominator of 18. Students would make equivalent fractions 6/18 + 3/18 = 9/18 which is also equal to one-half. Please note that while multiplying the denominators will always give a common denominator, this may not result in the smallest denominator.

Example 2

Jerry was making two different types of cookies. One recipe needed 3/4 cup of sugar and the other needed 2/3 cup of sugar. How much sugar did he need to make both recipes?

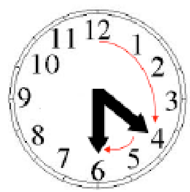
- Mental estimation:
  A student may say that Jerry needs more than 1 cup of sugar but less than 2 cups. An explanation may compare both fractions to ½ and state that both are larger than ½ so the total must be more than 1. In addition, both fractions are slightly less than 1 so the sum cannot be more than 2.
- Area model



$\frac{3}{4} = \frac{9}{12}$ $\frac{2}{3} = \frac{8}{12}$ $\frac{3}{4} + \frac{2}{3} = \frac{17}{12} = \frac{12}{12} + \frac{5}{12} = 1\frac{5}{12}$

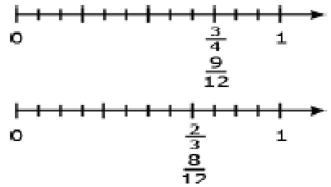
Example 3

Present students with the problem 1/3 + 1/6. Encourage students to use the clock face as a model for solving the problem. Have students share their approaches with the class and demonstrate their thinking using the clock model.

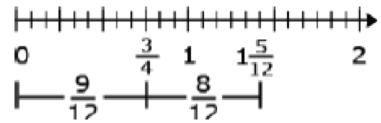


	Addition Algorithm: Students should apply their understanding of equivalent fractions and their ability to rewrite fractions in an equivalent form to find common denominators. They should know that multiplying the denominators will always give a common denominator but may not result in the smallest denominator. Examples: $\frac{2}{5}+\frac{7}{8}=\frac{16}{40}+\frac{35}{40}=\frac{51}{40}$ $3\frac{1}{4}-\frac{1}{6}=3\frac{3}{12}-\frac{2}{12}=3\frac{1}{12}$ Fifth grade students will need to express both fractions in terms of a new denominator with adding unlike denominators. For example, in calculating 2/3 + 5/4 they reason that if each third in 2/3 is subdivided into fourths and each fourth in 5/4 is subdivided into thirds, then each fraction will be a sum of unit fractions with denominator 3 x 4 = 4 x 3 + 12: $\frac{2}{3}+\frac{5}{4}=\frac{2\times 4}{3\times 4}+\frac{5\times 3}{4\times 3}=\frac{8}{12}+\frac{15}{12}=\frac{23}{12}.$ It is **not** necessary to find a least common denominator to calculate sums of fractions, and in fact the effort of finding a least common denominator is a distraction from understanding adding fractions.

Linear Subtraction Model



Solution:



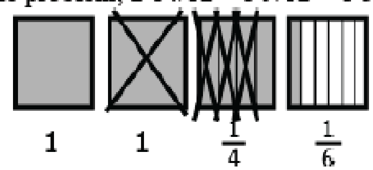
Example: Using a bar diagram

- Sonia had 2 1/3 candy bars. She promised her brother that she would give him ½ of a candy bar. How much will she have left after she gives her brother the amount she promised?
- If Mary ran 3 miles every week for 4 weeks, she would reach her goal for the month. The first day of the first week she ran 1 ¾ miles. How many miles does she still need to run the first week?
  - Using addition to find the answer:1 ¾ + n = 3
  - A student might add 1 ¼ to 1 ¾ to get to 3 miles. Then he or she would add 1/6 more. Thus 1 ¼ miles + 1/6 of a mile is what Mary needs to run during that week.

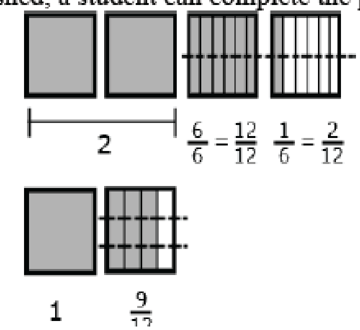
Area Subtraction Model

Example: Using an area model to subtract

- This model shows 1 ¾ subtracted from 3 1/6 leaving 1 + ¼ = 1/6 which a student can then change to 1 + 3/12 + 2/12 = 1 5/12. 3 1/6 can be expressed with a denominator of 12. Once this is done a student can complete the problem, 2 14/12 – 1 9/12 = 1 5/12.



- This diagram models a way to show how 3 1/6 and 1 ¾ can be expressed with a denominator of 12. Once this is accomplished, a student can complete the problem, 2 14/12 – 1 9/12 = 1 5/12.



Addition and Subtraction Algorithm with Application

Estimation skills include identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, and verifying solutions or determining the reasonableness of situations using various estimation strategies. Estimation strategies for calculations with fractions extend from students' work with whole number operations and can be supported through the use of physical models.

Example:
Elli drank 3/5 quart of milk and Javier drank 1/10 of a quart less than Ellie.
How much milk did they drink all together?

$$\frac{3}{5} - \frac{1}{10} = \frac{6}{10} - \frac{1}{10} = \frac{5}{10}$$

Solution:

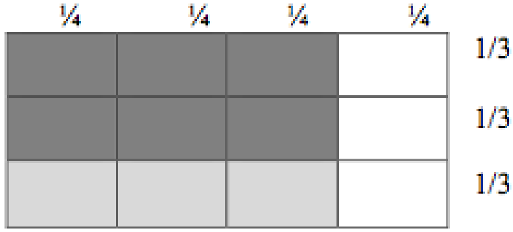
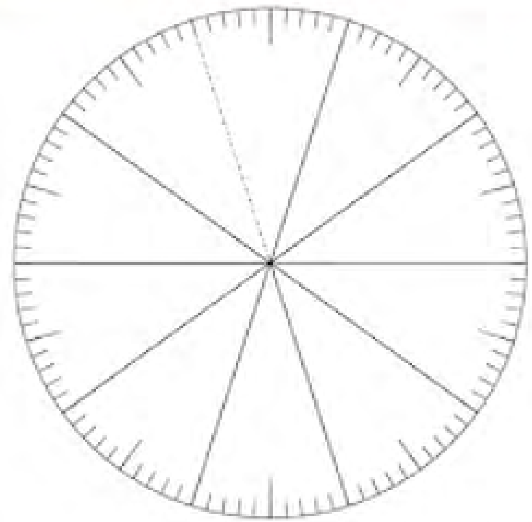
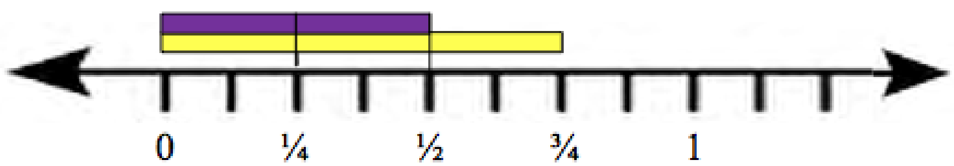
$$\frac{3}{5} - \frac{1}{10} = \frac{6}{10} - \frac{1}{10} = \frac{5}{10}$$ This is how much milk Javier drank.

$$\frac{3}{5} + \frac{5}{10} = \frac{6}{10} + \frac{5}{10} = \frac{11}{10}$$ Together they drank 1 1/10 quarts of milk.

This solution is reasonable because Ellie drank more than ½ quart and Javier drank ½ quart so together they drank slightly more than one quart.

Students make sense of fractional quantities when solving word problems, estimating answers mentally to see if they make sense.
Example:
Ludmilla and Lazarus each have a lemon. They need a cup of lemon juice to make hummus for a party. Ludmilla squeezes 1/2 a cup from hers and Lazarus squeezes 2/5 of a cup from his. How much lemon juice do they have? Is it enough?
Students estimate that there is almost but not quite one cup of lemon juice, because $2/5 < 1/2$. They calculate 1/2 + 2/5 = 9/10, and see this as 1/10 less than 1, which is probably a small enough shortfall that it will not ruin the recipe. They detect an incorrect result such as 2/5 + 2/5 = 3/7 by noticing that $3/7 < 1/2$.

5.3(I) Represent and solve multiplication of a whole number and a fraction that refers to the same whole using objects and pictorial models, including area models;	Students need to develop a fundamental understanding that the multiplication of a fraction by a whole number could be represented as repeated addition of a unit fraction (e.g., 2 x (1/4) = 1/4 + 1⁄4 This standard extends student's work of multiplication from earlier grades. In fourth grade, students worked with recognizing that a fraction such as 3/5 actually could be represented as 3 pieces that are each one-fifth (3 x (1/5)). This standard references both the multiplication of a fraction by a whole number and the multiplication of two fractions. Visual fraction models (area models, tape diagrams, number lines) should be used and created by students during their work with this standard. As they multiply fractions such as 3/5 x 6, they can think of the operation in more than one way. 3 x (6 ÷ 5) or (3 x 6/5) (3 x 6) ÷ 5 or 18 ÷ 5 (18/5) Students create a story problem for 3/5 x 6 such as, ● Isabel had 6 feet of wrapping paper. She used 3/5 of the paper to wrap some presents. How much does she have left? ● Every day Tim ran 3/5 of mile. How far did he run after 6 days? (Interpreting this as 6 x 3/5)

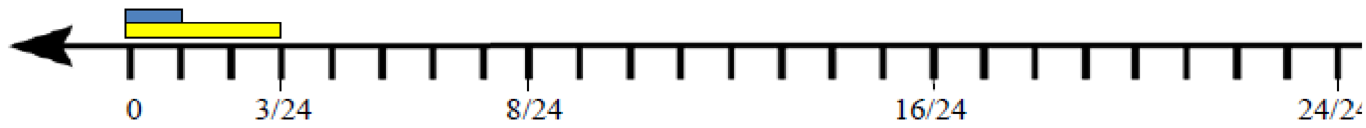
	Student 1 I drew a rectangle to represent the whole class. The four columns represent the fourths of a class. I shaded 3 columns to represent the fraction that are boys. I then split the rectangle with horizontal lines into thirds. The dark area represents the fraction of the boys in the class wearing tennis shoes, which is 6 out of 12. That is 6/12, which equals 1/2.  **Student 3** Fraction circle could be used to model student thinking. First I shade the fraction circle to show the ¾ and then overlay with 2/3 of that?  **Student 2** 
5.3(J) Represent division of a unit fraction by a whole number and the division of a whole	This standard calls for students to extend their work of partitioning a number line from third and fourth grade. Students need ample experiences to explore the concept that a fraction is a way to represent the division of two quantities.

number by a unit fraction, such as 1/3 ÷7 and 7 ÷1/3 using objects and pictorial models, including area models

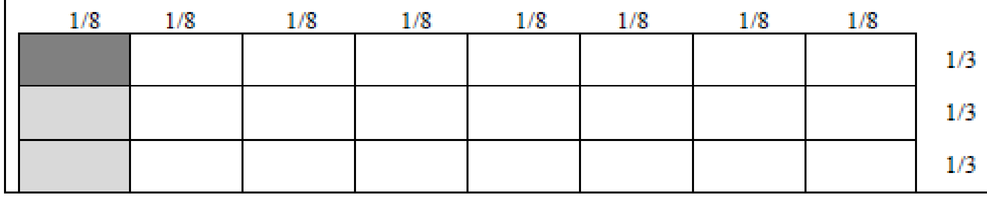
Students are expected to demonstrate their understanding using concrete materials, drawing models, and explaining their thinking when working with fractions in multiple contexts. They read 3/5 as “three fifths” and after many experiences with sharing problems, learn that 3/5 can also be interpreted as “3 divided by 5.”

Example: You have 1/8 of a bag of pens and you need to share them equally among 3 people. What fraction of the bag does each person get?

Student 1
Expression 1/ 8 ÷ 3



Student 2
I drew a rectangle and divided it into 8 columns to represent my 1/8. I shaded the first column. I then needed to divide the shaded region into 3 parts to represent sharing among 3 people. I shaded one-third of the first column even darker. The dark shade is 1/24 of the grid or 1/24 of the bag of pens.

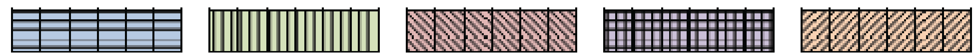


Student 3
1/8 of a bag of pens divided by 3 people. I know that my answer will be less than 1/8 since I’m sharing 1/8 into 3 groups. I multiplied 8 by 3 and got 24, so my answer is 1/24 of the bag of pens. I know that my answer is correct because (1/24) x 3 = 3/24 which equals 1/8.

Example:
Create a story context for 5 ÷ 1/6. Find your answer and then draw a picture to prove your answer and use multiplication to reason about whether your answer makes sense. How many 1/6 are there in 5?

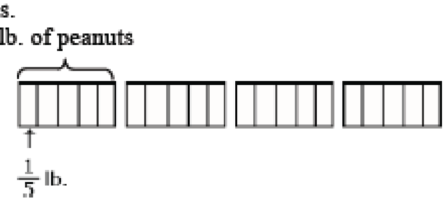
Student
The bowl holds 5 Liters of water. If we use a scoop that holds 1/6 of a Liter, how many scoops will we need in order to fill the entire bowl?

I created 5 boxes. Each box represents 1 Liter of water. I then divided each box into sixths to represent the size of the scoop. My answer is the number of small boxes, which is 30. That makes sense since 6 x 5 = 30.



1 = 1/6 + 1/6 + 1/6 + 1/6 + 1/6 a whole has 6/6 so five wholes would be 6/6 + 6/6 + 6/6 + 6/6 + 6/6 =30/6

Examples:
Knowing how many in each group/share and finding how many groups/shares
Angelo has 4 lbs of peanuts. He wants to give each of his friends 1/5 lb. How many friends can receive 1/5 lb of peanuts?
A diagram for 4 ÷ 1/5 is shown below. Students explain that since there are five fifths in one whole, there must be 20 fifths in 4 lbs.



Example:
How much rice will each person get if 3 people share 1/2 lb of rice equally?

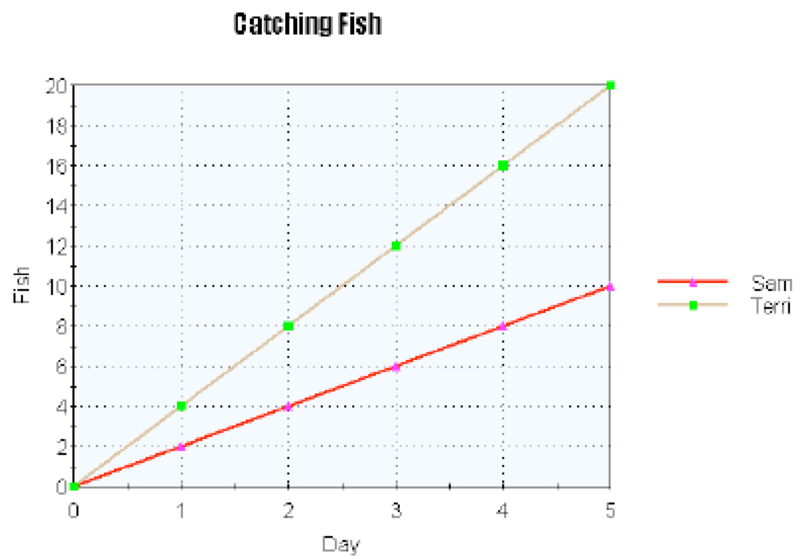
$$\frac{1}{2} \div 3 = \frac{3}{6} \div 3 = \frac{1}{6}$$

A student may think or draw ½ and cut it into 3 equal groups then determine that each of those part is 1/6.
A student may think of ½ as equivalent to 3/6. 3/6 divided by 3 is 1/6.

5.3(K) Add and subtract positive rational numbers fluently;	This standard is defined as the student being able to add positive decimals, fractions, and whole numbers fluently. Students are expected to have strong conceptual understandings of rational numbers and apply flexible strategies for adding and subtracting efficiently and accurately. Students should be able to draw from their knowledge of the models and algorithms to solve problems with accuracy. ● Decimals (up to thousandths) ● Fractions (like, unlike, mixed, improper)
5.3(L) divide whole numbers by unit fractions and unit fractions by whole numbers.	Unit fractions are defined as a fraction where the numerator is one and the denominator is a positive integer (ie. 1/2 , 1/3 , 1/4 , 1/5) Students should be able to rely upon their understanding of the relationship between a unit fraction and 1 whole to determine solutions to problems in which a whole number is divided by a given unit fraction.
Algebraic Reasoning TEKS 5.4	**Algebraic Reasoning. The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to:**
5.4(A) identify prime and composite numbers	Prime numbers are numbers with only two factors, itself and 1. A composite number is a number with more than 2 factors. Fact fluency will support students' ability to recognize factor pairs for of a given number. Students should be able to recognize examples and non-examples for both prime and composite numbers.

5.4(B) represent and solve multi-step problems involving the four operations with whole numbers using equations with a letter standing for the unknown quantity;	4.5(A) represent multi-step problems involving the four operations using strip diagrams and equations with a letter standing for the unknown quantity; Students are building upon the representation of multi-step problems with a letter standing for and unknown quantity in 4th grade and extending the task to solve Students read algebraic expressions: Students write expressions from verbal descriptions using letters and numbers, understanding order is important in writing subtraction and division problems. Students understand that the expression “5 times any number, *n*” could be represented with 5*n* and that a number and letter written together means to multiply. All rational numbers may be used in writing expressions when operations are not expected. Students use appropriate mathematical language to write verbal expressions from algebraic expressions. It is ***important*** for students to read algebraic expressions in a manner that reinforces that the variable represents a number. Example Set 1: Students read algebraic expressions: ● r + 21 as “some number plus 21” as well as “r plus 21” ● n x 6 as “some number times 6” as well as “n times 6” ● s ÷ 6 as “as some number divided by 6” as well as “s divided by 6” Example Set 2: Students write algebraic expressions: ● 7 less than 3 times a number *Solution:* 3*x* – 7 ● 3 times the sum of a number and 5 *Solution:* 3 (*x* + 5) ● 7 less than the product of 2 and a number *Solution:* 2*x* – 7 ● Twice the difference between a number and 5 *Solution:* 2(*z* – 5) ● The quotient of the sum of *x* plus 4 and 2 *Solution: x* + 4 Variables are letters that represent numbers. There are various possibilities for the number they can represent. Students should be able to evaluate an expression when given a possible value for the unknown.

5.4(C) generate a numerical pattern when given a rule in the form *y*=*ax* or *y*=*x* + *a* and graph;	Students should be able to transfer information from an equation, table, or graph to a different representation. **Example:** Use the rule y = x + 3 or to write a sequence of numbers. Starting with a 0, students write 0, 3, 6, 9, 12, . . . Use the rule y = x + 6 to write a sequence of numbers. Starting with 0, students write 0, 6, 12, 18, 24, . . . Use the rule y = 3x to write a sequence of numbers. Starting with 0, students write 0, 3, 6, 9, 18, . . . Use the rule y = 6x to write a sequence of numbers. Starting with 0, students write 0, 6, 12, 18, 24 . . . Graph the ordered pairs that represent y = 2x Ordered pairs (0, 0) (3, 6) (6, 12) (9, 18)
5.4(D) recognize the difference between additive and multiplicative numerical patterns given a table or graph,	Students need to be able to read a table or graph to idententify how one changes in relation to the other (the relationship between x and y) ***Misconception:*** students will often mis-identify a multiplicitative relationship as additive by looking at the constant rate of change in the x or y. Given the following graph students should be able to describe the relationship between the number of days (x) and the number of fish caught (y) by generating an equation or describing the relationship verbally.

	 Sam: y = 2x ● The number of fish caught is two times the number of day ● You multiply the number of days by 2 to get the number of fish caught Teri: y = 4x ● The number of fish caught is four time the number of days ● You multiply the number of days by 4 to get the number of fish caught

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Given the following table, students should be able to describe the relationship between the number of hours (x) and the number of tickets sold (y) by generating an equation or describing the relationship verbally.

<table>
<tr><th>Hours (x)</th><th>Tickets sold (y)</th></tr>
<tr><td>0</td><td>5</td></tr>
<tr><td>3</td><td>8</td></tr>
<tr><td>5</td><td>10</td></tr>
<tr><td>7</td><td>12</td></tr>
<tr><td>10</td><td>15</td></tr>
</table>

y = x + 5
● The number of tickets sold is five more than the number of hours.
● You add five to the number of hours to determine the number of tickets sold.
</td>
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<tr>
<td>5.4(E) describe the meaning of parentheses and brackets in a numeric expression;</td>
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Students must have an understanding of the order of operations and how parentheses, brackets, and braces will affect the evaluation of expressions.

Evaluate the expression 2{ 5[12 + 5(500 - 100) + 399]}
Students should have experiences working with the order of first evaluating terms in parentheses, then brackets, and then braces.

The first step would be to subtract 500 – 100 = 400. Then multiply 400 by 5 = 2,000.
Inside the bracket, there is now [12 + 2,000 + 399]. That equals 2,411.
Next multiply by the 5 outside of the bracket. 2,411 x 5 = 12,055.
Next multiply by the 2 outside of the braces. 12,055 x 2= 24,110.

To further develop students’ understanding of grouping symbols and facility with operations, students place grouping symbols in equations to make the equations true or they compare expressions that are
</td>
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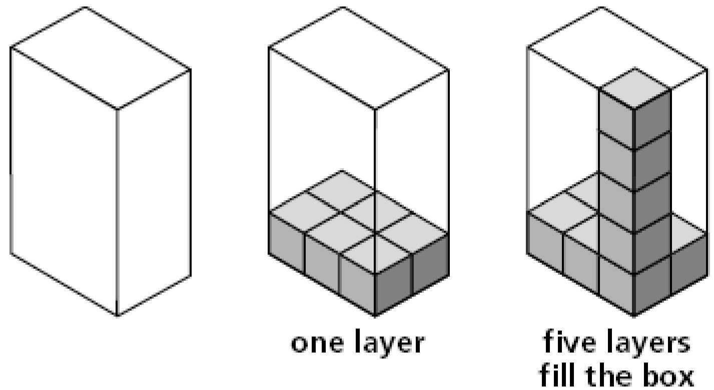
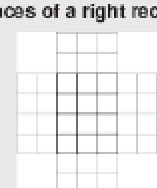
</table>

	grouped differently. Example: • 15 - 7 – 2 = 10 → 15 - (7 – 2) = 10 • 3 x 125 ÷ 25 + 7 = 22 → [3 x (125 ÷ 25)] + 7 = 22 • 24 ÷ 12 ÷ 6 ÷ 2 = 2 x 9 + 3 ÷ ½ → 24 ÷ [(12 ÷ 6) ÷ 2] = (2 x 9) + (3 ÷ ½) • Compare 3 x 2 + 5 and 3 x (2 + 5) • Compare 15 – 6 + 7 and 15 – (6 + 7)
5.4(F) simplify numerical expressions that do not involve exponents, including up to two levels of grouping;	Students need experiences with multiple expressions that use grouping symbols throughout the year to develop understanding of when and how to use parentheses, brackets, and braces. Example: • (26 + 18) 4 Solution: 11 • {[2 x (3+5)] – 9} + [5 x (23-18)] Solution: 32 • 12 – (0.4 x 2) Solution: 11.2 • (2 + 3) x (1.5 – 0.5) Solution: 5
5.4(G) use concrete objects and pictorial models to develop the formulas for the volume of a rectangular prism, including the special form for a cube (V = l x w x h, V = s x s x s, and V =Bh);	The concept of volume should be extended from area with the idea that students are building an area (bottom of a rectangular prism or cube) with a layer of unit cubes, then adding layers of unit cubes on top of the bottom layer. Measure volumes by counting unit cubes, in order to help develop volume formulas, using cubic cm, cubic in, cubic ft, and improvised units



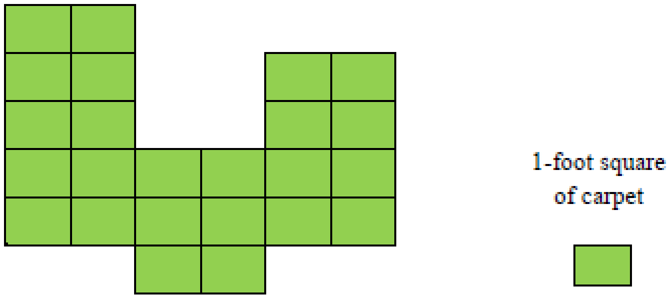
(3 x 2) represented by first layer
(3 x 2) x 5 represented by number of 3 x 2 layers
(3 x 2) + (3 x 2) + (3 x 2) + (3 x 2)+ (3 x2) = 6 + 6 + 6 + 6 + 6 + 6 = 30
6 representing the size/area of one layer

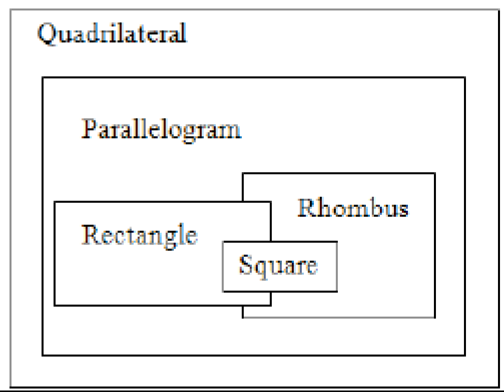
Net for five faces of a right rectangular prism

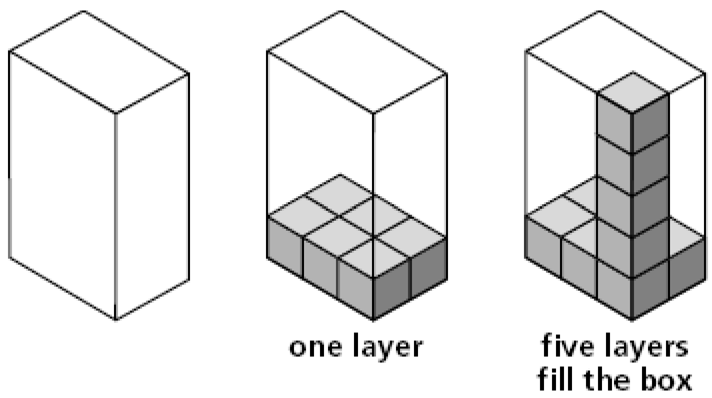


Students are given a net and asked to predict the number of cubes required to fill the container formed by the net. In such tasks, students may initially count single cubes or repeatedly add the number of cubes in a row to determine the number in each layer, and repeatedly add the number in each layer to find the total number of unit cubes. In folding the net to make the shape, students can see how the side rectangles fit together and determine the number of layers.

Students can then learn the formulas V= l x w x h or V=B x h or V=s x s x s for right rectangular prisms and cubes as efficient methods for computing volume, maintaining the connection between these methods and their previous work with computing the number of unit cubes that pack a right rectangular prism or cube.

5.4(H) represent and solve problems related to perimeter and/or area.	Mr. Rutherford is covering the miniature golf course with an artificial grass. How many 1-foot squares of carpet will he need to cover the entire course?  Example: A rectangular garden has as an area of 80 square feet. It is 5 feet wide. How long is the garden? Example: A plan for a house includes rectangular room with an area of 60 square meters and a perimeter of 32 meters. What are the length and the width of the room? Note: Perimeter problems involving rectangles often give only one length and one width, thus remembering the basic formula can help to prevent the usual error of adding only one length and one width.

Geometry and Measurement **TEKS 5.5**	**The student applies mathematical process standards to classify two dimensional figures by attributes and properties. The student is expected to:**
5.5(A) To classify two-dimensional figures by attributes and properties. The student is expected to classify two-dimensional figures in a hierarchy of sets and subsets using graphic organizers based on their attributes and properties.	Students should have experience discussing the properties of shapes. A sample of questions that might be posed to students include: A parallelogram has 4 sides with both sets of opposite sides parallel. What types of quadrilaterals are parallelograms? Regular polygons have all of their sides and angles congruent. Name or draw some regular polygons. All rectangles have 4 right angles. Squares have 4 right angles so they are also rectangles. True or False? Note: The concept of congruence may be part of classroom conversation, but does not appear until middle school. quadrilateral – a four-sided polygon. parallelogram – a quadrilateral with two pairs of parallel and congruent sides. rectangle – a quadrilateral with two pairs of congruent, parallel sides and four right angles. rhombus – a parallelogram with all four sides equal in length. square – a parallelogram with four congruent sides and four right angles. Possible student solution: 

Geometry and Measurement TEKS 5.6	**The student applies mathematical process standards to understand, recognize, and quantify volume. The student is expected to:**
5.6(A) recognize a cube with side length of one unit cube having one cubic unit of volume and the volume of a three-dimensional figure as the number of unit cubes (n cubic units) needed to fill it with no gaps or overlaps if possible;	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units. As students develop their understanding volume they understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. This cube has a length of 1 unit, a width of 1 unit and a height of 1 unit and is called a cubic unit. This cubic unit is written with an exponent of 3 (e.g., in^3, m^3). Students connect this notation to their understanding of powers of 10 in our place value system.
5.6(B) determine the volume of a rectangular prism with whole number side length in problems related to the number of layers times the number of unit cubes in the area of the base.	The concept of volume should be extended from area with the idea that students are covering an area (bottom of a rectangular prism or cube) with a layer of unit cubes, then adding layers of unit cubes on top of the bottom layer. 

	(3 x 2) represented by first layer (3 x 2) x 5 represented by number of 3 x 2 layers (3 x 2) + (3 x 2) + (3 x 2) + (3 x 2)+ (3 x2) = 6 + 6 + 6 + 6 + 6 + 6 = 30 6 representing the size/area of one layer Students can then learn the formulas V= l x w x h or V=B x h or V=s x s x s for right rectangular prisms and cubes as efficient methods for computing volume, maintaining the connection between these methods and their previous work with computing the number of unit cubes that pack a right rectangular prism or cube.
Geometry and Measurement **TEKS 5.7**	**The student applies mathematical process standards to select appropriate units, strategies, and tools to solve problems involving measurement. The student is expected to**
5.7(A) To solve problems by calculating conversions within a measurement system, customary or metric.	Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24),(3, 36), …

Centimeter and meter equivalences

cm	m
100	1
200	2
300	3
500	
1000	

Foot and inch equivalences

feet	inches
0	0
1	12
2	24
3	

<table>
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<td>Example:
Customary length conversion table
<table><tr><th>Yards</th><th>Feet</th></tr><tr><td>1</td><td>3</td></tr><tr><td>2</td><td>6</td></tr><tr><td>3</td><td>9</td></tr><tr><td>n</td><td>n x 3</td></tr></table>Foundational understandings to help with measure concepts:
Understand that larger units can be subdivided into equivalent units (partition).
Understand that the same unit can be repeated to determine the measure (iteration).
Understand the relationship between the size of a unit and the number of units needed (compensatory principal).</td>
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<tr>
<td>Geometry and Measurement
TEKS 5.8</td>
<td>The student applies mathematical process standards to identify locations on a coordinate plane. The student is expected to:</td>
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<tr>
<td>5.8(A) Describe the key attributes of the coordinate plane , including perpendicular number lines (axes) where the intersection (origin) of the two lines coincides with zero on each number line and the given point (0, 0); the x-coordinate, the first number in an ordered pair, indicates movement parallel to the x-axis starting at the origin; and the y-coordinate, the second number, indicates movement parallel to the y-axis starting at the origin</td>
<td>Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection
of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by
using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the
second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and
x-coordinate, y-axis and y-coordinate).</td>
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<tr>
<td>5.8(B) Describe the process for</td>
<td>These standards deal with only the first quadrant (positive numbers) in the coordinate plane.</td>
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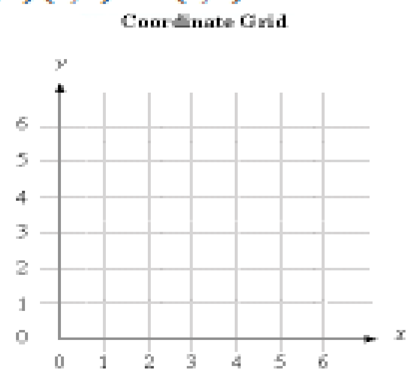
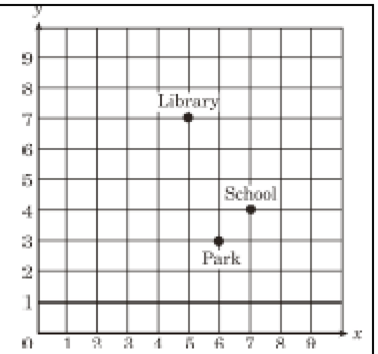
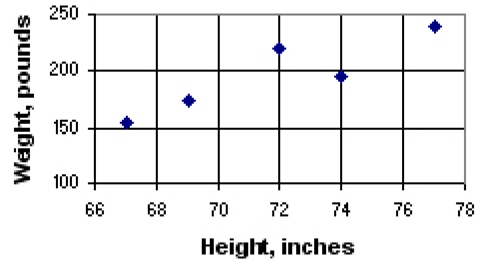
graphing ordered pairs of numbers in the first quadrant of the coordinate plane	Although students can often “locate a point,” these understandings are beyond simple skills. For example, initially, students often fail to distinguish between two different ways of viewing the point (2, 3), say, as instructions: “right 2, up 3”; and as the point defined by being a distance 2 from the *y*-axis and a distance 3 from the *x*-axis. In these two descriptions the 2 is first associated with the *x*-axis, then with the *y*-axis. Example: **Connect these points in order on the coordinate grid below:** (2, 2) (2, 4) (2, 6) (2, 8) (4, 5) (6, 8) (6, 6) (6, 4) and (6, 2). **What letter is formed on the grid?** *Solution: "M" is formed.* 

5.8(C) Graph in the first quadrant of the coordinate plane ordered pairs of numbers arising from mathematical and real-world problems, including those generated by number patterns or found in an input-output table	This standard references real-world and mathematical problems, including the traveling from one point to another and identifying the coordinates of missing points in geometric figures, such as squares, rectangles, and parallelograms. Example: Using the coordinate grid, which ordered pair represents the location of the School? Explain a possible path from the school to the library.  Example: Sara has saved $20. She earns $8 for each hour she works. If Sara saves all of her money, how much will she have after working 3 hours? 5 hours? 10 hours? Create a graph that shows the relationship between the hours Sara worked and the amount of money she has saved. What other information do you know from analyzing the graph? Example: Use the graph below to determine how much money Jack makes after working exactly 9 hours.

	
Data and Analysis TEKS 5.9	**The student applies mathematical process standards to solve problems by ocllecting, organizing, displaying and interpreting data. The student is expected to:**
5.9(A) 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-and- leaf plots	Dot plots are simple plots on a number line where each dot represents a piece of data in the data set. Dot plots are suitable for small to moderate size data sets and are useful for highlighting the distribution of the data including clusters, gaps, and outliers.
5.9(B) Represent discrete paired data on a scatterplot	A **scatterplot** is a graphic tool used to display the relationship between two quantitative variables. A scatterplot consists of an X axis (the horizontal axis), a Y axis (the vertical axis), and a series of dots. Each dot on the scatterplot represents one observation from a data set. The position of the dot on the scatterplot represents its X and Y values. Consider the example below. On the left, a table shows the height and the weight of five starters on a high school basketball team. On the right, the same data are displayed in a scatterplot.
5.9(C) Solve one- and two-step problems using data from a frequency table, dot plot, bar graph, stem-and-leaf plot, or scatterplot	

<table>
<tr><td></td><td>
<table>
<tr><td>Height, inches</td><td>Weight, pounds</td></tr>
<tr><td>67</td><td>155</td></tr>
<tr><td>72</td><td>220</td></tr>
<tr><td>77</td><td>240</td></tr>
<tr><td>74</td><td>195</td></tr>
<tr><td>69</td><td>175</td></tr>
</table>



Each player in the table is represented by a dot on the scatterplot. The first dot, for example, represents the shortest, lightest player. From the scale on the X axis, you see that the shortest player is 67 inches tall; and from the scale on the Y axis, you see that he/she weighs 155 pounds. In a similar way, you can read the height and weight of every other player represented on the scatterplot.
</td></tr>
<tr><td>Personal Financial Literacy TEKS 5.10</td><td>The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security. The student is expected to:</td></tr>
<tr><td>5.10(A) Define income tax, payroll tax, sales tax, and property tax</td><td>Students need to understand taxes, why we pay taxes, and how taxes are used.

Sample Lessons:
http://smartertexas.org/?page_id=914
http://www.moneyinstructor.com/taxes.asp
http://www.msbankers.com/assets/1674/its_a_balancing_act-_teacher_guide.pdf</td></tr>
<tr><td>5.10(B) Explain the difference between gross income and net income</td><td>Students need an understanding of gross income and net income. Gross income is the actual amount of money you make on a job before taxes and insurance are deducted. Net income is the actual amount of money you take home weekly/monthly after all taxes, insurance, etc have been deducted.

Sample Lessons:
http://smartertexas.org/?page_id=914
http://www.moneyinstructor.com/taxes.asp
http://www.msbankers.com/assets/1674/its_a_balancing_act-_teacher_guide.pdf</td></tr>
<tr><td>5.10(C) Identify the</td><td>Students will identify the various uses and forms of credit.</td></tr>
</table>

advantages and disadvantages of different methods of payment, including check, credit card, debit card, and electronic payments	Sample Lessons: http://smartertexas.org/?page_id=914 http://www.msbankers.com/assets/1674/its_a_balancing_act-_teacher_guide.pdf
5.10(D) Develop a system for keeping and using financial records	Students will learn how a business needs to keep track of income and expenses. Sample Lessons: http://smartertexas.org/?page_id=914 http://www.msbankers.com/assets/1674/its_a_balancing_act-_teacher_guide.pdf
5.10(E) Describe actions that might be taken to balance a budget when expenses exceed income	A good way to manage money is to have a budget, a plan for managing income, spending, and saving. Students will need to understand what fixed expenses and variable expenses are and how they might be modified to balance a budget. Sample Lessons: http://smartertexas.org/?page_id=914 http://www.msbankers.com/assets/1674/its_a_balancing_act-_teacher_guide.pdf
5.10(F) Balance a simple budget	Students will learn about a way to plan for what they spend and save. Sample Lessons: http://smartertexas.org/?page_id=914 http://www.msbankers.com/assets/1674/its_a_balancing_act-_teacher_guide.pdf