Clarification of Standards for Parents
Grade 5 Mathematics Unit 6

Dear Parents,

We want to make sure that you have an understanding of the mathematics your child will be learning this year. Below you will find the standards we will be learning in Unit Six. Each standard is in bold print and underlined and below it is an explanation with student examples. Your child is not learning math the way we did when we were in school, so hopefully this will assist you when you help your child at home. Please let your teacher know if you have any questions. ☺

MGSE5.MD.1 Convert among different-sized standard measurement units (mass, weight, length, time, etc.) within a given measurement system (customary and metric) (e.g., convert 5cm to 0.05m), and use these conversions in solving multi-step, real world problems.

This standard calls for students to convert measurements within the same system of measurement in the context of multi-step, real-world problems. Both customary and standard measurement systems are included; students worked with both metric and customary units of length in second grade. In third grade, students work with metric units of mass and liquid volume. In fourth grade, students work with both systems and begin conversions within systems in length, mass and volume.

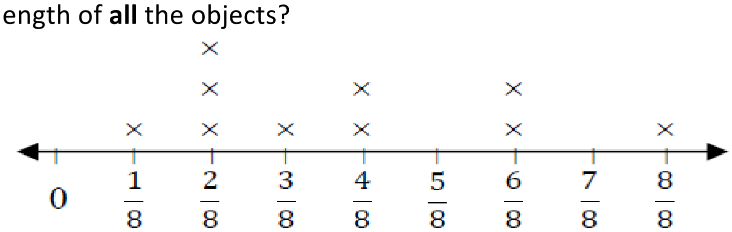
Students should explore how the base-ten system supports conversions within the metric system.

Example: 100 cm = 1 meter.

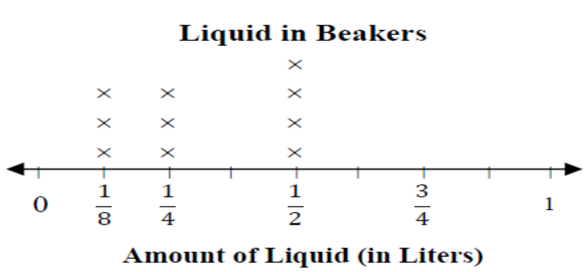
MGSE5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were*

This standard provides a context for students to work with fractions by measuring objects to one-eighth of a unit. This includes length, mass, and liquid volume. Students are making a line plot of this data and then adding and subtracting fractions based on data in the line plot.

Example:
Students measured objects in their desk to the nearest $^1/_2$, $^1/_4$, or $^1/_8$ of an inch then displayed data collected on a line plot. How many objects measured $^1/_4$? $^1/_2$? If you put all the objects together end to end what would be the total length of **all** the objects?



Example:
Ten beakers, measured in liters, are filled with a liquid.



The line plot above shows the amount of liquid in liters in 10 beakers. If the liquid is redistributed equally, how much liquid would each beaker have? (This amount is the mean.)

Students apply their understanding of operations with fractions. They use either addition and/or multiplication to determine the total number of liters in the beakers. Then the sum of the liters is shared evenly among the ten beakers.

MGSE5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

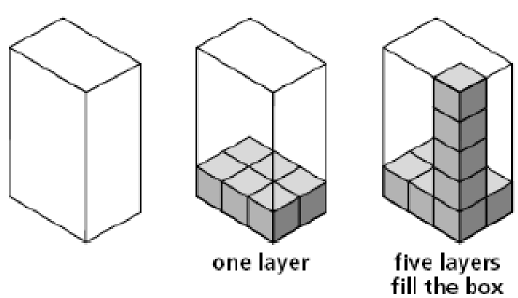
a. **A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.**
b. **A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.**

MGSE5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

MGSE5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

a. **Find the volume of a right rectangular prism with whole- number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.**
b. **Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.**
c. **Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems**

MGSE5.MD.3, MGSE5.MD.4, and **MGSE5.MD.5:** *These standards represent the first time that students begin exploring the concept of volume. In third grade, students begin working with area and covering spaces. The concept of volume should be extended from area with the idea that students are covering an area (the bottom of cube) with a layer of unit cubes and then adding layers of unit cubes on top of bottom layer (see picture below). Students should have ample experiences with concrete manipulatives before moving to pictorial representations. Students' prior experiences with volume were restricted to liquid volume. 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. Models of cubic inches, centimeters, cubic feet, etc are helpful in developing an image of a cubic unit. Students estimate how many cubic yards would be needed to fill the classroom or how many cubic centimeters would be needed to fill a pencil box.*



(3 × 2) represents the number of blocks in the first layer

(3 × 2) × 5 represents the number of blocks in 5 layers

6 × 5 represents the number of block to fill the figure

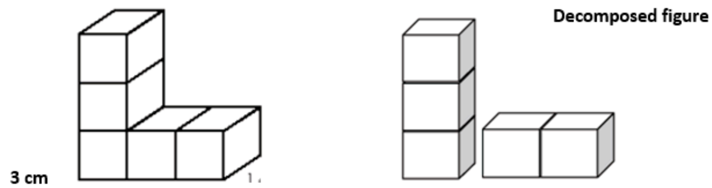
30 blocks fill the figure

MGSE5.MD.5a and MGSE5.MD.5b:

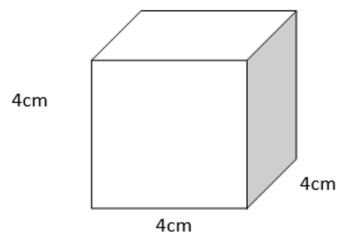
These standards involve finding the volume of right rectangular prisms. (See diagram below.) Students should have experiences to describe and reason about why the formula is true. Specifically that they are covering the bottom of a right rectangular prism (length x width) with multiple layers (height). Therefore, the formula (length × width × height) is an extension of the formula for the area of a rectangle.

MGSE5.MD.5c:
This standard calls for students to extend their work with the area of composite figures into the context of volume. Students should be given concrete experiences of breaking apart (decomposing) 3-dimensional figures into right rectangular prisms in order to find the volume of the entire 3-dimensional figure.

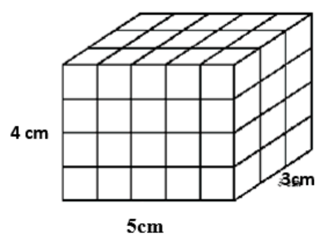
Example:



Example:



Example:



Students need multiple opportunities to measure volume by filling rectangular prisms with cubes and looking at the relationship between the total volume and the area of the base. They derive the volume formula (volume equals the area of the base times the height) and explore how this idea would apply to other prisms. Students use the associative property of multiplication and decomposition of numbers using factors to investigate rectangular prisms with a given number of cubic units.

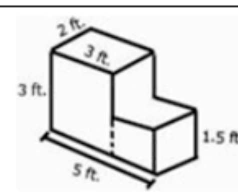
Example:

When given 24 cubes, students make as many rectangular prisms as possible with a volume of 24 cubic units. Students build the prisms and record possible dimensions.

Length	Width	Height
1	2	12
2	2	6
4	2	3
8	3	1

Example:

Students determine the volume of concrete needed to build the steps in the diagram at the right.



<u>MGSE5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.</u>
This standard builds on all of the work done in this cluster. Students should be given ample opportunities to use various strategies to solve word problems involving the multiplication of a fraction by a mixed number. This standard could include fraction by a fraction, fraction by a mixed number or mixed number by a mixed number.

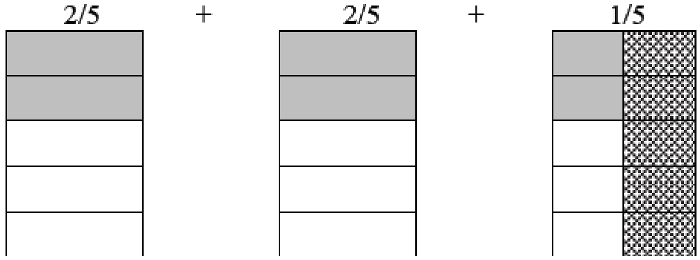
Example:
There are $2^{1}/_{2}$ bus loads of students standing in the parking lot. The students are getting ready to go on a field trip. $^{2}/_{5}$ of the students on each bus are girls. How many busses would it take to carry ***only*** the girls?

Student 1

I drew 3 grids and 1 grid represents 1 bus. I cut the third grid in half and I marked out the right half of the third grid, leaving $2^{1}/_{2}$ grids. I then cut each grid into fifths, and shaded two-fifths of each grid to represent the number of girls.

When I added up the shaded pieces, $^{2}/_{5}$ of the 1st and 2nd bus were both shaded, and $^{1}/_{5}$ of the last bus was shaded.

2/5 + 2/5 + 1/5 **= 5/5 = 1**



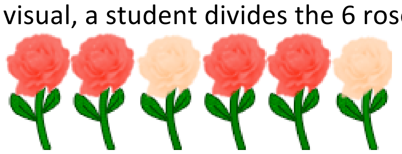
It would take 1

Student 2

$2^{1}/_{2} \times {}^{2}/_{5}$ = ?

I split the $2^{1}/_{2}$ 2 and $^{1}/_{2}$. $2^{1}/_{2} \times {}^{2}/_{5} = {}^{4}/_{5}$, and $^{1}/_{2} \times {}^{2}/_{5} = {}^{2}/_{10}$. Then I added $^{4}/_{5}$ and $^{2}/_{10}$. Because $^{2}/_{10} = {}^{1}/_{5}$, $^{4}/_{5} + {}^{2}/_{10} = {}^{4}/_{5} + {}^{1}/_{5} = 1$. So there is 1 whole bus load of just girls.

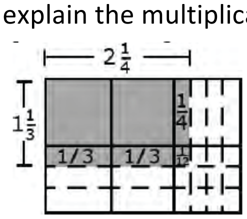
Example:
Evan bought 6 roses for his mother. $^{2}/_{3}$ of them were red. How many red roses were there?
Using a visual, a student divides the 6 roses into 3 groups and counts how many are in 2 of the 3 groups.



A student can use an equation to solve: $^{2}/_{3} \times 6 = {}^{12}/_{3} = 4$. There were 4 red roses.

Example:
Mary and Joe determined that the dimensions of their school flag needed to be $1^{1}/_{3}$ ft. by $2^{1}/_{4}$ ft. What will be the area of the school flag?

A student can draw an array to find this product and can also use his or her understanding of decomposing numbers to explain the multiplication. Thinking ahead a student may decide to multiply by $1^{1}/_{3}$ instead of $2^{1}/_{4}$.



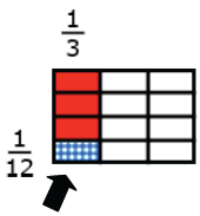
The explanation may include the following:

- First, I am going to multiply $2^1/_4$ by 1 and then by $^1/_3$.
- When I multiply $2^1/_4$ by 1, it equals $2^1/_4$.
- Now I have to multiply $2^1/_4$ by $^1/_3$.
- $^1/_3$ times 2 is $^2/_3$.
- $^1/_3$ times $^1/_4$ is $^1/_{12}$.

So the answer is $2^1/_4 + {}^2/_3 + {}^1/_{12}$ or $2^3/_{12} + {}^8/_{12} + {}^1/_{12} = 2^{12}/_{12} = 3$

MGSE5.NF.7 Apply and extend previous understandings of division to divide unit fractions, by whole numbers and whole numbers by unit fractions

When students begin to work on this standard, it is the first time they are dividing with fractions. In 4th grade students divided whole numbers, and multiplied a whole number by a fraction. The concept *unit fraction* is a fraction that has a one in the denominator. For example, the fraction $^3/_5$ is 3 copies of the unit fraction $^1/_5$. $^1/_5 + {}^1/_5 + {}^1/_5 = {}^3/_5 = {}^1/_5 \times 3$ or $3 \times {}^1/_5$.



Example:
Knowing the number of groups/shares and finding how many/much in each group/share Four students sitting at a table were given $^1/_3$ of a pan of brownies to share. How much of a pan will each student get if they share the pan of brownies equally?
The diagram shows the $^1/_3$ pan divided into 4 equal shares with each share equaling $^1/_{12}$ of the pan.

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. ***For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.***

This standard asks students to work with story contexts where a unit fraction is divided by a non-zero whole number. Students should use various fraction models and reasoning about fractions.

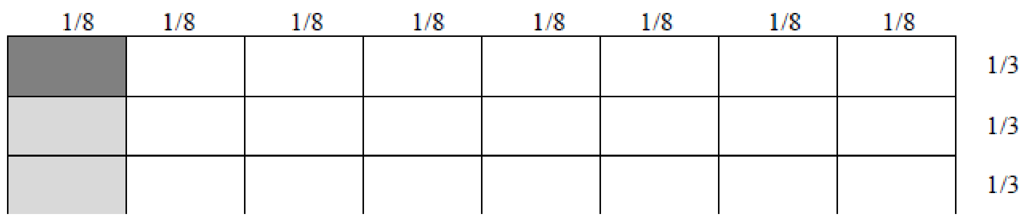
Example:
You have $^1/_8$ of a bag of pens and you need to share them among 3 people. How much of the bag does each person get?

Student 1

I know I need to find the value of the expression $^1/_8 \div 3$, and I want to use a number line.

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 $(^{1}/_{24}) \times 3 = {}^{3}/_{24}$ which equals $^{1}/_{8}$.

b. Interpret division of a whole number by a unit fraction, and compute such quotients. ***For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.***

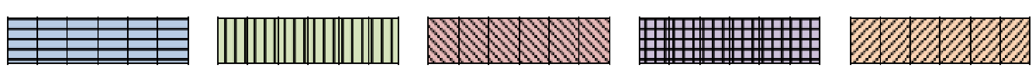
This standard calls for students to create story contexts and visual fraction models for division situations where a whole number is being divided by a unit fraction.

Example:
Create a story context for $5 \div {}^{1}/_{6}$. 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 $6 \times 5 = 30$.



$1 = {}^{1}/_{6} + {}^{1}/_{6} + {}^{1}/_{6} + {}^{1}/_{6} + {}^{1}/_{6}$ a whole has $^{6}/_{6}$ so five wholes would be $^{6}/_{6} + {}^{6}/_{6} + {}^{6}/_{6} + {}^{6}/_{6} + {}^{6}/_{6} = {}^{30}/_{6}$.

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. ***For example, how much chocolate will each person get if 3 people share ½ lb of chocolate equally? How many 1/3-cup servings are 2 cups of raisins***

Students should continue to use visual fraction models and reasoning to solve these real-world problems.

Example:
How many $^{1}/_{3}$-cup servings are in 2 cups of raisins?

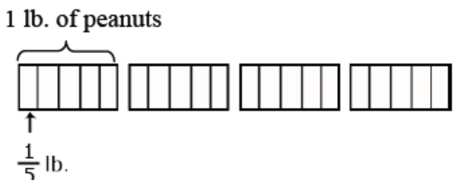
Student
I know that there are three $^{1}/_{3}$ cup servings in 1 cup of raisins. Therefore, there are 6 servings in 2 cups of raisins. I can also show this since 2 divided by $^{1}/_{3}$ = 2×3 = 6 servings of raisins.

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 $4 \div {}^{1}/_{5}$ is shown below. Students explain that since there are five fifths in one whole, there must be 20 fifths in 4 lbs.



3 people share $^{1}/_{2}$ lb of rice equally?

- $^{1}/_{2} \div 3 = {}^{3}/_{6} \div 3 = {}^{1}/_{6}$
- A student may think or draw $^{1}/_{2}$ and cut it into 3 equal groups then determine that each of those part is $^{1}/_{6}$.
- A student may think of $^{1}/_{2}$ as equivalent to $^{3}/_{6}$. $^{3}/_{6}$ divided by 3 is $^{1}/_{6}$.

(Adapted from Henry County Schools)