

## Frequently Asked Questions Related to the Mathematics Standards for Grades K-5

As an additional support for student growth in mathematics, questions that have been received by the Office of Standards and Learning related to the **K-5 South Carolina College- and Career-Ready Standards** for Mathematics have been set forth in the below chart, together with related responses. When possible, the questions and responses are organized by grade level. When questions are not grade level specific, the questions and responses are listed as “General”. Only the grades for which questions have been received are listed on the chart. Periodically the chart will be updated as additional questions are submitted.

In order to maintain the intent of a question, only identifying information of the submitter has been removed.

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### 3.G. 4 – Right Triangular Prism and Net

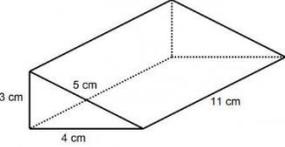
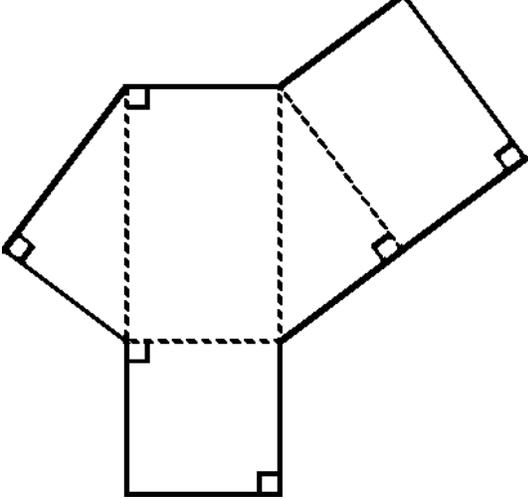
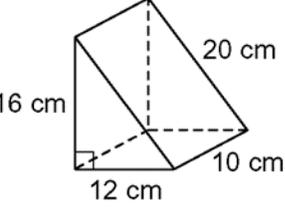
3.G.4 Identify a three-dimensional shape (i.e., right rectangular prism, right triangular prism, pyramid) based on a given two-dimensional net and explain the relationship between the shape and the net.

**Question:**

Please clarify for me exactly what a right triangular prism looks like? We have several triangular prisms in our sets. Some have triangular bases that are right triangles. Some have triangular bases that are equilateral triangles. For which will they have to identify a net or do we need to work on both?

**Response:**

The key is the word "right" in "right triangular" prism. Standard 3.G.4 requires that students identify, among other shapes, right triangular prisms and thus the need to have two parallel and congruent right triangular faces and three rectangular faces perpendicular to the right triangular faces. (Basic attributes/way to identify.) The examples below are only two examples of what a right triangular prism looks like. They are posted, not to be exclusively used, but rather to provide a visual and to emphasize the two right triangular faces and the relationship to the three rectangular faces. Likewise, the below example of a net is not to be used exclusively. Just like the net for a cube, the net for a right triangular prism can be joined at different edges - not just the obvious net below -- however, that is a good place to start discussion because it clearly shows the five faces and the right angles. NOTE: The below examples are not proportional but are merely free clip art that has been reduced to fit in this space.

Examples of Right Triangular Prism	Example of Net for Right Triangular Prism
	
	

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## 4.NSF.1 and 4.NSF.2 – Equivalent and Comparison

4.NSF.1	Explain why a fraction (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100), $\frac{a}{b}$ , is equivalent to a fraction, $\frac{n \times a}{n \times b}$ , by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
4.NSF.2	Compare two given fractions (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100) by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$ and represent the comparison using the symbols $>$ , $=$ , or $<$ .

Question:

We need some clarification of two 4<sup>th</sup> grade standards: 4.NSF.1 and 4.NSF.2. 4.NSF.1 says that visual fraction models should be used and students should recognize and generate equivalent fractions. Should students be expected to move beyond visual models and use multiplication to find equivalent fractions? 4.NSF.2 says that students should compare 2 given fractions by creating common denominators or numerators. Should this be with visual models only or again, are they expected to use multiplication to find common denominators or numerators?

Response:

First, let me point out that 4.NSF.1 is based on and expands 3.NSF.2c which states that whole numbers can be written as fractions. While 4.NSF.2 is based on and expands 3.NSF.2a, b, and d.

Now to answer the questions:

There are three student learning expectations set forth in standard 4.NSF.1.

1. Explain why a fraction  $\frac{a}{b}$  is equivalent to a fraction  $\frac{n \times a}{n \times b}$  by using visual fraction models. .

The purpose of using visual fraction models is for students to construct the conceptual understanding that the number and size of the parts of the visual models of two equivalent fractions look different even though the two fractions are the same size. This emphasizes the point that when comparing fractions, the comparison must be based on the same whole.

2. Use this principle  $\frac{n \times a}{n \times b}$  to recognize and generate equivalent fractions.

Then, once students have constructed the understanding set forth in 1 above, they are ready to “use this principle  $\frac{n \times a}{n \times b}$ ” to general equivalent fractions. The principle  $\frac{n \times a}{n \times b}$  is the multiplicative identity element 1 – or to say it another way, *anything times one is anything*. In 3<sup>rd</sup> grade (3.NSF.2c) students learned that whole numbers can be written as

fractions (e.g.,  $1 = \frac{4}{4}$ ). In 4<sup>th</sup> grade students build on that knowledge to understand that since whole numbers can be written as fractions, when they multiply the numerator and denominator of a fraction by the same whole, they are merely multiplying by 1 and thus the resultant fraction is equivalent.

3. Use this principle  $\frac{n \times a}{n \times b}$  to recognize and generate equivalent fractions.

So, while students should begin to use “visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size”, the ultimate goal is for students to recognize that a fraction like  $\frac{4}{4} (\frac{n}{n})$  is equal to one and therefore when used to generate another fraction, the two fractions are the same. The emphasis is on recognizing when the multiplicative identify element has been used and thus two fractions are equivalent.

Regarding 4.NSF.2, instruction may start with visual models for comparison (see explanation “1” above) or creating common denominators (see explanation “2” above) for comparison. However, the goal is for students to use fraction number sense as the basis for comparison. Number sense includes reasoning about the comparative size of two fractions. For example, if students have developed fraction number sense, they could generate common denominators for comparison (see explanation “2” above) or better yet, reason that  $\frac{5}{6}$  is greater than  $\frac{5}{8}$  because  $\frac{5}{6}$  is well over half of the whole while  $\frac{5}{8}$  is only slightly more than half of the same whole. Then use the symbols  $>$ ,  $=$ , or  $<$  to describe the comparison.

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## 4.MDA.5 and 4.MDA.6 Identify and Measure Angles

4.MDA.5	Understand the relationship of an angle measurement to a circle.
4.MDA.6	Measure and draw angles in whole number degrees using a protractor.

Question:

Is there a limit on what angles in fourth grade they need to measure and classify? Are we limited to acute and obtuse or would that include reflex angles as well?

Response:

(Reflex angles measure more than 180 degrees and less than 360 degrees.) While students are not required to identify reflex angles, it is appropriate to informally introduce the concept. Since standard 4.MDA.5 includes understanding the relationship of an angle measurement to a circle, it would be appropriate for students to have a visual concept of reflex angles. Regarding measurement of an angle, if students can measure angles and have that visualization of angle/circle relationships, then applying their knowledge to measuring reflex angles would be appropriate.

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## Simplest Form Fractions in 4<sup>th</sup> Grade

4.NSF.3	Explain why a fraction (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100), $\frac{a}{b}$ , is equivalent to a fraction, $\frac{n \times a}{n \times b}$ , by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
4.NSF.4	<p>Apply and extend an understanding of multiplication by multiplying a whole number and a fraction (i.e., denominators 2, 3, 4, 5, 6, 8, 10, 12, 25, 100).</p> <ol style="list-style-type: none"> <li>a. Understand a fraction <math>\frac{a}{b}</math> as a multiple of <math>\frac{1}{b}</math>;</li> <li>b. Understand a multiple of <math>\frac{a}{b}</math> as a multiple of <math>\frac{1}{b}</math>, and use this understanding to multiply a fraction by a whole number;</li> <li>c. Solve real-world problems involving multiplication of a fraction by a whole number (i.e., use visual fraction models and equations to represent the problem).</li> </ol>

Question:

Should students simplify fractions in 4<sup>th</sup> grade?

Response:

Yes, students do need to simplify fractions in 4<sup>th</sup> grade. However, when simplifying/renaming fractions, it is extremely important that students understand they are utilizing, applying and linking to knowledge gained from 3<sup>rd</sup> grade when generating equivalent fractions and from 4<sup>th</sup> grade when using the multiplicative identity element to generate equivalent fractions. The following provides more explanative details.

First let's address the change from improper to mixed which could be (doesn't have to be) the first step of "simplest form" and in some cases may be the only step. 4.NSF.4a requires that students "Understand a fraction  $\frac{a}{b}$  as a multiple of  $\frac{1}{b}$ ". So, for example, if I know that  $\frac{5}{3}$  is the same as  $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$  (or 5 "groups" of  $\frac{1}{3}$  or that  $\frac{5}{3}$  is a multiple of  $\frac{1}{3}$ ) then I should understand that  $\frac{5}{3}$  is the same as 1 whole +  $\frac{2}{3}$  more or  $1\frac{2}{3}$  simplified. Students may also be using 3.NSF.1b (fraction  $\frac{a}{b}$  is the quantity formed by  $a$  parts of size  $\frac{1}{b}$ ;) and 3.NSF.2c (whole numbers can be written as fractions (e.g.,  $4 = \frac{4}{1}$  and  $1 = \frac{4}{4}$ ); or in the case of my example  $1 = \frac{3}{3}$ ).

Second, let's say you have a fraction like  $\frac{8}{6}$  and the student uses my first explanation to arrive at  $1\frac{2}{6}$ . The student should use their knowledge from 3.NSF.2a (two fractions are equal if they are the same size, based on the same whole, or at the same point on a number line;) or 4.NSF.1 (Explain why a fraction  $\frac{a}{b}$  is equivalent to a fraction . . . Use this principle to recognize and generate equivalent fractions.") to realize that  $\frac{2}{6} = \frac{1}{3}$  and finally my answer in simplest form is  $1\frac{1}{3}$ .

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## 5.NSF.1 and 5.NSF.2 – Adding and Subtracting Fractions With Regrouping

5.NSF.1	Add and subtract fractions with unlike denominators (including mixed numbers) using a variety of models, including an area model and number line.
5.NSF.2	Solve real-world problems involving addition and subtraction of fractions with unlike denominators.

Question:

Should addition and subtraction of mixed fractions include situations where “regrouping” is required?

Response:

Yes, addition and subtraction of fractions and mixed numbers should be taught to include all situations related to the relative size of the addends/subtrahends -- including renaming fractions in order to regroup (to subtract when the fractional part of a mixed number to be subtracted is larger than the fractional part of the mixed number to be subtracted from).

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## 5.NSF.4 and 5.NSF.6 – Mixed Fraction $\times$ Mixed Fraction

5.NSF.4	Extend the concept of multiplication to multiply a fraction or whole number by a fraction. a. Recognize the relationship between multiplying fractions and finding the areas of rectangles with fractional side lengths; b. Interpret multiplication of a fraction by a whole number and a whole number by a fraction and compute the product; c. Interpret multiplication in which both factors are fractions less than one and compute the product.
5.NSF.6	Solve real-world problems involving multiplication of a fraction by a fraction, improper fraction and a mixed number.

Question:

We have a question about 5th grade standard, 5.NSF.4 and 5.NSF.6... should students multiply mixed number by mixed number at this level?

Response:

Yes, students should multiply a mixed number by a mixed number.

However, the a, b and c portions of standard 5.NSF.4 emphasize conceptual understanding as the basis for determining the reasonableness of the computation. For example:

- if the situation requires something like  $5 \times \frac{1}{4}$ , students should recognize that the product will be greater than one. On the other hand, if the situation requires something like  $2 \times \frac{1}{4}$ , the product will be less than one; or
- if the situation requires something like  $\frac{3}{4} \times \frac{2}{5}$  students should recognize that the product will be less than one because the situation requires taking part of a part.

In 5.NSF.6 students solve real-world problems involving multiplication of fractions, including mixed by mixed and use their conceptual understanding and computational work from 5.NSF.4 to determine the reasonableness of the solution.

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## 5.MDA.4 – Application of Perimeter, Area and Volume

5.MDA.4 Differentiate among perimeter, area and volume and identify which application is appropriate for a given situation.

Question:

Is the intent of this standard for students to also solve the problems based on which application they identified?

Response:

Yes, the standard implies that the students will problem solve. That is supported by what was done in 3rd grade (3.MDA.5-6) where students solved problems involving area and perimeter and in 4th grade where they applied those formulas (4.MDA.3). In 5th grade volume is introduced (5.MDA.3). Finally, in 5.MDA.4 they pull all the 3rd through 5th grade knowledge together to differentiate among the three. The "identify which application" is where the problem solving is implied - not that they will just select volume, area or perimeter in a given situation but will identify which application is appropriate by problem solving.

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## Distributive Property and Order of Operations

Distributive Property Portion of the Question	
3.ATO.5	Apply properties of operations (i.e., Commutative Property of Multiplication, Associative Property of Multiplication, Distributive Property) as strategies to multiply and divide and explain the reasoning.

Order of Operations Portion of the Question	
5.ATO.1	Evaluate numerical expressions involving grouping symbols (i.e., parentheses, brackets, braces).

Question:

I am having a hard time finding whether or not I should teach order of operations and the distributive property. My students have gotten a good feel for the distributive property while learning multiplication, but should it be taught separately and if so, any suggestions as to how?

Response:

Regarding the Distributive Property

Each time all mathematical properties, but specifically the Distributive Property in this case, are used in the standards, note how the property is paired with a verb. So, for example, in standard 3.ATO.5 students should apply the distributive property as a strategy to multiply. The term *Distributive Property* specifically appears again in the standards in 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grades where it is paired with the verb *use*. The value of mathematical properties comes in applying and using - not as standalone content to be taught devoid of application or utilization.

As properties are being applied/utilized, it is important to provide time for classroom discussion during which students explain/justify the application/utilization of the properties. This gives classroom teachers an opportunity to determine the level of understanding by students.

Please keep in mind that the standard I have referenced in this explanation is not the only instance where mathematical properties should be applied or utilized; the standard was used for illustrative/clarifying purposes.

Regarding Order of Operations

The first time Order of Operations is specifically utilized by students is in 5th grade at standard 5.ATO.1. The standards writing team purposefully did not use the term *Order of Operations* so as to avoid classroom introduction of the mnemonic typically associated with it. Rather the team wrote the standard to encourage a classroom focus on evaluating numerical expressions, having students think about how grouping symbols impact the solution and what mathematical conventions (Order of Operations) are needed in order to ensure everyone arrives at the same solution. After 5th grade, Order of Operations are utilized extensively throughout the standards.

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## Least Common Multiple and Greatest Common Factor

5.NSF.3	Add and subtract fractions with unlike denominators (including mixed numbers) using a variety of models, including an area model and number line.
5.NSF.4	Solve real-world problems involving addition and subtraction of fractions with unlike denominators.

Question:

Were *LCM* and *GCF* accidentally left out of the 5<sup>th</sup> grade standards?

Response:

No, in 5<sup>th</sup> grade the emphasis is on conceptual understanding of addition and subtraction of fractions. Thus the reason it may appear that the 5<sup>th</sup> grade standards are out of order with regard to the introduction of *LCM* and *GCF*. To explain:

5.NSF.1 - Add and subtract fractions with unlike denominators (including mixed numbers) using a variety of models, including an area model and number line.

Here students are adding and subtracting without mentioning *LCM* or *GCF* but rather developing conceptual understanding by utilizing the identity element for multiplication (4.NSF.1) to find common denominators (*LCM*). Likewise, the 4<sup>th</sup> grade standard just mentioned is based on students' 3<sup>rd</sup> grade work with equivalencies (3.NSF.2.c).

5.NSF.2 Solve real-world problems involving addition and subtraction of fractions with unlike denominators.

Here students apply their conceptual understanding to solve problems by using an algorithm.

Likewise, when simplifying or renaming fractions, rather than focus on the formal term *GCF*, students utilize and build on the same above mentioned conceptual understandings.

In 6<sup>th</sup> grade the concepts of *LCM* and *GCF* are formally introduced and linked back to 5<sup>th</sup> grade work with fractions. However, in 6<sup>th</sup> grade, work with *LCM* and *GCF* takes on an algebraic approach and is foundational to factoring - 6.NS.4 Find common factors and multiplies using two whole numbers. . .”

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