

Minnesota K-12 Academic Standards in Mathematics

April 14, 2007 Revision

Grades 5-11

Sorted by Standard:

1. Number & Operation
2. Algebra
3. Geometry and Measurement
4. Data Analysis

Number & Operation

5	Number & Operation	Divide multi-digit numbers; solve real-world and mathematical problems using arithmetic.	5.1.1.1	<p>Divide multi-digit numbers, using efficient and generalizable procedures, based on knowledge of place value, including standard algorithms. Recognize that quotients can be represented in a variety of ways, including a whole number with a remainder, a fraction or mixed number, or a decimal.</p> <p><i>For example:</i> Dividing 153 by 7 can be used to convert the improper fraction $\frac{153}{7}$ to the mixed number $21\frac{6}{7}$.</p>
			5.1.1.2	<p>Consider the context in which a problem is situated to select the most useful form of the quotient for the solution and use the context to interpret the quotient appropriately.</p> <p><i>For example:</i> If 77 amusement ride tickets are to be distributed evenly among 4 children, each child will receive 19 tickets, and there will be one left over. If \$77 is to be distributed evenly among 4 children, each will receive \$19.25, with nothing left over.</p>
			5.1.1.3	<p>Estimate solutions to arithmetic problems in order to assess the reasonableness of results of calculations.</p>
			5.1.1.4	<p>Solve real-world and mathematical problems requiring addition, subtraction, multiplication and division of multi-digit whole numbers. Use various strategies, including the use of a calculator and the inverse relationships between operations, to check for accuracy.</p> <p><i>For example:</i> The calculation $117 \div 9 = 13$ can be checked by multiplying 9 and 13.</p>
5	Number & Operation	Read, write, represent and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.	5.1.2.1	<p>Read and write decimals using place value to describe decimals in terms of groups from millionths to millions.</p> <p><i>For example:</i> Possible names for the number 0.37 are: 37 hundredths 3 tenths + 7 hundredths;</p> <p>possible names for the number 1.5 are: one and five tenths 15 tenths.</p>
			5.1.2.2	<p>Find 0.1 more than a number and 0.1 less than a number. Find 0.01 more than a number and 0.01 less than a number. Find 0.001 more than a number and 0.001 less than a number.</p>
			5.1.2.3	<p>Order fractions and decimals, including mixed numbers and improper fractions, and locate on a number line.</p> <p><i>For example:</i> Which is larger 1.25 or $\frac{6}{5}$?</p> <p><i>Another example:</i> In order to work properly, a part must fit through a 0.24 inch wide space. If a part is $\frac{1}{4}$ inch wide, will it fit?</p>

5	Number & Operation	Read, write, represent and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.	5.1.2.4	Recognize and generate equivalent decimals, fractions, mixed numbers and improper fractions in various contexts. <i>For example:</i> When comparing 1.5 and $\frac{19}{12}$, note that $1.5 = 1\frac{1}{2} = 1\frac{6}{12} = \frac{18}{12}$, so $1.5 < \frac{19}{12}$.
			5.1.2.5	Round numbers to the nearest 0.1, 0.01 and 0.001. <i>For example:</i> Fifth grade students used a calculator to find the mean of the monthly allowance in their class. The calculator display shows 25.80645161. Round this number to the nearest cent.
		Add and subtract fractions, mixed numbers and decimals to solve real-world and mathematical problems.	5.1.3.1	Add and subtract decimals and fractions, using efficient and generalizable procedures, including standard algorithms.
			5.1.3.2	Model addition and subtraction of fractions and decimals using a variety of representations. <i>For example:</i> Represent $\frac{2}{3} + \frac{1}{4}$ and $\frac{2}{3} - \frac{1}{4}$ by drawing a rectangle divided into 4 columns and 3 rows and shading the appropriate parts or by using fraction circles or bars.
	5.1.3.3		Estimate sums and differences of decimals and fractions to assess the reasonableness of results in calculations. <i>For example:</i> Recognize that $12\frac{2}{5} - 3\frac{3}{4}$ is between 8 and 9 (since $\frac{2}{5} < \frac{3}{4}$).	
	5.1.3.4		Solve real-world and mathematical problems requiring addition and subtraction of decimals, fractions and mixed numbers, including those involving measurement, geometry and data. <i>For example:</i> Calculate the perimeter of the soccer field when the length is 109.7 meters and the width is 73.1 meters.	

6	Number & Operation	Read, write, represent and compare positive rational numbers expressed as fractions, decimals, percents and ratios; write positive integers as products of factors; use these representations in real-world and mathematical situations.	6.1.1.1	Locate positive rational numbers on a number line and plot pairs of positive rational numbers on a coordinate grid.
			6.1.1.2	Compare positive rational numbers represented in various forms. Use the symbols $<$ and $>$. <i>For example:</i> $\frac{1}{2} > 0.36$.
			6.1.1.3	Understand that percent represents parts out of 100 and ratios to 100. <i>For example:</i> 75% is equivalent to the ratio 75 to 100, which is equivalent to the ratio 3 to 4.
			6.1.1.4	Determine equivalences among fractions, decimals and percents; select among these representations to solve problems. <i>For example:</i> Since $\frac{1}{10}$ is equivalent to 10%, if a woman making \$25 an hour gets a 10% raise, she will make an additional \$2.50 an hour, because \$2.50 is $\frac{1}{10}$ of \$25.
			6.1.1.5	Factor whole numbers; express a whole number as a product of prime factors with exponents. <i>For example:</i> $24 = 2^3 \times 3$.
			6.1.1.6	Determine greatest common factors and least common multiples. Use common factors and common multiples to do arithmetic with fractions and find equivalent fractions. <i>For example:</i> Factor the numerator and denominator of a fraction to determine an equivalent fraction.
			6.1.1.7	Convert between equivalent representations of positive rational numbers. <i>For example:</i> Express $\frac{10}{7}$ as $\frac{7+3}{7} = \frac{7}{7} + \frac{3}{7} = 1\frac{3}{7}$.

6	Number & Operation	Understand the concept of ratio and its relationship to fractions and to the multiplication and division of whole numbers. Use ratios to solve real-world and mathematical problems.	6.1.2.1	Identify and use ratios to compare quantities; understand that comparing quantities using ratios is not the same as comparing quantities using subtraction. <i>For example:</i> In a classroom with 15 boys and 10 girls, compare the numbers by subtracting (there are 5 more boys than girls) or by dividing (there are 1.5 times as many boys as girls). The comparison using division may be expressed as a ratio of boys to girls (3 to 2 or 3:2 or 1.5 to 1).
			6.1.2.2	Apply the relationship between ratios, equivalent fractions and percents to solve problems in various contexts, including those involving mixtures and concentrations. <i>For example:</i> If 5 cups of trail mix contains 2 cups of raisins, the ratio of raisins to trail mix is 2 to 5. This ratio corresponds to the fact that the raisins are $\frac{2}{5}$ of the total, or 40% of the total. And if one trail mix consists of 2 parts peanuts to 3 parts raisins, and another consists of 4 parts peanuts to 8 parts raisins, then the first mixture has a higher concentration of peanuts.
			6.1.2.3	Determine the rate for ratios of quantities with different units. <i>For example:</i> 60 miles in 3 hours is equivalent to 20 miles in one hour (20 mph).
			6.1.2.4	Use reasoning about multiplication and division to solve ratio and rate problems. <i>For example:</i> If 5 items cost \$3.75, and all items are the same price, then 1 item costs 75 cents, so 12 items cost \$9.00.
	Multiply and divide decimals, fractions and mixed numbers; solve real-world and mathematical problems using arithmetic with positive rational numbers.	6.1.3.1	Multiply and divide decimals and fractions, using efficient and generalizable procedures, including standard algorithms.	
		6.1.3.2	Use the meanings of fractions, multiplication, division and the inverse relationship between multiplication and division to make sense of procedures for multiplying and dividing fractions. <i>For example:</i> Just as $\frac{12}{4} = 3$ means $12 = 3 \times 4$, $\frac{2}{3} \div \frac{4}{5} = \frac{5}{6}$ means $\frac{5}{6} \times \frac{4}{5} = \frac{2}{3}$.	
		6.1.3.3	Calculate the percent of a number and determine what percent one number is of another number to solve problems in various contexts. <i>For example:</i> If John has \$45 and spends \$15, what percent of his money did he keep?	
		6.1.3.4	Solve real-world and mathematical problems requiring arithmetic with decimals, fractions and mixed numbers.	
		6.1.3.5	Estimate solutions to problems with whole numbers, fractions and decimals and use the estimations to assess the reasonableness of computations and of results in the context of the problem. <i>For example:</i> The sum $\frac{1}{3} + 0.25$ can be estimated to be between $\frac{1}{2}$ and 1, and this estimate can be used as a check on the result of a more detailed calculation.	

7	Number & Operation	Read, write, represent and compare positive and negative rational numbers, expressed as integers, fractions and decimals.	7.1.1.1	Know that every rational number can be written as the ratio of two integers or as a terminating or repeating decimal. Recognize that π is not rational, but that it can be approximated by rational numbers such as $\frac{22}{7}$ and 3.14.
			7.1.1.2	Understand that division of two integers will always result in a rational number. Use this information to interpret the decimal result of a division problem when using a calculator. <i>For example:</i> $\frac{125}{30}$ gives 4.1666667 on a calculator. This answer is not exact. The exact answer can be expressed as $4\frac{1}{6}$, which is the same as $4.\overline{16}$. The calculator expression does not guarantee that the 6 is repeated, but that possibility should be anticipated.
			7.1.1.3	Locate positive and negative rational numbers on the number line, understand the concept of opposites, and plot pairs of positive and negative rational numbers on a coordinate grid.
7	Number & Operation	Read, write, represent and compare positive and negative rational numbers, expressed as integers, fractions and decimals.	7.1.1.4	Compare positive and negative rational numbers expressed in various forms using the symbols $<$, $>$, \leq , \geq . <i>For example:</i> $-\frac{1}{2} < -0.36$.
			7.1.1.5	Recognize and generate equivalent representations of positive and negative rational numbers, including equivalent fractions. <i>For example:</i> $-\frac{40}{12} = -\frac{120}{36} = -\frac{10}{3} = -3.\overline{3}$.
		Calculate with positive and negative rational numbers, and rational numbers with whole number exponents, to solve real-world and mathematical problems.	7.1.2.1	Add, subtract, multiply and divide positive and negative rational numbers that are integers, fractions and terminating decimals; use efficient and generalizable procedures, including standard algorithms; raise positive rational numbers to whole-number exponents. <i>For example:</i> $3^4 \times \left(\frac{1}{2}\right)^2 = \frac{81}{4}$.
			7.1.2.2	Use real-world contexts and the inverse relationship between addition and subtraction to explain why the procedures of arithmetic with negative rational numbers make sense. <i>For example:</i> Multiplying a distance by -1 can be thought of as representing that same distance in the opposite direction. Multiplying by -1 a second time reverses directions again, giving the distance in the original direction.
			7.1.2.3	Understand that calculators and other computing technologies often truncate or round numbers. <i>For example:</i> A decimal that repeats or terminates after a large number of digits is truncated or rounded.
			7.1.2.4	Solve problems in various contexts involving calculations with positive and negative rational numbers and positive integer exponents, including computing simple and compound interest.

7	Number & Operation	Calculate with positive and negative rational numbers, and rational numbers with whole number exponents, to solve real-world and mathematical problems.	7.1.2.5	Use proportional reasoning to solve problems involving ratios in various contexts. <i>For example:</i> A recipe calls for milk, flour and sugar in a ratio of 4:6:3 (this is how recipes are often given in large institutions, such as hospitals). How much flour and milk would be needed with 1 cup of sugar?
			7.1.2.6	Demonstrate an understanding of the relationship between the absolute value of a rational number and distance on a number line. Use the symbol for absolute value. <i>For example:</i> $ -3 $ represents the distance from -3 to 0 on a number line or 3 units; the distance between 3 and $\frac{9}{2}$ on the number line is $ 3 - \frac{9}{2} $ or $\frac{3}{2}$.

8	Number & Operation	Read, write, compare, classify and represent real numbers, and use them to solve problems in various contexts.	8.1.1.1	Classify real numbers as rational or irrational. Know that when a square root of a positive integer is not an integer, then it is irrational. Know that the sum of a rational number and an irrational number is irrational, and the product of a non-zero rational number and an irrational number is irrational. <i>For example:</i> Classify the following numbers as whole numbers, integers, rational numbers, irrational numbers, recognizing that some numbers belong in more than one category: $\frac{6}{3}$, $\frac{3}{6}$, $3.\bar{6}$, $\frac{\pi}{2}$, $-\sqrt{4}$, $\sqrt{10}$, -6.7 .
			8.1.1.2	Compare real numbers; locate real numbers on a number line. Identify the square root of a positive integer as an integer, or if it is not an integer, locate it as a real number between two consecutive positive integers. <i>For example:</i> Put the following numbers in order from smallest to largest: 2 , $\sqrt{3}$, -4 , -6.8 , $-\sqrt{37}$. <i>Another example:</i> $\sqrt{68}$ is an irrational number between 8 and 9.
8	Number & Operation	Read, write, compare, classify and represent real numbers, and use them to solve problems in various contexts.	8.1.1.3	Determine rational approximations for solutions to problems involving real numbers. <i>For example:</i> A calculator can be used to determine that $\sqrt{7}$ is approximately 2.65. <i>Another example:</i> To check that $1\frac{5}{12}$ is slightly bigger than $\sqrt{2}$, do the calculation $(1\frac{5}{12})^2 = (\frac{17}{12})^2 = \frac{289}{144} = 2\frac{1}{144}$. <i>Another example:</i> Knowing that $\sqrt{10}$ is between 3 and 4, try squaring numbers like 3.5, 3.3, 3.1 to determine that 3.1 is a reasonable rational approximation of $\sqrt{10}$.
			8.1.1.4	Know and apply the properties of positive and negative integer exponents to generate equivalent numerical expressions. <i>For example:</i> $3^2 \times 3^{(-5)} = 3^{(-3)} (\frac{1}{3})^3 = \frac{1}{27}$.

8	Number & Operation	Read, write, compare, classify and represent real numbers, and use them to solve problems in various contexts.	8.1.1.5	<p>Express approximations of very large and very small numbers using scientific notation; understand how calculators display numbers in scientific notation. Multiply and divide numbers expressed in scientific notation, express the answer in scientific notation, using the correct number of significant digits when physical measurements are involved.</p> <p><i>For example:</i> $(4.2 \times 10^4) \times (8.25 \times 10^3) = 3.465 \times 10^8$, but if these numbers represent physical measurements, the answer should be expressed as 3.5×10^8 because the first factor, 4.2×10^4, only has two significant digits.</p>
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