Kansas Mathematics

Grade 7

Adopted 2017

Standards for Mathematical Practice

1. **Make sense of problems and persevere in solving them.** MP.1
2. **Reason abstractly and quantitatively.** MP.2
3. **Construct viable arguments and critique the reasoning of others.** MP.3
4. **Model with mathematics** MP.4
5. **Use appropriate tools strategically** MP.5
6. **Attend to precision.** MP.6
7. **Look for and make use of structure.** MP.7
8. **Look for and express regularity in repeated reasoning.** MP.8

Geometry

Solve real-world and mathematical problems involving area, surface area, and volume.

4. .Use the formulas for the area and circumference of a circle and solve problems; give an informal derivation of the relationship between the circumference and area of a circle. 7.G.4
5. Investigate the relationship between three-dimensional geometric shapes; 7.G.5
   a. Generalize the volume formula for prisms and cylinders (V = Bh where B is the base and h is the height). 7.G.5.A
   b. Generalize the surface area formula for prisms and cylinders (SA = 2B + Ph where B is the area of the base, P is the perimeter of the base, and h is the height (in the case of a cylinder, perimeter is replaced by circumference)). 7.G.5.B
6. Solve real-world and mathematical problems involving area of two-dimensional objects and volume and surface area of three-dimensional objects including cylinders and right prisms. (Solutions should not require students to take square roots or cube roots. 7.G.6

Draw, construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. 7.G.1
2. Identify three-dimensional objects generated by rotating a two-dimensional (rectangular or triangular) object around one edge. 7.G.2
3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right cylinder. 7.G.3

Ratios and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. 7.RP.1
2. Recognize and represent proportional relationships between quantities: 7.RP.2
   a. Determine whether two quantities are in a proportional relationship, e.g. by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. 7.RP.2.A
   b. Analyze a table or graph and recognize that, in a proportional relationship, every pair of numbers has the same unit rate (referred to as the "m"). 7.RP.2.B
   c. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t=pn. 7.RP.2.C
   d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. 7.RP.2.D
3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. 7.RP.3

The Number System

Apply and extend previous understandings of operations with positive rational numbers to add, subtract, multiply, and divide all rational numbers.

1. Represent addition and subtraction on a horizontal or vertical number line diagram. 7.NS.1
   a. Describe situations in which opposite quantities combine to make 0. Show that a number and its opposite have a sum of 0 (are additive inverses). 7.NS.1.A
   b. Show p+q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. 7.NS.1.B
   c. Model subtraction of rational numbers as adding the additive inverse, p-q=p+(-q). 7.NS.1.C
   d. Model subtraction as the distance between two rational numbers on the number line where the distance is the absolute value of their difference. 7.NS.1.D
   e. Apply properties of operations as strategies to add and subtract rational numbers. 7.NS.1.E
2. Apply and extend previous understandings of multiplication and division of positive rational numbers to multiply and divide all rational numbers. 7.NS.2
   a. Describe how multiplication is extended from positive rational numbers to all rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1)=1 and the rules for multiplying signed numbers. 7.NS.2.A
   b. Explain that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. Leading to situations such that if p and q are integers, then -(p/q)=(-p)/q=p/(-q). 7.NS.2.B
   c. Apply properties of operations as strategies to multiply and divide rational numbers. 7.NS.2.C
   d. Convert a rational number in the form of a fraction to its decimal equivalent using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. 7.NS.2.D
3. Solve and interpret real-world and mathematical problems involving the four operations with rational numbers. 7.NS.3

Expressions and Equations

Use properties of operations to generate equivalent expressions.

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with integer coefficients. 7.EE.1
2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. 7.EE.2

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems with rational numbers. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. 7.EE.3
4. Use variables to represent quantities in a real-world or mathematical problem, and construct two-step equations and inequalities to solve problems by reasoning about the quantities. 7.EE.4
    a. Solve word problems leading to equations of the form px+q=r, and p(x+q)=r where p, q, and r are specific rational numbers. Solve equations of these forms fluently (efficiently, accurately, and flexibly). Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. 7.EE.4.A
    b. Solve word problems leading to inequalities of the form px+q > r or px+q < r where p, q, and r are specific rational numbers and p > 0. Graph the solution set of the inequality and interpret it in the context of the problem. 7.EE.4.B

Statistics and Probability

Use random sampling to draw inferences about a population.

1. Use statistics to gain information about a population by examining a sample of the population; 7.SP.1
    a. Know that generalizations about a population from a sample are valid only if the sample is representative of that population and generate a valid representative sample of a population. 7.SP.1.A
    b. Identify if a particular random sample would be representative of a population and justify your reasoning. 7.SP.1.B
2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to informally gauge the variation in estimates or predictions. 7.SP.2

Draw informal comparative inferences about two populations.

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability (requires introduction of mean absolute deviation). 7.SP.3
4. Use measures of center (mean, median and/or mode) and measures of variability (range, interquartile range and/or mean absolute deviation) for numerical data from random samples to draw informal comparative inferences about two populations. 7.SP.4

Investigate chance processes and develop, use, and evaluate probability models.

5. Express the probability of a chance event as a number between 0 and 1 that represents the likelihood of the event occurring. (Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.) 7.SP.5
6. Collect data from a chance process (probability experiment). Approximate the probability by observing its long-run relative frequency. Recognize that as the number of trials increase, the experimental probability approaches the theoretical probability. Conversely, predict the approximate relative frequency given the probability. 7.SP.6
7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. 7.SP.7
    a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. 7.SP.7.A
    b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. 7.SP.7.B
8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. 7.SP.8
    a. Know that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. 7.SP.8.A
    b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g. "rolling double sixes"), identify the outcomes in the sample space which compose the event. 7.SP.8.B
    c. Design and use a simulation to generate frequencies for compound events. 7.SP.8.C