Parent Guide to the Standards
9th/10th Grade
Mathematics – Algebra

This guide provides a summary of the algebra skills that your child will learn by the end of tenth grade in mathematics in the state of Kansas. This guide will also give some examples of the ninth/tenth grade mathematics so you can assist your child. To view the standards in their entirety, please go to:

http://community.ksde.org/Default.aspx?tabid=5276

The Mathematics Standards are divided into two sections. The first section is the same for every grade level from Prekindergarten to 12th Grade and is described below. The Standards for Mathematical Practice address *how* mathematics is to be taught and *how* the students are to engage with the mathematics. The second section outlines the content at each grade level.

Standards for Mathematical Practice — 9/10

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

Your child will be taught skills that will encourage critical thinking and problem solving. Some examples include:

- Students in 9th/10th grade algebra seek to make sense of quantities and their relationships in problem situations.
- Students justify their conclusions, communicate them to others, and respond to the arguments of others.
- Students solve real world problems using algebraic skills and routinely reflect on whether the results make sense.
- Students make assumptions and approximations to simplify complicated problems, making revisions when necessary.
- Students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning.
- Students look closely to discern a pattern or structure and use these patterns to create equivalent expressions or to factor and solve equations.

Content Standards for Mathematics — 9/10

The specific skills and content your child will be taught come from the content standards. The conceptual categories are listed below with some examples of the algebra at the 9th/10th grade level.

Number and Quantity:
- Generate equivalent expressions using numerical bases and the laws of exponents.

Algebra:
- ➤ Write expressions in equivalent forms by factoring to find the zeros of a quadratic function and explain the meaning of the zeros.
- ➤ Solve equations and inequalities in one variable.
- ➤ Solve systems of equations using substitution, elimination, and graphing techniques.
- ➤ Represent and solve equations and inequalities graphically.

Functions:
- ➤ Graph functions and show key features of the graph, such as intercepts, maxima, or minima.
- ➤ Use different forms of linear functions to show rate of change and intercepts.

Statistics and Probability:
- ➤ Use statistics to compare center and spread of two or more different data sets.
- ➤ Interpret differences in shape, center, and spread in the context of the data sets.
- ➤ Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Samples of Math Applications

$9^{th}/10^{th}$ grade students are expected to factor quadratic equations and apply the Zero Product Property to solve the equation.

Example: The area of a rectangular garden is 40 ft². If the length is 6 feet longer than the width, find the dimensions of the garden.

Solution:
$Area = length \times width$
$40 = (w + 6)w$
$40 = w^2 + 6w$
$w^2 + 6w - 40 = 0$
$(w + 10)(w - 4) = 0$
$w + 10 = 0$ or $w - 4 = 0$
$w = -10$ or $w = 4$

Since the width cannot be a negative amount, -10 may be eliminated as a solution. Therefore, the width of the garden must be 4 feet and its length must be 10 feet.

The graph of a quadratic equation is called a _parabola_!

Applications of Parabolas

The path of an object thrown into the air forms a parabola.

The inner surface of a car's headlight is shaped like a parabola. This allows for a very focused beam of light to be emitted.

Satellite dishes are shaped like parabolas to allow the reflection and focus of radio waves.

Systems of Equations

Systems of linear equations can have one solution, infinitely many solutions, or no solutions. Students will discover these cases as they graph systems of linear equations and solve them algebraically.

Example: Tickets to a local ballet cost $6.50 for adults and $4.00 for children. If $3,805 from 670 tickets was collected, how many of each type of ticket were sold?

Solution: Let a = the number of adult tickets sold, Let c = the number of child tickets sold.

$$a + c = 670 \longrightarrow a = 670 - c \qquad a + 220 = 670$$
$$6.50a + 4.00c = 3805 \qquad 6.50(670 - c) + 4.00c = 3805 \qquad a = 450$$
$$4355 - 6.50c + 4.00c = 3805$$
$$4355 - 2.50c = 3805$$
$$-2.50c = -550$$
$$c = 220$$

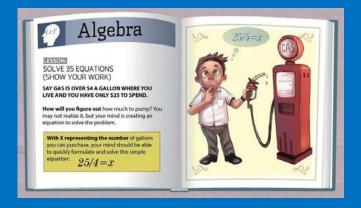450 adult tickets and 220 child tickets were sold.

Why Must I Learn Math?

Here's a Math Guide!
http://www.mathguide.com/issues/whymath.html#6

'When Am I Ever Going To Use Algebra?'
The Real-World Utility of Classroom Learning

This infographic offers students an interesting look at how algebra (and other content) may be useful in their daily lives.

http://bit.ly/WhenAmIEverGoingToUseAlgebraInLife

Interpreting Data

9th/10th grade students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits the data.

Example: Data was collected for the weight of a male white laboratory rat for the first 25 weeks after its birth. A scatterplot of the rat's weight (in grams) and the time since birth (in weeks) indicates a fairly strong, positive linear relationship. The linear regression equation $W = 100 + 40t$ (where W = weight in grams and t = number of weeks since birth) models the data fairly well.

a. Explain the meaning of the slope of the linear regression equation in context.
   Solution: The slope of the regression equation is 40, which means the rat's weight increases by 40 grams each week.

b. Explain the meaning of the y-intercept of the linear regression equation in context.
   Solution: The y-intercept of the linear regression equation is 100, which was the weight of the rat at birth.

c. Based on the linear regression model, what will be the weight of the rat 10 weeks after birth?
   Solution: Replacing t with 10 in the linear regression model gives:
$$W = 100 + 40(10)$$
$$W = 100 + 400$$
$$W = 500$$
   The rat would weigh 500 grams 10 weeks after birth.

d. Based on the linear regression model, at how many weeks will the rat be 760 grams?
   Solution: Replacing W with 760 in the linear regression model gives:
$$760 = 100 + 40t$$
$$660 = 40t$$
$$t = 16.5$$
   The rat would weight 760 grams 16.5 weeks after birth.

Real-Life Applications

"Linear regression is one of the most frequently applied statistical procedures in observational astronomy."   *--Linear Regression in Astronomy*

http://bit.ly/LinearRegressionInAstronomy

Helpful Websites:

✓ Kansas Math Standards – http://community.ksde.org/Default.aspx?tabid=5276

✓ Illustrative Mathematics–https://www.illustrativemathematics.org/content-standards/tasks/

✓ Khan Academy Algebra Help –https://www.khanacademy.org/math/algebra

✓ Desmos Online Graphing Calculator –https://www.desmos.com/calculator