

# **Philosophy of the Math Department**

To develop in each student a sound mind which is able to discern truth from error through logic, reasoning and basic mathematical literacy. To enable each student to maximize his own potential in mathematical skills.

## **Math Department Objectives**

A graduate of Denbigh Baptist Christian School should . . .

1. understand numbers, ways of representing numbers, relationships among numbers, and number systems. (Expected Student Outcomes 2, 4, 5)
2. understand meanings of operations and demonstrate basic computational skills. (ESO 2, 4, 5)
3. recognize and appreciate connections of mathematical ideas to God's creation as a product of intelligent and exact design and order. (ESO 4, 7, 9)
4. be able to apply and adapt a variety of appropriate strategies to solve problems that arise in mathematics and in real world applications. (ESO 1, 3, 4, 5, 9)
5. use visualization, spatial reasoning, and geometric modeling to solve problems. (ESO 1, 2, 3, 4, 5, 9)
6. demonstrate facility with available technology for complicated calculations, modeling, and representing mathematical systems. (ESO 2, 4, 5)
7. be able to explore, conjecture, reason and communicate mathematically in areas outside of academia. (ESO 1, 2, 3, 4, 5, 10, 17)
8. be prepared for work and citizenship, having a positive mathematical disposition and the conceptual basis for further study of mathematics in post secondary education. (ESO 2, 3, 4, 5, 13, 16)

## **K5 MATH CURRICULUM – A BEKA KINDERGARTEN NUMBER SKILLS**

The student will:

1. Know that God created numbers and mathematics to show His order, design and goodness. (Math Department Objective # 3)
2. Develop skills in number recognition, writing and counting numbers 1-100. (MO # 1)
3. Understand the concept of 1-1 correspondence. (MO # 1)
4. Identify, describe, and extend patterns. (MO # 5)
5. Build a basis for logical thinking by identifying and describing relationships among objects and numbers. (MO # 1, 5)
6. Recognize and know the values of a penny, nickel, dime, and quarter. (MO #1, 4, 8)
7. Tell time on the hour and half hour. (MO #5)
8. Draw and identify basic shapes. (MO # 3, 5)
9. Be introduced to the concepts of addition and subtraction: addition families to ten and subtracting by one. (MO # 1, 3, 5)

# Arithmetic 1

The student will:

1. Introduced to the concept of multiplication 1-10. (*Math Dept.# 1*)
2. Develop skills in number recognition, writing and counting numbers 1-1000. (*Math Dept.# 1*)
3. Understand place values through the hundreds place. (*Math Dept.#1*)
4. Memorize addition and subtraction facts for families 1-13. (*Math Dept.#5*)
5. Build a basis for measurements: dealing with time, linear lines and capacity. (*Math Dept.#3,4*)
6. Recognize, know and count the values of a penny, nickel, dime, and quarter. (*Math Dept.# 1,4,8*)
7. Tell time on the hour, half hour and quarter hour. (*Math Dept.# 3,5*)
8. Identifying and draw basic geometric shapes. (*Math Dept.# 3,5*)
9. Be introduced to simple graphs, the concept of degrees and the construction of the calendar. (*Math Dept.# 3,6*)

## Arithmetic 2

The student will:

1. Read, write and compare numbers, fractions and Roman numerals. (*Math Dept.# 1*)
2. Develop and practice skills in number recognition, writing and counting numbers 1-1000. (*Math Dept.# 1*)
3. Memorize addition, subtraction, multiplication, and division tables 0-5. (*Math Dept.# 1,2*)
4. Solve simple addition and subtraction word problems. (*Math Dept.# 1,4*)
5. Measure, estimate, and compare objects. (*Math Dept.#3,4,5*)
6. Read, write and count money amounts. (*Math Dept.# 1,4,8*)
7. Tell time on the hour, half hour and quarter hour. (*Math Dept.# 3,5*)
8. Identifying and draw basic geometric shapes. (*Math Dept.# 3,5*)
9. Read simple graphs, thermometer and the calendar. (*Math Dept.# 4,7*)

## Arithmetic 3

The student will:

1. Recognize Roman numerals and the place values of numbers up to hundred thousands. (*Math Dept. #1*)
2. Read, write and compare numbers with an understanding of fractions, mixed numbers. (*Math Dept. # 1,2,4*)
3. Memorize addition, subtraction, multiplication, and division tables. (*Math Dept. # 1,2*)
4. Practice the four step process for solving simple word problems. (*Math Dept. # 1,4*)
5. Recognize the English and Metric measures. (*Math Dept. #1,7*)
6. Recognize the work with greater than ( $>$ ) and less than ( $<$ ) and parentheses ( $()$ ). (*Math Dept. # 1,3,6*)
7. Count and solve money problems using a focus on decimals. (*Math Dept. # 1,2,6*)
8. Identifying and draw basic geometric shapes. (*Math Dept. # 3,5*)
9. Read simple graphs, thermometer and the calendar. (*Math Dept. # 3,4,6,7*)

## Arithmetic 4

The student will:

1. Recognize the place values of numbers up to millions and Roman numerals to a thousand with a focus on division. (*Math Dept. #1, 4, 8*)
2. Know fraction terminology and how to apply it. (*Math Dept. # 7, 8, 9*)
3. Memorize and know addition, subtraction, multiplication, and division tables. (*Math Dept. # 1, 2, 4, 8*)
4. Practice solving simple word problems with and without missing facts. (*Math Dept. # 7, 8, 9*)
5. Recognize the English and Metric measures. (*Math Dept. #1, 7*)
6. Find the average of a series of numbers. (*Math Dept. # 7, 8, 9*)
7. Identify how to factor numbers to find the greatest common factor and the least common multiple.  
(*Math Dept. # 7, 8, 9*)
8. Identifying and use formulas to solve geometric problems. (*Math Dept. # 5, 7, 8, 9*)
9. Recognize thermometer, different graphs, scale drawings and maps. (*Math Dept. # 4, 6, 7, 8*)

# Arithmetic 5

The student will:

1. Master the six basic operations (notation, numeration, addition, subtraction, multiplication, and division) of whole numbers. (Math Dept.# 1,2,3,4,7,8)
2. Practice the converting of measurements : English and Metric. (Math Dept. 1,2,4,8)
3. Recognize and practice the six basic operations with fractions. (Math Dept.# 1,2,4,8)
4. Understand basic algebraic equations and practice the six basic operations with axioms. (Math Dept.#1,2,4,8)
5. Review and practice: prime factoring, lowest common denominator, greatest common factor, and lowest common multiple. (Math Dept.# 1,2,5)
6. Practice calculating percentages and conceptualize estimations. (Math Dept.#1,3,4,7)
7. Read and sketch simple graphs. (Math Dept.# 1,2,4,5)
8. Practice the six basic operations of decimals. (Math Dept.# 1,2,4,7,8)
9. Be introduced to the concepts of geometry. (Math Dept. # 1,2,4,5,8)
10. Use mathematical language and symbols to make connections to other subject areas and practical life situations. (Math Dept.# 3,6,7,8)

# Arithmetic 6

The Student will:

1. Master basic computations with whole numbers, fractions and decimals. (Math Dept.#1,2,3)
2. Master basic computation using order of operation. (Math Dept.#1,2,3)
3. Master converting measurements: English and Metric. (Math Dept.#1,2,4,7)
4. Recognize and solve world/logic problems by using various methods. (Math Dept.#4,7,8)
5. Master factoring: dealing with prime factoring, lowest common multiples and greatest common factors. (Math Dept.#1,2,5)
6. Calculate percentages and conceptualize estimations. (Math Dept.#1,3,4,7)
7. Read and sketch simple graphs. (Math Dept.#1,5,6,7)
8. Master the basics of statistics. (Math Dept.#1,5,6,7)
9. Recognize basic geometric shapes in two- and three-dimensions, and know their formulas in order to solve geometric problems. (Math Dept.#7)
10. Master basic computation with integers. (Math Dept.#1,2,3,7)
11. Master basic computation with equations. (Math Dept.#1,2,4)
12. Use mathematical language and symbols to make connections to other subject areas and practical life situations. (Math Dept.#3,6,7,8)

# Pre-Algebra

The Student will:

1. Translate simple verbal expressions and problems into mathematical equations. (Math Dept.#1)
2. Learn methods to strategize in Problem solving. (Math Dept.#4)
3. Practice basic operations with properties, exponents, powers, ratios, and products. (Math Dept.#1,2,3)
4. Practice basic computations and ordering of integers and ratio numbers. (Math Dept.#2)
5. Become familiar with the language of statistics and the techniques to measure central tendency and range. (Math Dept.#1,4,6)
6. Be introduced to methods of graphing equations and inequalities. (Math Dept.#4,5)
7. Recognize geometric shapes and how to apply formulas. (Math Dept.#8)
8. Practice simple probability problems (Math Dept.#1,3,4)
9. Use mathematical language and symbols to make connections to other subject areas and practical life situations. (Math Dept.#3,6,7)

# ALGEBRA 1 A

The student will

1. translate verbal expressions and problems into mathematical expressions and equations. *[Math dept # 1]*
2. master basic computation with integers and rational numbers. *[Math dept # 1, 2]*
3. learn how to integrate and use a calculator as a tool to simplify calculations and to verify solutions. *[Math dept # 2, 6]*
4. develop the use of equations and inequalities to solve problems with one unknown. *[Math dept # 3, 4, 7]*
5. learn methods and strategies for problem solving. *[Math dept # 4, 7, 8]*
6. learn methods of graphing linear equations and inequalities. *[Math dept # 4, 5]*
7. practice four basic operations with monomials and polynomials. *[Math dept # 2, 3, 4]*
8. practice basic operations with exponents, powers, ratios, properties, and products. *[Math dept # 1, 2, 3]*
9. calculate and interpret simple data from graphs, tables, and statistical models. *[Math dept # 1, 5, 6]*
10. use mathematical language and symbols to make connections with other subject areas and practical life situations. *[Math dept # 3, 6, 7]*

# ALGEBRA 1 B

The student will

1. demonstrate the ability to solve linear equations and inequalities and use this knowledge to solve problems. *[Math dept # 1, 4, 7]*
2. review and practice basic computation with integers and rational numbers using calculators as tools to simplify and verify solutions. *[Math dept # 2,5]*
3. understand and perform basic operations with polynomials, exponents, and powers. *[Math dept # 2, 4, 6]*
4. solve quadratic equations and related problems using methods of factoring, graphing, and the quadratic formula. *[Math dept # 3, 4, 6]*
5. graph equations, inequalities, and systems of equations using tables, slope, and intercepts. *[Math dept # 4, 5, 6]*
6. use algebra to solve systems of equations with two variables. *[Math dept # 4, 7]*
7. learn to simplify radical expressions and solve equations with radicals. *[Math dept # 1, 2, 4]*
8. calculate and interpret simple data from graphs, tables, and statistical models. *[Math dept # 1, 5, 7]*
9. use mathematical language and symbols to make connections with other subject areas and practical life situations. *[Math dept # 3, 7, 8]*

# ALGEBRA 1

The student will

1. translate verbal expressions and problems into mathematical expressions and equations. *[Math dept # 1]*
2. master basic computation with integers and rational numbers, using calculators as tools to simplify and verify solutions. *[Math dept # 2, 6]*
3. develop the use of equations and inequalities to solve problems with one unknown. *[Math dept # 3, 4, 7]*
4. practice four basic operations with polynomials and solve quadratic equations by the methods of factoring and the use of the quadratic formula. *[Math dept # 3, 4, 6]*
5. learn methods of graphing linear equations, inequalities, and systems of equations. *[Math dept # 4, 6]*
6. use algebra to solve systems of equations with two variables. *[Math dept # 4, 7]*
7. learn to simplify radical expressions and solve equations with radicals. *[Math dept # 1, 2, 4]*
8. calculate and interpret simple data from graphs, tables, and statistical models. *[Math dept # 1, 5, 7]*
9. use mathematical language and symbols to make connections with other subject areas and practical life situations. *[Math dept # 3, 7, 8]*

# Algebra II Objectives

The algebra II student will . . .

1. solve equations and inequalities using properties of real numbers. (Math Department Objectives 1, 2, 4, 5, 6)
2. graph relations, functions, and inequalities on the coordinate plane. (Math Department Objectives 1, 3, 5, 6)
3. solve systems of equations and inequalities using a variety of methods including matrix operations. (Math Department Objectives 1, 2, 4, 5, 6)
4. perform basic math operations on polynomial expressions, radical expressions, and complex numbers. (Math Department Objectives 1, 2, 6)
5. solve quadratic equations and inequalities using a variety of methods and graph quadratic functions. (Math Department Objectives 2, 3, 4, 5, 6)
6. derive and graph the general and standard forms of the equations of conic sections. (Math Department Objectives 3, 5, 7)
7. simplify rational expressions, solve equations involving rational expressions, and graph rational functions. (Math Department Objectives 5, 6, 7)
8. investigate and understand the composition of functions and the inverse of functions. (Math Department Objectives 1, 4, 5)
9. solve equations and inequalities involving exponential, and logarithmic functions. (Math Department Objectives 2, 6, 7)
10. investigate and understand trigonometric functions and solve problems using right triangle trigonometry, the law of sines and the law of cosines. (Math Department Objectives 1 – 8)
11. derive the trigonometric functions from the unit circle, graph the functions and their inverses, and use identities and inverses to solve trigonometric equations. (Math Department Objectives 1 – 8)
12. recognize arithmetic and geometric sequences and series and be able to determine terms and sums. (Math Department Objectives 1, 2, 3, 8)
13. investigate and understand various representations of statistical data and determine central tendencies and measures of variance. (Math Department Objectives 1, 6)
14. investigate and understand the basic principles of probability. (Math Department Objectives 1, 6)

# College Algebra Objectives

The College Algebra student will . . .

1. Simplify exponents containing radicals or rational exponents, and rationalizing the denominator. (Math Department Objectives 1, 2 )
2. derive and interpret linear relations and functions and apply linear concepts to real world application. (Math Department Objectives 2, 4, 5)
3. solve systems of equations and inequalities using the most appropriate technique for the given application. (Math Department Objectives 1, 2, 4)
4. graph and mathematically analyze polynomial, rational, exponential, and logarithmic functions. (Math Department Objectives 5, 6, 7)
5. solve equations and inequalities involving algebraic, exponential, and logarithmic functions. (Math Department Objectives 2, 6, 7)
6. solve systems of linear equations using Gaussian elimination, matrix algebra, and determinants. (Math Department Objectives 2, 4, 6)
7. convert the general form of a conic section equation into the particular standard form of the equation and graph the resulting conic section. (Math Department Objectives)
8. evaluate arithmetic and geometric sequences and series ( Math Department Objective 1, 6)

## Precalculus Objectives

The precalculus student will . . .

1. understand, appreciate and use a graphing calculator as a tool for mathematical analysis of functions, systems, and statistics. (Math Department Objectives 6, 8)
2. derive and interpret linear relations and functions and apply linear concepts to real world application. (Math Department Objectives 2, 4, 5)
3. solve systems of equations and inequalities using the most appropriate technique for the given application. (Math Department Objectives 1, 2, 4)
4. graph and mathematically analyze polynomial, rational, trigonometric, exponential, and logarithmic functions. (Math Department Objectives 5, 6, 7)
5. solve equations and inequalities involving algebraic, exponential, and logarithmic functions. (Math Department Objectives 2, 6, 7)
6. derive the trigonometric functions from the unit circle, graph the functions and their inverses, and use identities and inverses to solve trigonometric equations. (Math Department Objectives 1 – 8)
7. perform operations using vector quantities and the polar coordinate system in solving problems. (Math Department Objectives 1 - 8)
8. derive and graph the general and standard forms of the equations of conic sections. (Math Department Objectives 3, 5, 7)
9. recognize arithmetic and geometric sequences and series and determine terms, sums, limits, convergence and divergence. (Math Department Objectives 1, 2, 3, 8)
10. perform iteration of functions and generate basic fractal geometric shapes. (Math Department Objectives 1, 2, 3, 6)

# Calculus Objectives

The calculus student will . . .

1. Understand and be able to apply the concepts of a limit of a function and continuity of a function. (Math Department Objectives 2, 4, 8)
2. Know the definition of a derivative of a function and compute derivatives of various algebraic and trigonometric functions. Apply techniques of differentiation to find the slope and equation of a tangent line, rates of change, instantaneous velocity, and to solve related rate problems. (Math Department Objectives 1, 2, 4, 5, 6)
3. Know the definitions of and the theorems indicating how to find extrema of functions, intervals of concavity, points of inflection, and asymptotes. Apply the First and Second Derivative Tests to analyzing and graphing functions and to solving optimization application problems. (Math Department Objectives 3, 4, 5, 6, 7)
4. Know the definitions of and be able to evaluate antiderivatives, indefinite integrals, sums using summation notation, area and definite integrals. (Math Department Objectives 3, 4, 5, 6, 7)
5. Develop an understanding of various applications of the definite integral and solve problems involving those applications: area, volumes of solids of revolution, and calculation of work. (Math Department Objectives 5, 6, 7, 8)
6. Find the derivative of the inverse of a function. Differentiate and integrate exponential and logarithmic functions. (Math Department Objectives 1, 3, 4, 5)
7. Define the inverse trigonometric functions and know the basic properties of these functions. Differentiate inverse trigonometric functions and integrate functions of certain forms that result in inverse trigonometric expressions. (Math Department Objectives 4, 8)
8. Develop an understanding of further applications of integration including arc length and surface areas of revolution. (Math Department Objectives 4, 5, 6)
9. Evaluate indefinite and definite integrals using various techniques of integration; such as integration by parts, trigonometric substitution, and partial fraction decomposition. (Math Department Objectives 4, 5, 8)
10. Apply l'Hopital's Rule to find limits of indeterminate forms. (Math Department Objectives 1, 3, 4)

## Calculus Objectives (cont'd)

The calculus student will . . .

11. Evaluate improper integrals and use the terminology of convergence and divergence when discussing such integrals. (Math Department Objectives 5, 6, 7)
12. Solve separable differential equations and applications involving laws of exponential growth and decay. (Math Department Objectives 3, 5, 6)
13. Apply the definitions and theorems related to sequences and series of real numbers in order to find terms of a sequence or series, determine convergence or divergence, and find a partial sum of a series. (Math Department Objectives 1, 2, 5)
14. Know and be able to apply tests for convergence/divergence of a series. (Math Department Objectives 5, 6, 8)
15. Find the interval and radius of convergence for a given power series. Express functions as a power series and as a Taylor/MacLaurin polynomial. (Math Department Objectives 4, 6, 8)

# Finite Math Objectives

The Finite Math student will . . .

1. derive and interpret linear relations and functions and apply linear concepts to real world application. (Math Department Objectives 2, 4, 5)
2. solve systems of equations and inequalities using the most appropriate technique for the given application. (Math Department Objectives 1, 2, 4)
3. solve problems and compute quantities associated with the mathematics of finance. (Math Department Objectives 3, 4, 6)
4. solve problems using set theory, the multiplication principle of counting, and combinations and permutations. (Math Department Objectives 1, 4, 5, 6, 7, 8)
5. solve systems of linear equations using Gaussian elimination, matrix algebra, and determinants. (Math Department Objectives 2, 4, 6)
6. solve linear programming problems graphically and using the simplex method. (Math Department Objectives 4,5, 6,7, 8)
7. determine the sample space for an experiment and use basic rules of probability (Math Department Objectives 2, 3, 6, 7)

# Statistics Objectives

The statistics student will . . .

1. understand, appreciate and use descriptive statistics and statistical inference. (Math Department Objective 4)
2. summarize data using tables and graphs. (Math Department Objective 5)
3. calculate and interpret the quantities associated with descriptive statistics. (Math Department Objectives 2, 6, 7)
4. know the properties of the normal distribution curve and use the Empirical Rule associated with it. (Math Department Objectives 2, 6, 7)
5. apply the applicable rules associated with calculating probability. (Math Department Objectives 2, 6, 7)
6. identify a probability distribution and calculate, interpret and use the parameters associated with the distribution. (Math Department Objectives 5, 8)
7. calculate probabilities from normal probability distributions and use the Central Limit Theorem to make inferences about the population. (Math Department Objectives 3, 4, 5, 6, 7, 8)
8. calculate and interpret point a point estimate and confidence interval for a population proportion, mean, and standard deviation. (Math Department Objectives 4, 5, 7)
9. perform hypothesis testing on claims involving population proportions, means, and standard deviation. (Math Department Objectives 6, 7, 8)
10. determine whether there is statistically significant linear correlation between two variables. (Math Department Objectives 5, 6)