

PLANNED COURSE CURRICULUM GUIDE PRE-CALCULUS

I. COURSE DESCRIPTION AND INTENT:

II. INSTRUCTIONAL TIME:

Class Periods: 180 days; 120 clock hours

Length of Class Periods (minutes): 42

Length of Course: 180 days

Unit of Credit: 1

Course Weight:

A GREAT PLACE TO LEARN!



PINE GROVE AREA SCHOOL DISTRICT
PINE GROVE, PENNSYLVANIA

PINE GROVE AREA SCHOOL DISTRICT
Pine Grove, Pennsylvania 17963

PLANNED COURSE ADAPTATIONS/MODIFICATIONS
Introduction

The instructional adaptations that follow are provided as suggestions to be implemented with all students, particularly with those in need of special education services including the gifted. This listing is in no way intended to be exhaustive. Rather, it is reflective of some major considerations in the area of curriculum adaptations/modifications.

These instructional adaptations will work with any student, but are especially beneficial to those in need of learning support. Some may argue that these modifications are simply *good teaching*. Indeed, modifications of this type do represent good teaching. These principles of good teaching become instructional modifications whenever: (1) certain students in a particular class require such modifications *above and beyond* what is typically required by *most* students in that class and (2) without these modifications, these same students would not succeed.

PREFACE

Users and information seekers should familiarize themselves with the purpose and terminology of this **Planned Course Curriculum Guide (PCCG)**. We suggest that you first read the following:

- **PCCG PURPOSE AND INTENT**
- **PCCG DEFINITIONS**

The PCCG specifies the unit lesson outcome, essential content, standards, activities, resources, and evaluation of student performance. This sector provides the means to initiate the learning activities to attain the program goal as identified in the course description and intent.

The standards and outcomes are minimal expectations; further embellishment of the course is discretionary with the instructor depending upon the capability of the students.

This PCCG is designed as an ACTIVE document capable of technological modification as required.

The instructional delivery of this curriculum is quality controlled through the lesson plan development of the teacher.

Lawrence J. Mussoline, Jr., Ph.D.
Superintendent of Schools

PLANNED COURSE CURRICULUM GUIDE (PCCG) PURPOSE AND INTENT

The Planned Course Curriculum Guide (PCCG) is a multi-purpose document:

- All staff, particularly new teachers, can understand instructional expectations through the WRITTEN curriculum
- A continuing district-wide instructional process and scope and sequence of subject matter are enhanced. The WRITTEN curriculum is delivered through the TAUGHT curriculum (instructional content and learning activities) and is evaluated through the TESTED curriculum (expected levels of student achievement - learning outcomes)
- Priority student-centered outcomes are identified and attained through suggested learning activities and content designed to help insure a balanced and comprehensive basic curriculum
- Essential content and course standards provide an efficient basis for selecting appropriate instructional materials and resources
- Staff development areas for curriculum improvement are provided
- The PCCG conforms with current Pennsylvania Department of Education curriculum regulations and serves the dual feature of providing both an administrative document and an instructional guide
- Content and subject format remain flexible and adaptable to modification - an "active" document
- Special Pennsylvania Department of Education (PDE) legislation is identified
- Parents and students are provided with an overview of the instructional program and each course in particular

PLANNED COURSE CURRICULUM GUIDE (PCCG) DEFINITIONS

- **Course Description and Intent**: a brief overview of the course and program goals
- **Instructional Time**: frequency of class meetings and time/appropriate credit at the secondary level
- **Special Notes**: emphatic features or highlights and identification of Department of Education mandates found in the course
- **Unit Lesson Outcome**: describes the knowledge, skills, attitudes, student performance behaviors and areas of study that have been identified as appropriate to help the student attain the rigorous standards of a quality education
- **Teaching-Learning Activities**: suggested activities designed to help all students achieve the learning outcomes and standards
- **Standards**: statements establishing the minimal knowledge, skills, performance behaviors, and essential learning (content) a student must attain. A standard defines what students should know and be able to do
- **Expected Levels of Achievement (Learning Outcomes)**: what students will be expected to do as a result of the application of teaching-learning activities and content
- **Evaluation Criteria (Actual Level of Attainment)**: student performance level achieved and measured through specified evaluation criteria

LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #1: All students use numbers, number systems and number relationships to represent theoretical and practical situations. Number types (e.g., whole, prime, irrational, complex) and equivalent forms (e.g., fractions, decimals, percents) are mastered.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ☺</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|---|---|--|---|
| <p>STANDARD 1</p> <p>78. Describe and apply inverse operations (reciprocal, absolute value, raising to a power, and/or finding roots) to solve equations and inequalities.</p> <p>79. Order and describe verbally, graphically, and using set notation subsets of real numbers.</p> <p>81. Describe domain and range of functions modeled from real life data.</p> <p>82. Represent and analyze finite graphs as relations, and pictorial representations.</p> | <p>78. Simplify expressions and equations using order of operations. Solve exponential and logarithmic functions mathematically and graphically.</p> <p>79. Define set theory terminology.</p> <p>81. Determine and graph functions within the limits of their domain and range.</p> <p>82. Graph functions utilizing intercepts and extrema.</p> <p>Corrections: Review Algebra II problems, CCC program, supplemental problems in Algebra II book.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software |

Extensions: Use determinants to solve systems of equations and do Internet problems.

- Internet

LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #2: All students use computation and estimation skills to solve theoretical and practical problems using appropriate tools including modern technology such as calculators and computers.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ☺</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|--|---|--|---|
| <p>STANDARD 2</p> <p>73. Develop and use computation concepts, operations and procedures on real numbers in problem solving situations.</p> <p>80. Determine and explain the meaning of the zeros of functions modeled from real life situations.</p> <p>81. Construct and apply graphs of polynomial functions modeled from real data.</p> <p>82. Use graphing utilities to determine the best-fit functions (e.g. linear, quadratic, cubic, exponential, power, etc.)</p> | <p>73. Solve various word problems involving conic sections.</p> <p>80. Find zeroes of the function mathematically and graphically as the x-intercepts.</p> <p>81. Graph polynomial functions with and without calculators.</p> <p>82. Graph points from experimental data.</p> <p>Correctives: Review worksheet and supplemental problems, use graphing calculators and computer software for graphing.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software • Internet |

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| | <p>Extensions: Design conic section problems with the “xy” term. Derive the general formulas for all conic sections with the center or vertex at (O,O) and at (h,k)</p> | | |
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LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #3: All students use measurement and estimation skills to solve theoretical and practical problems.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ☺</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|---|---|--|---|
| <p>STANDARD 3</p> <p>58. Define radians and convert between radians and degrees.</p> <p>61. Determine relationships between linear, square, and cubic measures, describe how changes in one of the measures of the figure affect the others, and apply these concepts to real world problems.</p> <p>62. Apply degree and radian measure to solve real world problems.</p> | <p>58. Do radian and angle conversion problems.</p> <p>61. Require proper units in all application problems.</p> <p>62. Solve circumference, arc length, and central angle problems using degrees and radians.</p> <p>Correctives: Review Trig. chapters and supplemental problems.</p> <p>Extensions: Derive formula for length of</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software • Internet |

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| | fan belt between two pulleys. Program formula into graphing calculator to solve the pulley problem. | | |
|--|---|--|--|

LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #4: All students use mathematical reasoning and make mathematical connections.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ©</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|---|--|--|---|
| <p>STANDARD 4</p> <p>37. Demonstrate mathematical solutions to problems in the physical sciences.</p> <p>38. Apply appropriate arguments, proofs, (inductive and deductive), and mathematical rules and properties of logic in problem solving situations.</p> | <p>37. Use derivatives to solve distance, velocity, acceleration, and time problems.</p> <p>38. Use mathematical induction to prove or disprove series formulas. Derive formulas and theorems for arithmetic and geometric series and sequences.</p> <p>Correctives: Review worksheets and supplemental problems.</p> <p>Extensions: Prove by math induction the binomial expansion theorem.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software • Internet |

LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #5: All students formulate and solve problems, communicate the mathematical process used, and the reasons for using them.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ☺</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|---|---|--|---|
| <p>STANDARD 5</p> <p>35. Create and solve complex problems using appropriate mathematical concepts and techniques.</p> <p>36. Communicate, both in writing and orally, mathematical concepts, problems, procedures, and solutions using appropriate mathematical language.</p> | <p>35. Use algebraic manipulations, graphing techniques, or matrices in solving systems of equations.</p> <p>36. Solve word problems involving systems at equations, extrema of polynomial functions, and linear and higher degree equations.</p> <p>Correctives: Review worksheet and supplemental problems.</p> <p>Extensions: More difficult problems.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software • Internet |

LEARNING STANDARDS AND CONTENT ACTIVITIES

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Academic Content Standard #6: All students make decisions based upon the collection, organization, analysis, and interpretation of statistical data.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ☺</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|---|--|--|---|
| <p>STANDARD 6</p> <p>42. Compare and contrast different data distributions using summary statistics.</p> | <p>42. Use the graphing calculator to enter two column data and determine mean, median, mode, quartiles, range, and standard deviation.</p> <p>Correctives: Review calculator manual.</p> <p>Extensions: Program the calculator with the standard deviation formula.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software • Internet |

LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #7: All students make predictions based upon the collection, organization, analyzing and interpretation of statistical data and the application of probability.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ☺</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|--|---|--|---|
| <p>STANDARD 7</p> <p>39. Define, calculate, and compare the probability and odds of an event.</p> <p>40. Define and distinguish between independent and dependent events.</p> <p>43. Design and conduct simulation experiments, apply appropriate theoretical probability, and draw and justify a conclusion.</p> | <p>39. Determine the probability of an event occurring.</p> <p>40. Design a probability problem involving dependent and independent events.</p> <p>43. Design a probability problem involving a die and specific events.</p> <p>Correctives: Review worksheet and supplemental problems</p> <p>Extensions: Determine correlation of coin toss probability with Pascal's triangle.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software • Internet |

LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #8: All students understand, demonstrate, and apply basic concepts of algebra to solve theoretical and practical problems.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ☺</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|---|---|--|---|
| <p>STANDARD 8</p> <p>66. Formulate expressions, equations, inequalities, systems of equations, and systems of inequalities to model routine and non-routine problem situations.</p> <p>72. Create and interpret function models.</p> <p>74. Describe the connection between the Binomial expansion and Pascal's triangle and apply to permutation and combination problems.</p> <p>75. Solve problems involving direct, inverse and joint variation.</p> | <p>66. Solve systems of equations graphically on the calculators and determine the appropriate "window" for the most accurate results.</p> <p>72. Solve carbon dating problems using formula for radioactive decay.</p> <p>74. Define the binomial expansion theories using various methods and show connection between it, Pascal's triangle, and combinations. Show relationship between permutations and combinations.</p> <p>75. Solve ideal gas law problems involving direct, inverse, and joint variation.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software • Internet |

76. Create, write, and solve real life problems that demonstrate an understanding of appropriate function models.

76. Solve compound interest problems compounded in a variety of ways.

Correctives: Review worksheets and supplemental problems.

Extensions: Determine other laws of physics that are direct or inverse variations.

LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #9: All students understand, demonstrate and apply basic concepts of geometry to solve theoretical and practical problems.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ☺</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|---|---|--|---|
| <p>STANDARD 9</p> <p>87. Describe the center, vertices, foci, and/or asymptotes of conic sections from their general equations.</p> <p>88. Demonstrate appropriate use of vectors and vector operations to solve real world applications (bearings).</p> | <p>87. Complete the square in solving conic section problems to determine center, vertex, foci, or asymptotes.</p> <p>88. Solve velocity problems with the directions given according to the compass point of 0° at due North.</p> <p>Correctives: Review trig. vector problems, use computer software for adding vectors.</p> <p>Extensions: Solve force problems involving magnitude and direction.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software • Internet |

LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #10: All students understand, demonstrate, and apply basic concepts of trigonometry to solve theoretical and practical problems.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ©</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|---|--|--|---|
| <p>STANDARD 10</p> <p>21. Graph periodic and circular functions, and describe the properties of these graphs.</p> <p>24. Create, write, and solve real word application problems that demonstrate an understanding of solving right triangles and/or using the law of sines and/or law of cosines.</p> <p>25. Create, write, and solve real world problems that demonstrate an understanding of inverse trigonometric functions.</p> | <p>21. Graph the sine function and find the values of quadrant angles as check points.</p> <p>24. Use right triangles to solve vector problems.</p> <p>25. Graph the inverse of the sine function and find the appropriate values of the quadrant angles within the arbitrary range of the inverse function.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives • Computer software |

Correctives: Review trig. chaps., graphing calculators, and computer graphing software.

Extensions: Do surveying problem to determine the area of an irregular shape plot.

- Internet

LEARNING STANDARDS AND CONTENT ACTIVITIES

Statement of student learning expectations achieved through suggested teaching-learning activities and selected content to help reach standards and graduation requirements.

Academic Content Standard #11: All students understand, demonstrate, and apply basic concepts of calculus to solve theoretical and practical problems.

| ESSENTIAL CONTENT PERFORMANCE STANDARD | CONTENT & INSTRUCTIONAL ACTIVITIES/STRATEGIES WITH CORRECTIVES AND EXTENSIONS <i>(individually created teaching activities may be used to achieve the standards; however, listed below are activities which may be helpful) ©</i> | ACTUAL LEVEL OF ATTAINMENT (EVALUATION CRITERIA) ASSESSMENT | RESOURCES AND MATERIALS |
|---|---|--|--|
| <p>STANDARD 11</p> <p>44. Describe the meaning of maximum or minimum values of a function and how it applies to a real life situation.</p> <p>45. Create, write, and solve real world application problems that demonstrate an understanding of arithmetic and geometric sequences and series.</p> <p>46. Describe the method for estimating the area under curves and apply to real world situations.</p> | <p>44. Find the maximum volume of a box that will fit within the limits defined by 1st class mail. (i.e. length + girth \leq 108 in.)</p> <p>45. Use geometric and arithmetic series and sequence to determine the depreciation of a car or population growth.</p> <p>46. Use rectangular approximation to find the area under the curve at various functions.</p> | <ul style="list-style-type: none"> • Teacher made/commercial made tests • Board work complete with oral explanation • Student notebooks | <ul style="list-style-type: none"> • Textbook – Algebra II and Calculus • PCTM Journal • TI-82 graphing calculator and manual • TI newsletters • Previous years textbooks • Various resource books • Various models and manipulatives |

Correctives: Review worksheet and graphing calculator with integral capabilities.

Extensions: Show how integration accomplishes the same thing as rectangular approximation.

- Computer software
- Internet