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Wisconsin Indianhead Technical College

10804115 College Technical Mathematics 1

Course Outcome Summary

Course Information

Description	Topics include: solving linear, quadratic, and rational equations; graphing; formula rearrangement; solving systems of equations; percent; proportions; measurement systems; computational geometry; right and oblique triangle trigonometry; and operations on polynomials. Emphasis will be on the application of skills to technical problems. This course is the equivalent of successful completion of College Technical Mathematics 1A and College Technical Mathematics 1B. PREREQUISITE: Successful scores on placement test or 10834109 Pre-Algebra.
Instructional Level	Associate Degree
Total Credits	5.00
Total Hours	80.00

Course History

Revised By	Amber Booth (15588070)
Last Approval Date	12/29/2016

Purpose/Goals

This course outcome summary includes the competencies and criteria for College Technical Mathematics 1 (10-804-115). This course is part of the General Studies Core offered throughout the Wisconsin Technical College System (WTCS). The course competencies are consistent among the colleges and are at baccalaureate level to accommodate student success in transfer to four-year colleges.

Course Competencies

1.	Perform basic operations with real numbers					
	<i>Domain</i>	<i>Cognitive</i>	<i>Level</i>	<i>Applying</i>	<i>Status</i>	<i>Active</i>

Assessment Strategies

1.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 1.1. you perform the arithmetic operations in proper sequence
- 1.2. you simplify expressions using the laws of exponents

- 1.3. you evaluate numeric expressions containing exponents
- 1.4. you convert numbers between decimal notation and scientific and/or engineering notation
- 1.5. you perform arithmetic operations with numbers in scientific notation
- 1.6. you calculate powers and roots with numbers in scientific notation
- 1.7. you apply skill to technical problems
- 1.8. you utilize appropriate technology
- 1.9. you apply the process for solving technical problems according to the problem-solving criteria (i.e. show work in a clear and logical manner, verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 1.a. Use correct order of arithmetic operations
- 1.b. Simplify expressions involving exponents and radicals
- 1.c. Convert numbers between decimal notation and power of ten notation
- 1.d. Perform arithmetic using power of ten notation
- 1.e. Apply skills to related technical problems

2. Solve linear equations

Domain Cognitive Level Applying Status Active

Assessment Strategies

- 2.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 2.1. you solve linear equations in one variable
- 2.2. you rearrange a formula to solve for an indicated first-degree variable
- 2.3. you represent unknown(s) with a variable and translate English phrases into equations
- 2.4. you substitute given number for variables into formula or equation
- 2.5. you apply skill to technical problems
- 2.6. you utilize appropriate technology
- 2.7. you apply the process for solving technical problems according to the problem-solving criteria (i.e. show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 2.a. Solve linear equations in one variable
- 2.b. Rearrange a formula to solve for any indicated first-degree variable
- 2.c. Assign a variable to an unknown quantity in an English phrase and translate that phrase into an equation
- 2.d. Substitute numbers for variables in equations and formulas
- 2.e. Apply mathematics skills to related technical problems

3. Solve problems using percent and proportion

Domain Cognitive Level Applying Status Active

Assessment Strategies

- 3.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 3.1. you perform conversions among fractions, decimals, and percent
- 3.2. you write an equation representing the problem
- 3.3. you solve the equation
- 3.4. you apply skill to technical problems
- 3.5. you utilize appropriate technology
- 3.6. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 3.a. Perform conversions among fractions, decimals, and percent

- 3.b. Write an equation representing the problem
- 3.c. Utilize appropriate technology
- 3.d. Apply mathematics skills to related technical problems

4. Solve variation problems

Domain Cognitive Level Applying Status Active

Assessment Strategies

- 4.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 4.1. you identify the type of variation
- 4.2. you write the variation equation
- 4.3. you solve direct variation problems
- 4.4. you solve inverse variation problems
- 4.5. you solve joint and combined variation problems
- 4.6. you apply skill to technical problems
- 4.7. you utilize appropriate technology
- 4.8. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 4.a. Identify the type of variation that fits a verbal problem
- 4.b. Write an equation for a variation
- 4.c. Solve direct variation problems
- 4.d. Solve inverse variation problems
- 4.e. Solve joint variation problems
- 4.f. Apply mathematics skills to related technical problems

5. Perform operations polynomials

Domain Cognitive Level Applying Status Active

Assessment Strategies

- 5.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 5.1. you add, subtract, multiply, and divide polynomials
- 5.2. you utilize appropriate technology
- 5.3. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 5.a. Combine like terms within a polynomial
- 5.b. Simplify expressions involving the addition, subtraction, multiplication, and division of monomials and polynomials
- 5.c. Find powers and roots of monomials and polynomials
- 5.d. Utilize appropriate technology

6. Factor algebraic expressions

Domain Cognitive Level Applying Status Active

Assessment Strategies

- 6.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 6.1. you factor using the greatest common factor
- 6.2. you factor binomials and trinomials
- 6.3. you apply skill to technical problems
- 6.4. you utilize appropriate technology
- 6.5. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 6.a. Identify factors of a monomial
- 6.b. Factor a polynomial by greatest common factor
- 6.c. Factor a polynomial by reverse multiplication
- 6.d. Factor a polynomial by grouping
- 6.e. Utilize appropriate technology
- 6.f. Apply mathematics skills to related technical problems

7. Solve quadratic equations over the set of real numbers

Domain Cognitive Level Applying Status Active

Assessment Strategies

- 7.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 7.1. you identify coefficients of a quadratic equation in standard form
- 7.2. you select appropriate method for solving second degree equations
- 7.3. you generate the equation which satisfies the conditions of the problem
- 7.4. you solve second degree equation using the selected method
- 7.5. you select relevant solution(s)
- 7.6. you apply skill to technical problems
- 7.7. you utilize appropriate technology
- 7.8. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 7.a. Identify coefficients of a quadratic equation in standard form
- 7.b. Select appropriate method for solving second-degree equations
- 7.c. Generate the equation, which satisfies the condition of the problem
- 7.d. Solve second-degree equations using the selected method
- 7.e. Select relevant solutions
- 7.f. Apply mathematics skills to related technical problems

8. Perform operations with rational expressions

Domain Cognitive Level Applying Status Active

Assessment Strategies

- 8.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 8.1. you add, subtract, multiply, and divide rational expressions
- 8.2. you apply skill to an applied technical problem
- 8.3. you simplify complex fractions
- 8.4. you utilize appropriate technology
- 8.5. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 8.a. Perform the operations of addition, subtraction, multiplication, and division with rational expressions

- 8.b. Factor fractional expressions containing more than one variable
- 8.c. Simplify complex fractions
- 8.d. Utilize appropriate technology
- 8.e. Apply mathematics skills to related technical problems

9. Solve rational equations

Domain Cognitive Level Applying Status Active

Assessment Strategies

- 9.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 9.1. you apply multiplication property to clear all denominators
- 9.2. you solve equations
- 9.3. you identify extraneous solutions
- 9.4. you apply skill to technical problems
- 9.5. you utilize appropriate technology
- 9.6. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 9.a. Use multiplication to clear denominators of algebraic fractions
- 9.b. Solve algebraic fractional equations
- 9.c. Identify extraneous solutions
- 9.d. Utilize appropriate technology
- 9.e. Apply mathematics skills to related technical problems

10. Graph algebraic functions

Domain Cognitive Level Applying Status Active

Assessment Strategies

- 10.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 10.1. you determine ordered pairs from a given graph
- 10.2. you differentiate a function from a relation
- 10.3. you utilize function notation
- 10.4. you identify range and domain of a given function
- 10.5. you graph linear and quadratic functions on the Cartesian plane
- 10.6. you apply skill to technical problems
- 10.7. you utilize appropriate technology
- 10.8. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 10.a. Identify range and domain of a given function
- 10.b. Graph linear and second-degree functions on a Cartesian coordinate plane
- 10.c. Determine ordered pairs from a given graph
- 10.d. Differentiate a function from a relation
- 10.e. Utilize function notation
- 10.f. Utilize appropriate technology
- 10.g. Apply mathematics skills to related technical problems

11. Relate the equation of a line to its graph

Domain Cognitive Level Applying Status Active

Assessment Strategies

11.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 11.1. you calculate the distance between two points
- 11.2. you calculate the slope of a line given two points on the line
- 11.3. you determine the slope of a line parallel to a given line
- 11.4. you determine the slope of a line perpendicular to a given line
- 11.5. you write the equation of a line using the slope-intercept form, the point-slope form, or the two-point form
- 11.6. you apply skill to technical problems
- 11.7. you utilize appropriate technology
- 11.8. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 11.a. Calculate the distance between two points
- 11.b. Calculate the slope of a line parallel to a given line
- 11.c. Determine the slope of a line parallel to a given line
- 11.d. Determine the slope of a line perpendicular to a given line
- 11.e. Write the equation of a line using the slope-intercept form, point-slope form, or the two-point form
- 11.f. Utilize appropriate technology
- 11.g. Apply mathematics skills to related technical problems

12. Solve systems of equations

Domain Cognitive Level Applying Status Active

Assessment Strategies

12.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 12.1. you solve systems of two and three equations or formulas
- 12.2. you check all solutions in the system
- 12.3. you apply skill to technical problems
- 12.4. you utilize appropriate technology
- 12.5. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 12.a. Solve systems of two and three variable equations
- 12.b. Check all solutions in the system
- 12.c. Utilize appropriate technology
- 12.d. Apply mathematics skills to related technical problems

13. Convert units of measure

Domain Cognitive Level Applying Status Active

Assessment Strategies

13.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 13.1. you convert within SI (metric)
- 13.2. you convert within USCS (United States Customary System)
- 13.3. you convert between USCS and SI units
- 13.4. you apply skill to technical problems
- 13.5. you utilize appropriate technology
- 13.6. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you

show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 13.a. Convert within the SI system
- 13.b. Convert within the standard system
- 13.c. Convert between standard and metric units
- 13.d. Utilize appropriate technology
- 13.e. Apply mathematics skills to related technical problems

14. Compute angle measures, length of sides, perimeter, and area of plane geometric figures

Domain *Cognitive* *Level* *Applying* *Status* *Active*

Assessment Strategies

- 14.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 14.1. you calculate the measure of the specified angle(s) of polygons
- 14.2. you calculate the circumference, perimeter, and area of plane figures including composite figures
- 14.3. you calculate a specified side of similar polygons
- 14.4. you apply skill to technical problems
- 14.5. you utilize appropriate technology
- 14.6. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 14.a. Calculate the measure of the specified angle(s) of polygons
- 14.b. Calculate the circumference, perimeter, and area of plane figures including composite figures
- 14.c. Calculate a specified side of similar polygons
- 14.d. Utilize appropriate technology
- 14.e. Apply mathematics skills to related technical problems

15. Calculate surface area, volume, and weight/mass

Domain *Cognitive* *Level* *Applying* *Status* *Active*

Assessment Strategies

- 15.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 15.1. you calculate the surface area of solids
- 15.2. you calculate the volume of solids
- 15.3. you identify the density of a given material
- 15.4. you calculate the weight/mass of a solid or liquid
- 15.5. you apply skill to technical problems
- 15.6. you utilize appropriate technology
- 15.7. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 15.a. Calculate the surface area of geometric solids
- 15.b. Calculate the volume of geometric solids
- 15.c. Perform calculations with the density of a given material
- 15.d. Perform calculations with the weight/mass of a given material
- 15.e. Utilize appropriate technology

16. Solve right triangles

Domain *Cognitive* *Level* *Applying* *Status* *Active*

Assessment Strategies

16.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 16.1. you use the angle-sum principle to compute the third angle of a triangle
- 16.2. you use the Pythagorean Theorem to compute a side of a right triangle
- 16.3. you use sine, cosine, and tangent ratios to compute sides and/or angles of right triangles
- 16.4. you apply skill to technical problems such as vectors
- 16.5. you utilize appropriate technology
- 16.6. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 16.a. Use the angle sum principle to compute a missing angle of a triangle
- 16.b. Use the Pythagorean Theorem to determine a missing side of a right triangle
- 16.c. Use the trigonometric ratios to compute sides and/or angle of right triangles
- 16.d. Apply mathematics skills to related technical problems
- 16.e. Utilize appropriate technology

17. Solve oblique triangles

Domain Cognitive Level Applying Status Active

Assessment Strategies

17.1. oral, written, or graphic product

Criteria

Performance will be satisfactory when:

- 17.1. you use the Law of Cosines, Law of Sines, and right triangle methods when appropriate
- 17.2. you apply skill to technical problems such as vectors
- 17.3. you utilize appropriate technology
- 17.4. you apply the process for solving technical problems according to the problem-solving criteria (i.e. you show work in a clear and logical manner, you verify the solution, solution is within stated range and reflects appropriate accuracy or precision, solution is labeled with appropriate units)

Learning Objectives

- 17.a. Use Law of Cosines, Law of Sines, and right triangle methods when appropriate
- 17.b. Apply trig processes to vectors
- 17.c. Utilize appropriate technology
- 17.d. Apply mathematics skills to related technical problems