Lakeshore Technical College

10-804-115 College Technical Mathematics 1

Course Outcome Summary

Course Information

Alternate Title	College Technical Math 1
Description	...prepares the student to solve linear, quadratic, and rational equations; graphing; formula rearrangement; solve systems of equations; percent; proportions; measurement systems; computational geometry; right and oblique triangle trigonometry; trigonometric functions on the unit circle; 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 Tech Math 1a and 1b.
Total Credits	5
Total Hours	108

Pre/Corequisites

Prerequisite 10-834-110 Elementary Algebra w Apps or 31-457-318 Industrial Maintenance Trades Math or 31-420-320 Machine Tool Math or equivalent.

Course Competencies

1. Perform basic operations with real numbers

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

1.1. MyMathLab Activities
1.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

1.1. perform the arithmetic operations in proper sequence
1.2. simplify expressions using the laws of exponents
1.3. evaluate numeric expressions containing exponents
1.4. convert numbers between decimal notation and scientific and/or engineering notation·
1.5. perform arithmetic operations with numbers in scientific notation
1.6. calculate powers and roots with numbers in scientific notation
1.7. express angles in radian, degree, or revolution measurement
1.8. apply skill to technical problems
1.9. utilize appropriate technology

1.10. 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. Identify natural numbers, whole number, integers, rational and irrational real numbers.
1.b. Add whole numbers, integers, decimals, and fractions.
1.c. Subtract whole numbers, integers, decimals, and fractions.
1.d. Multiply whole numbers, integers, decimals, and fractions.
1.e. Divide whole numbers, integers, decimals, and fractions.
1.f. Evaluate expressions using the order of operations.
1.g. Simplify expressions using the laws of exponents.
1.h. Evaluate expressions that contain numbers in scientific notation.
1.i. Apply the use of basic operations with real numbers to technical problems.
1.j. Convert numbers decimal notation and scientific and/or engineering notation.
1.k. Evaluate expressions with numbers in scientific or engineering notation.
1.l. Evaluate expressions that contain roots.
1.m. Use significant digit rules to determine the number of significant digits in any given measurement.
1.n. Apply significant digit rules to report answers with the correct number of significant digits to reflect appropriate accuracy or precision.
1.o. Use properties of real numbers to simplify numerical expressions.
1.p. Use mathematical terminology appropriately.

2. Solve linear equations

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

2.1. MyMathLab Activities
2.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

2.1. solve linear equations in one variable
2.2. rearrange a formula to solve for an indicated first-degree variable
2.3. represent unknown(s) with a variable and translate English phrases into equations
2.4. substitute given number for variables into formula or equation
2.5. apply skill to technical problems
2.6. utilize appropriate technology
2.7. 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. Translate between verbal statements and symbolic statements.
2.b. Solve linear equations using the addition property of equality.
2.c. Solve linear equations using the multiplication property of equality.
2.d. Use the distributive property to solve equations.
2.e. Rearrange formulas to solve for a specified variable.
2.f. Evaluate algebraic expressions and formulas given values for the variables.
2.g. Use properties of real numbers to simplify algebraic expressions.
2.h. Solve linear equations containing fractions or decimals.
2.i. Recognize identities and equations with no solutions.
2.j. Use mathematical terminology appropriately.

3. Solve problems using percent and proportion

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

3.1. MyMathLab Activities
3.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

3.1. perform conversions among fractions, decimals, and percent
3.2. write an equation representing the problem
3.3. solve the equation
3.4. apply skill to technical problems
3.5. utilize appropriate technology
3.6. 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. Convert among fractions, decimals and percents.
3.b. Identify the base, rate, and portion in a percent problem.
3.c. Solve percent increase or decrease problems.
3.d. Solve various technical application problems involving percents.
3.e. Use proportions to solve various technical application problems.
3.f. Use mathematical terminology correctly.

4. Solve variation problems

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

4.1. MyMathLab Activities
4.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

4.1. identify the type of variation
4.2. write the variation equation
4.3. solve direct variation problems
4.4. solve inverse variation problems
4.5. solve joint and combined variation problems
4.6. apply skill to technical problems
4.7. utilize appropriate technology
4.8. 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. Solve direct variation problems using proportions.
4.b. Solve inverse variation problems using proportions.
4.c. Solve joint variation problems using the correct variation equation.
4.d. Solve combined variation problems using the correct variation equation.
4.e. Apply the use of variation problems to technical problems.
4.f. Use mathematical terminology appropriately.

5. Perform operations polynomials

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

5.1. MyMathLab Activities

5.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

5.1. add, subtract, multiply, and divide polynomials
5.2. utilize appropriate technology
5.3. 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. Solve direct variation problems using proportions.
5.b. Solve inverse variation problems using proportions.
5.c. Solve joint variation problems using the correct variation equation.
5.d. Solve combined variation problems using the correct variation equation.
5.e. Apply the use of variation problems to technical problems.
5.f. Use mathematical terminology appropriately.

6. Factor algebraic expressions

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

6.1. MyMathLab Activities
6.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

6.1. factor using the greatest common factor
6.2. factor binominals and trinominals
6.3. apply skill to technical problems
6.4. utilize appropriate technology
6.5. 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. Use mathematical terminology appropriately.
6.b. Factor the greatest common factor out of a polynomial.
6.c. Factor the difference of two perfect squares.
6.d. Factor a perfect square trinomial.
6.e. Factor trinomials by grouping.
6.f. Multiply factors to verify that they are equivalent to the original expression.

7. Solve quadratic equations over the set of real numbers

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

7.1. MyMathLab Activities
7.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

7.1. identify coefficients of a quadratic equation in standard form
7.2. select appropriate method for solving second degree equations
7.3. generate the equation which satisfies the conditions of the problem
7.4. solve second degree equation using the selected method

7.5. select relevant solution(s)
7.6. apply skill to technical problems
7.7. utilize appropriate technology
7.8. 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. Solve quadratic equations over the set of real numbers.
7.b. Solve quadratic equations by factoring.
7.c. Solve quadratic equations by completing the square.
7.d. Solve quadratic equations by using the quadratic formula.
7.e. Solve applied technical problems using quadratic equations.
7.f. Use mathematical terminology appropriately.

8. Perform operations with rational expressions

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

8.1. MyMathLab Activities
8.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

8.1. add, subtract, multiply, and divide rational expressions
8.2. apply skill to an applied technical problem
8.3. simplify complex fractions
8.4. utilize appropriate technology
8.5. 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. Simplify rational expressions by factoring.
8.b. Add rational expressions by applying the process of adding fractions.
8.c. Subtract rational expressions by applying the process of subtracting fractions.
8.d. Multiply rational expression by applying the process of multiplying fractions.
8.e. Divide rational expression by applying the process of dividing fractions.
8.f. Simplify complex fractions using addition and subtraction of rational expressions.
8.g. Use mathematical terminology appropriately.

9. Solve rational equations

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

9.1. MyMathLab Activities
9.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

9.1. apply multiplication property to clear all denominators
9.2. solve equations
9.3. identify extraneous solutions
9.4. apply skill to technical problems
9.5. utilize appropriate technology
9.6. 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. Solve fractional equations by multiplying by the least common denominator.
9.b. Determine which solutions are extraneous solutions.
9.c. Write a rational equation for an applied technical problem.
9.d. Solve an applied technical problem using rational equations.
9.e. Use mathematical terminology appropriately.

10. Graph algebraic functions

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

10.1. MyMathLab Activities
10.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

10.1. determine ordered pairs from a given graph
10.2. differentiate a function from a relation
10.3. utilize function notation
10.4. identify range and domain of a given function
10.5. graph linear and quadratic functions on the Cartesian plane
10.6. apply skill to technical problems
10.7. utilize appropriate technology
10.8. 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. Determine the value a function for a given value.
10.b. Determine the range of a function for a given domain.
10.c. Graph independent and dependent values of functions.
10.d. Use the vertical line test to distinguish between a function and a relation .
10.e. Graph linear and quadratic functions using a t-chart.
10.f. Graph linear functions using the slope intercept method.
10.g. Graph linear functions using the intercepts.
10.h. Communicate using appropriate mathematical terminology.

11. Relate the equation of a line to its graph

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

11.1. MyMathLab Activities
11.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

11.1. calculate the distance between two points
11.2. calculate the slope of a line given two points on the line
11.3. determine the slope of a line parallel to a given line
11.4. determine the slope of a line perpendicular to a given line
11.5. write the equation of a line using the slope-intercept form, the point-slope form, or the two-point form
11.6. apply skill to technical problems
11.7. utilize appropriate technology
11.8. 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 slope of a given line.
11.b. Write the equation of a line using the slope intercept or point slope form.
11.c. Write the equation of a line parallel to a given line.
11.d. Write the equation of a line perpendicular to a given line.
11.e. Find the distance between two points.
11.f. Find the midpoint of a line segment given the endpoints.
11.g. Communicate using appropriate mathematical terminology.

12. Solve systems of equations

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

12.1. MyMathLab Activities
12.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

12.1. solve systems of two and three equations or formulas
12.2. check all solutions in the system
12.3. apply skill to technical problems
12.4. utilize appropriate technology
12.5. 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 quadratic equations over the set of real numbers.
12.b. Solve a system of equations graphically.
12.c. Solve a system of equations using the addition method.
12.d. Solve a system of equations using substitution.
12.e. Solve a system of equations using determinants.
12.f. Use systems of equations to solve applied technical problems.
12.g. Communicate using appropriate mathematical terminology.

13. Convert units of measure

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

13.1. MyMathLab Activities
13.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

13.1. convert within SI (metric)
13.2. convert within USCS (United States Customary System)
13.3. convert between USCS and SI units
13.4. apply skill to technical problems
13.5. utilize appropriate technology
13.6. 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. Use unit fractions to convert within USCS.

13.b. Use powers of 10 to convert within the metric system.
13.c. Use unit fractions to convert from USCS to the metric system.
13.d. Use multiple unit fractions to convert from one rate measure to another.
13.e. Communicate using appropriate mathematical terminology.

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

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

14.1. MyMathLab Activities
14.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

14.1. calculate the measure of the specified angle(s) of polygons
14.2. calculate the circumference, perimeter, and area of plane figures including composite figures
14.3. calculate a specified side of similar polygons
14.4. apply skill to technical problems
14.5. utilize appropriate technology
14.6. 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. Find the measure of one angle of a triangle given the other two using the angle sum property.
14.b. Find the measure of the angles of a quadrilateral using the properties of quadrilateral.
14.c. Find the measure of the angles of a regular polygon.
14.d. Use similar polygons to find the measure of the side of a polygon.
14.e. Find the perimeter or circumference of a plane figure.
14.f. Find the area of a plane figure.
14.g. Find the area and perimeter of a composite figure by examining the parts.
14.h. Communicate using appropriate mathematical terminology.

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

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

15.1. MyMathLab Activities
15.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

15.1. calculate the surface area of solids
15.2. calculate the volume of solids
15.3. you identify the density of a given material
15.4. calculate the weight/mass of a solid or liquid
15.5. apply skill to technical problems
15.6. utilize appropriate technology
15.7. 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 a prism or cylinder.
15.b. Calculate the volume of a prism or cylinder.
15.c. Calculate the surface area of a pyramid or cone.
15.d. Calculate the volume of a pyramid or cone.

15.e. Calculate the surface area and area of a sphere.
15.f. Calculate the density of an object given the volume and the weight or mass of the object.
15.g. Calculate the weight or mass of an object given the volume and the density of the object.
15.h. Communicate using appropriate mathematical terminology.

16. Solve right triangles

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

16.1. MyMathLab Activities
16.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

16.1. use the angle-sum principle to compute the third angle of a triangle
16.2. use the Pythagorean Theorem to compute a side of a right triangle
16.3. use sine, cosine, and tangent ratios to compute sides and/or angles of right triangles
16.4. apply skill to technical problems such as vectors
16.5. utilize appropriate technology
16.6. 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. Find the trigonometric values for the sine, cosine, tangent, cotangent, secant and cosecant of a given angle using a calculator.
16.b. Find the angle measure given a trigonometric value using a calculator.
16.c. Use the pythagorean theorem to find a side of a right triangle given the other two.
16.d. Use the angle-sum theorem to find the remaining angle given two of the angles of a triangle.
16.e. Find the sine, cosine, tangent, cotangent, secant, and cosecant of angles of right triangles given at least two sides.
16.f. Find the measures of the other angles and sides of a right triangle given one side and one angle.
16.g. Solve vector problems using right triangle methods.
16.h. Communicate using appropriate mathematical terminology.

17. Solve oblique triangles

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

17.1. MyMathLab Activities
17.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

17.1. use the Law of Cosines, Law of Sines, and right triangle methods when appropriate
17.2. relate angle in standard position to its reference angle
17.3. apply skill to technical problems such as vectors
17.4. utilize appropriate technology
17.5. 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. Determine if one, two, or no triangles are possible given three parts of an oblique triangle.
17.b. Use the Law of Sines to find the measure of a unknown side or angle of an oblique triangle.
17.c. Use the Law of Cosines to find the measure of a unknown side or angle of an oblique triangle.
17.d. Apply the use of oblique triangles to technical problems including vectors.

17.e. Communicate using appropriate mathematical terminology.

18. Relate trigonometric functions to the unit circle

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

18.1. MyMathLab Activities
18.2. Test

Criteria

Criteria: Performance will be satisfactory when you:

18.1. express angles in radian, degree, or revolution measurement
18.2. relate angle in standard position to its reference angle
18.3. determine the values for sine, cosine, or tangent of angles between -360 and 360 degrees
18.4. use inverses of sine, cosine, and tangent functions to determine possible angles from -360 to 360 degrees
18.5. sketch graphs of sine, cosine, and tangent functions for angles from -360 to 360 degrees
18.6. apply skill to technical problems
18.7. utilize appropriate technology
18.8. 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

18.a. Solve oblique triangles.
18.b. Convert the measure of an angle to degrees, radians, and revolutions using unit fractions..
18.c. Convert the measure of an angle to degrees or radians using a calculator.
18.d. Find the reference angle of any standard position angle.
18.e. Determine the signs of trigonometric values of any angle.
18.f. Find the value of the trigonometric values of any angle.
18.g. Find all angles between -360 and 360 degrees with a given trigonometric value.
18.h. Graph the basic sine, cosine, and tangent functions from -360 to 360 degrees.
18.i. Communicate using appropriate mathematical terminology.