

# Introduction to College Math

## Course Outcome Summary

### Course Information

<b>Organization</b>	Madison Area Technical College
<b>Developers</b>	Tom Pomykalski
<b>Development Date</b>	1/1/2004
<b>Course Number</b>	10-804-106
<b>Instructional Level</b>	Associates Degree
<b>Potential Hours of Instruction</b>	54
<b>Total Credits</b>	3

### Description

Basic computational skills are reviewed and fundamental mathematical concepts from algebra, geometry, trigonometry, and statistics are developed. The topics covered in this course are fractions, decimals, ratios and proportions, percent, geometry and measurement systems, data interpretation and presentation, basic algebraic concepts, and right angle trigonometry. Additionally, how-to study mathematics, how-to approach problem solving, and the use of calculators as mathematical tools will be addressed.

### Target Population

Associate Degree Student

### Types of Instruction

Instruction Type	Contact Hours	Credits
Lecture demonstration	54	3

### Textbooks

*Current textbook on file in the Arts and Sciences office.*

### Learner Supplies

Textbook.

Scientific or graphing calculator.

### Competencies

#### A. Perform basic mathematical operations

**You will demonstrate your competence:**

A.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

A.1. you add whole numbers

A.2. you subtract to whole numbers

A.3. you multiply whole numbers

- A.4. you divide whole numbers
- A.5. you use exponents correctly with whole numbers
- A.6. you combine these operations applied to whole numbers according to the standard order of operation rules
- A.7. you recognize explicit grouping symbols in performing calculations
- A.8. you use explicit grouping symbols in performing calculations correctly
- A.9. you recognize implicit grouping symbols (fraction bar, radical symbol, etc) in performing calculations
- A.10. you use implicit grouping symbols (fraction bar, radical symbol, etc) in performing calculations correctly
- A.11. you use a scientific calculator to compute expressions that involve addition, subtraction, multiplication, division, exponentiation or combinations of these according to the standard order of operation rules correctly

**B. Apply mathematical problem solving skills**

**You will demonstrate your competence:**

- B.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- B.1. you show work in a clear and logical manner
- B.2. you verify solution
- B.3. you verify that solution is within stated range and reflects appropriate accuracy or precision
- B.4. you label solution with appropriate unit(s)

**C. Perform basic mathematical operations with fractions**

**You will demonstrate your competence:**

- C.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- C.1. you determine if fractions are equivalent
- C.2. you compare the magnitude of different fractions
- C.3. you express improper fractions as mixed numbers
- C.4. you express mixed numbers as improper fractions
- C.5. you reduce fractions to lowest terms
- C.6. you perform multiplication, division, addition, subtraction, or combinations of these operations with fractions according to the standard order of operations
- C.7. you use a scientific calculator to check calculations involving fractions
- C.8. you use a scientific calculator to check calculations involving fractions

**D. Perform basic mathematical operations with decimal numbers**

**You will demonstrate your competence:**

- D.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- D.1. you convert fractions into decimals
- D.2. you convert terminating decimals into fractions
- D.3. you perform addition, subtraction, multiplication, division, exponentiation, root taking or combinations of these operations with decimal numbers according to the standard order of operation rules

- D.4. you recognize signed decimal numbers
- D.5. you use signed decimal numbers correctly
- D.6. you recognize decimal numbers expressed in scientific notation
- D.7. you use decimal numbers expressed in scientific notation correctly
- D.8. you use a scientific calculator to compute expressions that involve addition, subtraction, multiplication, division, exponentiation, root taking or combinations of these with decimal numbers according to the standard order of operations correctly
- D.9. you round a decimal to a required place

**E. Perform basic mathematical operations with numbers expressed as percents**

**You will demonstrate your competence:**

E.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- E.1. you explore the definition of percent
- E.2. you convert fractions or decimals into percentages and vice versa
- E.3. you convert fractions or decimals into percentages
- E.4. you convert percents into fractions or decimals into percentages
- E.5. you solve percent problems for amount
- E.6. you solve percent problems for base
- E.7. you solve percent problems for percentage
- E.8. you use a scientific calculator to compute the answer to percent problems correctly
- E.9. you translate a verbally stated application involving percentages into performing an equivalent computation correctly
- E.10. you solve percent problems that arise in personal finance
- E.11. you interpret the computer answer to a word problem correctly
- E.12. you check the reasonableness of a computed answer to a word problem

**F. Create and interpret graphs**

**You will demonstrate your competence:**

F.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- F.1. you determine the coordinates of a point from a graph
- F.2. you extract quantitative information from graphs
- F.3. you summarize the relationships between variables represented in a graph
- F.4. you interpret the information represented in a graph
- F.5. you generate a graph with appropriate scales, labels and dimensions from a table of values
- F.6. you generate a graph with appropriate scales, labels and dimensions from an equation relating two variables
- F.7. you create and interpret line graphs
- F.8. you create and interpret bar graphs and histograms
- F.9. you create and interpret pie graphs
- F.10. you create and interpret box and whiskers graphs

**G. Calculate statistical measures from data sets**

**You will demonstrate your competence:**

G.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

G.1. you compute the mean

G.2. you compute the median

G.3. you compute the mode

G.4. you compute the midrange

G.5. you compute the range

G.6. you compute the variance of a sample and population

G.7. you compute the standard deviation of a sample and population

G.8. you compute various quartiles

**H. Perform basic mathematical operations with signed numbers**

**You will demonstrate your competence:**

H.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

H.1. you perform multiplication with signed numbers according to the standard order of operations

H.2. you perform division with signed numbers according to the standard order of operations

H.3. you perform addition with signed numbers according to the standard order of operations

H.4. you perform subtraction with signed numbers according to the standard order of operations

H.5. you perform combinations of these operations with signed numbers according to the standard order of operations

**I. Apply the rules of exponents**

**You will demonstrate your competence:**

I.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

I.1. you use the rules of exponents to simplify expressions with whole number exponents

I.2. you use the rules of exponents to simplify expressions with integer exponents

I.3. you recognize numbers expressed in scientific notation

I.4. you interpret numbers expressed in scientific notation correctly

I.5. you simplify numbers expressed in scientific notation

I.6. you perform calculations on numbers expressed in scientific notation

I.7. you use a scientific calculator to compute expressions with exponents

I.8. you use a scientific calculator to compute expressions with numbers expressed in scientific notation

**J. Simplify algebraic expressions**

**You will demonstrate your competence:**

J.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- J.1. you recognize "like terms"
- J.2. you distinguish between "like terms" and "unlike terms"
- J.3. you use the distributive property to correctly combine "like terms"
- J.4. you distribute a minus sign across a sum or difference of terms correctly
- J.5. you distribute a single term denominator across a numerator expressed as a sum correctly
- J.6. you distinguish the simplification of a fraction with a numerator expressed as a sum from the simplification of a fraction with a numerator expressed as a product
- J.7. you use the distributive property to simplify linear combinations of polynomials
- J.8. you use a scientific calculator to numerically check the result of an algebraic simplification

**K. Simplify and rearrange formulas**

**You will demonstrate your competence:**

- K.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- K.1. you use the rules of equivalence to solve linear equations in a single variable
- K.2. you use the rules of equivalence to rearrange formulas

**L. Perform calculations with quantities having units of measure**

**You will demonstrate your competence:**

- L.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- L.1. you perform addition, subtraction, multiplication, division, exponentiation, root taking or combinations of these operations for quantities expressed as measurements
- L.2. you express the answer with the appropriate units
- L.3. you use a scientific calculator to compute the answer to problems involving measured quantities correctly
- L.4. you set up unit fractions to convert measurements from one unit to another

**M. Convert measurements within the English system of units**

**You will demonstrate your competence:**

- M.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- M.1. you set up unit fractions to convert measurements from one unit to another
- M.2. you use unit fractions to convert measurements from one unit to another
- M.3. you convert area measurements to different square and cubic units of length measure
- M.4. you convert volume measurements to different square and cubic units of length measure

**N. Convert measurements within the metric system of units**

**You will demonstrate your competence:**

- N.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- N.1. you use the prefixes in the metric system to convert measurements within the metric system

- N.2. you set up unit fractions to convert measurements from one unit to another
- N.3. you use unit fractions to convert measurements from one unit to another
- N.4. you convert metric area measurements to different metric square and cubic units of length measure
- N.5. you convert volume measurements to different metric square and cubic units of length measure

**O. Convert measurements between the metric and English systems**

**You will demonstrate your competence:**

- O.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- O.1. you set up unit fractions to convert measurements from specified English units to specified metric units
- O.2. you use unit fractions to convert measurements from specified English units to specified metric units
- O.3. you set up unit fractions to convert measurements from specified metric units to specified English units
- O.4. you use unit fractions to convert measurements from specified metric units to specified English units

**P. Solve applied problems**

**You will demonstrate your competence:**

- P.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- P.1. you translate a verbally stated problem into solving an equivalent equation
- P.2. you solve the equation extracted from a verbally stated problem
- P.3. you interpret the computed answer to a word problem
- P.4. you check the reasonableness of a computed answer to a word problem

**Q. Solve ratio and proportion problems**

**You will demonstrate your competence:**

- Q.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- Q.1. you rearrange a proportion to solve for an unknown quantity
- Q.2. you translate a relationship stated in the language of variation ("varies directly as", "varies inversely as", etc) into a proportion
- Q.3. you solve the proportion extracted from a verbally stated variation problem
- Q.4. you interpret the computed answer to a variation word problem
- Q.5. you check the reasonableness of a computed answer to a word problem

**R. Solve variation problems**

**You will demonstrate your competence:**

- R.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- R.1. you identify types of ratio and proportion
- R.2. you write variation equations

- R.3. you solve direct variation problems
- R.4. you solve indirect variation problems
- R.5. you solve inverse variation problems
- R.6. you solve joint and combined variation problems
- R.7. you apply skill to applied technical problems
- R.8. you apply the process for solving technical problems according to the problem solving criteria

**S. Use and compute angle measurements**

**You will demonstrate your competence:**

S.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- S.1. you label angles in a diagram
- S.2. you interpret diagrams with labeled angles
- S.3. you convert decimal degrees into DMS notation
- S.4. you convert DMS notation into decimal degrees
- S.5. you perform DMS to DD conversions on a scientific calculator
- S.6. you perform DD to DMS conversions on a scientific calculator
- S.7. you use properties of parallel and intersecting lines and polygons to solve for missing angles in a figure

**T. Use properties of triangles and other polygons**

**You will demonstrate your competence:**

T.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- T.1. you identify polygons (triangles, quadrilaterals and hexagons)
- T.2. you identify special cases of triangles (isosceles, equilateral, right)
- T.3. you identify quadrilaterals (rectangles, squares, parallelograms, trapezoids)
- T.4. you solve for missing angles in a triangle and polygon
- T.5. you solve for missing sides in a triangle and polygon
- T.6. you recognize the rules of congruence (SAS, ASA, SSS) for triangles
- T.7. you use the rules of congruence (SAS, ASA, SSS) for triangles

**U. Perform calculations using the Pythagorean Theorem**

**You will demonstrate your competence:**

U.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- U.1. you use the Pythagorean Theorem to solve for any missing side of a right triangle
- U.2. you determine the height of an isosceles triangle with given sides by dropping a perpendicular and using the Pythagorean Theorem
- U.3. you use a scientific calculator to perform calculations involving the Pythagorean Theorem correctly

**V. Calculate perimeters and areas of closed planar figures**

**You will demonstrate your competence:**

V.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- V.1. you compute (given sufficient data) the perimeters and areas of rectangles
- V.2. you compute (given sufficient data) the perimeters and areas of triangles
- V.3. you compute (given sufficient data) the perimeters and areas of parallelograms
- V.4. you compute (given sufficient data) the perimeters and areas of trapezoids
- V.5. you compute (given sufficient data) the perimeters and areas of regular hexagons
- V.6. you use a scientific calculator to compute the area of a triangle (given the lengths of its sides) from Heron's formula correctly
- V.7. you compute the area of a circle given its radius or diameter
- V.8. you compute the circumference of a circle given its radius or diameter

**W. Calculate the volume and surface area of a three-dimensional solid**

**You will demonstrate your competence:**

- W.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- W.1. you compute (given sufficient data) the lateral surface area of a right prism
- W.2. you compute (given sufficient data) the total surface area of a right prism
- W.3. you compute (given sufficient data) the volume of a right prism
- W.4. you compute (given sufficient data) the volumes of cones
- W.5. you compute (given sufficient data) the volumes of right pyramids
- W.6. you compute the total surface area of a sphere from its radius or diameter
- W.7. you recognize the geometric solid (prism, cone, cylinder, sphere, etc) necessary to compute a surface area or volume required in an application
- W.8. you compute a surface area or volume required in an application
- W.9. you check the reasonableness of a computer answer to an area or volume problem

**X. Convert angle measurements from degrees to radians and vice versa**

**You will demonstrate your competence:**

- X.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- X.1. you convert angles measured in radians to DD (decimal degrees)
- X.2. you convert angles measured in radians to DMS (degrees, minutes, seconds)
- X.3. you convert angles measured in DD to radians
- X.4. you convert angles measured in DMS to radians
- X.5. you compute the arc length subtended by a central angle

**Y. Use radian measure to solve applied problems**

**You will demonstrate your competence:**

- Y.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

- Y.1. you use radian measure to solve a verbally stated application
- Y.2. you check the reasonableness of a verbally stated application of radian measure

**Z. Perform computations with the sine, cosine, tangent functions and their inverses**

**You will demonstrate your competence:**

Z.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

Z.1. you distinguish between the opposite and adjacent sides to an acute angle in a right triangle

Z.2. you identify the correct ratio of sides for the sine function of an acute angle in a right triangle

Z.3. you identify the correct ratio of sides for the cosine function of an acute angle in a right triangle

Z.4. you identify the correct ratio of sides for the tangent function of an acute angle in a right triangle

Z.5. you use a scientific calculator to compute the sine function for an acute angle expressed either in DD or DMS notation

Z.6. you use a scientific calculator to compute the cosine function for an acute angle expressed either in DD or DMS notation

Z.7. you use a scientific calculator to compute the tangent function for an acute angle expressed either in DD or DMS notation

Z.8. you use a scientific calculator and the appropriate inverse trigonometric function to compute an acute angle for a given value of a trigonometric function and express the answer in either DD or DMS notation

Z.9. you identify the correct relationship between the coordinates of a point on the standard unit circle and the sine, cosine, and tangent functions of a central angle measured from the positive x axis

Z.10. you use a scientific calculator and the appropriate inverse trigonometric function to compute the measure of the angle and express the answer in either DD or DMS notation for a given value of a trigonometric function and a specified quadrant

Z.11. you use a scientific calculator to compute the sine function for any angle expressed either in DD or DMS notation

Z.12. you use a scientific calculator to compute the cosine function for any angle expressed either in DD or DMS notation

Z.13. you use a scientific calculator to compute the tangent function for any angle expressed either in DD or DMS notation

**AA. Solve for the missing information in a right triangle**

**You will demonstrate your competence:**

AA.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

AA.1. you solve for the length of the missing side and the measure of the two missing acute angles given the lengths of two sides in a right triangle

AA.2. you solve for the measure of the missing acute angle and the lengths of the two missing sides given the length of one side and the measure of one acute angle in a right triangle

AA.3. you check the reasonableness of the answers for the missing information in a right triangle

**BB. Solve for the missing information in an oblique triangle**

**You will demonstrate your competence:**

BB.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

BB.1. you use the law of cosines to find the length of the missing side and then use either the law of sines or the law of cosines to find the measure of the two missing angles given the lengths of two sides and the included angle (SAS)

BB.2. you compute the measure of the missing angle and then use the law of sines to find the lengths of the two missing sides given the measures of two angles and the length of the included side (ASA)

BB.3. you use the law of cosines to compute the measure of the largest missing angle and then use either the law of sines or the law of cosines to find the measure of the two missing acute angles given the lengths of all three sides (SSS)

BB.4. you check the reasonableness of the answers for the missing information in an oblique triangle

**CC. Solve applications of trigonometry**

**You will demonstrate your competence:**

CC.1. by a satisfactory score on all tests, quizzes, or graded assignments incorporating this competency

**Your performance will be successful when:**

CC.1. you translate a verbally stated problem in solving for the missing information of a triangle

CC.2. you solve for the missing information of a triangle extracted from a verbally stated problem

CC.3. you interpret the computed answer to a word problem

CC.4. you check the reasonableness of a computed answer to a word problem