

## **Applied Math I Course Outcome Summary**

### **Information**

Project Title:	Applied Math I
Developer(s):	Peter C. Esser
Development Date:	02/01/1995
Revised By:	Pete Esser
Revision Date:	4/25/2005
Course Number:	31-804-301
Organization:	SWTC - Southwest Wisconsin Technical College
Division:	General Education
Department:	Mathematics
Potential Hours of Instruction:	48
Total Credits:	2 (3 hours / week)

### **Target Population**

This is a required course for the following programs: Agricultural Power & Equipment Technician, Auto Collision Repair and Refinish Technician, Automotive Technician, Bricklaying, Engine Machining Technician, Machine Tool Operation, Carpentry, and Welding.

### **Course Description**

Students taking Applied Math I make and convert various measurements. Students use formulas to solve problems. They compute dimensions of geometric shapes. Students use statistical tools to represent and analyze data. They analyze various financial situations. Students use basic right triangle trigonometry to solve problems. In each topic area, students solve application problems.

### **Course Prerequisites**

Math Review or Sufficient score on TABE entrance test

### **Textbooks**

#### **Applied and General Mathematics 6th edition**

Author:	Peter C. Esser
Publisher:	SWTC
Copyright:	2002

### **Supplies**

Scientific Calculator  
Notebook

### **Target Exit Learning Outcomes**

#### **General Education Outcomes**

A. Apply mathematical concepts

#### **Core Abilities**

- A. Act Professionally
- B. Communicate Clearly
- C. Value Learning
- D. Work Productively
- E. Work Cooperatively
- F. Solve Problems

## **Performance Expectations**

### **Goals**

1. Apply computational skills to program specific applications
2. Convert measurements
3. Measure objects
4. Compute using formulas
5. Compute dimensions of geometric shapes
6. Analyze data using statistical tools
7. Analyze occupational and personal purchasing situations
8. Analyze occupational and personal saving situations
9. Analyze occupational and personal loan situations
10. Find missing dimensions of right triangles

### **1. Apply computational skills to program specific applications**

#### **Properties**

Domain: Cognitive

Level: Application

Difficulty: Medium

Importance: Essential

#### **Linked Core Abilities**

Work Productively

Solve Problems

#### **Linked General Education Outcomes**

Apply mathematical concepts

*Criteria - Criteria - Performance will be satisfactory when:*

- o learner writes intermediate computation steps when solving generic rational number (add, subtract, multiply, divide: fractions, decimals, and percents) problems.
- o final answer to a generic rational number problem is written to the tolerance specified with each question. (Example: " Round answer to nearest tenth of an inch.")
- o learner successfully answers 80% of all questions.
- o learner completes test within scheduled class period.

*Conditions for Assessment - Conditions - Competence will be demonstrated:*

- o Student may not use the Applied Mathematics textbook while taking quizzes and tests.
- o Student may use pencil, blank paper, calculator, and 1/2 page of notes for all chapter tests.
- o In chapter tests.
- o In order to complete the entire Applied Math course, Chapters 1-3 should be completed by the fifth week

#### **Learning Objectives**

- a. Read problem thoroughly to understand what is to be determined or solved.
- b. Determine whether or not enough information is given to solve the given problem.
- c. Determine the mathematical operation(s) needed to solve the problem.
- d. Select the numbers necessary to solve the problem.
- e. Estimate a reasonable answer for the given problem.
- f. Compute with selected numbers and selected mathematical operations.

### **2. Convert measurements.**

#### **Properties**

Domain: Cognitive  
Level: Application  
Difficulty: Medium  
Importance: Important

**Linked Core Abilities**

Work Productively  
Solve Problems

**Linked General Education Outcomes**

Apply mathematical concepts

Criteria - *Criteria - Performance will be satisfactory when:*

- o learner uses the Conversion Factor Fraction method to convert from a given measurement to a desired measurement.
- o answer is expressed to the accuracy indicated by the question. (Example: Change 3.5 ft to centimeters (nearest tenth))
- o answer is written with the required new unit of measure.
- o learner completes test within scheduled class period.
- o test score is 80% or above.

Conditions for Assessment - *Conditions - Competence will be demonstrated:*

- o In a test.
- o Student may use any measurement conversion table or chart that is found in the Applied Math textbook. Pencil, paper, calculator, and 1/2 page of notes may also be used.

**Learning Objectives**

- a. List the most commonly used units used for length, mass/weight, and capacity for a given system of measurement (English & metric).
- b. Determine the most appropriate unit of measure to describe a given situation.
- c. Estimate the length, weight, capacity for some common everyday objects.
- d. Determine conversion factors needed to convert the given measurement.
- e. Use the Conversion Factor Fraction Method to convert measurements within a given system of measurement.
- f. Express the converted measurement to the indicated precision with the correct units of measure.
- g. Use the Conversion Factor Fraction Method to convert measurements from English to metric and vice-versa.

**3. Measure objects.**

**Properties**

Domain: Psychomotor  
Level: Practice  
Difficulty: Medium  
Importance: Important

**Linked Core Abilities**

Solve Problems  
Work Productively

**Linked General Education Outcomes**

Apply mathematical concepts

Criteria - *Criteria - Performance will be satisfactory when:*

- o learner uses ruler or steel scale to measure specified items to within 1/32nd inch (English)

or 1 mm (metric).

- o learner measures the capacity of specified containers and other 3-dimensional objects to within 5 ml.
- o learner measures the mass of specified objects to within 1 g.
- o measurement is written with the correct unit of measure.
- o measurement test is completed with 80% of all problems correct.

Conditions for Assessment - *Conditions - Competence will be demonstrated:*

- o using supplied steel rules, micrometers, and vernier calipers (English and metric versions), graduated cylinders/beakers, pan balance.
- o using designated objects to be measured.

### **Learning Objectives**

- a. Identify various measuring instruments, such as steel rules, calipers, micrometers, graduated cylinders/beakers, balances/scales.
- b. List the ultimate accuracy that can be obtained by each type of measuring instrument.
- c. List the type of component dimensions each instrument can be used for.
- d. Identify the dimension of part/component needed to be measured.
- e. Select the correct measuring instrument needed to determine the desired dimension to the required level of precision.
- f. Determine measurement of the given part with the correct units of measure and correct level of precision.

## **4. Compute using formulas.**

### **Properties**

Domain: Cognitive

Level: Application

Difficulty: Medium

Importance: Essential

### **Linked Core Abilities**

Work Productively

Solve Problems

### **Linked General Education Outcomes**

Apply mathematical concepts

Criteria - *Criteria - Performance will be satisfactory when:*

- o learner demonstrates understanding of a given formula's variables by substituting given values into the correct position in the formula.
- o answer is written to the indicated precision.
- o answer is written with the correct unit of measure.
- o student completes quiz/unit test with an 80% or higher score.

Conditions for Assessment - *Conditions - Competence will be demonstrated:*

- o when learner completes unit test.

### **Learning Objectives**

- a. Review symbolic notation (eg sq. roots, other symbols for multiplication, exponents)
- b. Review calculator skills
- c. List the four levels of mathematical operations as indicated by the Order of Operations.
- d. Compute multi-operation expressions using the Order of Operations.
- e. Determine the purpose of each variable and constant in a formula.
- f. Substitute known values into the formula.
- g. Evaluate the formula with calculator using the Order of Operations.

- h. Express answer to the required accuracy with the correct units of measure.
- i. Discuss how to obtain a reasonable estimate for the answer that can be used to check the final computed value.

## 5. Compute dimensions of geometric shapes.

### Properties

Domain: Cognitive

Level: Application

Difficulty: Medium

Importance: Important

### Linked Core Abilities

Work Productively

Solve Problems

### Linked General Education Outcomes

Apply mathematical concepts

Criteria - *Criteria - Performance will be satisfactory when:*

- o learner correctly identifies the name of the given 2-dimensional and 3-dimensional objects.
- o learner correctly identifies which of these three geometric measures is to be computed: perimeter, area, or volume.
- o learner correctly identifies the formula(s) necessary to solve the given geometric problem.
- o final answer is written to the indicated precision.
- o final answer is written with the correct units of measure.
- o when quiz/unit test is completed with an 80% or higher average.

Conditions for Assessment - *Conditions - Competence will be demonstrated:*

- o by completing unit test.

### Learning Objectives

- a. Identify basic two-dimensional objects.
- b. Define perimeter/circumference, area.
- c. Select formula needed to compute perimeter, or area for a given 2-d geometric shape.
- d. Compute perimeter/area for a given 2-d object with answer written to the desired precision and units of measure.
- e. Identify basic three-dimensional objects.
- f. Define surface area, lateral surface area, and volume.
- g. Select formula(s) needed to compute surface area, lateral surface area, or volume for a given 3-d shape.
- h. Compute surface area, lateral surface area, or volume for a given 3-d object with answer written to the desired precision and units of measure.

## 6. Analyze data using statistical tools.

### Properties

Domain: Cognitive

Level: Evaluation

Difficulty: Medium

Importance: Important

### Linked Core Abilities

Solve Problems

### Linked General Education Outcomes

Apply mathematical concepts

Criteria - *Criteria - Performance will be satisfactory when:*

- o learner selects the best measure of central tendency (mean, median, mode) to accurately represent a given group of data.
- o learner selects the best measure of variability (range, standard deviation) to accurately represent a given group of data.
- o learner accurately computes the above-listed statistical measurements with 100% accuracy.
- o learner accurately analyzes properties of normal distributions
- o Learner accurately completes SPC chart
- o Learner accurately determines the correlation of data

Conditions for Assessment - *Conditions - Competence will be demonstrated:*

- o through completion of a chapter test.

### **Learning Objectives**

- a. Define measures of central tendency: mean, median, mode.
- b. Determine, for a given situation, which measure of central tendency is most appropriate.
- c. Compute measures of central tendency for a given group of data.
- d. Define measures of dispersion: range, standard deviation.
- e. Determine for a given situation, which measure of dispersion is most appropriate.
- f. Compute measures of dispersion for a given group of data.
- g. Analyze a set of data by computing measures of central tendency and dispersion.
- h. Define the characteristics of a normal distribution.
- i. Determine 1 and 2 standard deviation intervals from a given normal distribution.
- j. Use basic statistical process control charting
- k. Analyze data to assess correlation

## **7. Analyze purchasing situations.**

### **Properties**

Domain: Cognitive

Level: Analysis

Difficulty: Medium

Importance: Important

### **Linked Core Abilities**

Solve Problems

### **Linked General Education Outcomes**

Apply mathematical concepts

Criteria - *Criteria - Performance will be satisfactory when:*

- o learner determine which product size/pricing option presents the best value.
- o learner accurately fills out a catalog order form. Correct items/quantity/prices and Grand Total.

Conditions for Assessment - *Conditions - Competence will be demonstrated:*

- o through a chapter test.

### **Learning Objectives**

- a. Determine for a given situation which product has the cheapest unit pricing.
- b. Determine the correct amount to pay for a completed invoice by interpreting the \*/10 n/30 (or similar) format.
- c. Determine the grand total for a given list of items taking in to account product discounts,

order discounts, shipping/handling charges.

d. Complete an order form by locating products to be purchased from a catalog.

## 8. Analyze saving situations.

### Properties

Domain: Cognitive

Level: Knowledge

Difficulty: Medium

Importance: Important

### Linked Core Abilities

Solve Problems

### Linked General Education Outcomes

Apply mathematical concepts

Criteria - *Criteria - Performance will be satisfactory when:*

- o learner computes interest earned in a simple interest savings scenario.
- o learner computes interest earned in a compound interest savings situation.
- o learner distinguishes differences among savings options.
- o learner computes money saved on taxes by using an IRA.

Conditions for Assessment - *Conditions - Competence will be demonstrated:*

- o through completion a chapter test.

### Learning Objectives

- a. Determine how given information about a simple interest loan scenario fits into the simple interest formula.
- b. Compute the interest earned in a simple interest situation.
- c. Define the fundamental difference between simple and compound interest accounts.
- d. Define the purpose of each variable in the compound interest formula.
- e. Compute the amount of interest earned in a given situation where compound interest is used.
- f. Compare and contrast different money saving options.

## 9. Analyze loan situations.

### Properties

Domain: Cognitive

Level: Application

Difficulty: Medium

Importance: Essential

### Linked Core Abilities

Solve Problems

### Linked General Education Outcomes

Apply mathematical concepts

Criteria - *Criteria - Performance will be satisfactory when:*

- o learner computes monthly payments for a given loan.
- o learner compares among different loan options to decide which is the more economical choice.
- o learner reads various information from a pre-made amortization schedule.
- o learner computes the initial and a few subsequent lines for an amortization schedule

- o learner uses the full extra principle payment strategy to reduce the amount of interest paid on a loan.

Conditions for Assessment - *Conditions - Competence will be demonstrated:*

- o through quiz and chapter test.

### **Learning Objectives**

- Define the elements of a basic loan.
- List strategies that help reduce the amount of money paid on loans.
- Use loan table, furnished in the text, to determine monthly payments for a loan.
- Determine the cheapest loan option by comparing total amount of interest paid for each of the given choices.
- Select specified information from a pre-made amortization schedule.
- Use I=PRT formula to generate the first several lines of an amortization schedule.
- Analyze the full extra principle payment strategy.

## **10. Find missing dimensions of right triangles**

### **Properties**

Domain: Cognitive

Level: Analysis

Difficulty: Medium

Importance: Essential

### **Linked Core Abilities**

Solve Problems

### **Linked General Education Outcomes**

Apply mathematical concepts

Criteria - *Criteria - Performance will be satisfactory when:*

- o learner defines terminology according to the text
- o calculations are accurate to desired precision
- o measures are expressed with correct units of measure
- o learner chooses correct formula or trig function where appropriate
- o learner shows work
- o learner accurately determines missing dimensions

Conditions for Assessment - *Competence will be demonstrated:*

- o using a scientific calculator
- o given machined part diagrams

### **Learning Objectives**

- Define right triangle terminology (opposite, adjacent, hypotenuse)
- Use the Pythagorean Theorem to find dimensions of right triangles
- Define trig ratios (sin, cos, tan)
- Determine the trig function of a given angle
- Determine the length of a side using trig ratios
- Determine the size of an angle using trig ratios
- Apply right triangle trig to machining problems