

# Quantitative Reasoning

## Course Outcome Summary

### Course Information

<b>Organization</b>	Madison Area Technical College
<b>Developers</b>	Wayne Sigelko, Judy Jones, Jim Moore, Laird Marshall
<b>Development Date</b>	3/2/1998
<b>Revised Date</b>	5/29/2001
<b>Course Number</b>	20-804-211
<b>Instructional Level</b>	College Parallel
<b>Potential Hours of Instruction</b>	68
<b>Total Credits</b>	3

### Description

This course is intended to develop analytic reasoning and the ability to solve quantitative problems. Topics to be covered may include: construction & interpretation of graphs; descriptive statistics; geometry & spatial visualizations; math of finance; functions and modeling; probability; and logic. Appropriate use of units and dimensions, estimates, mathematical notation, and available technology will be emphasized throughout the course.

### Target Population

College Transfer and Associate Degree (Liberal Studies) students who are not planning to take Calculus, or those who desire a broad, integrative course in mathematics.

### Types of Instruction

<b>Instruction Type</b>	<b>Contact Hours</b>	<b>Credits</b>
Classroom Presentation	68	3

### Textbooks

---. *Current Syllabus* (contact Arts and Sciences Division Office).

Johnson & Mowry. *Mathematics: A Practical Odyssey*. 2001. **Edition:** 4th. **ISBN:** 0-534-37891-9.

---. *Student Solutions Manual for Johnson and Mowry's Mathematics: A Practical Odyssey*.

### Learner Supplies

Scientific Calculator. **Manufacturer:** ---.

### Prerequisites

Intermediate Algebra (20-804-201) with a grade of 'C' or better

OR Intermediate Algebra Parts 1 (20-804-202) and 2 (20-804-203) with a grade of C or better in both parts

OR appropriate score on placement exam

## ***Exit Learning Outcomes***

### **Core Abilities**

- A. Critical thinking
- B. Mathematics

### ***Competencies***

#### **Unit 1. Logic & Problem Solving: The Structure of Mathematics**

##### **A. Analyze logical arguments**

###### **Linked Core Abilities**

Critical thinking

###### **Competence will be demonstrated:**

A.1. in the solution to a problem on a quiz, homework, project or exam

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

- A.1. you identify logical fallacies in popular arguments
- A.2. you recognize arguments as inductive or deductive
- A.3. you use appropriate symbols in construction and evaluating syllogisms
- A.4. you develop truth tables to aid in analysis

##### **B. Employ valid arguments in constructing proofs**

###### **Linked Core Abilities**

Critical thinking

Mathematics

###### **Competence will be demonstrated:**

B.1. in the solution on a quiz, homework, project or exam

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

- B.1. you construct a short deductive proof
- B.2. you develop a short inductive proof

#### **Unit 2. Sets, Counting & Number Theory**

##### **A. Employ appropriate set theory and notation**

###### **Linked Core Abilities**

Mathematics

###### **Competence will be demonstrated:**

A.1. in the solution to a problem on a quiz, homework, project or exam

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

- A.1. you identify complete and incomplete set definitions
- A.2. you use roster notation to completely define a set
- A.3. you find the intersection of sets
- A.4. you find the complement of a set
- A.5. you find the union of sets
- A.6. you use appropriate set notation

##### **B. Investigate infinite sets**

###### **Linked Core Abilities**

Mathematics

###### **Competence will be demonstrated:**

B.1. in the solution to a problem on a quiz, homework, project or exam

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

B.1. you identify equivalent versus equal sets

B.2. you establish on-to-one correspondence between equivalent sets

B.3. you distinguish between countable and uncountable infinite sets

**C. Analyze data using set theory**

**Linked Core Abilities**

Mathematics

**Competence will be demonstrated:**

C.1. in the solution to a problem on a quiz, homework, project or exam

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

C.1. you use mathematics effectively

C.2. you employ permutations in determining the number of ordered subsets for a given set

C.3. you employ combinations in determining the number of unordered subsets for a given set

C.4. you make use of Venn diagrams to identify elements that are in the intersection, union or complement of conjoint or disjoint sets

C.5. you apply DeMorgan's Laws to find the complement of conjoint or disjoint sets

**Unit 3. Mathematical Modeling**

**A. Employ linear, polynomial, logarithmic and exponential models in solving application problems**

**Linked Core Abilities**

Mathematics

**Competence will be demonstrated:**

A.1. in the solution to a problem on a quiz, homework, project or exam

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

A.1. you identify appropriate model for the application given

A.2. you identify which data is relevant and which is not

A.3. you assign variable(s) as needed

A.4. you develop equations which express relationships inherent in the application

A.5. you employ solution techniques appropriate to the equations

A.6. you utilize solutions to answer the original question

**B. Develop graphs to depict the model**

**Linked Core Abilities**

Mathematics

**Competence will be demonstrated:**

B.1. in the solution to a problem on a quiz, homework, project or exam

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

B.1. you plot points to construct the graph of a given equation

B.2. you evaluate graph to solve application problems

**Unit 4. Geometry**

**A. Apply principles of geometry**

**Linked Core Abilities**

Mathematics

**Competence will be demonstrated:**

A.1. in the solution to a problem on a quiz, homework, project or exam

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

A.1. you use appropriate units

A.2. you convert units as needed

A.3. you use precision and accuracy to round values appropriately

A.4. you calculate circumference, perimeter and area of plane figures

A.5. you calculate volumes of three dimensional figures

**B. Construct geometric proofs**

**Linked Core Abilities**

Mathematics

**Competence will be demonstrated:**

B.1. in the solution to a problem on a quiz, homework, project or exam

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

B.1. you identify similar polygons

B.2. you identify congruent sides for similar polygons

B.3. you apply Euclid's postulates and given theorems to prove geometric theorems

**C. Solve right triangles**

**Linked Core Abilities**

Mathematics

**Competence will be demonstrated:**

C.1. in the solution to a problem on a quiz, homework, project or exam

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

C.1. you use the angle-sum principle to compute the third angle of a triangle

C.2. you use the Pythagorean Theorem to compute the length of a side of a right triangle given the measure of the other two sides

C.3. you use sine, cosine and tangent ratios to compute sides and/or angles of right triangles

C.4. you apply solution skills in solving application problems

**Unit 5. Probability and Statistics**

**A. Evaluate statistical arguments**

**Linked Core Abilities**

Critical thinking

**Competence will be demonstrated:**

A.1. in the solution to a problem on a quiz, homework, project or exam

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

A.1. you identify inconsistencies in statistical arguments

A.2. you identify necessary assumptions and/or conditions for statistical techniques employed

A.3. you test conditions and/or assesses the reasonableness of assumptions

**B. Assess probabilities of individual and joint probability experiments using the rules for probability**

**Linked Core Abilities**

Critical thinking

Mathematics

**Competence will be demonstrated:**

B.1. in the solution to a problem on a quiz, homework, project or exam

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

- B.1. you distinguish theoretical and empirical probability
- B.2. you compute the probability using the basic definition
- B.3. you compute the probability of joint and disjoint events
- B.4. you compute probability of one event conditioned on another
- B.5. you determine if two events are independent
- B.6. you distinguish between discrete and continuous probability distributions
- B.7. you interpret probability as an area given by either the probability mass function (discrete) or the probability density function (continuous)
- B.8. you compute probability of events for random variables with a discrete distribution
- B.9. you compute probability of events for normally distributed variables
- B.10. you apply rules of probability in solving application problems

**C. Employ appropriate descriptive methods to summarize data**

**Linked Core Abilities**

Mathematics

**Competence will be demonstrated:**

C.1. in the solution to a problem on a quiz, homework, project or exam

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

- C.1. you generate frequency distributions from a given data set
- C.2. you calculate the mean, median and mode of a distribution
- C.3. you interpret the mean, median and mode of a distribution as measures of central tendency
- C.4. you calculate quartile and percentile ranks
- C.5. you calculate quartile and percentile ranks as measures of position
- C.6. you calculate the range, standard deviation and interquartile range
- C.7. you calculate the range, standard deviation and interquartile range as measures of spread for a distribution
- C.8. you identify and interpret outliers
- C.9. you use measures of central tendency and spread to compare and contrast two distributions
- C.10. you construct a modified box-and-whisker plot to summarize comparisons
- C.11. you construct scatter plots of bivariate data
- C.12. you compute the correlation coefficient for bivariate data
- C.13. you compute the constant and slope coefficient for an OLS regression
- C.14. you graph the OLS regression line
- C.15. you interpret the constant and slope coefficient for regression equation in order to provide answers to research questions
- C.16. you construct appropriate charts or graphs to depict distributions

**D. Apply inferential methods to answer questions about population parameters**

**Linked Core Abilities**

Mathematics

**Competence will be demonstrated:**

D.1. in the solution to a problem on a quiz, homework, project or exam

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

D.1. you employ the Central Limit Theorem to construct a distribution for sample statistics

D.2. you construct a confidence interval to estimate a population parameter and interpret the error term