Washtenaw Community College Comprehensive Report

MTH 170 Math for Beginning Programmers
Effective Term: Winter 2014

Course Cover

Division: Math, Science and Health
Department: Mathematics
Discipline: Mathematics
Course Number: 170
Org Number: 12200
Full Course Title: Math for Beginning Programmers
Transcript Title: Math for Beginning Programmers
Is Consultation with other department(s) required: Yes
Please Explain:
This is a service course for CIS.
Publish in the Following:
Reason for Submission: New Course
Change Information:
Consultation with all departments affected by this course is required.
Rationale: Course conditionally approved, seeking full approval.
Proposed Start Semester: Fall 2013
Course Description: In this course, students will learn the basic mathematical materials expected of a beginning programmer. Topics such as basic properties of mathematical operations, number representations, integer specialties, number bases, Boolean logic, subscripts, functions, set theory, descriptive statistics (mean, median, mode, quartiles, percentiles, range, variance, standard deviation, linear regression) and trig and log functions will be covered.

Course Credit Hours

Variable hours: No
Credits: 3
Lecture Hours: Instructor: 45 **Student:** 45
Lab: Instructor: 0 **Student:** 0
Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 45 **Student:** 45
Repeatable for Credit: NO
Grading Methods: Letter Grades
Audit
Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Level 2

Requisites

General Education

MACRAO
MACRAO Science & Math

General Education Area 3 - Mathematics
Assoc in Applied Sci - Area 3
Assoc in Science - Area 3
Assoc in Arts - Area 3

Request Course Transfer

Proposed For:

Student Learning Outcomes

1. Recognize and apply basic properties of the order of operations and the use of parentheses.
   Assessment 1
   Assessment Tool: Departmental exam
   Assessment Date: Fall 2013
   Assessment Cycle: Annually
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: Each outcome will be considered satisfied if the pass-rate for the question is 75% or higher.
   Who will score and analyze the data: The final will be graded by the instructor, but a random sample of 20% of the tests will be blind-scored by another member or members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

2. Use various numeric representations and recognize their limitations.
   Assessment 1
   Assessment Tool: Departmental exam
   Assessment Date: Fall 2013
   Assessment Cycle: Annually
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: Each outcome will be considered satisfied if the pass-rate for the question is 75% or higher.
   Who will score and analyze the data: The final will be graded by the instructor but a random sample of 20% of the tests will be blind-scored by another member or members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

3. Recognize and apply the integer topics of modular division, factoring, greatest common factors, least common multiples, factorials, and Fibonacci sequencing.
   Assessment 1
   Assessment Tool: Departmental exam
   Assessment Date: Fall 2013
   Assessment Cycle: Annually
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Departmentally-developed rubric

Standard of success to be used for this assessment: Each outcome will be considered satisfied if the pass-rate for the question is 75% or higher.
Who will score and analyze the data: The final will be graded by the instructor but a random sample of 20% of the tests will be blind-scored by another member or members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

4. Represent values in different number bases and correctly convert from one number base to another.
   Assessment 1
   Assessment Tool: Departmental exam
   Assessment Date: Fall 2013
   Assessment Cycle: Annually
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: Each outcome will be considered satisfied if the pass-rate for the question is 75% or higher.
   Who will score and analyze the data: The final will be graded by the instructor but a random sample of 20% of the tests will be blind-scored by another member or members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

5. Recognize and apply Boolean logic along with the construction and use of Truth Tables.
   Assessment 1
   Assessment Tool: Departmental exam
   Assessment Date: Fall 2013
   Assessment Cycle: Annually
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: Each outcome will be considered satisfied if the pass-rate for the question is 75% or higher.
   Who will score and analyze the data: The final will be graded by the instructor but a random sample of 20% of the tests will be blind-scored by another member or members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

6. Recognize and apply subscripts in 1, 2, and 3 dimensions.
   Assessment 1
   Assessment Tool: Departmental exam
   Assessment Date: Fall 2013
   Assessment Cycle: Annually
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: Each outcome will be considered satisfied if the pass-rate for the question is 75% or higher.

Who will score and analyze the data: The final will be graded by the instructor but a random sample of 20% of the tests will be blind-scored by another member or members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

7. Recognize and apply the terminology and use of functions, both as one variable functions and as multi-variable functions.
   Assessment 1
   Assessment Tool: Departmental exam
   Assessment Date: Fall 2013
   Assessment Cycle: Annually
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: Each objective will be considered satisfied if the pass-rate for the question is 75% or higher.
   Who will score and analyze the data: The final will be graded by the instructor but a random sample of 20% of the tests will be blind-scored by another member or members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

8. Recognize and apply basic set theory including Venn diagrams.
   Assessment 1
   Assessment Tool: Departmental exam
   Assessment Date: Fall 2013
   Assessment Cycle: Annually
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: Each outcome will be considered satisfied if the pass-rate for the question is 75% or higher.
   Who will score and analyze the data: The final will be graded by the instructor but a random sample of 20% of the tests will be blind-scored by another member or members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

9. Recognize and apply basic descriptive statistics.
   Assessment 1
   Assessment Tool: Departmental exam
   Assessment Date: Fall 2013
   Assessment Cycle: Annually
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: Each outcome will be considered satisfied if the pass-rate for the question is 75% or higher.
   Who will score and analyze the data: The final will be graded by the instructor but a random sample of 20% of the tests will be blind-scored by another member or

members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

10. Recognize and apply trig and log functions.
    Assessment 1
    Assessment Tool: Departmental exam
    Assessment Date: Fall 2013
    Assessment Cycle: Annually
    Course section(s)/other population: All sections
    Number students to be assessed: All students
    How the assessment will be scored: Departmentally-developed rubric
    Standard of success to be used for this assessment: Each outcome will be considered satisfied if the pass-rate for the question is 75% or higher.
    Who will score and analyze the data: The final will be graded by the instructor but a random sample of 20% of the tests will be blind-scored by another member or members of the department. If the blind-scoring confirms the instructor's grading to the 90% level, then the instructor's grading will be used for assessment. If there is a discrepancy between the two gradings then all of the non-sampled finals will be blind-scored as above and those grades will be used for assessment. Departmental faculty will analyze the data.

Course Objectives

1. Evaluate numeric expressions that use the addition, subtraction, multiplication, and/or division, in various orders, applying the "My Dear Aunt Sally" rules [and the "Dear Me, Such Anger" equivalent rule]. For example, evaluate 3+5*2-7.
   Matched Outcomes
2. Evaluate numeric expressions involving addition, subtraction, multiplication, and/or division, along with parentheses to alter the order of operations. For example, evaluate (7+4*3)+(63-7*8).
   Matched Outcomes
3. Evaluate numeric expressions involving the 4 basic operations along with exponentiation, with and without parentheses. For example, evaluate 7+3^2*2-8, or (635-4^(8-2*3)^(5-24/3))*4-11^2.
   Matched Outcomes
4. Associate integer values with nominal and ordinal data. For example, use numeric values to represent the scale of responses to an opinion questionnaire.
   Matched Outcomes
5. Differentiate between the infinite precision of actual integer values and the limits of machine representations of integer values.
   Matched Outcomes
6. Explain the degree of inability of the TI-84 to correctly express the product of 345,231,734 and 942,208,123.
   Matched Outcomes
7. Demonstrate that integers are "closed" under the operations of addition, subtraction, multiplication, and counting number exponentiation, but not under division and negative integer exponentiation. For example, create an expression with at least 3 distinct integer values using at least two of the basic operations of addition, subtraction, multiplication, division, and integer exponentiation to produce a result that is not an integer.
   Matched Outcomes
8. Convert rational values between fractional form and decimal form. For example, convert 0.368136813681... to the fractional form of p/q where both p and q are integers.
   Matched Outcomes
9. Distinguish between truncated and repeating representations of rational numbers. For example, why is 1/7 not equal to 0.14285714257142857?
   Matched Outcomes

10. Round rational values to a given number of decimal places. For example, round 34.283453 to 4 decimal places.
    Matched Outcomes
11. Distinguish between computed values for irrational numbers and the true value of such numbers. For example, the TI-84 calculator gives the square root of ten as 3.16227766. Is this correct? If so, show that it is correct, and if not, explain why it is not correct.
    Matched Outcomes
12. Convert between decimal representations of values and scientific representations of those values. For example, convert 0.0003428 to scientific notation, or convert 5.8734x10–4 to standard decimal representation.
    Matched Outcomes
13. Recognize and compute with the modular division operator %. For example, give the result of 4524 % 17.
    Matched Outcomes
14. Factor a positive integer into its prime factors. For example, factor 4275 into its prime factors.
    Matched Outcomes
15. Compute the greatest common factor (GCF) of two positive integers. For example, compute the GCF of 324 and 784.
    Matched Outcomes
16. Correctly compute the least common multiple (LCM) of two positive integers. For example, compute the LCM of 162 and 324.
    Matched Outcomes
17. Recognize and compute with the factorial operator !. For example, compute 6!.
    Matched Outcomes
18. Continue a given Fibonacci-like sequence for at least three more values. For example, given the sequence 3, 4, 7, 11, 18, 29, ..., produce the next three values in the sequence.
    Matched Outcomes
19. Express base ten integer values in other number bases. For example, express the value 734 in base 7.
    Matched Outcomes
20. Express non-base ten values in base ten. For example, convert the base twelve value 7E2T (where the digits of base twelve are 0123456789TE) to base ten.
    Matched Outcomes
21. Express dot notation values into hexadecimal numbers. For example convert 172.22.12.208 to a hexadecimal number.
    Matched Outcomes
22. Convert an integer value from base 16 to base 2. For example, convert 7E2A to base 2.
    Matched Outcomes
23. Convert an integer value from base 2 to base 16. For example, convert 110001011100011 to base 16.
    Matched Outcomes
24. Convert to and from BCD
    Matched Outcomes
25. Give the Truth Tables for the basic operations of "and" (symbol ?), "or" (symbol ?), and "not" (symbol ¬). For example, construct the truth table for a?b.
    Matched Outcomes
26. Construct the truth tables for complex Boolean expressions of up to 4 terms possibly using parentheses. For example, construct the truth table for ¬(a?b)?(¬a)
    Matched Outcomes
27. Use truth tables to demonstrate de Morgan's Laws. For example, use truth tables to show that ¬(a?b) is equivalent to (¬a)?(¬b).
    Matched Outcomes
28. Convert from variables to subscripted variables. For example, rewrite the expression $3x-(4y+7xz)/(2y-3x^2)$ using subscripted variables in x.
    Matched Outcomes
29. Expand a given term of a sequence described using a formula involving subscripted

variables. For example, given the sequence x(i)=3(i)+5 find the 7th term of the sequence.
Matched Outcomes

30. Given the formula for a row of Pascal's triangle, correctly produce a specified row of the triangle. For example, produce the eighth row (it starts with 1 7) of Pascal's Triangle.
Matched Outcomes
31. Identify 2-dimensional matrix elements specified by subscript. For example, in a given matrix (say it is 5x5) what is the value of the element (2,3)?
Matched Outcomes
32. Fill a nxm matrix given a rule for matrix elements that determines their value from their subscripts. For example, write out a 3x4 matrix where the (i,j) element of the matrix is given by 2i-3j.
Matched Outcomes
33. Convert a given mxn matrix, held in column major order, to a list of values. For example, convert the following column-major ordered matrix to an ordered list.
Matched Outcomes
34. Identify 3-dimensional matrix elements specified by subscript. For example, in a given matrix (say it is 5x5x5) what is the value of the element (2,4,3)?
Matched Outcomes
35. Given a 3-dimensional matrix of values, correctly create a 2-dimensional sub-matrix by taking a specified slice of the matrix. For example, given the following 4x5x3 matrix, form a 2-dimensional matrix representing the slice created by holding the second dimension constant at 3.
Matched Outcomes
36. Convert between the various forms of describing and/or specifying mathematical functions of one variable. For example, convert f(x)=3x+7 to set-builder notation for points (x,y).
Matched Outcomes
37. Correctly identify and enumerate the domain and range of a given function of one variable. For example, given x?{3,5,9,11,23}, give the Domain and Range of the function f(x)=(x+7)/2.
Matched Outcomes
38. Identify the domain and range of the basic trig functions, the log and ln functions, the sqrt function, and functions such as abs, ceil, and floor. For example, give the domain and range of the function log(x).
Matched Outcomes
39. Convert trig relations to functions by restricting their domain. For example, explain why sin(13pi/6)=0.5 but arcsin(0.5) is not 13pi/6?
Matched Outcomes
40. Evaluate multi-variable functions. For example, compute the value of round (3.24156,3).
Matched Outcomes
41. Assess set membership. For example, given two set descriptions identify if a number is a member of one, the other, both, or neither.
Matched Outcomes
42. Identify the relationship between two given sets, including subset, proper subset, equality, inequality, and disjoint. For example, given two sets choose the strongest correct relation between the two.
Matched Outcomes
43. Identify the expressions {}, ?, {?}, {?,{?}}, and {?,{?},{?,{?}}. For example, which of the following is (are) correct representations of the empty or null set? A:{}, B:?, C:{?}, D:{?,{?}}, and E:{?,{?},{?,{?}}
Matched Outcomes
44. Identify set union and intersection. For example, given five sets identify if a sixth set is the intersection, or union, of various pairs of those sets.
Matched Outcomes
45. Construct the intersection and/or union of given sets. For example, given two sets A and B find A?B.
Matched Outcomes
46. Construct a set complement. For example, given a universal set and a particular set A, find

the complement of A.

Matched Outcomes

47. Determine the cardinality of a set. For example, given A=the set of multiples of 3 between 5 and 35, find n(A).

    Matched Outcomes

48. Construct the Cartesian Product of two given sets. For example, if A={1,3,5,7, 9} and B={4,5,6} find B×A?

    Matched Outcomes

49. Determine the cardinality of a union of two sets given the cardinality of each set and the cardinality of the intersection of the two sets. For example given n(A)=21, n(B)=17, and n(A?B)=5, find n(A?B)?

    Matched Outcomes

50. Illustrate the relationship between three sets and their Venn Diagrams, For example, create a Venn Diagram for the sets A={1,2,3,4,5}, B={2,4,6,8,10,12}, and C={3,6,9,12,15,18,21}.

    Matched Outcomes

51. Distinguish between a formal set and a list (a list can have duplicate members whereas a set cannot}. For example, which of the following would qualify as a list, but not as a formal set?

    Matched Outcomes

52. Compute and/or identify the mean, median, and mode of a set of data. For example, given the data {3,4,4,3,2,5,2,3,5,6,3,6,8,3,2,2,3} find the mean, median, and mode.

    Matched Outcomes

53. Compute the quartile points, Q0, Q1, Q2, Q3, and Q4, for the data {3,4,4,3,2,5,2,3,5,6,3,6,8,3,2,2,3}.

    Matched Outcomes

54. Compute the percentile point of a given value given within a data set. For example, what is the percentile point associated with 5 in the data {3,4,4,3,7,5,9,3,5,6,3,6,8,3,2,9,3}?

    Matched Outcomes

55. Identify from a list of five possibilities the only reasonable value for the standard deviation for a given population. For example, given the data {3,4,6,8,2,1,4,6,3} which of the following is the most reasonable value for the standard deviation of that population: A)4.231 B) 7.000 C) 0.234 D) 2.078 E)5.324.

    Matched Outcomes

56. Apply a linear regression equation to produce a set of expected values. For example, if a given set of data yields the regression equation y = 1.94x + 13.45 what is the expected value for independent variable values 40, 50, and 60?

    Matched Outcomes

57. Evaluate trig functions (sin, cos, and tan) for an angle given in either degrees or radians. For example, if x=1.5pi radians find sin(x).

    Matched Outcomes

58. Estimate both fractional powers of 10 and e.

    Matched Outcomes

59. Estimate both log(x) and ln(x) for a given value of x.

    Matched Outcomes

New Resources for Course

Course Textbooks/Resources

Textbooks
Manuals
Periodicals
Software

Equipment/Facilities

Reviewer	Action	Date
Faculty Preparer:		

Roger Palay	*Faculty Preparer*	*Aug 07, 2013*
Department Chair/Area Director:		
Michael King	*Recommend Approval*	*Aug 07, 2013*
Dean:		
Martha Showalter	*Recommend Approval*	*Sep 12, 2013*
Vice President for Instruction:		
Bill Abernethy	*Approve*	*Oct 01, 2013*