SEMESTER PLANS FOR MATH COURSES, FOR MAJORS OUTSIDE MATH.

CONTENTS:
- AP calculus credit and Math Placement levels.
- List of semester math courses.
- Student pathways through the semester math courses
- Transition plans for math courses: Spring 2012 - Autumn 2012
- List of the transition courses, and short descriptions.
- Chart of transition pathways (quarters to semesters).

AP-Calculus credit:

Students who took AP-calculus exams in high school will get credit for certain OSU calculus courses.

Score	Credit for:	Recommended Courses
AB-1, AB-2, BC-1, BC-2	no credit	Use OSU Math Placement Exam
AB-3	1151	1151 (allowed into 1152, but that is not recommended)
AB-4	1151	1152 or 1172
AB-5	1151	1161.xx, 1152, 1172; or 1181H or 4181H with adviser approval
BC-3	1151	1161.xx, 1152, 1172; or 1181H or 4181H with adviser approval
BC-4, 5	1151, 1152	2153; or 1181H, or 4181H with adviser approval, or: 1162.02 or 2162.02: with FEH-adviser approval

OSU Math Placement levels:

Entering freshmen who do not have AP-credit or college credit for math, take the on-line Math Placement Exam. Based on that score, and high school records, the student is assigned a placement level. The quarter system levels are L, M, N, R, S, T. The semester system levels will keep the same names, even though there will be some differences in definitions and in course prerequisites.

L : enter Calculus: 1131, 1151, 1156, 1165[b]; or 1116, or 1125[a].
M : enter Precalculus: 1150; or 1116, or 1125[a]. Or 1131[c], 1151[c].
N : enter College Alg: 1148, 1130; or 1116, or 1125[a].
R : enter Excursions in Math, or Elementary Ed Math: 1116, 1125[a]; or 1075 [if they need 1130 or 1148]
S : enter Precollege Math II: 1075.
T : enter Precollege Math I: 1050.
U : not enough information available to determine level: retake Placement Exam.

Placement level L, M, N, or R fulfills the *Basic Computational Skills* GE requirement.
(A passing grade in Math 1075 also fulfills that GE requirement.)

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[a] Restricted to students intending to major in Early Childhood Education, Special Education, or Middle Childhood Education (if on Columbus campus, not in math concentration).

[b] Restricted to students intending to major in Middle Childhood Education, math concentration.

[c] For Level M: Calculus options allowed by permission only in Autumn Semester. Students with such permission who earn D+ or lower in calculus in Autumn, must revert back to 1150 the next time they take math.

Semester math classes taken by freshmen and sophomores.

Credit hours in parentheses. Most honors math courses are not listed here. [Details might change.]
Special one-time transition courses are presented later, in a separate list.

Throughout this document we omit decimals from all the quarter-system course numbers.
    Then 151.xx is written as 151, etc.

1050 Precollege Math I (5)
    Prereq: Placement S or T, or Math 50.
    Exclusions: Not open to students with credit for any higher numbered math class, or for any quarter math class
        numbered higher than 50.
Number line, scientific notation, order of operations, linear equations in one variable, graphing and equations of
lines, systems of two linear equations, factoring polynomials, solving quadratics by factoring, applications.

1075 Precollege Math II (5)
    Prereq: Placement R; C- or better in 1050; or credit for 75 or 1074.
    Exclusions: Not open to students with credit for any higher numbered math class, or for any quarter math class
        numbered higher than 75.
Review of polynomials, factoring, linear inequalities, concept of a function, graphs of quadratics, quadratic
formula, complex numbers, rational expressions, variation, equations with radicals, applications.

1116 Excursions in Mathematics (3)
    Prereq: Placement R, or higher; or credit for 1075, 75, 104, or 1074.
    Exclusions: Not open to students with credit for Math 1152 or higher, or for quarter math class numbered 153
        or higher.
Math for non-scientists: topics, each lasting one or two weeks.

1125[a] Mathematics for Elementary Teachers I (5)
    Prereq: Placement R, or higher; C- or better in 1075; or credit for 75, or 104, or 1074.
    Exclusions: Open only to students intending to major in early childhood, middle childhood, or special
        education.
Number systems, geometry of rigid motions, measurement and units, problem solving.

1126[a] Mathematics for Elementary Teachers II (5)   • Not offered in Au12.
    Prereq: C- or better in Math 1125.
Geometry: constructions, proofs, coordinates; Number theory: factors and primes; Counting: inclusion/exclusion,
permutations and combinations; Probability: law of large numbers, independent events, conditional probability.

1130 College Algebra for Business (4)
    Prereq: Placement N; C- or better in 1075; or credit for 104.
    Exclusions: Not open to students with credit for any higher numbered math class.
Review of algebra, exponential and logarithmic functions and equations, exponential models, compound interest,
present value, annuities, systems of equations, matrices, applications.

1131 Calculus for Business (5)
    Prereq: Placement L; C- or better in: 1130 or 1148; or credit for 130 or 148.
    Exclusions: Not open to students with credit for any math class numbered 1151 or higher.
Derivatives of algebraic, exponential, and logarithmic functions, optimization, anti-derivatives, first-order ODEs,
integrals, Fundamental Theorem, partial derivatives, extrema, applications to business.

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[a] Restricted to students intending to major in Early Childhood Education, Special Education, or
  Middle Childhood Education (if on Columbus campus, not in math concentration).

1148 College Algebra (4)
    Prereq: Placement N, or C- or better in: 1075, 104, or 148.
    Exclusions: Not open to students with credit for any higher numbered math class.
Functions and graphs, inverse functions, exponential and logarithmic equations, exponential models, applications, inequalities, systems of equations, right angle trigonometry.

1149 Trigonometry (3)   • Not offered in Au12.
    Prereq: C- or better in 1148.
    Exclusions: May not enter 1149 without 1148 credit. Not open to students with credit for any higher
        numbered math class.
Angles, radians, trigonometric functions, angle addition formulas, inverse trig functions, trigonometric equations, polar coordinates, vectors, complex numbers, conics.

1150 Precalculus (5)   • Possibly offered only in Autumn Semesters.
    Prereq: Placement M, or B or better in 148.
    Exclusions: Not open to students with credit for any higher numbered math class.
Fast-paced course covering topics in both 1148 and 1149.
Advising note: With D+ or lower in 1150, student could retake 1150, or take 1148-1149. (Expect 1148-1149 to provide Freshman Forgiveness for 1150, after petition.)

1151 Calculus I (5)
    Prereq: Placement L, or C- or better in: 1150, {1148 & 1149}, or 150.
    Exclusions: Not open to students with credit for any higher numbered math class.
Limits, derivatives, max-min, definite integrals, Fundamental Theorem, substitution in integrals, applications.

1152 Calculus II (5)
    Prereq: C- or better in 1151, 1156, 152, or 161, or in 114 or 1114.
    Exclusions: Not open to students with credit for any higher numbered math class.
Integration techniques, sequences and series, convergence tests, Taylor series,
parametric and polar curves, {optional: vectors}.

1156 Calculus for the Biological Sciences (5)
    Prereq: Placement L; C- or better in: 1150 or {1148 & 1149}; or credit for 150.
    Exclusions: Not open to students with credit for 1151, or with credit for any higher numbered math class.
Discrete models, limits and continuity, derivatives and applications, antiderivatives, integrals, Fundamental Theorem, team modeling projects.

1157 Mathematical Modeling for the Biological Sciences (5)
    Prereq: C- or better in: Math 1156, 1151; or credit for 152.
    Exclusions: Not open to students with credit for 1152 or with credit for any higher numbered math class.
Integration, topics in linear algebra, dynamical systems, vector fields, gradients, team modeling projects.

1161.01 Accelerated Calculus I (5)
    Prereq: Placement L and previous calculus experience.
    Exclusions: Intended for students having prior experience with calculus.
Limits, derivatives, max-min, integrals, Fundamental Theorem, techniques of integration, sequences & series, Taylor series, applications.

1161.02 Accelerated Calculus II (5)
    Prereq: Placement L and previous calculus experience.
    Exclusions: Open only to students in Freshman Engineering Honors.
Limits, derivatives, max-min, integrals, Fundamental Theorem, techniques of integration, sequences & series, Taylor series, applications.

1165[b] Mathematics for Middle School Teachers I (5)
    Prereq: Placement L; C- or better in Math 1150 or {1148 & 1149}; or credit for 150.
    Exclusions: Limited to students intending to major in middle childhood education with math concentration.
Number systems, Euclidean algorithm, Diophantine equations, polynomials, quadratic equations and complex numbers, mathematical induction, modeling.

1166[b] Mathematics for Middle School Teachers II (5)   • Not offered in Au12.
    Prereq: C- or better in Math 1165.
    Exclusions: Limited to students intending to major in middle childhood education with math concentration.
Visual reasoning, geometric constructions, congruence, similarity, coordinates, non-Euclidean geometries, transformations, complex numbers, modeling.

1172 Engineering Math A (5)
    Prereq: C- or better in 1151, 152, or 161, or in 114 or 1114.
    Exclusions: Not open to students in math, pre-actuarial science, or actuarial science. Not open to students
        with credit for any higher numbered math class, or for 1152.
Integration techniques, sequences & series, Taylor series, vectors and parametric curves, several variables, partial derivatives, chain rule, max-min.

1181H Honors Calculus I (5)
    Prereq: Permission of department.
Differential calculus of one variable, integral calculus, convergence of sequences and series, Taylor series with remainder estimates, vectors, derivatives of vector functions. Emphasis on abstract proofs.

2153 Calculus III (4)
    Prereq: C- or better in 1152 or 1172; or credit for 153, or 162, or 1534.
    Exclusions: Not open to students with credit for any higher numbered math class.
Vectors, several variables, partial derivatives, chain rule, gradient, max-min, multiple integrals, line integrals and vector fields, divergence, curl, integration theorems.

2162.01 Accelerated Calculus II (5)
    Prereq: C- or better 1161.xx.
    Exclusions: Not open to students with credit for any higher numbered math class.
Vectors, parametric curves, partial derivatives, optimization, multiple integrals, line integrals, divergence, curl, integration theorems.

2162.02 Accelerated Calculus II (5)
    Prereq: C- or better 1161.xx.
    Exclusions: Open only to students in Freshman Engineering Honors.
Vectors, parametric curves, partial derivatives, optimization, multiple integrals, line integrals, divergence, curl, integration theorems.

2167 Calculus for Middle School Teachers (3)
    Prereq: C- or better in 1166; or credit for 110, or 1164.
    Exclusions: Limited to students intending to major in middle childhood education with math concentration.

2168 History of Mathematics for Middle School Teachers (3)
    Prereq: C- or better in 2167; or credit for 111.
    Exclusions: Limited to students intending to major in middle childhood education with math concentration.

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[b] Restricted to students intending to major in Middle Childhood Education, math concentration.

2173 Engineering Math B (3)
    Prereq: C- or better in 1172; or credit for 1544 or 154.
    Exclusions: Not open to students with credit for any higher numbered math class, or for 1152 or 2153.
Multiple integrals, line integrals, vector fields, second order constant coefficient ODEs.

2174 Linear Algebra and Differential Equations (3)
    Prereq: C- or better in 2173 or 2153.
Vectors, matrices, diagonalization, systems of Ordinary Diff Eqs (ODEs), Fourier series, Partial Diff Eqs (PDEs).

2177 Mathematical Topics for Engineers (4)
    Prereq: C- or better 1172 or 2153; or credit for 1544 or 154.
Multiple integrals, line integrals, matrices and linear systems, constant coefficient ODEs, Fourier series, PDEs.

2255 Ordinary Differential Equations (3)
    Prereq: C- or better in 2153, 2162.xx, or 2173; or credit for 254, 263, 263H, or 264H.
    Exclusions: Not open to students with credit for Math 2415, 5520H, 255, 415, or 521H.
First order methods, existence and uniqueness, second order linear equations, Wronskian, undetermined coefficients, variation of parameter, series solutions, Laplace transform.

2415 Ordinary and Partial Differential Equations (3)
    Prereq: C- or better in 2153, 2162.xx, 2173, or {1172 and 2568}; or credit for 254, 263, 263H, or 264H.
    Exclusions: Not open to students with credit for Math 2255, 5520H, 2174, 255, 415, or 521H.
First and second order ODEs, Fourier series, constant coefficient PDEs, boundary and initial value problems, systems of ODEs.

2568 Linear Algebra (3)
    Prereq: C- or better in 1172, 2153, 2162.xx, 1181H, or 4182H; or credit for 254, 263, 263.01H, or 264H.
Systems of equations, matrices, vector spaces, dimension, linear transformations, determinants, eigenvalues, diagonalization, orthogonality.

4551 Vector Analysis (3)
    Prereq: C- or better in 2153, 2162.xx, 2173, or 2182H; or credit for 254.xx, 263.xx, 263.01H, or 264H.
Vector operations; Jacobian and change of variables; div, grad and curl; Green's Stokes', and divergence theorems; applications.

Typical Paths through Calculus

| Course sequences starting with calculus		majors that use them
• Standard Calculus:	1151 – 1152 – 2153 – 2568 – 2255	math, act sci, some sciences
• Eng-Calculus:	1151 – 1172 – 2173 – 2174	AE, ISE, ME, Eng Phys
• Eng-Calculus / Topics:	1151 – 1172 – 2177	BME, CEEGS, FABE, MSE, CBE, WE
• Calc - LinAlg - DiffEq:	1151 – 1172 – 2568 – 2415	ECE
• Eng-Calculus + Discrete:	1151 – 1172 – CSE2321 – 2566 – 2568	CSE
• Calculus + Discrete:	1151 – 1152 – CSE2321 (+ 2566 if BS)	CIS (BA and BS)
• Accelerated Calculus:	1161.02 – 2162.02 (+ 2568 + 2415)	FEH
• Honors Calculus:	1181H – 2182H	honors math
• Honors Analysis:	4181H – 4182H	honors math

Note: 1151, 1152, 2153, 2568, and 2255 satisfy the *Transfer Assurance Guides* provided by Ohio's Board of Regents.

Possible student paths among freshman math courses.

Arrows indicate ways students may move among these courses:
Dotted arrow: allowed but not recommended (e.g. because of overlapping material).
No arrow from X to Y: students with credit for Course X may not enroll in Course Y.

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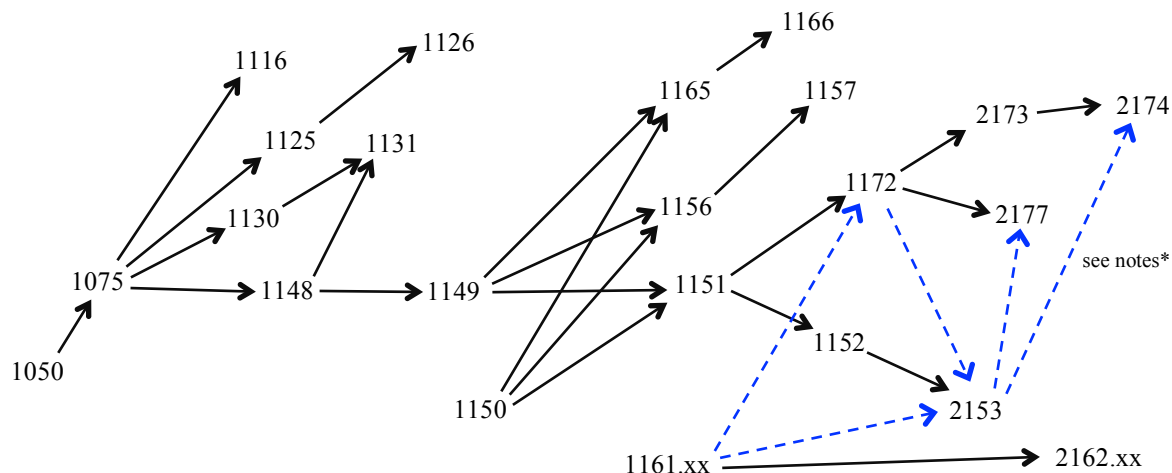
* NOTES:
Dotted arrows indicate moves that are allowed but not recommended.
For instance, a move from 1172 to 2153 is allowed even though it involves repetition of several weeks work on multivariable calculus.

Students moving from 2153 to 2174 are advised to read independently (in the Calculus textbook) about second order constant coefficient differential equations.

Math and Act Sci majors with credit for Math 2174 must also take 2255 and 2568, even though that involves overlaps in content with 2174.

TRANSITION PLANS for Math Courses.

Here is a list of one-time *Transition Courses* at the calculus level. Transition courses in Autumn Semester are expected to run for the full 14 weeks (except possibly for the 2-credit class, Math 1114).

Further details appear on subsequent pages.

    1074 [3] Math 75 presented in a semester.

    1124 [3] Math 107 presented in a semester.

    1134 [3] Math 132 presented in a semester.

    1164 [3] Math 110 presented in a semester.

    114 [3] Added to 151 yields 1151, in Sp12.   [on-line lectures,]

    1114 [2] Added to 151 yields 1151, in Su12 and Au12.   [on-line lectures]

    1534 [3] Math 153 presented in a semester.

(E) **154** [5] Parallel to 153, completes 1172. Offered only in Spring 2012.

(E) **1544** [3] Math 154 presented in a semester.

Notes: Math transition course numbers end in the digit 4.   [But Math 104, 254, and 2174 don't follow that pattern.]

        (E) marks options designed for Engineering students.

BRIEF DESCRIPTIONS OF TRANSITION COURSES (non-Engineers)

Throughout this document we omit decimals from all the quarter-system course numbers.
   Then 151.xx is written as 151, etc.

Math 1074, a 3-credit transition course in Au12.
Prereq: D or better in 50.

| Math 1074 is equivalent to 75, but less than 1075. |

C- or better in 1074: may enter 1075, 1116, or 1125.   [Note: Math 1075 covers topics in 75 & 104.]
D+ or D in 1074:   may enter 1116.
D+ or lower in 1074: must enter 1050.   [With petition, 1075 will provide Freshman Forgiveness for 1074.]

Note: D or better in 1074 fulfills the "Basic Skills" part of the GE requirement. [Proposed rule pending approval.]

Math 1124, a 3-credit transition course in Su12 and Au12.
Prereq: D or better in 106.

| Math 1124 is 107 done in a semester. |

Note: 1124 is restricted to students intending to major in Early Childhood Education, Special Education, and Middle Childhood Education (if on Columbus campus, not in math concentration).

C- or better in 1124: Completes math requirement for Early Childhood majors.
D+ or lower in 1124: may enter 1126.   [With petition, 1126 will provide Freshman Forgiveness for 1124.]

Math 1134, a 3-credit transition course in Su12 and Au12.
Prereq: D or better in 131.

| Math 1134 is 132 done in a semester. |

C- or better in 1134: Completes math requirement for business.
D+ or lower in 1134: may enter 1131.   [With petition, 1131 will provide Freshman Forgiveness for 1134.]

Math 1164, a 3-credit transition course in Au12.
Prereq: D or better in 109.

| Math 1164 is 110 done in a semester. |

Note: 1164 is restricted to students intending to major in Middle Childhood Education (math or science concentration).

C- or better in 1164: may enter 2167.
D+ or lower in 1164: may enter 1166.   [With petition, 1166 will provide Freshman Forgiveness for 1164.]

Math   114, a 3-credit on-line transition course in Sp12.
Math 1114, a 2-credit on-line transition course in Su12 and Au12.
Prereq: C- or better in 151.
Content: Topics (integrals) that are in 1151 but not included in 151.

151 & 114	$\Leftrightarrow$ 1151
151 & 1114	$\Leftrightarrow$ 1151

C- or better in 114 or 1114: may enter 1152 or 1172.
D+ or lower in 114 or 1114: repeat 1114 or enter 1151.   [With petition, 1151 will provide Freshman Forgiveness for 114 or 1114.]

Course formats.
Math 1114 will use video lectures that each student will view independently, on a personal computer. Recitation classes following those lectures come in two formats, to accommodate different needs of students. Each recitation class will have a maximal enrollment of 30 students. Both of the formats will have video lectures, on-line homework assignments, and a **proctored, paper-and-pencil, final exam**.

Formats for recitation sections of 114 and 1114 are:

1. Hybrid: Traditional, live, recitation sections meeting in an OSU classroom twice a week.
   • The best option. In Columbus, this class will probably be offered Sp12, Su12, and the first term of Au12.

2. Online: At the scheduled class time, each student logs in to the class using a personal computer, communicating with the instructor through microphone and chat box. Students will hear their recitation instructor and see the problems being written out.
   • Available for students unable to attend a traditional class in Columbus.

Note: Most majors with math requirement 151-152 will change that requirement to 1151.
Such majors are expected to allow that requirement to be satisfied by: 151 and {114 or 1114}.

Math 1534, a 3-credit transition course in Su12 and Au12.
Prereq: C- or better in 152.

Math 1534 = 153 presented in a semester.

C- or better in 1534: may enter 2153.
D+ or lower in 1534: enter 1152.
   [With petition, 1152 will provide Freshman Forgiveness for 1534.]

151 - 152 - 1534 $\Leftrightarrow$ 1151 - 1152.

BRIEF DESCRIPTIONS OF TRANSITION COURSES (for Engineers)

Throughout this document we omit decimals from all the quarter-system course numbers.
  Then 151.xx is written as 151, etc.

(E) **Math 154**, a 5-credit transition course in Sp12.
Prereq: C- or better in 152.

$$151 - 152 - 154 \iff 1151 - 1172$$

154 is parallel to 153, but with syllabus matching the topics in 1172 (Engineering Math A). That is:
  Math 154 = (153 with material on convergence of series replaced by multivariable differential calculus).

C- or better in 154: may enter 2173 or 2177.
D+ or lower in 154: enter 1172.   [With petition, 1172 will provide Freshman Forgiveness for 154.]

(E) **Math 1544**, a 3-credit transition course in Su12 and Au12.

Prereq: C- or better in 152.

$$\text{Math } 1544 = 154 \text{ presented in a semester.}$$

C- or better in 1544: may enter 2173 or 2177.
D+ or lower in 1544: enter 1172.

$$151 - 152 - 1544 \iff 1151 - 1172.$$

 [With petition, 1172 will provide Freshman Forgiveness for 1544.]

Transition Pathways through Math Courses: Non-Engineering

Note: Students taking a math course sequences tend to perform better if they take those courses *without a break*. A delay of several months between one math course and the next can result in significant losses of momentum and mastery.

Au11	Wi12	Sp12	Su12	Au12	Sp13
50	75	104	-	1116, 1125, 1130, 1148	
	50	75	-	1075, 1116, 1125	
		50	-	1074 [Note: 1074 fulfills GE Basic Skills Req.]	
· ·					
75	104	148	-	1148	1149
75	104	130	-	1131	
104	148	150	-	1151, 1156, 1165	
· ·					
105	106	107	-	-	-
	105	106 & 107	-	-	-
	105	106	1124	-	-
	105	106	-	1124	-
· ·					
108	109	110	-	2167	2168
	108	109 & 110	-	2167	2168
	108	109		1164 & 2167	2168
	108	109	-	1164	2167
· ·					
130	131	132	-	-	-
	130	131	1134	-	-
	130	131	-	1134	-
	130		-	1131	-
· ·					
148	150	151	1114	-	-
148	150	151	1114	1152	2153
148	150	151	-	1114	1152
148	150	-	-	1151	
148	-	150	-	1151	
-	148	150	-	1151	
· ·					
150	151	114	-	-	-
150	151	114	-	1152	2153
150	151	152	-	1534	2153
150	151	152	1534	2153	
151	152	153	-	2153	

In this chart, a horizontal step from a quarter course can happen only with D or better in lower course.
    Such steps require C- or better for courses 150 and above, and **for all steps after Au12**.
Hyphen (-) indicates: no math class taken that term.

Notes. 5-credit semester courses (like Math 1151) will probably NOT be offered in Summer sessions.
    If there is student demand, such courses might be offered in the 12-week May-Summer term.

Transition Pathways through Math Courses: Engineering

Note: Students taking a math course sequences tend to perform better if they take those courses *without a break*. A delay of several months between one math course and the next can result in significant losses of momentum and mastery.

Au11	Wi12	Sp12	Su12	Au12	Sp13
148	150	151	1114	1172	
150	151	114	-	1172	2173 or 2177
150	151	-	1114	1172	2173 or 2177
150	151	-	-	1114	1172
150	151	152	-	1544	2173 or 2177
150	151	152	1544	2177	-
150	151	152	1544	2173	2174
150	151	152		1172 ← (~ 4 week overlap of material for 152 / 1172)	
151	152	154	-	2173 or 2177	

In this chart, a horizontal step from a quarter course can happen only with D or better in lower course.
   Such steps require C- or better for courses 150 and above, and **for all steps after Au12**.
Hyphen (-) indicates: no math class taken that term.

Notes. 5-credit semester courses (like Math 1151) will probably NOT be offered in Summer sessions.
   If there is student demand, such courses might be offered in the 12-week May-Summer term.