# Bachelor of Arts in Mathematics: Concentration in Mathematics for Advanced Study Roadmap

120 Total Units Required  
Minimum Number of Units in the Major: 48

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 226</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Oral Communication (A1) or Critical Thinking (A3)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE Area A: Written English Communication (A2)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE Area C: Arts (C1) or Humanities (C2)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE Area D: U.S. History (D2) or U.S. and California Government (D3)</td>
<td>3</td>
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</tr>
<tr>
<td><strong>Units</strong></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Second Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 227</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Oral Communication (A1) or Critical Thinking (A3)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE Area A: Written English Communication II (A4)</td>
<td>3</td>
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</tr>
<tr>
<td>or Written English Communication (A2) Stretch II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GE Area D: Social Sciences (D1)</td>
<td>3</td>
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</tr>
<tr>
<td>GE Area D: U.S. History (D2) or U.S. and California Government (D3)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Third Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSC 210 or CSC 309</td>
<td>Introduction to Computer Programming</td>
<td>3</td>
</tr>
<tr>
<td>or Computer Programming for Scientists and Engineers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 228</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>GE Area A: Written English Communication II (A4) if not already satisfied</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>or Complementary Studies or SF State Studies or University Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Fourth Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 301GW</td>
<td>Exploration and Proof - GWAR</td>
<td>3</td>
</tr>
<tr>
<td>MATH 440</td>
<td>Probability and Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>GE Area B: Life Science (B2) and Laboratory Science (B3)</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>GE Area C: Arts (C1)</td>
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<td>3</td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td></td>
<td>16-17</td>
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Complementary Studies or SF State Studies or University Elective 3

**Fifth Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 325</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 380</td>
<td>Introduction to Complex Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GE Area UD-B: Upper Division Physical and/or Life Sciences (Consider SF State Studies Course)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Complementary Studies or SF State Studies or University Elective - Take Two</td>
<td>6</td>
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</tr>
<tr>
<td><strong>Units</strong></td>
<td></td>
<td>15-16</td>
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**Sixth Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 310 or MATH 376</td>
<td>Elementary Number Theory or Ordinary Differential Equations I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 335</td>
<td>Modern Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Major Elective (6 Units Total)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GE Area UD-C: Upper Division Arts and/or Humanities (Consider SF State Studies Course)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Complementary Studies or SF State Studies or University Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Units</strong></td>
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<td>15</td>
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**Seventh Semester**

<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>MATH 370</td>
<td>Real Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 435</td>
<td>Modern Algebra II</td>
<td>3</td>
</tr>
<tr>
<td>Major Elective (6 Units Total)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GE Area UD-D: Upper Division Social Sciences (Consider SF State Studies Course)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Complementary Studies or SF State Studies or University Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Units</strong></td>
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<td>15</td>
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**Eighth Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 470 or MATH 471</td>
<td>Real Analysis II: Several Variables or Introduction to Fourier and Wavelet Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Complementary Studies or SF State Studies or University Elective - Take Three</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

**Total Units**

120-122

1 Depending on courses completed through Early Start and in high school, students in Pathway/Category 3 or 4 may be required to enroll in additional courses before they can take MATH 199 or MATH 226. Most students in Pathway/Category 3 or 4 will need to take a stretch format for MATH 199 (MATH 197 in Fall 2018 and MATH 198 in Spring 2019). Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center (http://cms.sfsu.edu/content/student-center). Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website (http://developmentalstudies.sfsu.edu).
To avoid taking additional units, it is recommended that you meet **LLD and SF State Studies** requirements (AERM, GP, ES, SJ) within your GE or major.

ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you select ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.

**Complementary Studies**

Students who pursue a Bachelor of Arts in Mathematics with Concentrations in Liberal Arts, Teaching, or Advanced Studies must complete 12 complementary units, within a coherent group of courses with a prefix other than MATH, and not cross-listed with MATH. Complementary Studies units for the Mathematics major may come from:

1. Any courses offered by other departments in the College of Science & Engineering (CoSE), or
2. Any of the following courses outside of CoSE:
   a. DS 312 Data Analysis with Computer Applications (3 units)
   b. DS 408 Computer Simulation (3 units)
   c. ECON 101 Introduction to Microeconomic Analysis (3 units)
   d. ECON 301 Intermediate Microeconomic Theory (3 units)
   e. ECON 302 Intermediate Macroeconomic Theory (3 units)
   f. FIN 350 Business Finance (3 units)
   g. ISYS 363 Information Systems for Management (3 units)
   h. ISYS 463 Information Systems Analysis and Design (3 units)
   i. ISYS 464 Managing Enterprise Data (3 units)
   j. ISYS 650 Business Intelligence (3 units)
   k. PHIL 205 Formal Logic I (3 units)
   l. PHIL 350 Philosophy of Science (3 units)
   m. PHIL 351 Philosophy of Risk (3 units)
   n. PHIL 694 Philosophical Logic Workshop (3 units)
   o. PHIL 695 Advanced Logic Workshop (3 units)

Students who have earned AA-T or AS-T degrees and are pursuing a similar B.A. degree at SF State are required to fulfill the Complementary Studies requirement as defined by the major department. Students should consult with a major advisor about how transfer units and/or SF State units can best be applied to this requirement in order to ensure degree completion within 60 units.

Consider taking a class combined with a laboratory or a separate lab to fulfill B3 if not already satisfied.

**Major Electives**

Two elective courses numbered 400 or above except MATH 475, MATH 565, MATH 575, MATH 576, MATH 577, and MATH 578.