Comprehensive Program Review of Developmental Math for AY 2018-19

Prepared by
Allen Shockley

3/12/2019
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1.0 Program Data and Resource Repository

1.1 Program Summary

The program should provide a descriptive summary of the program.

Narrative:
The developmental math program focuses on improving the mathematical literacy of students prior to taking a college level math course (College Algebra or Statistics). There are two courses in the program that work together to accomplish this literacy task—Elementary Algebra and Intermediate Algebra. Elementary Algebra is the lowest level of math that is offered at Independence Community College (ICC). Both Elementary and Intermediate Algebras are worth four credit hours.

1.2 Quantitative and Qualitative Data

All programs are provided with the most recent two years of data by the Office of Institutional Research (IR) as well as two-year budget data provided by the Business Office.

The data sets provided by the Office of Institutional Research include the following elements for the most recent two (completed) academic years:

- Number of Faculty (Full Time; Part Time; Total)
- Student Credit Hours by Faculty Type
- Enrollment by Faculty Type
- Faculty Name by Type
- Average Class Size, Completion, and Attrition
- Course Completion, Success and Attrition by Distance Learning v Face-to-Face
- Number of Degrees/Certificates Awarded
- Number of Graduates Transferring (if available from IR)
- Number of Graduates Working in Related Field (technical programs only)
- Expenditures and Revenues

Additional data may also be available for reporting from the Office of Institutional Research, as applicable. Requests for additional data must be made through a data request.

(See Section 1.2 in the Program Review Handbook for more information.)

Narrative:

DEV Math Assessment Data AY 2016-2017
**Number of Faculty:**
3 full time (B. Southworth, J. Gross, J. Lowrance)
3 part time (K. Butler, A. Shockley, T. Denson)

**Enrollment & Student credit hours by Faculty type:**
- Full time: 56 total credit hours taught, with 231 total student enrollments
- Part time: 20 credit hours taught, 85 total student enrollments
  - Total Enrollment: 316

**Average Class size:**
- 16.35 students in Face-to-Face classes
- 19 students in online classes
- 16.63 students across all DEV Math courses

**Completion rates:**
- 97.84% face-to-face
- 94.74% online
- 97.47% all DEV Math courses

**Pass rates (C or better):**
- 51.47% face-to-face
- 72.22% online
- 53.90% all DEV Math courses

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**DEV Math Assessment Data AY 2017-2018**

**Number of Faculty:**
3 full time (Shockley, Southworth, Liu)
2 part time (Gross, Hays)

**Enrollment & Student credit hours by Faculty type:**
- Full time: 64 total credit hours taught, with 255 total students enrolled
- Part time: 8 credit hours taught, 29 total students enrolled
  - Total Enrollment 284

**Average Class size:**
- 15.94 students in Face-to-Face classes
- 14.5 students in online classes
- 15.78 students across all courses

**Completion rates:**
- 91.37% face-to-face
- 96.55% online
- 91.90% all courses

**Pass ('D' or better) rates:**
- 68.7% face-to-face
- 67.86% online
- 68.58% all courses

**Pass ('C' or better) rates:**
- 45.49% face-to-face
- 64.29% online
- 47.51% all courses
### INDEPENDENCE COMMUNITY COLLEGE

**Math**

For the Twelve Months Ending Friday, June 30, 2017

<table>
<thead>
<tr>
<th>Fund 11 Expenses</th>
<th>Published Budget</th>
<th>Operating Budget</th>
<th>Expense</th>
<th>Encumbered</th>
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#### Salary:

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<tr>
<th>Account</th>
<th>Description</th>
<th>Budgeted</th>
<th>Encumbered</th>
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<tbody>
<tr>
<td>11-1177-520-000</td>
<td>Faculty Salaries: Full-Time Faculty</td>
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<tr>
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</tbody>
</table>

**Total Salary**

- **Budgeted**: 141,605.02
- **Encumbered**: (141,605.02)

#### Fringe Benefits:

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<td>11-1177-594-000</td>
<td>Insurance Premiums</td>
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**Total Fringe Benefits**

- **Budgeted**: 34,170.90
- **Encumbered**: (34,170.90)

**Total**

- **Budgeted**: 175,775.92
- **Encumbered**: (175,775.92)
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<th>Operating Budget</th>
<th>Expense</th>
<th>Encumbered</th>
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<tr>
<td>Salary:</td>
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<td>Total Salary</td>
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<td>221,167.35</td>
<td>(221,167.35)</td>
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</table>
2.0 Student Success

2.1 Define Student Success

The program faculty should provide a definition of how student success is defined by the program. *(See Section 2.1 in the Program Review Handbook for more information.)*

**Narrative:**

Student success is defined as the acquisition of the skills necessary to successfully complete, at a C-level or higher, a college level mathematics course.

2.2 Achieve/Promote Student Success

The program faculty should describe how the program achieves and promotes student success. *(See Section 2.2 in the Program Review Handbook for more information.)*

**Narrative:**

The department promotes student success by engaging with students and improving instruction based on end-of-course surveys and collaboration among faculty members. Faculty closely align topics between College Algebra and both developmental courses to ensure student retention of material upon successful completion of the developmental math sequence.

The link between College Algebra and Intermediate algebra can be more specifically seen when comparing learning outcomes of the two courses *(see Appendix A for more details).* College algebra’s first learning outcome sees students solving and simplifying various types of equations (linear, rational, quadratic, radical, and absolute value). Intermediate algebra covers this over learning outcomes: 1, 3, 4, 6, and 8. In College Algebra, these learning outcomes are presented as interwoven ideas that can cross between the different types of equations. In Intermediate, each equation is learned separately, but the same rules are applied to each type of equation.

Elementary, Intermediate, and College algebra teach many of the same topics (even the textbooks have copy/pasted sections between them) but as you move further into the progression, the content is harder and presented faster. By taking a developmental math course, students can familiarize themselves with the basic steps before moving into the more complex thought patterns that exists in College Algebra.
3.0 Assessment of Student Learning Outcomes

3.1 Reflection on assessment

The program faculty should provide a narrative reflection on the assessment of program curriculum. Please provide data gathered for outcomes at both program, course, and general education levels. Please review the Assessment Handbook for resources on gathering this information provided by the Assessment Committee.

**Narrative:**

For AY 16-17 and AY 17-18, assessment data was collected differently for each year and differently for each faculty member. Some faculty members collected data throughout the year while others waited until the final to collect assessment data. These varying methods of assessment collection creates an unequal representation of the data found. It is the recommendation of the program to collect data at similar points in the semester to better understand student learning based on instructor, content, and to compare cohort to cohort.

Current assessment methods are to assess an outcome based on three measures. The measures are averaged by each instructor and then averaged together to create a picture of how close the instructors (as a whole body) were to meeting the learning outcome. Target success for a learning outcome is that 70% of the students will score a 70% on each measure tied to the learning outcome. Learning outcomes are considered “Met” if the average score for a learning outcome is at 70% or higher. Outcomes are “Partially Met” if scored in the 55-69% range, and “Not Met” for outcomes less than 55%. The range for Partially Met is scored there to match current trends in the number of students who obtain a grade of “C” or higher.

It should also be mentioned that at least one faculty member (Shockley) included all students who were enrolled in their course for each learning outcome measured. If a student did not take an exam, they were still counted as not meeting a measure, even when they had dropped the course. This has been corrected for future assessments.

At the request of the Developmental Math Faculty, the Office of Institutional Research has included data for the success rate of students who take a developmental math course and then continue to a college level math (specifically College Algebra). This data is found in Appendix A with a full reflection in Section 5.1 of this document.
3.2 Significant Assessment Findings

The program faculty should provide a narrative overview of the program's significant student learning outcomes assessment findings, any associated impact on curriculum, as well as any ongoing assessment plans. The program may attach data charts, assessment reports or other relevant materials. (See Section 3.2 in the Program Review Handbook for more information.)

Narrative:

*Learning Outcome data (broken down by measure) has been provided in Appendix B.*

*Sample Learning Outcomes and measures can be found in Appendix C.*

For the two courses, Elementary and Intermediate Algebra, only one learning outcome was considered fully met: Elementary Algebra, Learning Outcome 1 at a 73% overall passing rate. Several Learning Outcomes (LO) were rated at “Partially Met”: Elem Algebra, LO 2 (55%), Intermediate Algebra LO 1 and 2 (69% and 66%, respectively). Elementary algebra Learning Outcome 7 and Intermediate Algebra Outcome 3 are considered “Not Met” at 47% and 48% respectively.

Most of the measures saw instructors having the same issues across all sections: not doing the same thing to both sides of an equation, deciphering word problems, and dealing with fractions. A common theme was to spend more time with students on these sections or provide additional reinforcement to the students on these topics. It was also referenced that many students simply did not come back (mentally) from a break to finish off a semester.

3.3 Ongoing Assessment Plans

The program faculty should describe ongoing assessment plans and attach any new assessment progress reports for the current or past academic year.

Narrative:

Assessment plans for AY 16-17 & 17-18 were different. In AY 16-17, assessment was collected as part of the Math Department’s overall program review and developmental math took a back seat to college algebra (as the focus was on the transfer course of college algebra). In AY 17-18, the assessment of developmental math was made a priority with the hiring of a full-time
developmental math faculty member. Assessment of dev math was then given to this person and a more complete picture of the state of dev math on ICC’s campus can now begin taking shape.

Future plans for dev math include an on-going push to collect assessment data during the semester (instead of collected data via the final) and to compare success rates between sections, semesters, and cohorts of students. This is accomplished using the built-in function of Canvas called Learning Mastery. Learning Mastery allows an instructor to link a learning outcome to a specific set of assignments or questions and track how well a student does with that learning outcome. At the end of the semester (or when appropriate), this data can be pulled by the faculty or Canvas administrator.

Collecting data at the end of the semester via a comprehensive final was easier but many measures were failed due to students feeling/being overwhelmed during finals week. There were also the rare instances when a student would simply not take a section of the final because they were guaranteed to pass (or fail) the class—no matter the outcome of the final. Collecting data during the semester allows for more accurate accounts of how well a particular topic was taught and the instructor can make notes as to what they need to improve upon for the next chapter and next semester.
4.0 External Constituency and Significant Trends

An important component of maintaining a superior program lies in awareness and understanding of other possible factors that may impact the program and/or student outcomes. After consideration of these other factors, program faculty should document the relevant information within this section. As applicable, this should include the following.

4.1: Program Advisory Committee:

- Include Advisory Member Name/ Title/ Organization/ Length of Service on committee; note the Committee Chair with an asterisk (*).
- Upload meeting minutes from the previous spring and fall semesters and attach in the appendices section (10.0).

Narrative:

There is no program advisory committee for developmental math.

4.2: Specialized Accreditation:

- Include Accrediting Agency title, abbreviation, ICC contact; Agency contact, Date of Last Visit, Reaffirmation, Next Visit, FY Projected Accreditation Budget.
- Upload the most recent self-study and site visit documents.
- Upload agency correspondence which confirm accreditation status.

Narrative:

There is no specialized accreditation required for this program.

4.3: Other:

Discuss any external constituencies that may apply to the program. (See Section 4.3 in the Program Review Handbook for more information.)

Narrative:

Higher Learning Commission

HLC’s Criterion 3.3.D.1: The institution provides student support services suited to the needs of its student populations.
ICC Contact: Dan Barwick, President of ICC
Date of Last Visit: September 28-29, 2017
Reaffirmation: On-Notice
Next Visit: March 2019
### 5.0 Curriculum Reflection

#### 5.1 Reflection on Current Curriculum

The program faculty should provide a narrative reflection that describes the program’s curriculum holistically. The following are prompts formulated to guide thinking/reflection on curriculum. While presented in question form, the intent of the prompts is to stimulate thought and it is not expected that programs specifically answer each and every question.

- Is the curriculum of the program appropriate to the breadth, depth, and level of the discipline?
- How does this program transfer to four-year universities? (give specific examples)
- What types of jobs can students get after being in your program? (Please use state and national data)
- How dynamic is the curriculum? When was the last reform or overhaul?
- In the wake of globalization, how “internationalized” is the curriculum?
- How does the program assess diversity?
- Does the program have any community-based learning components in the curriculum?

#### Narrative:

For the first time, program data is being compared with college algebra as a marker for the overall effectiveness of the developmental math program in preparing students to take a college level math course. This data can be found in Appendix A. Currently, 67% of students pass college algebra without having taken a developmental math course. The passing rate of non-developmental math students is well below the success rate for students who have taken a developmental course before attempting college algebra at 76%. This number continues to climb if the student passes Intermediate Algebra to 84%.

Overall, the better a student does in Intermediate algebra, the better that student will do in College algebra. Even being exposed to elements of developmental math can increase a student’s effectiveness in college algebra.

One area that needs improvement for the program is its current pass/fail rate of just under 50% for AY 17-18. It is the goal of the program to increase this number for future years to 60%. Much of this goal is centered around student persistence during the semester and students not taking weeks off at a time. Increasing engagement of material can foster better study habits and increase student performance on exams—in-turn increasing overall Learning Outcome passing percentages. Currently, the program lead is searching/attending professional development centered on increasing student engagement in a math course.
5.2 Degree and Certificate Offerings or Support

Program faculty should list what degrees and certificates are offered and/or describe how the program curriculum supports other degrees and/or certificates awarded by the college.

Narrative:

The program does not offer any degree or certificate as all developmental courses are non-transferrable and below college level. Instead, the program supports all students by giving them a stepping stone towards completing the requirements for graduation (i.e. College Algebra).
6.0 Faculty Success

6.1 Program Accomplishments

The program faculty should highlight noteworthy accomplishments of individual faculty.

Narrative:

The program completed both goals for AY2018-2019.

By AY2018-2019, full time faculty will receive training on developmental/accelerated courses and course development to better serve students.

By AY2018-2019, include student success rate in College Algebra after taking a developmental math course into the annual review of this program. *will change to comprehensive review moving forward.

6.2 Faculty Accomplishments

The program faculty should highlight noteworthy program accomplishments.

Narrative:

Adjunct instructor was raised to full-time instructor and placed in charge of the program’s assessment.

6.3 Innovative Research, Teaching and Community Service

The program faculty should describe how faculty members are encouraged and engaged in promoting innovative research, teaching, and community service.

Narrative:

The full-time developmental math instructor uses innovative technology in their courses. The instructor takes notes on an iPad that is screen shared to the TV’s in the room (via an AppleTV). These notes are then immediately uploaded to Canvas where students may use them how they see fit. These notes are then shared with the Tutoring Center and anyone else that has need of these notes.
7.0 Program Planning & Development for Student Success

7.1 Narrative Reflection on Qualitative and Quantitative Data and Trends

Provide a thoughtful reflection on the available assessment data. *(See Section 7.1 in the Program Review Handbook examples.)*

**Narrative:**

Faculty turnover is high for this program and can account for a difference of approximately $40,000 between AY16-17 and AY17-18. For several months in AY 16-17, only one full-time faculty member was employed (reducing the overhead of faculty salary) compared to AY 17-18 when there were always at least two full-time faculty members employed by the College.

Over the two years of this program review, only one full-time faculty member has persisted, Brian Southworth. The program’s enrollment numbers are down (matching institutional losses) but class size has remained relatively similar from year to year, only dropping on average by one student. Passing and completion rates are down around 6% between the two years. Face-to-face classes dropped 6% in total number of students passing, while online passing rates dropped closer to 8%.

For AY16-17, intuitional costs for teaching developmental courses totaled $140 per credit hour using the total salary cost incurred by the college. This does not take into consideration other classes taught by these instructors (i.e. College Algebra, Calculus, Stats, etc.).

For AY17-18, institutional costs for teaching developmental courses were $195 per credit hour.

\[
\frac{Total\ Salary}{Program\ Enrollment \times 4 \text{ credit hours}} = Faculty\ Cost \ per \ credit \ taught
\]

7.2 Academic Program Vitality Reflection, Goals and Action Plans

The program vitality assessment, goals and action planning are documented by completing the Program Summative Assessment form.

Programs should use previous reflection and discussion as a basis for considering program indicators of demand, quality, and resource utilization and a program self-assessment of overall program vitality. *(See Section 7.2 in the Program Review Handbook for more information.)*

**Narrative:**

Category 2: Maintain Current Levels of Support/Continuous Improvement
Students enrolled in a developmental math course have been placed there due to low ACT, SAT, and/or Next-Generation ACCUPLACER score(s). These students enter college with deficiencies in mathematics and generally would not succeed in a college level math. In order to best serve the interests of students and their success at the college level, a developmental math program allows students to obtain the necessary skills to be successful in future courses.

7.3 Academic Program Goals and Action Plans

Programs will also establish or update 3 to 5 long-term and short-term goals and associated action plans which support student success. These goals should include consideration of co-curricular and faculty development activities. Long-term goals are considered to be those that extend 3 to 5 years out, while short-term goals are those that would be accomplished in the next 1 to 2 years. Additionally, programs should update status on current goals. Programs should use S.M.A.R.T. goal setting for this purpose. (See Section 7.3 in the Program Review Handbook for more information.)

**Narrative:**

**Goals:**

By the end of the 2019-2020 school year, full-time developmental math faculty will participate in at least one professional development conference relating to their subject.

By the end of the 2021-2022 school year, the overall success rate (C or better) of developmental math courses will be 60% (up from 54% in AY 2016-2017).

By the end of the 2021-2022 school year, all faculty members teaching developmental math will receive content specific training.

7.4 Mission and Strategic Plan Alignment

Program faculty should indicate the ways in which the program's offerings align with the ICC mission. Also, in this section program faculty should provide narrative on the ways that initiatives may be tied to the ICC Strategic Plan and to HLC accreditation criterion. It is not necessary to consider an example for each HLC category, but program faculty are encouraged to provide one or two examples of initiatives in their program that are noteworthy. These examples may be helpful and included in future campus reporting to HLC. (Refer to section 4.3 for HLC categories)

**Narrative:**

The Developmental Math program embraces the mission of Independence Community College by providing basic skills and college readiness to all students. “Through academic and other support services, students can achieve the proficiency required for continuance in higher
education, for employment, or for day-to-day communication and computation” (About Us-Independence Community College).

Students who are successful completers of the Developmental Math program and choose to take a college level mathematics will successfully complete the college level course at a rate higher than those who did not take a developmental math course.


- 3. D. The institution provides support for student learning and effective teaching.
  - 1. The institution provides student support services suited to the needs of its student populations.
8.0 Fiscal Resource Requests/Adjustments

8.1 Budget Requests/Adjustments

Based on program data review, planning and development for student success, program faculty will complete and attach the budget worksheets to identify proposed resource needs and adjustments. These worksheets will be available through request from the college’s Chief Financial Officer. Program faculty should explicitly state their needs/desires along with the financial amount required.

Programs should include some or all of the following, as applicable, in their annual budget proposals:

- Budget Projections (personnel and operation)
- Position Change Requests
- Educational Technology Support
- Instructional Technology Requests
- Facilities/Remodeling Requests
- Capital Equipment
  - Non-Capital Furniture & Equipment
  - New Capital Furniture & Equipment
  - Replacement Capital Furniture & Equipment
- Other, as applicable
  - Accreditation Fee Request
  - Membership Fee Request
  - Coordinating Reports

Resource requests should follow budgeting guidelines as approved by the Board of Trustees for each fiscal year. The resource requests should be used to provide summary and detailed information to the division Dean and other decision-makers and to inform financial decisions made throughout the year.

Narrative:

Currently there is no budget for the program. All budgetary needs are being met through access to the Academic Affairs Professional Development and Instructional Supplies budget lines. If these funds are removed from the general budget, it is the request of this program to be allotted funds to continue operation and pursue needed professional development.
9.0 Program Planning and Development Participation

9.1 Faculty and Staff

Program faculty will provide a brief narrative of how faculty and staff participated in the program review, planning and development process. List the preparer(s) by name(s).

**Narrative:**

All previous math faculty members (adjuncts included) have contributed towards the comprehensive program review by submitting their assessment data at the end of each semester. Anita Chappuie (Director of Institutional Research) provided end of year academic data and Wendy Isle (Chief Financial Officer) provided all financial data for AY 16-17 and AY 17-18. Allen Shockley (Instructor of Developmental Math) prepared this comprehensive program review for the aforementioned academic years.

9.2 VPAA and/or Administrative Designee Response

**After review and reflection of the Comprehensive Program Review or the Annual Program Review, the Division Chair and VPAA will write a summary of their response to the evidence provided. The Division Chair and VPAA’s response will be available to programs for review and discussion prior to beginning the next annual planning and development cycle.**

**Narrative:**

PRC Committee Member (Brett Gilcrist): I agree with the findings of this report. I believe developmental courses are invaluable to our success as an open-enrollment community college, and I believe the data proves that our developmental math program is helping students become more successful. I do also agree, however, that efforts need to be made to streamline the data collection process so we are consistent across instructors; the full-time faculty member in charge of developmental math should be able to institute the plan he has outlined in this review so data can be collected throughout each semester.

Division Chair:  I agree with the findings of this report. Brian Southworth 3.26.2019

VPAA:  I recommend that this program be maintained at a Category 2:  Maintain current levels of support/continuous improvement.  Focus on streamlining course assessment data will assist faculty moving forward to make necessary changes quicker.
10.0 Appendices

Any additional information that the programs would like to provide may be included in this section.
Appendix A

% of AY2018 Students Passing Intermediate ('C' or better):
Summer: 68.75% (11 of 16)
Fall: 51.52% (34 of 66)
Spring: 39.13% (18 of 46)
Total: 49.22% (63 of 128)

% of AY2018 Students Who Passed (with ‘C’) Intermediate Who Completed College Algebra as of Fall 2018:
Summer: 81.82% (9 of 11)
Fall: 47.06% (16 of 34)
Spring: 72.22% (11 of 18)
Total: 57.14% (36 of 63)

% of AY2018 Students Who Passed (with ‘C’) Intermediate & Completed College Algebra Who Passed (with ‘C’) College Algebra as of Fall 2018:
Summer: 88.89% (8 of 9)
Fall: 75.00% (12 of 16)
Spring: 90.91% (11 of 18)
Total: 83.33% (30 of 36)

% of AY2018 Students Who Completed Any Dev Math Course & Completed College Algebra Who Passed (with ‘C’) College Algebra as of Fall 2018:
Summer: 90.00% (9 of 10)
Fall: 73.58% (39 of 53)
Spring: 76.92% (20 of 26)
Total: 76.40% (68 of 89)

% of AY2018 Students Who Completed Any Dev Math Course BUT Did Not Pass Intermediate Algebra & Completed College Algebra Who Passed College Algebra as of Fall 2018:
Summer: 100% (1 of 1)
Fall: 72.97% (27 of 37)
Spring: 66.67% (10 of 15)
Total: 71.70% (38 of 53)

% of AY2018 Students Who Completed College Algebra Who Hadn’t Taken Any Dev Math Course in the Last 2 Academic Years Who Passed
Summer: 77.78% (21 of 27)
Fall: 79.85% (107 of 134) without HS: 62.69% (42 of 67)
Spring: 79.37% (50 of 63) without HS: 67.74% (21 of 31)
Total: 79.46% (178 of 224) without HS: 67.20% (84 of 125)
### Appendix B

Elementary Algebra AY
Ending in 2018

<table>
<thead>
<tr>
<th>Outcome</th>
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<th>Outcome</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>M2</td>
</tr>
<tr>
<td></td>
<td>M1</td>
<td>M2</td>
</tr>
</tbody>
</table>

| Southworth | 22% 56% 89% | 72% 72% 6% | 42% 42% 8% |
| Shockley   | 88% 57% 77% | 78% 62% 31% | 51% 43% 43% |
| Liu        | 91% 89% 89% | 84% 74% 16% | 62% 62% 71% |

| Average    | 67% 67% 85% | 78% 69% 17% | 51% 49% 41% |
| Average for Outcome | 73% | 55% | 47% |

Intermediate Algebra AY
Ending in 2018

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Outcome</th>
<th>Outcome</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Measure1</td>
<td>Measure2</td>
</tr>
<tr>
<td></td>
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<td>M2</td>
</tr>
<tr>
<td></td>
<td>M1</td>
<td>M2</td>
</tr>
</tbody>
</table>

| Hays*    | 67% 17% 67% | 50% 58% 50% | 42% 58% 33% |
| Southworth | 100% 50% 100% | 83% 83% 17% | 100% 13% 38% |
| Shockley | 80% 30% 63% | 67% 82% 51% | 79% 36% 31% |
| Liu      | 89% 78% 89% | 78% 100% 78% | N/a  N/a N/a |

| Average    | 84% 44% 80% | 70% 81% 49% | 73% 36% 34% |
| Average for Outcome | 69% | 66% | 48% |

* denotes Online Only course offering
Appendix C

ICC Mathematics
Assessment Plan and Common Measures for AY2018-2019

Contents
Assessment Plan AY2018-2019 ................................................................. 24
Analytic Geometry and Calculus I ......................................................... Error! Bookmark not defined.
Analytic Geometry and Calculus II ....................................................... Error! Bookmark not defined.
Business Calculus ................................................................................ Error! Bookmark not defined.
College Algebra and College Algebra with Supplement ..................... 25
Elementary Algebra ............................................................................. 26
Intermediate Algebra .......................................................................... 27

Assessment Plan AY20xx-20xx

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Even AY</th>
<th>Odd AY</th>
</tr>
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<tr>
<td>Analytical Geometry and Calculus I</td>
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<tr>
<td>Analytical Geometry and Calculus II</td>
<td>5,6,7,8</td>
<td>1,2,3,4</td>
</tr>
<tr>
<td>Business Calculus</td>
<td>5,6,7,8,9</td>
<td>1,2,3,4</td>
</tr>
<tr>
<td>College Algebra (3hr) and College Algebra (3hr) plus Supplement (2 hr)</td>
<td>4, 5, 6</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Elementary Algebra</td>
<td>4,5,6,7</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>Intermediate Algebra</td>
<td>5,6,7,8,9</td>
<td>1,2,3, 4</td>
</tr>
</tbody>
</table>

- Each academic year begins with summer semester.
- Even and Odd AY is based on the year the summer semester takes place.
1. Simplify expressions and solve equations involving linear, rational, quadratic equations (by factoring, completing the square, and the quadratic formula), radicals, and absolute values; Solve linear and absolute value inequalities. This includes equations that have real and complex solutions and applications.
   1.1. Solve $x^2 - 6x + 10 = 0$ by factoring, completing the square, or using the quadratic formula.
   1.2. Solve and check. $\sqrt{x + 10} = x - 2$
   1.3. Solve $8x - 11 \leq 3x - 13$ and leave your answer in interval notation.
2. Show understanding of functions by identifying the differences between relations and functions, using function notation, finding the domain and range of function, combining functions, and finding composite and inverse functions.
   2.1. State the domain and range of the function, $f(x) = \sqrt{x} + 2$
   2.2. Find the inverse of $f(x) = 3x - 5$
   2.3. Find and simplify $f \circ g$, if $f(x) = x^2 - 3$ and $g(x) = x - 4$.
3. Find the zeroes of a function; solve rational and polynomial inequalities; and model using variation.
   3.1. Find the zeros for $f(x) = 2(x - 1)^5(x + 4)^3$ and give the multiplicity of each zero. State whether the graph crosses the x-axis or touches the x-axis and turns, at each zero.
   3.2. Solve $x^2 - 6x + 8 \geq 0$ and leave your answer in interval notation.
   3.3. The intensity of light received at a point varies inversely as the square of the distance from the source of light. A particular light has an intensity of 20 footcandles at 15 feet. What is the light’s intensity at 10 feet?
4. Solve exponential and logarithm equations using properties of exponential and logarithmic functions; use exponential decay and growth to solve application problems.
   4.1. Solve. $3^{x+2} = 5$
   4.2. Solve. $6 + 2 \ln x = 5$
   4.3. Suppose you invest $4000. Which investment yields the greater return over 6 years: 5.5% compounded semiannually or 5.25% compounded monthly.
5. Solve systems of equations by various methods, including matrices, and solve systems of inequalities by graphing.
   5.1. Solve the system by the substitution method, the elimination by addition method, or matrix methods. $\begin{cases} 2x - y = 2 \\ x + 2y = 11 \end{cases}$
   5.2. Solve this system by eliminating variables by the addition method or using matric methods. $\begin{cases} x + 2y - z = 5 \\ 2x - y + 3z = 0 \\ 2y + z = 1 \end{cases}$
6. Use concepts of symmetry, intercepts, left- and right-hand behavior, asymptotes, and transformations to sketch the graph of various types of functions (constant, linear, quadratic, absolute value, piecewise-defined, square root, cubic, polynomial, rational, exponential, and logarithmic) or relations (circle) given in description and use graphs of functions for analysis.
   6.1. Graph $f(x) = |x - 1| + 2$
6.2. Use the leading coefficient test to determine the end behavior of the graph of \( f(x) = -5x^8 + 7x^2 - x + 9 \).

**Elementary Algebra**

1. **Use order of operations to simplify and evaluate arithmetic expressions including absolute value.**
   1.1. Use order of operations to simplify. \((-3)(-4) + (7 - 10)\)
   1.2. Simplify. \(11x - (7x - 4)\)
   1.3. Evaluate \(5(x - 7)\) at \(x = 4\).

2. **Simplify linear algebraic expression and equation; solve linear inequalities; and develop and solve mathematical models including number, geometry, and percentage applications.**
   2.1. Solve. \(2(4x + 3) - 8 = 46\)
   2.2. Solve \(8x - 4 \geq 12\) and leave the answer in interval notations.
   2.3. This year’s salary, $50,220, is an 8% increase over last year’s salary. What was last year’s salary?

3. **Graph linear equations by plotting points, identifying and using intercepts, and by the slope-intercept form of a line; find slope and intercept from equations and graphs; find equations of a lines using slope-intercept form and point-slope, including horizontal and vertical lines; and determine the slope of a line between two points.**
   3.1. Find the slope of the line passing through the given points. \((-5, 7)\) and \((3, -2)\)
   3.2. Graph the linear equation: \(4x - 2y = -8\)
   3.3. Find the equation of a line passing through the point \((3, -1)\) and has a slope of \(-2\).

4. **Simplify algebraic expressions involving exponents and polynomials; and express numbers in scientific notation.**
   4.1. Add or subtract as indicated: \((7x^3 + 3x^2 - 5x - 10) - (4x^3 - 8x^2 + 13x + 5)\)
   4.2. Divide \((2x^2 + x - 9)\) by \((x - 2)\).
   4.3. Write the number 7,450,000 in scientific notation.

5. **Factor expressions with common factors, expressions that require grouping, trinomial expressions, and differences of squares; and solve quadratic equations using the Zero Factor Property.**
   5.1. Factor. \(4x^2 + 4x - 15\)
   5.2. Factor. \(49 - 100y^2\)
   5.3. Use factoring to solve. \(2x^2 + 15x = 8\)

6. **Simplify rational expressions and solve rational equations.**
   6.1. Simplify. \(\frac{x^2 - 4x - 5}{x^2 + 8x + 7}\)
   6.2. Divide. \(\frac{6x+2}{x^2-1} \div \frac{3x^2+x}{x-1}\)
   6.3. Solve. \(\frac{4}{x-3} - \frac{1}{x} = \frac{6}{x(x-3)}\)

7. **Simplify radical expressions and solve radical equations.**
   7.1. Subtract and simplify. \(4\sqrt{50x} - 6\sqrt{32x}\)
   7.2. Solve and check. \(\sqrt{x} - 6 = 5\)
   7.3. Simplify. \(\sqrt{48x^5}\)
Intermediate Algebra

1. Solve linear equations.
   1.1. Solve. \( 5x + 3 = 18 \)
   1.2. Solve. \( 20 - \frac{x}{3} = \frac{x}{2} \)
   1.3. Solve. \( 3(x + 2) = 7 + 3x \)

2. Show understanding of functions by identifying the functions, using function notation, finding the domain and range of function, combining functions, finding slope of linear functions, using slope-intercept and the point slope form of a line to graph and find equations.
   2.1. Graph. \( y = \frac{1}{2}x - 3 \)
   2.2. For \( f(x) = 7x - 5 \), find \( f(-3) \).
   2.3. Find the equation of a line through the point \((3, 2)\) with a slope of \(-2\).

3. Solve linear inequalities, including compound inequalities; solve equations and inequalities involving absolute values; and solve linear inequalities in two variables.
   3.1. Solve \( 5x + 11 < 26 \) and leave your answer in interval notation.
   3.2. Solve. \( |2x - 3| = 11 \)
   3.3. Solve the linear system.

4. Simplify polynomial expressions, factoring quadratic expressions directly, using special forms, and by grouping; solve quadratic equations.
   4.1. Simplify. \( (3x + 7y)^2 \)
   4.2. Simplify. \( x^3y - 16xy^3 \)
   4.3. Solve. \( (x + 3)(x - 2) = 50 \)

5. Simplify rational expressions, including complex fractions; divide polynomials by long division and synthetic division; solve rational equations; develop and solve mathematical models involving mixture, motion, work, variation, etc.
   5.1. Simplify the rational expression. \( \frac{2}{x+3} + \frac{5x}{x^2-9} + \frac{2}{x+3} + \frac{2}{x-2} \)
   5.2. Divide: \( (4x^4 - 17x^2 + 14x - 3) \) by \( (2x - 3) \)
   5.3. On a dry asphalt road, a car’s stopping distance varies directly as the square of its speed. A car traveling at 45 miles per hour can stop in 67.5 feet. What is the stopping distance for a car traveling at 80 miles per hour?

6. Simplify expressions involving radicals and rational exponents; solve radical and rational exponent equations; and simplify expressions involving complex numbers.
   6.1. Simplify. \( \sqrt[3]{16x^4y^8} \)
   6.2. Solve. \( \sqrt{x + 9} - \sqrt{x - 7} = 2 \)
   6.3. Simplify. \( \sqrt{-8} \cdot \sqrt{-3} \)

7. Calculate the distance between two points.
   7.1. Find the distance between the given points: \((-5, 7)\) and \((-6, 5)\).

8. Solve quadratic equations using the Quadratic Formula; solve equations that are quadratic in form.
   8.1. Solve. \( x^2 + 5x - 10 \)
   8.2. Solve. \( 2x(x - 2) = x + 12 \)
8.3. Solve. \( x^3 - \frac{1}{3} - 12 = 0 \)

9. Simplify exponential and logarithmic expressions; solve exponential and logarithmic equations; and find inverse functions.

9.1. Simplify. \( \log_{12} 1 \)

9.2. Solve. \( \log(x + 3) + \log(x - 2) = \log 14 \)

9.3. Find the inverse function of: \( f(x) = (x + 2)^3 \)