Peirce College 2018-19 Institutional Learning Outcomes Assessment Report

This report is divided into three main sections. The first section is a report of the action items scheduled at the end of the previous period to be completed in 2019-20. Next is a section dedicated to the current year's assessment activities' methods, results, and implications. Finally, action item plans for the coming year are established and discussed.

Last Year's (2017-2018) Action Items in Review

Actions items established at the end of last year's SLOA cycle, together with their status at the end of the 2018-19 assessment cycle, are included the following:

1. Incorporate an introduction to research skills into BIS 111.
   This effort was completed in its entirety along with the comprehensive redesign of BIS 111 that concluded this year.

2. Review prerequisite requirements to make sure that ENG 103 is required for all courses requiring research writing.
   This review has been completed for the courses in the General Education core and the IT program, but still needs to be finalized across the entire undergraduate curriculum

3. Revisit the grading patterns for the courses that made up the basis for the sampled papers here to check for a change in grading habits, particularly with regard to the assignment of grades of 100%.
   This work is being finalized and will be reported under separate cover by the end of summer 2019.

4. Conduct during the 18-19 academic year a faculty-led professional development session dedicated to a discussion of grading and its implications.
   Given that this conversation is best framed by the results of item 3 above, this item was postponed to 2019-20. We hope to have such a session scheduled for the first all-hands faculty Professional Development Session of 2019-20.

5. Evaluate the prospect of revising the Peirce ILO statements
   This was tabled in light of the new incoming presidential administration and the impact that resultant changes might have on foundational issues of mission and vision from which such a review should stem.

6. Make the ILO focus of 2018-19 the quantitative portion of ILO 2: Solve problems using critical, analytical, and quantitative skills Conduct an ILO direct assessment project - see below

Shortcuts to Important Documents

SLOAC Presentations related to Quantitative Literacy assessment made during 2018-19 full faculty meetings include the following

1. Raw Datafiles and Analysis - Brian Finnegan, last edited 7/15/2019
2. Context, Background, and Introductory Discussion - Linda Curry, October 26, 2018
3. Planning the Quantitative Literacy Assessment Agenda - Brian Finnegan, December 7, 2018
4. Direct Assessment Results and Implications - Brian Finnegan, May 17, 2019

Quantitative Literacy Needs Assessment

A major objective for SLOAC in 2018-19 was to perform a comprehensive, per-department mathematics / quantitative literacy needs assessment that documents from a program perspective mathematical "must haves" together with department's perspectives on specific perceived pain points. The report summarizing that effort is contained in Appendix I.

In sum, with the exception of some idiosyncratic and discipline-specific material identified by the IT department (e.q. Facility with binary and octal numbers) , all key areas identified by the needs assessment are already addressed. While from one important perspective, this fact certainly represents a positive outcome, it does not change the fact that the identified gaps nonetheless do exist in spite of their being addressed in the required mathematics curriculum, and makes developing a strategy to address these shortcomings more challenging. See "2019-2020 Action Items" for further discussion.

Quantitative Literacy Direct Assessment Project

Introduction

Since 2008 it has been Peirce's standing practice to assess annually one of its six institutional learning outcomes using direct evidence of student learning. While ILO 2, the focus of 2018-19's efforts, was last assessed in 2012-13, the sole focus of that assessment was critical thinking, and quantitative skills were excluded from analysis[1]. The following summarizes the methods, results and implications of that assessment.

[1] The implications of the fact that a subset of our ILOs is overloaded with multiple independent objectives, and that these objectives are orthogonal to one another or nearly so, are worth considering when we do review and update our ILOs.

Context

Quantitative skills are addressed in the curriculum both in the required general education core curriculum and in the respective disciplines in accordance with their particular needs. All Peirce undergraduate students, irrespective of program, are required to satisfy the following mathematics requirements:

- MAT 101- Introduction to College Mathematics Prerequisite: A grade of C or above in MAT 010 or placement into college-level mathematics. Content begins with basic mathematical foundations and extends to include topics from finance and algebra such as simple and compound interest, investments, and loans. Concepts are interwoven with practical applications.
- MAT 102 - College Algebra Prerequisite: A grade of C or above in MAT 010 or placement into college-level mathematics. Designed to provide the student with a solid foundation in quantitative thinking, this is a course in real number algebra that focuses on operations and properties. Abstract and practical problems are solved using algebraic methods. The course provides practice in the use of variables in expressions and equations, reading and writing mathematical symbols, algebraic problem-solving, functional analysis, and interpreting and creating graphs.

Additionally, students are required to place into college-level mathematics (i.e. MAT 101) or to complete the following developmental mathematics course:

- MAT 010 Arithmetic & Elementary Algebra A grade of C or above is required in this course. This three-credit skills enhancement course is designed to increase students' academic readiness for college-level math courses. The course reviews computation and problem solving while concentrating on the concepts of beginning algebra. Percents, decimals, and fractions as well as signed numbers and powers (to include scientific notation) are covered. Beginning algebra topics of variables and expressions through solving linear equations, and the Cartesian coordinate system are included. Computer-assisted instruction is employed to facilitate students' abilities to engage in independent work. Students are expected to reflect back on the course content and seek additional means, through the resources provided in this course, to continue restructuring thought patterns and reinforcing skills with regular practice. This course does not satisfy course requirements for any degree program.

Methods

Locus of Analysis and Sample Identification

Our quantitative literacy needs analysis revealed that both the most commonly identified as well as the most pressing skills gaps were foundational. As such, MAT 101 was the focus of our empirical investigation.

Our typical ILO assessment involves a sample of the most recent year's bachelor's graduates. However, because our recent transition to a new Learning Management System ended reliable access to archived student work and related data, we were limited to post-transition data. Thus, rather than analyze longitudinal data, we examined a large cross section, gathering test score results from all students completing MAT 101 in the latest available calendar year.

MAT 101 is assessed mainly by objective examination, and as a result, manual rubric-based assessments were unnecessary, allowing us to examine the performance of all 258 students taking MAT 101. Because we were precluded from looking longitudinally, however, this sample involves students at all stages of their academic career, making results incommensurate with prior year's ILO projects and perhaps understating performance results, given that students often take MAT 101 quite early in their studies, and may well advance their quantitative abilities later in their studies.[2]

MAT 101 involves a comprehensive, high-stakes, multiple-choice final examination that served as an effective proxy of overall course performance and was the target of our analysis. The examination consisted of 52 questions (less 2 bonus questions that were omitted from analysis). Twenty-two sections were run; of these, 16 had question-level test data available, while the remaining 6 sections were scored offline.

Results

Overall

On average, the score across all 258 students in the sample was 75% correct. The range of individual question percentages went from a low of 36% correct for the most difficult question to a high of 96%for the easiest.

Per Outcome

The 52 questions making up the examination were then classified by MAT 101's course-level outcomes, which are as follows:

1. Apply the arithmetic of percents
2. Be proficient at reading tables or using special features of a calculator needed in business and finance calculations
3. Use algebraic methods to solve problems involving formulas
4. Solve applied problems using the latest banking practices
5. Apply concepts of personal debt management using current market rates
6. Demonstrate an understanding of and apply concepts of time-value of money
7. Calculate amounts for simple and compound interest
8. Solve problems involving percents and decimals encountered in daily living: basic calculations and applications from both business and personal finance
9. Make intelligent decisions involving consumer business applications

[2] That said, however, there exists a sense, at least to an extent reinforced by the data reported here relative to the results of the needs analysis, that quantitative skills are somewhat more ephemeral or forgettable than those of the other ILOs, and as a result skills could in fact degrade after time away from their point of primary reinforcement.

Average scores per MAT 101 outcome were as follows:

Outcome	Avg Correct
Use algebraic methods to solve problems involving formulas	83%
Apply the arithmetic of percents	78%
Solve problems involving percents and decimals encountered in daily living: basic calculations and applications from both business and personal finance	71%
Calculate amounts for simple and compound interest	67%
Be proficient at reading tables or using special features of a calculator needed in business and finance calculations	66%
Demonstrate an understanding of and apply concepts of time-value of money	62%
Apply concepts of personal debt management using current market rates	61%
Solve applied problems using the latest banking practices	59%
Make intelligent decisions involving consumer business applications	NA
Not classifiable	74%

Student performance per individual question is summarized in Appendix II

Discussion & Takeaways

Examining per-outcome performance shows some superficially surprising results. First, the outcome students did best in was using algebraic methods to solve problems using formulas. Given that this is among the most advanced topics in the class, it is unexpected to see students doing best here. This result appears to be related to an effect noted in several past institutional outcome analyses: the level at which students perform on a given outcome is a function of both their master level and the difficulty level at which the outcome is assessed.

Percentage math was the topic cited most frequently by non-GE faculty as a problem in their respective areas. Yet student performance in this outcome was second highest at 78 percent of questions being answered correctly. While this fact is a considerable relief given how foundational these skills are, it does indicate that at least at the time of completing MAT 101, a large majority of students are able to address this sort of material effectively. We suspect that this sort of arithmetic skills can be much more fleeting than other academic objectives.

Question Discrimination Issues

Question discrimination, measured by Point Biserial Correlation (PBC), reflects the extent to which students who perform best on a test overall are also among those who answer a given question correctly. When PBC is low, it indicates that those who did best on the test overall were less likely to have answered a given question correctly, which can indicate a misleading or even incorrectly keyed question. Test questions wit a PBC of under 0.3 and particularly under 0.2 warrant review. For the MAT 101 final examination, there were 20 questions with a PBC less than 0.3, 10 with less than 0.2 and 8 less than 0.1.

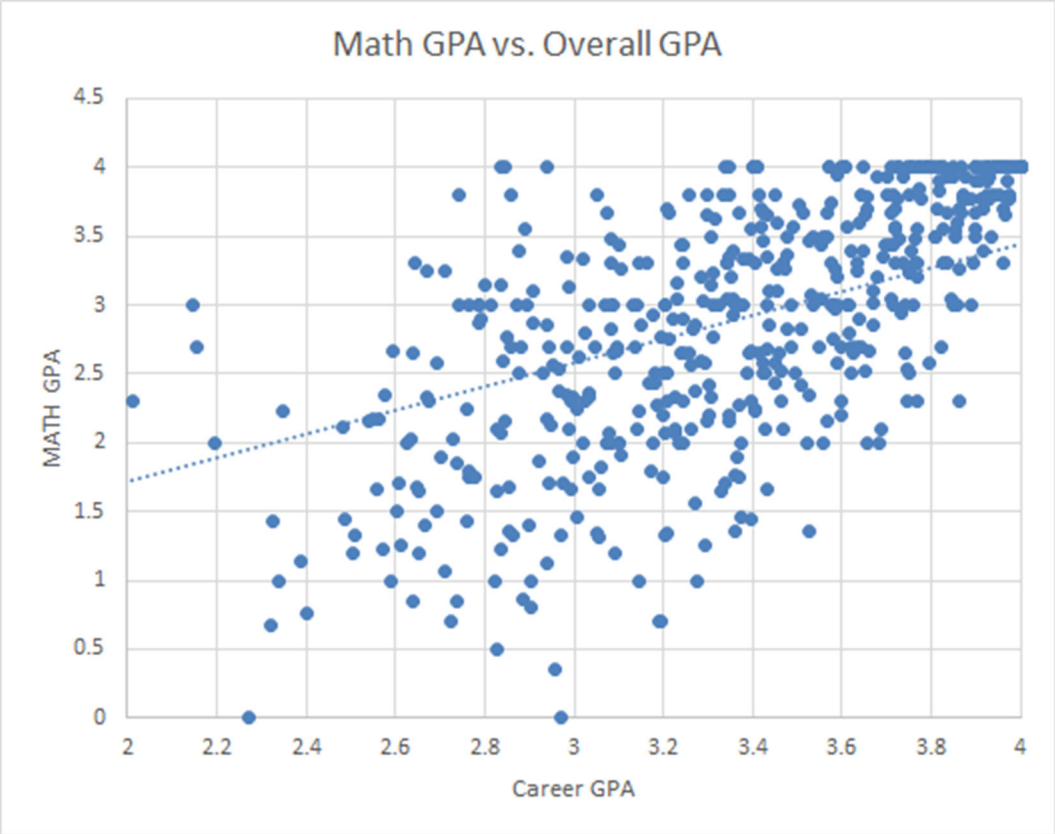
Three course-level outcomes represented over 76% of the questions with worrisome discrimination performance:

- Use algebraic methods to solve problems involving formulas (41%)
- Solve problems involving percents and decimals encountered in daily living (18%)
- Apply the arithmetic of Percents (18%)

Questions whose correct answers had a PBC of less than 0.3 will receive a manual review and revision as necessary, as indicated in the action item section that follows.

Graduates' Math Performance Compared to Overall Performance

As an ancillary analysis to the main one described above, we examined the math grades of the most recent 4 years of Peirce bachelor's graduates relative to their overall local career GPAs. As expected, performance in math classes was on average lower than overall local (i.e. non-transfer) academic performance:



This result at least to an extent confirms the widely held notion that Peirce students under-perform in mathematics. The regression line above show, for example, that on average one would expect a Peirce student with an overall GPA of 3.0 to have earned about a 2.6 in their math courses. At the highest end of the GPA scale (say, 3.75 or higher) there is a sizable cluster of students whose mathematics achievement outperforms their overall GPA.

Action Items for 2019-2020 in Light of these Assessment Results

While the results from the assessment study detailed herein are on the whole encouraging, there are nonetheless several action items that result from the study and the discussions faculty have had around them. They include the following:

- Consider extent of and prospects for closing gaps from departmental needs analysis:
    - Ratios
    - Data interpretation / analysis
- Update course-level outcomes in MAT 101, MAT 102
- Reconsider the role of MAT 102 in advancing Peirce students' mathematical / quantitative literacy needs
    - For example, there is not any obvious demand from degree-granting departments for factoring binomials, which occupies a large and prominent place in MAT 102

- Consider conducting a more comprehensive, curriculum-wide objective test QA initiative using item-level analysis via Canvas
- Make MAT 101 a prerequisite for MAT 102
- Review material in MAT 101 related to tax returns and banking applications and streamline for a focus on generalized applied problem solving rather than specific knowledge of or techniques related to tax preparation and/or finance
- Consider the prospect of adding a review of fractions and ratios to the material on percents in MAT 101
- Provide pointers to instructors in impacted courses to refresher material related to percentages, decimals, fractions, ratios and related foundational areas to help students with quick in-course refreshers.
- Review and, as necessary, revise the low discrimination question on the MAT 101 final examination.

Routine and Previously Planned Assessment Actions Planned for 2019-2020

- Conduct a faculty professional development event related to grading written assignments (carryover from last year)
- Complete GE prerequisite review (carryover from last year)

Multi-Year ILO Assessment Timetable (revised and updated 7/15/2019)

Year	ILO
2018-2019 (current year)	2. Solve problems using critical, analytical, and quantitative skills - Quantitative Literacy
2019-2020	2. Solve problems using critical, analytical, and quantitative skills - Critical Thinking
2020-2021	1. Communicate clearly and effectively both orally and in writing
2021-2022	4. Demonstrate information literacy
2022-2023	5. Use information technology proficiently and responsibly

(Note that ILO 3, Demonstrate up-to-date knowledge, skills, and methods in one's discipline, given that it is by its nature specific to the specific degree programs' respective disciplines, does not lend itself to institution-wide assessment and is as such omitted from institution-wide assessment. Program level assessment happens in all degree programs every year.)

Note Regarding Amendments to ILO Assessment Timetable

SLOAC altered the ILO timetable in light of the fact that while we assessed ILO 2 successfully in 2018-19 as planned, because it consists of multiple, independent components, ILO 2 was not assessed in its entirety. As such, we moved to add a separate full-scale assessment iteration for the unaddressed critical thinking component in 2019-2020, thus shifting the rest of the ILO assessment schedule ahead one year. 2019-2020 is a particularly good time to investigate Peirce students' critical thinking outcome performance given that COM 312, our capstone Gen Ed course will focus on

Appendix I: Quantitative Literacy Needs Assessment Report

Quantitative Reasoning Summary from Departmental Reviews

Summary of key elements is derived from department discussions and from full faculty discussions (Fall 2018). Overarching themes include spreadsheet usage (Excel), data analysis, and fraction/decimal/percent understanding. While all of these are within the current curriculum, additional measures to help students value, retain and utilize such skills may improve student performance in upper division courses and in careers as graduates. One suggestion is to have each department contribute both a short video on what math is utilized in their field and a data set for use in math classes to help with student buy-in and later success. Additionally, in all discussions of math and quantitative reasoning was the element of fear, both students who experience math anxiety as well as staff and faculty. Measures to help alleviate the impact of math anxiety is woven into the math course designs with computer aided learning (24/7 support and feedback is built into these programs), formative low-stakes assessments/assignments, and some take home exam options. Continued awareness of this issue is important, it is a wide-spread long-standing issue. Efforts to relieve math anxiety and engage students should be continued; Peirce efforts outside of course design include: High Engagement Approach to Teaching (HEAT), early alert reporting for high DFW courses, and support services including academic coaching. Appendix contains more details, summary highlights key elements and provides some details.

What to document

1. What math/quantitative skills do you want your grads to have? Both core must-haves and blue sky/wish list
2. What portion of these skills do you cover internally in your dept. and where/how?
3. From the perspective of your discipline, what are the basic quantitative life skills everyone needs?
4. Any indication of specific pain points for your students in math

Business:

1. Arithmetic, percentages (conversions and applications), roots of numbers, understanding ratios; analytical and critical thinking skills; TVM (via tables or formulas); averages (EV, mean, moving and weighted means); probability (introductory level); probability and statistics
2. Basics not covered in program courses (Gen Ed core and prerequisite skills), contextualized in program specific courses
3. Basic arithmetic, percentages, understanding ratios, data analysis
4. Fear of math and overcoming this fear/math anxiety; lack of Excel skills (proper selection and technical ability to utilize charts etc. from Excel)

Courses that utilize math and/or quantitative reasoning: ACC, FIN201 & 401, ENT225 & 401, MGT204 & 404, HRM201, 310, 330, & 395, BUS450

Healthcare:

1. Ratios and specific percentages and healthcare billing computations, QA measures: arithmetic; data manipulation, interpretation & analysis; Excel and use of real world data sets
2. HIT200 covers statistics and contextualized applications are throughout; HIA340 covers research methods, IRB and human subjects/ethics, and some descriptive statistics

3. Data analysis: understanding and proper use of healthcare statistics
4. Lack of Excel skills—technical aspects of data storage, retrieval, analysis and use of analysis (proper selection and technical ability to utilize charts etc. from Excel, note that some credentialing exams include data analysis)

Courses that utilize math and/or quantitative reasoning: HIT200 & 218, HIA340, 400 & 480, HCA340

Legal Studies:

1. Arithmetic (including integers, decimals and fractions), analysis (critical and analytical thinking), percents (determine and compare), statistical computation, deductive reasoning, understanding trial data and criminal statistics
2. Career specific skills such as billable hours and proportions allocated (e.g. % liability): LGL206 and 219 and capstone courses cover billing, percent breakouts, trial data and criminal statistics; from MAT courses, students need to understand what a rate is and values expressed as out of a unit value (such as crimes per 100,000 residents, why compare this and not the raw crime value)
3. Students need to show work steps, critical thinking skills, understand valuations, percentages and quantitative reasoning
4. Proportional thinking skills, deeper understanding of percent (using ratios and per unit numerical expressions properly); students need better technical skills with calculators or other technology—think it through and then compute correctly and interpret value correctly; credentialing exams involve applications such as area and measurement (not covered explicitly in current math courses but this is prerequisite K-12 content used in some assigned applications)

Courses that utilize math and/or quantitative reasoning: LGL113, 206 & 219, CJS101&107, Capstone courses in LGL and CJS

Information Technology:

1. Reading and using tables (numeric values), abstraction (creating formulas), spreadsheets (formulas, graphics and relationships), proportions and percent (e.g. usage and web traffic data), problem solving skills (how to approach a problem, reason through its solution)
2. Contextualized applications are in BIS111 and 201 as well as programming and NET courses.
3. Ability to abstract is a key skill for IT.
4. Students struggle with formulas and abstracting the relationship to program it into a spreadsheet or otherwise; problem solving tactics are needed.

Courses that utilize math and/or quantitative reasoning: BIS111 is an important course for introducing Excel and Office suite, BIS201, programming and networking courses

General Education:

1. General Studies students should have arithmetic and algebra math skills along with problem solving and critical thinking skills to support career and further academic success.
2. General studies students complete MAT and COM courses that support learning and practice of these stills.
3. From a general studies perspective, a broad ability to reason and compute are important, combating fear of math so that people go into their career or further academics engaged in math is important.
4. A general disinterest and fear of math is a pain point, students need to engage more to grow their math skills and reasoning abilities.

Courses that utilize math and/or quantitative reasoning: The core math and COM312 courses utilize math skills, challenge students with applications and problem solving (including contextualized problems) and the statistics

course includes extensive use of Excel for data manipulation and analysis. The core science courses also involve some use of math, as well as reading and interpreting data, charts, and tables.

Career Development: No response was received. Follow up with the new director may be useful in 2019-2020.

Sub-Appendix 1:
Departmental Submissions

In addition to content herein, notes from the December 2018 faculty meeting collaborative activity and follow-up discussion also informed the summary.

BUSINESS DEPARTMENT—MATH NEEDS FOR SLOC COMMITTEE

Information from Cathy:

1. What Math/quantitative skills do you want your graduates to have? Both core must-haves and blue sky/wish list?
Addition, subtraction, multiplication, division, use of percentages and understanding of ratios

2. What portion of these skills do you cover internally in your courses. and where/how?
We do not teach these skills in the ENT courses, BUS 100, BUS 210, or MGT courses, but expect students to have baseline math skills. As courses advance, level of analytical and critical thinking skills is needed.

3. From the perspective of your discipline, what are the basic quantitative life skills everyone needs?
Addition, subtraction, multiplication, division, use of percentages and understanding of ratios

4. Any indication of specific pain points for your students in Math?
Overcoming their fear of math – once they get past it, they are fine.

Specific course information from Cathy, Gail, & Michael:
ACC 101—Accounting Principles I
ACC 201—Financial Accounting
FIN 201—Introduction to Finance
ACC 222-Managerial Accounting

- Reducing fractions to decimals
- Converting decimals to percentages
- Additions, Subtractions, multiplications and Divisions
- Square roots, (and finding the roots of any number)
- Time Value of Money Calculations (using tables or calculators)
- Expected Value, Average, Moving and Weighted Mean
- Basic Concepts of Probability

ACC 203---Intermediate Accounting I
ACC 204—Intermediate Accounting II
ACC 301—Auditing
ACC 303—Cost Accounting
ACC 325—Taxation
ACC 401—Advanced Accounting
ACC 401—Government & Non Profit Accounting
ACC 425—Special Topics in Accounting
FIN 401—Financial Analysis
ENT225 – Accounting, Finance and Tax for Small Business

Assessed via homework assignments, projects (in part), and exams
Evaluate and interpret the financial performance of a business.

- Calculate the rate of return and risk analysis.
- Calculate venture capital needs using various models/methods.
- Apply payback, net present value, profitability index, internal rate of return, and accounting rate of return as techniques of capital budgeting.
- Determine the tax implications and securities laws in relation to venture financing.
- Expected Value, Average , Moving and Weighted Mean
- Basic Concepts of Probability
- Exponents and Reciprocals
- Variance and Standard Deviations
- Coefficient of Variations
- Reciprocals

ENT 401 Entrepreneurial Strategies and Tactics
Assessed via project and weekly assignments

- Formulate analytical and critical thinking skills through the process of developing a complete feasibility analysis for a new venture.
- Apply primary and secondary research skills necessary for a potential business acquisition.
- Evaluate the various management factors impacting small business operations.
- Identify management skills and personal characteristics necessary to succeed in a new venture.

MGT 204 Production and Operations Analysis
Assessed via homework

- Students use basic calculations to determine break even points, production schedules, and efficiencies of production lines.

MGT 404 Operations Management
Assessed via homework and project

- Students use calculations to determine ratios, break even points, production schedules, and organizational efficiencies and deficiencies.

Specific Course Information from Kristen:
HRM 201—Human Resource Management
HRM 330—HR Information Systems
HRM 395—Total Rewards

- Total Rewards has more metrics than other courses)
- Metrics are addressed

HRM 310—Training Development and Design

- Focuses on validity and value.

Information from—Charlene:

1. What Math/quantitative skills do you want your graduates to have? Both core must-haves and blue sky/wish list?

Students should be able to calculate financial ratios; calculate percentages; and interpret fractions.

2. What portion of these skills do you cover internally in your courses. and where/how?

Students are required to calculate financial ratios in the BUS 450, business capstone course.

3. From the perspective of your discipline, what are the basic quantitative life skills everyone needs?

Calculate percentages and interpret fractions.

4. Any indication of specific pain points for your students in Math?

Students have difficulty with calculating percentages, and interpreting fractions.

Information from Kristen:

1. What Math/quantitative skills do you want your graduates to have? Both core must-haves and blue sky/wish list?

Students in the HR program need to understand how to identify what needs to be measured and how to create the measurements to achieve those metrics. HR generally has a balanced scorecard to constantly monitor these metrics. It requires understanding basic math skills such as fractions and decimals as well as using excel to calculate and chart these metrics. Students must be able to convert numbers to percentages to represent the selected scorecard categories. They must be able to measure validity in the design of testing and other programs.

2. What portion of these skills do you cover internally in your courses. and where/how?

Metrics are addressed in HRM 201, HRM 330, HRM 395

3. From the perspective of your discipline, what are the basic quantitative life skills everyone needs?

Students need to use excel to calculate basic mathematical information such as fractions, mid, mean, and standards with or without deviation and present it clearly.

4. Any indication of specific pain points for your students in Math?

Students need to understand how to use excel to calculate and present data. They are able to either with or without a calculator perform basic math calculations but they struggle putting it into an excel program to present it professional context.

Health Care Programs
Quantitative Assignments

Healthcare Statistics HIT 200

Learning Outcomes:

At the conclusion of this course, students should be able to:

1. Collect, maintain and report data for clinical indices/databases/registries to meet specific organization needs such as medical research and disease registries
2. Collect, organize and present data for quality management, utilization management, risk management and other related studies.

3. Comprehend basic descriptive, institutional and healthcare vital statistics.
4. Abstract and report data for facility-wide quality management and performance improvement programs
5. Analyze clinical data to identify trends that demonstrate quality, safety, and effectiveness of healthcare data for facility-wide quality management and performance improvement programs.

Subdomain. Data Management			
Collect and maintain health data	Understand	● Health data collection tools ● Screen design, screens ● Data elements, data sets, databases, indices ● Data mapping ● Data warehousing	● During week 1, students utilize the Healthcare Cost and Utilization Project (HCUP), to explore and understand how various databases are utilized and what value these have in the healthcare community through statistical analysis. ● During week 4 students visit the Healthcare Research and Quality-Healthcare Cost and Utilization Project (Hospital Readmissions) and perform a query of their choice. They explain the query ran, what the query revealed and how the results can be utilized in healthcare statistics.
2. Apply graphical tools for data presentations	Apply	● Graphical tools ● Presentations	● During week 5 students apply statistics computed in health information such as FTE''s, productivity, variances, cost justification, mean, median, mode, range, frequency distribution, and standard deviation (SD). Students also utilize excel to complete a frequency distribution and create a histogram utilizing data provided by the instructor.
Subdomain. Analytics and Decision Support			
1. Explain analytics and decision support	Understand	● Analytics and decision support. ● Data visualization, dashboard, data capture tools and technologies	● During week 5 students must choose a statistical brief that interest them from HCUP. The need to read and analyze the brief, provide a summary to the class, discuss how the data was captured and what story/rationale is provided to the reader based on the data.
Subdomain. Health Care Statistics			
1. Utilize basic descriptive, institutional, healthcare statistics	Apply	● Mean, frequency, percentile, standard deviation, etc. ● Healthcare statistical formulas ● LOS, death, autopsy, infections, birth rates	● During week 1 students' complete homework that focuses on a review of basic math principles such as converting fractions to a quotient and a percentage, rounding decimals, converting fractions to simplest form, etc. ● During weeks 2-4 student's complete homework utilizing

			healthcare statistical formulas such as mortality rate, average LOS to calculate healthcare statistics, ● During week 5 students apply statistics computed in health information such as FTE''s, productivity, variances, cost justification, mean, median, mode, range, frequency distribution, and standard deviation (SD). Students also utilize excel to complete a frequency distribution and create a histogram utilizing data provided by the instructor. ● During week 6 students do homework focusing on descriptive statistics using scales of measurement of categorical and numerical data and how such data can be displayed (e.g. bar graphs, charts, etc.). Research methodology principles (basic and applied), research design, collection techniques are also part of their week 6 homework assignments. ● Week 7's homework focuses on Inferential statistics, such as confidence intervals, null hypothesis, ANOVA, and the t test, and introduction into data analytics (Predictive and descriptive). ● Cumulative final exam at the end of the course. ● Weekly matching terminology quizzes from each chapter so that students can understand and be fluent in mathematics vocabulary.
Subdomain. Research Methods			
1. Explain common research methodologies and why they are used in healthcare	Understand	● Research methodologies CDC, WHO, AHRQ ● Quantitative, Qualitative, and mixed methods, IRB	● During week 3 students are provided a NCHS Data brief (Mortality in the United States, 2016) and are asked to identify the two highest mortality rates (infants as well) in 2016 and 2015, explain what the report indicates regarding average life expectancy, and explain why the US mortality rates are higher in comparison to other countries identified within the brief. ● During week 4 students visit the Healthcare Research and Quality-Healthcare Cost and Utilization Project and perform a query of their

			choice. They explain the query ran, what the query revealed and how the results can be utilized in healthcare statistics. ● During week 7 students review a case study titled Sacred Space in OR, and identify/explain at least three of the research steps utilized and provide how they feel about the study.

Course: HIA400 Data Analytics in Healthcare

Assignment	Basic Computation	Algebraic Reasoning	Problem-solving	Data Mining	Data Gathering	Processing and Analysis	Statistical Case Study Review	Other math skills
Thoughts and Considerations – Using Healthcare Data to Analyze Healthcare Disparities						X		
Exploratory Data Applications: Explain the components of RVUs and their impact on physician reimbursement		X	X			X		
Identify appropriate data sources for preparing data to submit to Leapfrog			X		X	X		
Evaluate the format and quality of an infographic and recommend modifications to improve it						X		X [spatial reasoning and data interpretation]
Lab: Use COUNTIF function in Excel to create a frequency table						X		X [statistical analysis]
Lab: Use a dataset provided to build a Data Dictionary			X					X [logic]
Lab: Conduct a t-test analysis to evaluate whether mean LOS of dataset is comparable to CMS average			X			X	X	
Exams/Quizzes: Calculate case			X			X		

mix index, describe and explain the importance of MCC, CC, and baseline DRG								
Build a data dashboard using a given data set; requires student to select which data to present and explain why they selected it.			X		X	X		

For HIT 218 no document was provided but the qualitative assignments are listed below.

HIT 218 Healthcare Reimbursement, students complete the following assignments which require basic computation:

Calculating reimbursement

Case mix index

High Cost outlier payment

Calculating APC payment rate.

HCA340: Health Care Finance Assignment	Basic Computation	Algebraic Reasoning	Problem-solving	Data Mining	Data Gathering	Processing and Analysis	Statistical Case Study Review	Other math skills
Reading and interpreting a balance sheet						X		
Analyze/Compare/Contrast meaning of Value Based Payment as used by HC professionals						X		
Quiz: Variable and Fixed Costs, Salvage Value and Depreciation Expense calculation	X		X			X		
Quiz: Understanding financial statement components	X		X			X		
Quiz: Understanding operating and capital budgets			X			X		
Quiz: Forecasting, estimating average costs, budget development	X		X					
Excel Workbook: Allocating Fixed and Variable Costs	X		X			X		
Exercise: Calculate Contribution Margin and manipulate to maximize profit	X	X	X					

Discussion: Retrospective and Prospective analysis						X		X [using business math terminology in discussion]
Analyzing FTE cost and computing net days paid.	X					X		
Analyzing mixed costs: calculating variable and fixed cost components	X					X		
Applying cumulative inflation factors	X					X		

Course: HIA480 Strategic Planning and Operations Management

Assignment	Basic Computation	Algebraic Reasoning	Problem-solving	Data Mining	Data Gathering	Processing and Analysis	Statistical Case Study Review	Other math skills
Building a budget – interactive model demonstrating budgetary planning	X		X			X		

Purpose: determine what qualitative literacy expectations you have of your students in a given course.

Definition: quantitative literacy includes basic computation, algebraic reasoning, problem-solving, data mining, data gathering, processing and analysis, statistical case study reviews, as well as other measurable assignments that measure mathematical skills and knowledge of our students.

Course: HIA 340 Healthcare Research Methods

COURSE DESCRIPTION:

This course builds upon the principles of healthcare statistics and focuses on inferential statistics and research methodology principles. Research methods including survey, observational, experimental and quasi-experimental, and epidemiological research are examined as are methods of data collection, reporting, and presentation. The ethical, legal, and social implications of undertaking research on human subjects and role of the IRB are closely examined.

COURSE LEARNING OBJECTIVES:

1. Distinguish between ordinal, ratio, interval, and nominal variables
2. Interpret the meaning of basic statistics
3. Complete a literature review using credible scholarly articles from the Peirce Library
4. Create simple graphs and charts using statistical software
5. Construct surveys and questionnaires that allow for useful data analysis

6. List the criteria necessary to establish causation between two variables
7. Connect research questions with the appropriate research methodology and design
8. Critique research articles based on the requirements of the IRB, and based on the 4 four ethical principles: Justice, Beneficence, Non-maleficence, and Justice

Research Paper Assignment

Step 1. Introduction and Literature Review (700-1000 words including reference page)

To begin the research paper, students must first select a specific research topic in the area of healthcare. Students will struggle to complete the rest of this paper if they choose topics that are too broad. For example, rather than choosing "Healthcare Policy" to research, students might choose the topic: "Strategies to Promote Menu Labeling Policies in Philadelphia". Or, instead of choosing something broad like "HIPAA", students might choose to research, "Best Practices in HIPAA Trainings for Healthcare Managers".

Students are required to identify at least FIVE SCHOLARLY ARTICLES in academic journals to better understand the subject matter. Students must read all of the articles and organize the themes into a comprehensive literature review, including an APA style reference page. Please note: A successful literature review does not simply summarize each article, but it identifies trends and themes throughout the body of research. The student's findings should be synthesized and analyzed in a way that demonstrates critical thinking skills.

Step 2. Survey Methodology (100-400 words not including the actual survey)

Using the topic that you chose in step 1, develop a survey of 12 questions that you could administer to friends, family members, coworkers, or classmates.

For example, if your topic was "Best Practices in HIPAA Trainings for Healthcare Managers", you might develop questions like:

What do you look for in a professional training?

On a scale of 1-10, how interested would you be in receiving more advanced training related to HIPAA?

How many hours of HIPAA training have you received in your career?

If your topic was "Benefits of preventive medicine", you might ask questions like:

How many times a year do you visit your primary care physician?

What kinds of conversations has your doctor had with you about prevention of chronic disease?

Guidelines:

1. Develop at least 12 questions to submit for a grade.
    1. Include 2-3 demographic questions.
    2. You do not have to include any qualitative (open-ended) questions, but if you choose to, do not include any more than 2 questions that are qualitative in nature.
    3. Keep in mind that Step 3 of the project (due next week) requires you to calculate some basic statistics from your survey results. You will need to be able to calculate things like, "30% of my participants expressed interest in advanced HIPAA training" or "I asked my participants how many doctor visits they have had in the past year, and the average answer was 2". Design your questions in a way that will allow you to perform some basic calculations.

1. Administer your survey to at least 6 people. Choose anyone you like.

2. Write 100-400 words about how you selected your sample. Write about how you felt when administering the survey. Were there questions that you wanted to edit or change after you started administering the survey? Did your participants find any questions confusing or difficult to answer? What would you do differently if you were to repeat this activity in the future?

Step 3. Results (300-500 words)

Analyze the results of your survey including a visual display of data

Step 4. Critique Your Work (400-700 words)

What problems did you run into and what would you do differently in the future? The best researchers are the ones who know how to critique their own work. Every single research study on earth has problems, and yours will too. You cannot earn full credit for this section if you claim that there were no limitations of your study.

For your final paper submission, submit all of your work in one document.

Legal Studies Math Competencies

1. **What is desired of a college graduate in your field, with regard to quantitative skills.**

   Basic Computational Skills (addition/subtraction/multiplication/division)
   Analysis / Utilize critical and analytical thinking skills
   Understanding of numbers (positive, negative, decimals)
   Percents and how to determine and compare.
   Statistical Computation
   Deductive Reasoning Skills

Specific Program/Course Learning Outcome examples:

CJS Program LO # 2: Proficiency in the methods for conducting, analyzing, and utilizing criminal justice research

LSB Program LO #1: Utilize critical and analytical thinking skills in business and legal work assignments

Paralegal Program LO #1: Utilize critical and analytical thinking skills in paralegal work assignments

2. **What quantitative reasoning is covered in your courses or part of an assignment that you use in a capstone (or any course)?**

LGL113: Timekeeping, time management (all courses), Time records, Billing rates hourly, If lawyer A charges $99.00 per hour and pts in 124 billable hours what is the client charged.

Comparative negligence. How jurors assigned a percentage of responsibility in civil cases.

CJS 101/107: discussion and understanding of crime rates. Comparing one jurisdiction to another. Why is one cities rate per 100,000 people higher than others if they actually had less incidences of crime? Students don't seem to come understanding what a rate per # actually means.

3. **What are you wanting them to get in Gen Ed math courses? Have we identified a gap anywhere that can be remedied with curricular changes or course sequencing etc.**

Students need to show work. Often they just arrive at an answer without showing how they got there.

Critical thinking skills.

Valuations

Percentage

Quantitative Reasoning.

Are there any credentialing exams that your students might sit for that require math or quantitative reasoning?

Students who wish to move from Paralegal or LSB to seek a JD will need to take the LSAT.

Students interested in security may have to take the Certified Protection Professional exam.

CPP Requirements: https://www.asisonline.org/certification/certified-protection-professional-cpp/cpp-exam-domains-and-knowledge-statements/

Includes such things as quantitative and qualitative risk assessments, and cost benefit analysis. Measurements, computation of area, perimeter, etc would also be expected.

Appendix II - Per-Question Performance

Question	Primary Outcome	Difficulty
Write as a percent: 0.011	1	0.97
Solve the equation: 5 = b - 9	3	0.95
Solve the equation: s + 1.5 = 6.24	3	0.95
Solve the equation: 30.5 = 6.1c	3	0.89
Find the Social Security tax and Medicare tax on the annual gross income of a self-employed individual. For a self-employed person, the FICA rate is 12.4% and the Medicare rate is 2.9%. Round to the nearest cent if needed. Drew Laughlin, attorney, earned $54,296.53	8	0.88
Solve for part in the problem. Round to the nearest hundredth, if necessary: 2 1/5 % of 96 quarts	1	0.87
Solve the problem. The appliance store where the Jordans shop offers a 9% discount for paying cash. The Jordans received a discount of $87. What was their total bill before the discount? Round to the nearest dollar.	8	0.87
Solve the equation: 9.4 = 4.7c	3	0.87
Find the federal withholding tax for the employee. Use the wage bracket method.	?	0.86
Find the median. Number of miles driven: 12, 12, 38, 54, 60, 69, 79	?	0.86
Find the missing quantities. Round rates to the nearest whole percent and money to the nearest cent.	8	0.84
Write the phrase as a mathematical expression. Use x as the variable. The quotient of 2 less than a number and 8 more than the number	3	0.84
Use this graph to answer the question. Which month in 2010 had the lowest sales?	2	0.83
This frequency table gives the distribution of ages of 100 people in a small town. How many people are: Less than 30 years of age	2	0.83
Find the final balance in the check register.	?	0.81
Find the average inventory.	?	0.81

Find the stock turnover at cost and at retail. Round to the nearest hundredth.	?	0.81
Solve for rate in the problem. Round to the nearest tenth of a percent: 4.1 cases is _____% of 22.0 cases.	1	0.80
Solve the problem. Sharon Welberts owns common stock valued at $5700, which is 5% of her total investments. What is the value of her total investments? Round to the nearest dollar.	8	0.80
Solve the problem. Round dollars to the nearest cent and rates to the nearest tenth of a percent. The cost of an item is $284. The price is marked up 20% on cost. Find the selling price of the item.	8	0.80
Find the compound amount for the certificate of deposit. Assume daily compounding using the following table. Round to the nearest cent. Amount: $2100 Rate: 3% compounded daily Years: 4	7	0.78
Solve the problem. Henry Smith buys a $100,000 T-bill at a 5.6% discount for 28 weeks. Find the purchase price of the T-bill. (Assume 52 weeks per year.)	4	0.75
Solve the problem. Anita Anderson owns bank CDs valued at $10,100, which is 12% of her total investments. What is the value of her total investments? Round to the nearest dollar.	8	0.75
Translate the statement into a mathematical expression: A salesperson drove 7 hours. How long will he have driven t hours later?	3	0.74
From the following credit card transactions, find the credit-card sales less refunds. Then find the amount of the charge at the statement date.	8	0.74
Make a bar graph using the given frequencies. The frequency distribution indicates the height in feet of persons in a group of 270 people.	2	0.74
Find the balance forward for the check stub.	?	0.73
Find the exact number of days from the first date to the second. Assume that the second month is in the following year, and assume no leap years. July 16 to January 14	?	0.72
Find the principal. Round to the nearest cent. Rate: 11% Time: 180 days Interest: $32.67	5	0.72

Solve the problem. Round dollars to the nearest cent and rates to the nearest tenth of a percent. The Oak House had a markup of $20.71 on an oak table that they sold for $85.99. Find (a) the cost, (b) the markup on cost, and (c) the selling price as a percent of cost.	8	0.72
Find the present value of the annuity. Round to the nearest cent. Payments of $16,000 made annually for 10 years at 10% compounded annually (PV of an Annuity table provided)	6	0.69
Solve for base in the problem. Round to the nearest hundredth, if necessary: 70% of _____ barrels is 69 barrels.	1	0.68
Find the missing numbers. Round rates to the nearest tenth of a percent and dollar amounts to the nearest cent.	8	0.66
Solve the application problem. Round to the nearest cent. (PV of annuity table provided) Find the least amount that could be deposited in a bank account today at 4% compounded semiannually to allow $1875 withdrawals at the end of each 6 months for 10 years.	4	0.65
Solve the problem. Round dollar amounts to the nearest cent. Use ordinary interest unless otherwise indicated. Linda Young bought a new computer system. To pay for the system, she borrowed from the credit union at 10 1/2 % interest for 85 days. Find the interest.	7	0.65
Find the weighted mean. Round to the nearest tenth. Value Frequency 16 1 17 7 22 6 27 3 34 2 37 3	?	0.64
Find the amount of the ordinary annuity rounded to the nearest cent. (annuity amount table provided) Amount of each deposit $7200 Deposited Quarterly Rate 6% Time(years) 4	4	0.62
Solve the formula for the specified variable: A = 1/2 bh for b	3	0.62

Solve the problem. Customer relations specialists need to respond to email messages in addition to taking calls. The department is thinking of creating a new position that will solely handle email. The supervisor records the number of email messages received for eight consecutive days: 10, 7, 29, 18, 27, 50, 33, 31. Find the median number of email messages received.	?	0.61
Solve the problem. Barbara knows that she will need to buy a new car in 6 years. The car will cost $15,000 by then. How much should she invest now at 10%, compounded quarterly, so that she will have enough to buy a new car?	6	0.59
Find the present value. Round to the nearest cent. Amount Needed $13,000 Time (years) 8 Interest 10% Compounded Semiannually	6	0.57
Use values from the compound interest table to find the compound interest. Round to the nearest cent.$18,000 at 6% compounded semiannually for 6 years	7	0.57
Solve the problem. Round rates to the nearest tenth of a percent, dollar amounts to the nearest cent, and time to the nearest day. Mark Golden needs $7870.30 to pay for remodeling work. His bank loans money at a discount rate of 9% for 270 days. Find the face value of a loan so he will have $7870.30.	5	0.56
Find the discount period. Loan made: July 13 Length of loan: 180 days Date of discount: Sep 9	5	0.55
Calculate the total amount due to the IRS from the firm. Peter's Landscaping collected $1038.07 FICA, $247.16 medicare, and $296.08 federal withholding from employees.	?	0.54
Find the tax refund or tax due. The letter following the name indicates the marital status, and all married people are filing jointly. Assume a 52-week year. Use $3700 for each personal exemption; a standard deduction of $5800 for single people, $11,600 for married people filing jointly, $5800 for married people filing separately, and $8500 for head of a household; and the tax rate schedule. Taxable Income $83,233 Fed Income Tax withheld from checks $241.93 weekly	2	0.53

Solve the application problem. If no interest rate is given, assume 3 1/2 % interest compounded daily. Round to the nearest cent. Kerry and Andy Zell are retired and after saving their entire life, they have $200,000 in a savings account paying compounded daily. What is their gain or loss in purchasing power in a year in which the CPI is 6%?	4	0.52
Solve the problem. Round rates to the nearest whole percent and dollar amounts to the nearest cent. The Galerie d'Art paid $118.60 for a limited edition Graux print. The original selling price was $154.18, but this was marked down 29% to make room for incoming pieces. If operating expenses are 21% of cost, find the operating loss and the absolute loss.	8	0.48
Find the Social Security tax for the current pay period. Assume a 6.2% FICA rate up to a maximum of $115,000: Gross Earnings This Year: $108,213.25 Current Period Earnings: $4024.90	1	0.47
Reconcile the bank statement with the check register balance. Find the current balance.	4	0.43
Use the percentage method of withholding, a FICA rate of 6.2%, a Medicare rate of 1.45%, an SDI rate of 1%, and a state withholding tax of 3.4%. One withholding allowance is $73.08 when paid weekly.Larry Calanan has earnings of $511 in a week. He is single and claims 2 withholding allowances. His deductions include FICA, Medicare, federal withholding, state disability insurance, state withholding, union dues of $15, and charitable contributions of $21. Find his net pay.	8	0.37
Find the amount of taxable income and the tax owed. The letter following the name indicates the marital status, and all married people are filing jointly. Use $3700 for each personal exemption; a standard deduction of $5800 for single people, $11,600 for married people filing jointly, $5800 for married people filing separately, and $8500 for head of a household; and the following tax rate schedule. Marital status - M Num exemptions 3 Adjusted Gross Income $102,367 Total Deductions $11,610	2	0.36