Assessing Mathematical Reasoning in Finite Math Class (M118)

IU Northwest students will:

• Use mathematical models such as formulas, graphs, tables to draw inferences. (i)

• Represent mathematical information symbolically, visually, numerically, and verbally. (ii)

• Demonstrate the ability to effectively use arithmetic, algebraic, geometric, logical and/or statistical methods to model and solve real world problems. (iii)
M118 serves a large audience (~140 students per semester)

Help in Math Lab is limited to tutors having extensive knowledge of probability and linear programming

D,W,F rates are higher than in other 100-level math classes (44% vs 37%)

Importance of creative problem-solving and statistics (Northwest Indiana Business community considers these essential to success in the business world)
Data Collected from IUIE for all M118 students from Spring 2004 to Spring 2006

59% of students are female
SPSS t-test shows no significant difference in performance of male and female students

High percentage (34.5%) of African-American and Latino students
SPSS t-test shows significant difference at level less than 0.1% in performance of minority students

While traditional and non-traditional students preparation differs - average Math SAT is higher by 43 points for the traditional students, SPSS t-test shows no significant difference in performance of the two groups
Study/Interventions funded by the Center for Regional Sustainable Vitality (2007)

Service Learning (specialized tutors)

Use of Math Anxiety Rating Test (MARS) (U Colorado, 1972)

Common Midterm and Final Exams preceded by practice problems published on the web

Enforced prerequisites with practice pretest published on the departmental website
Conclusions of CRE study

Midterm Exam is a good and significant predictor of student success. So is the Final Exam.

Service Learning did not significantly impact success of our students (only a small percentage of the students visited the Math Lab.)

MARS scores did not predict success.
DFW Rates Math Classes
Spring 2004-Spring 2008

Term and Year
Frequency


M118 All Other Math 100 Level Classes
M#5. How many 5-person committees are possible from a group of 10 people if
a) There are no restrictions?
b) John must be on the committee? (i, ii, iii)

M#7. An experiment consists of dealing 6 cards from a standard deck. What is the probability of being dealt 6 clubs? What is the probability of being dealt five face cards? (i, ii, iii)

M#11. Two balls are drawn in succession out of a box containing 10 red and 4 white balls. Find the probability that the second ball is white. Note that the balls are not replaced before the second draw. (i, ii, iii)
**F#3.** Solve the following system using matrix methods.  
Show all the row operations. (i, ii)

\[
\begin{align*}
    x - 2y - 3z &= -1 \\
    2x + y &= 3 \\
    x + 5z &= -7
\end{align*}
\]

**F#6.** A corporation wants to lease a fleet of 16 airplanes.  
There are three types of plane available: small, which carries 10 passengers, medium, which carries 14 passengers, and large, with the capacity of 25 passengers. The company needs to transport 340 passengers. Assume that the cost of leasing and operating a plane is proportional to its carrying capacity. Set up a linear system whose answer will help you determine how many of each type of plane should be leased? Write the augmented matrix of the system. (ii, iii)

**F#9.** Graph the system of linear inequalities and find the coordinates of each corner: (i,ii)

\[
\begin{align*}
    x + y &\leq 10 \\
    x + y &\geq -10 \\
    2x - y &\leq 10 \\
    x - 3y &\geq -15
\end{align*}
\]
**Assessment Findings M 118  F 2007**

Six problems (that address mathematical reasoning outcomes) were assessed for a random sample of 20 students (that received C or better in Fall 2007  M118 – Finite mathematics classes)

85% of students scored better than 70% (satisfactory) on the six problems and thus achieved given outcomes.

Average performance was between 81% and 84% (between excellent and satisfactory) for all problems but one. The hardest problem had an average score of 63% (needs improvement).

The average Midterm Exam score was 84% (between excellent and satisfactory) vs. 76% (satisfactory) on the Final Exam.

Based on this we plan to put more emphasis on systems of linear inequalities and on preparation for the Final Exam in the future.
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Conclusion

We are confident that the students who passed the course achieved goals of the class and general education mathematical reasoning outcomes.

We plan to put more emphasis on systems of linear inequalities and on preparation for the Final Exam in the future.

Provide support for specialized tutoring for M118 through Student Support Services

We will continue to analyze data and based on these results adjust our program to help students succeed.