

TO: Kathy McConnell, Ruth Heinrichs and Kerry Fulcher
FROM: Maria Zack
RE: Mathematical, Information and Computer Sciences Department Assessment Report
DATE: May 28, 2010

Department Mission Statement:

The Mathematical, Information and Computer Sciences Department at Point Loma Nazarene University is committed to maintaining a curriculum that provides its students with the tools to be productive, the passion to continue learning, and Christian perspectives to provide a basis for making sound value judgments.

Department Learning Outcomes

1. Teach/Learning: Graduates will have a coherent and broad based knowledge of their discipline.
2. Shape/Growing: Students will develop characteristics necessary to be effective members of the communities where they work and live.
3. Send/Serving: We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities.

Computer Information Systems Program Learning Outcomes:

1. Students will be able to write correct and robust software.
2. Students will analyze the interaction between hardware and software.
3. Students will use information management as a tool to support decision making in business environments.
4. Students will be able to apply their technical knowledge to solve problems.
5. Students will be able to speak about their work with precision, clarity and organization.
6. Students will be able to write about their work with precision, clarity and organization.
7. Students will collaborate effectively in teams.
8. Graduates will be prepared for:
 - a. careers that use computer information systems in business, industry, government and the non-profit sector; and
 - b. graduate study in fields related to computer information systems.

Computer Science Program Learning Outcomes:

1. Students will be able to write correct and robust software.
2. Students will use the theory of algorithms and computation to solve problems.
3. Students will analyze the interaction between hardware and software.
4. Students will be able to apply their technical knowledge to solve problems.
5. Students will be able to speak about their work with precision, clarity and organization.
6. Students will be able to write about their work with precision, clarity and organization.
7. Students will collaborate effectively in teams.
8. Graduates will be prepared for:
 - a. careers that use computer science in business, industry, government and the non-profit sector; and
 - b. graduate study in fields related to computer science.

Mathematics Program Learning Outcomes:

1. Students will be able to demonstrate facility with analytical concepts.
2. Students will be able to write proofs.
3. Students will be able to demonstrate facility with algebraic structures.
4. Students will be able to apply their mathematical knowledge to solve problems.
5. Students will be able to use technology to solve problems.
6. Students will be able to speak about their work with precision, clarity and organization.
7. Students will be able to write about their work with precision, clarity and organization.

8. Students will collaborate effectively in teams.
9. Graduates will be prepared for:
 - a. careers that use mathematics in business, industry, government and the non-profit sector;
 - b. graduate study in fields related to mathematics; and
 - c. teaching mathematics and computer science at the secondary level.

Curriculum Maps

The maps for each program can be found on the next three pages.

Computer Information Systems Curriculum, Outcomes and Assessment Diagram (April 18, 2011)

Institutional Learning Outcome	PLNU Mission Component	Department Learning Outcomes	Program Learning Outcomes	Introduced	Reinforced	Mastery	Measure	Global Measure
<i>Learning: Informed by our Christian Faith:</i> Members of the PLNU community will display openness to and mastery of foundational knowledge and perspectives; think critically, analytically, and creatively; and communicate effectively.	<i>....minds are engaged and challenged</i>	Graduates will have a coherent and broad based knowledge of their discipline. (Learning/Teach)	Students will be able to write correct and robust software.	CSC143 MTH164 ISS242	CSC153 CSC254 ISS424	ISS324 CSC493*	CSC 254 Signature Assignment (A) <i>To be developed.</i>	TEACH: ETS overall score (A) Alumni Survey (5)
			Students will analyze the interaction between hardware and software.	CSC133 CSC143	CSC153 CSC254 CSC314	CSC374 CSC493* ISS414 ISS424	CSC314 Signature Assignment (A) <i>To be developed.</i>	
			Students will use information management as a tool to support decision making in business environments.	CSC 133 MTH203 ECO102	ISS242 ACC201* BUS201* BUS212	ISS 414 BUS313* BUS332* BUS374*	ISS414 Signature Assignment (2) <i>To be developed.</i>	
<i>Growing: In a Christian Faith Community:</i> Members of the PLNU community will demonstrate God-inspired development and understanding self and others and live hospitably within complex professional, environmental and social contexts.	<i>....character is modeled and formed</i>	Students will develop characteristics necessary to be effective members of the communities where they work and live. (Growing/Shape)	Students will be able to apply their technical knowledge to solve problems.	CSC143 MTH203	CSC153 CSC254 CSC412* ISS242	ISS414 ISS424 ISS472^ ISS481 CSC493* HON498 & HON499^ ISS496 & ISS497^ ISS498 & ISS499^	ISS414 Signature Assignment (2) <i>To be developed.</i>	
			Students will be able to speak about their work with precision, clarity and organization	COM100 CSC153 CSC254	ISS242 ISS324	ISS481 CSC493* ISS472^ HON498 & HON499^ ISS496 & ISS497^ ISS498 & ISS499^	Senior Seminar: Oral presentation evaluated by a jury using a rubric (A).	
			Students will be able to write about their work with precision, clarity and organization	WR110 CSC153 CSC254	ISS242 ISS324	ISS481 CSC493* ISS472^ HON498 & HON499^ ISS496 & ISS497^ ISS498 & ISS499^	Senior Seminar: Written summary evaluated by a jury using a rubric (A).	
			Students will collaborate effectively in teams.	CSC143 CSC153 MTH164	CSC254 CSC314	ISS324 ISS424 ISS472^ CSC493* ISS496 & ISS497^	CSC324 Group assignment (2) Group rubric/questionnaire <i>To be developed.</i>	
<i>Serving: In a Context of Christian Faith:</i> Members of the PLNU community will engage in actions that reflect Christian discipleship in a context of communal service and collective responsibility, serve both locally and globally in a vocational and social setting	<i>....service becomes an expression of faith</i>	We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities. (Serving/Send)	Graduates will be prepared for: <ul style="list-style-type: none"> careers that use computer information systems in business, industry, government and the non-profit sector ; and graduate study in fields related to computer information systems. 	This occurs throughout the curriculum in every class and is the overall goal of the program.			Overall ETS Score (A) Alumni survey (5)	

- A – means that the measure is done annually (once it has been phased into the cycle)
2 – means that the measure done every two years (once it has been phased into the cycle)
5 – means that the measure done every five years (once it has been phased into the cycle)
* - means and elective
^ - means that the student must choose one in the list

Computer Science Curriculum, Outcomes and Assessment Diagram (April 18, 2011)

Institutional Learning Outcome	PLNU Mission Component	Department Learning Outcomes	Program Learning Outcomes	Introduced	Reinforced	Mastery	Measure	Global Measure
<i>Learning: Informed by our Christian Faith:</i> Members of the PLNU community will display openness to and mastery of foundational knowledge and perspectives; think critically, analytically, and creatively; and communicate effectively.	<i>....minds are engaged and challenged</i>	Graduates will have a coherent and broad based knowledge of their discipline. (Learning/Teach)	Students will be able to write correct and robust software.	CSC143	CSC153 CSC254 CSC354 CSC394 ISS424*	CSC324 CSC493	CSC 254 Signature Assignment (A) <i>To be developed.</i>	TEACH: ETS overall score (A) Alumni Survey (5)
			Students will use the theory of algorithms and computation to solve problems.	CSC133 MTH164 MTH174	CSC254 CSC394 MTH274* MTH343	CSC354 CSC422	ETS: Structures and algorithms subscore (A)	
			Students will analyze the interaction between hardware and software.	CSC133 CSC143	CSC153 CSC254 CSC314 CSC374 CSC422 ISS414* ISS424*	CSC394 CSC454 CSC493	ETS: Computer Organization, Architecture and Operating Systems subscore (A) and CSC314 Signature Assignment (A) <i>To be developed.</i>	
<i>Growing: In a Christian Faith Community:</i> Members of the PLNU community will demonstrate God-inspired development and understanding self and others and live hospitably within complex professional, environmental and social contexts.	<i>....character is modeled and formed</i>	Students will develop characteristics necessary to be effective members of the communities where they work and live. (Growing/Shape)	Students will be able to apply their technical knowledge to solve problems.	CSC143 MTH203* MTH233* MTH382* MTH392* ISS242*	CSC153 CSC254 CSC412 MTH373* ISS424*	CSC354 CSC493 ISS414* ISS472^ HON498 & HON499^ CSC496 & CSC497^ CSC498 & CSC499^ CSC481	CSC493 Signature Assignment (2) <i>To be developed.</i>	Senior Seminar: Oral presentation evaluated by a jury using a rubric (A). Senior Seminar: Written summary evaluated by a jury using a rubric (A). CSC324 Group assignment (2) Group rubric/questionnaire <i>To be developed.</i>
			Students will be able to speak about their work with precision, clarity and organization	COM100 CSC153 CSC254	CSC324 CSC354	CSC481 CSC493 ISS472^ HON498 & HON499^ CSC496 & CSC497^ CSC498 & CSC499^		
			Students will be able to write about their work with precision, clarity and organization	WRI110 CSC153 CSC254	CSC324 CSC354	CSC481 CSC493 ISS472^ HON498 & HON499^ CSC496 & CSC497^ CSC498 & CSC499^		
			Students will collaborate effectively in teams.	CSC143 CSC153 MTH164	CSC254 CSC314 CSC354 CSC454	CSC324 CSC493 CSC496 & CSC497^ ISS424*		
<i>Serving: In a Context of Christian Faith:</i> Members of the PLNU community will engage in actions that reflect Christian discipleship in a context of communal service and collective responsibility, serve both locally and globally in a vocational and social setting.	<i>....service becomes an expression of faith</i>	We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities. (Serving/Send)	Graduates will be prepared for: <ul style="list-style-type: none"> careers that use computer science in business, industry, government and the non-profit sector ; and graduate study in fields related to computer science. 	This occurs throughout the curriculum in every class and is the overall goal of the program.			Overall ETS Score (A) Alumni survey (5)	

A – means that the measure is done annually (once it has been phased into the cycle)
2 – means that the measure done every two years (once it has been phased into the cycle)
5 – means that the measure done every five years (once it has been phased into the cycle)
* - means and elective
^ - means that the student must choose one in the list

Mathematics Curriculum, Outcomes and Assessment Diagram (April 18, 2011)

Institutional Learning Outcome	PLNU Mission Component	Department Learning Outcomes	Program Learning Outcomes	Introduced	Reinforced	Mastery	Measure	Global Measure
<i>Learning: Informed by our Christian Faith:</i> Members of the PLNU community will display openness to and mastery of foundational knowledge and perspectives; think critically, analytically, and creatively; and communicate effectively.minds are engaged and challenged	Graduates will have a coherent and broad based knowledge of their discipline. (Learning/Teach)	Students will be able to demonstrate facility with analytical concepts.	MTH164 MTH174	MTH274 MTH352 MTH402* MTH471*	MTH413** MTH424	ETS: Calculus subscore (A)	TEACH: ETS overall score (A) Alumni Survey (5)
			Students will be able to write proofs.	MTH242	MTH343** MTH352 MTH402*	MTH424 MTH444	MTH242 (A), MTH424 (2) and MTH444 (2) Signature Assignments <i>To be developed.</i>	
			Students will be able to demonstrate facility with algebraic structures.	MTH164 MTH174 MTH274	MTH233 MTH242 MTH352 MTH343**	MTH444	ETS: Algebra subscore (A)	
<i>Growing: In a Christian Faith Community:</i> Members of the PLNU community will demonstrate God-inspired development and understanding self and others and live hospitably within complex professional, environmental and social contexts.character is modeled and formed	Students will develop characteristics necessary to be effective members of the communities where they work and live. (Growing/Shape)	Students will be able to apply their mathematical knowledge to solve problems.	MTH233 MTH274 PHY241	MTH382 MTH343** MTH402* MTH471* MTH492*	MTH333 MTH373** MTH392* MTH413** HON498 & HON499^ MTH496 & MTH497^ MTH498 & MTH499^ MTH481	ETS: Applied subscore (A)	
			Students will be able to use technology to solve problems.	MTH131 MTH164 MTH174 MTH274 CSC143	MTH333 CSC153 CSC254 MTH492*	MTH382 MTH373** HON498 & HON499^ MTH496 & MTH497^ MTH498 & MTH499^	MTH382 Signature Assignment (2) <i>To be developed.</i>	
			Students will be able to speak about their work with precision, clarity and organization	COM100 MTH164 MTH174 MTH274	MTH233 MTH242 MTH352 MTH373** MTH471	MTH424 MTH444 MTH481 MTH492 HON498 & HON499^ MTH496 & MTH497^ MTH498 & MTH499^	Senior Seminar: Oral presentation evaluated by a jury using a rubric (A).	
			Students will be able to write about their work with precision, clarity and organization	WRI110 MTH164 MTH174 MTH274	MTH233 MTH242 MTH352 MTH373**	MTH424 MTH444 MTH481 MTH492 HON498 & HON499^ MTH496 & MTH497^ MTH498 & MTH499^	Senior Seminar: Written summary evaluated by a jury using a rubric (A).	
			Students will collaborate effectively in teams.	MTH164 MTH174 MTH274 CSC143	MTH233 MTH242 MTH352 MTH492 CSC153	MTH382 MTH424 MTH444 MTH496 & MTH497^ MTH373**	MTH352 Group assignment (2) Group rubric/questionnaire <i>To be developed.</i>	
<i>Serving: In a Context of Christian Faith:</i> Members of the PLNU community will engage in actions that reflect Christian discipleship in a context of communal service and collective responsibility, serve both locally and globally in a vocational and social setting.service becomes an expression of faith	We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities. (Serving/Send)	Graduates will be prepared for: <ul style="list-style-type: none"> careers that use mathematics in business, industry, government and the non-profit sector ; graduate study in fields related to mathematics; and teaching mathematics and computer science at the secondary level. 	This occurs throughout the curriculum in every class.			Overall ETS Score (A) Alumni survey (5) Fieldwork evaluations for prospective teachers (A)	

A – means that the measure is done annually (once it has been phased into the cycle)
2 – means that the measure done every two years (once it has been phased into the cycle)
5 – means that the measure done every five years (once it has been phased into the cycle)

** - means students must choose two of the three of these
* - means elective
^ - means students must choose one of these

Multi-Year Assessment Plan

Note that some of the signature assignments may move to alternating years once rubrics are tested.

2009-10

ETS Exam (A)

Senior Seminar Oral and Written Presentations (A)

Alumni Survey (5)

2010-11

ETS Exam (A)

Senior Seminar Oral and Written Presentations (A)

CSC254 Signature Assignment and Rubric (develop) (A)

MTH242 Signature Assignment and Rubric (develop) (A)

MTH242 Signature Assessment (A)

MTH213 and MTH223 Assessment (Liberal Studies) (A)

MTH213 and MTH223 Signature Assignments and Rubric Developed, and Historical Data Gathered

GE: MTH144, MTH164, MTH303 Assessment (Random Samples) (A)

GE: MTH144, MTH164, MTH303 Signature Assignments and Rubric Developed, and Historical Data Gathered

2011-12

ETS Exam (A)

Senior Seminar Oral and Written Presentations (A)

CSC254 Signature Assignment (A)

MTH242 Signature Assignment (A)

CSC314 Signature Assignment and Rubric (develop) (A)

ISS414 Signature Assignment and Rubric (develop) (2)

MTH382 Signature Assignment and Rubric (develop) (A)

MTH213 and MTH223 Assessment (Liberal Studies) (A)

GE: MTH144, MTH164, MTH303 Assessment (Random Samples) (A)

2012-13

ETS Exam (A)

Senior Seminar Oral and Written Presentations (A)

CSC254 Signature Assignment (A)

CSC314 Signature Assignment (A)

MTH242 Signature Assignment (A)

MTH382 Signature Assignment (A)

CSC324 Signature Assignment and Rubric to measure teamwork (develop) (2)

CSC493 Signature Assignment and Rubric (develop) (2)

MTH352 Signature Assignment and Rubric to measure teamwork (develop) (2)

MTH444 Signature Assignment and Rubric (develop) (2)

MTH213 and MTH223 Assessment (Liberal Studies) (A)

GE: MTH144, MTH164, MTH303 Assessment (Random Samples) (A)

2013-14

ETS Exam (A)

Senior Seminar Oral and Written Presentations (A)

CSC254 Signature Assignment (A)

CSC314 Signature Assignment (A)

MTH242 Signature Assignment (A)

MTH382 Signature Assignment (A)

ISS414 Signature Assignment (2)

MTH424 Signature Assignment and Rubric (develop) (2)

Alumni Survey (5)

MTH213 and MTH223 Assessment (Liberal Studies) (A)

GE: MTH144, MTH164, MTH303 Assessment (Random Samples) (A)

2014-15

ETS Exam (A)

Senior Seminar Oral and Written Presentations (A)

CSC254 Signature Assignment (A)

CSC314 Signature Assignment (A)

MTH242 Signature Assignment (A)

MTH382 Signature Assignment (A)

CSC324 Signature Assignment to measure teamwork (2)

CSC493 Signature Assignment (2)

MTH352 Signature Assignment to measure teamwork (2)

MTH444 Signature Assignment (2)

MTH213 and MTH223 Assessment (Liberal Studies) (A)

GE: MTH144, MTH164, MTH303 Assessment (Random Samples) (A)

2015-16

ETS Exam (A)

Senior Seminar Oral and Written Presentations (A)

CSC254 Signature Assignment (A)

CSC314 Signature Assignment (A)

MTH242 Signature Assignment (A)

MTH382 Signature Assignment (A)

ISS414 Signature Assignment (2)

MTH424 Signature Assignment (2)

MTH213 and MTH223 Assessment (Liberal Studies) (A)

GE: MTH144, MTH164, MTH303 Assessment (Random Samples) (A)

2016-17

ETS Exam (A)

Senior Seminar Oral and Written Presentations (A)

CSC254 Signature Assignment (A)

CSC314 Signature Assignment (A)

MTH242 Signature Assignment (A)

MTH382 Signature Assignment (A)

CSC324 Signature Assignment to measure teamwork (2)

CSC493 Signature Assignment (2)

MTH352 Signature Assignment to measure teamwork (2)

MTH444 Signature Assignment (2)

MTH213 and MTH223 Assessment (Liberal Studies) (A)

GE: MTH144, MTH164, MTH303 Assessment (Random Samples) (A)

Assessment Activities

ETS Exams

We use ETS exams to give us data on students overall preparation (Program Learning Outcome #8 for CIS and CS and Program Learning Outcome #9 for Math) as well as using indicator scores measuring individual areas of learning.

Computer Information Systems (CS Test Taken Spring 2011)

Exam Score:	Score	Percentile
Department Average	140.8	20

Computer Information Systems Indicator Scores:

Assessment Indicator Scores:	Score	Percentile
Programming Fundamentals	53	30
Computer Org/Arch/Oper Sys	25	10
Alg/Theory/Comp Math	35	15

Five of the six CIS majors scored at the 25th percentile or higher. Thus our target of having at least half of the graduating class of CIS majors at the 25th percentile or higher was met. This is a significant improvement over the past few years. We believe that it may be the first sign that changing our Information Systems curriculum to a Computer Information Systems (CIS) by increasing the amount of computer science is having the intended outcome of producing CIS graduates with a greater depth of CS knowledge. Because ETS does not have a CIS exam, we are supplementing the ETS with other outcome measures embedded in courses.

Computer Science (Spring 2011)

Exam Score:	Score	Percentile
Department Average	156.3	70

Computer Science Indicator Scores:

Assessment Indicator Scores:	Score	Percentile
Programming Fundamentals	64	65
Computer Org/Arch/Oper Sys	39	65
Alg/Theory/Comp Math	56	90

Five of the seven Computer Science Majors obtained a score at or above the 50th percentile. The overall target of at least half of the graduating class of CS majors at the 50th percentile or higher was met.

Mathematics (Spring 2011)

Exam Score:	Score	Percentile
Department Average	163.3	80

Assessment Indicator Scores:	Score	Percentile
Calculus	39	70
Algebra	49	90
Routine	45	85
Non-routine	26	35
Applied	40	70

Five of seven students scored at or above the 50th percentile. The overall target of at least half of the graduating class of CS majors at the 50th percentile or higher was met.

Looking at longitudinal data (inserted on the next page) for the ETS exam a few things are worth noting:

- We have made adjustments in our Computer Science curriculum in the area of computer architecture and operating systems and it seems to be having an impact on the subscores in those areas.
- The scores on non-routine problems in the area of mathematics have been wildly erratic. In the spring of 2010 we did some analysis of this type of problem as part of our Program Review. It indicated three things:
 - Many other schools are also experiencing erratic scores in this area so there is probably on a limited amount that we can do to reduce the variability in scores.
 - They key areas of weakness for our students appear to be linear algebra, differential equations and some modeling. We have made modifications in our curriculum to address these issues. The new classes will begin in the Fall of 2011 (see the MICS Program Review for further details).
 - Our requirement of an “integrative experience” for all majors and that seems to be having a positive impact on our “applied” subscores.

ETS MFT Longitudinal Summary 2010-11

Score of 200 is possible

	2010-11		2009-10		2008-09		2007-08		2006-07		2005-06		2004-05		2003-04		2002-03	
	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Computer Science																		
Department Average	156.3	70	153.5	65	162.8	90	167.3	95	166.3	95	158.6	80	152.3	55	163.7	85	159.5	83
Percent of Students Above 50th Percentile		71%		60%		100%		100%		100%		75%		100%		83%		75%
Number of Students Taking the Test		7		5		4		3		3		8		3		6		8

Assessment Indicator Scores:	2010-11		2009-10		2008-09		2007-08		2006-07		2005-06		2004-05		2003-04		2002-03	
	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Programming Fundamentals	64	65	65	70	73	95	68	85	73	85*	*	*	*	*	66.7	85	65.4	83
Computer Org/Arch/Oper Sys	39	65	49	90	54	95	52	44	52	90*	*	*	*	*	39.2	75	40.9	83
Structures and Algorithms	56	90	49	70	50	70	77	95	59	90*	*	*	*	*	65.7	95	42.9	54

* Sample size too small to be given indicator scores.

Computer Information Systems	2010-11		2009-10		2008-09		2007-08		2006-07		2005-06		2004-05		2003-04		2002-03	
	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Department Average	140.8	20	138.8	15	137.8	10	120.0	1	133.75	15	142.3	20	122	1	145.8333	35	141.8	38
Percent of Students Above 25th Percentile		83%		20%		50%		0%		25%		100%		0%		83%		67%
Number of Students Taking the Test		6		5		4		1		4		3		1		6		6

Assessment Indicator Scores:	2010-11		2009-10		2008-09		2007-08		2006-07		2005-06		2004-05		2003-04		2002-03	
	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Programming Fundamentals	53	30	44	15	52	30	18	1	39	10	55.8	55*	*	*	42.7	20	40.8	33
Computer Org/Arch/Oper Sys	25	10	27	15	19	1	13	1	30	35	37.1	65*	*	*	25	15	26.3	33
Structures and Algorithms	35	15	31	10	33	15	17	1	21	1	45.4	45*	*	*	39	35	32.2	33

* Sample size too small to be given indicator scores.

Note in 2007-08 and 2004-05 only one Information Systems student took the test.

Mathematics	2010-11		2009-10		2008-09		2007-08		2006-07		2005-06		2004-05		2003-04		2002-03	
	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Department Average	163.3	80	160.3	70	162.3	75	161.3	75	166.5	85	173.4	90	157.6	65	155.3	55	169	93
Percent of Students Above 50th Percentile		71%		50%		67%		67%		75%		80%		50%		50%		100%
Number of Students Taking the Test		7		6		12		6		8		5		8		6		8

Assessment Indicator Scores:	2010-11		2009-10		2008-09		2007-08		2006-07		2005-06		2004-05		2003-04		2002-03	
	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Calculus	39	70	46	90	45	90	41	80	47	90	41.2	75	42.5	80	33.3	40	45.9	91
Algebra	49	90	42	65	45	80	45	80	46	80	56	95	35	25	50	75	56.6	90
Routine	45	85	42	75	43	75	41	70	48	90	52.2	90	42.6	75	51.3	65	62.6	95
Non-routine	26	35	25	20	25	25	32	75	30	70	40	95	22.8	15	21	10	32.5	92
Applied	40	70	43	85	48	95	38	60	40	75	40	75	33.8	45	46.2	70	49.9	84

Note the ETS change the Mathematics test in 2004-05

Summary of Program Learning Outcome Information from the ETS Scores:

Computer Information Systems Program Learning Outcomes:

1. Students will be able to write correct and robust software.
 - ETS scores satisfactory (see above)
 - CSC254 signature assignment to begin in 2011-12
2. Students will analyze the interaction between hardware and software.
 - ETS Scores satisfactory (see above)
 - CSC314 signature assignment to begin in 2011-12
3. Students will use information management as a tool to support decision making in business environments.
 - ETS scores satisfactory (see above)
 - ISS414 signature assignment to begin in 2011-12
4. Students will be able to apply their technical knowledge to solve problems.
 - ETS scores satisfactory (see above)
 - ISS414 signature assignment to begin in 2011-12
8. Graduates will be prepared for:
 - a. careers that use computer information systems in business, industry, government and the non-profit sector; and
 - b. graduate study in fields related to computer information systems.
 - ETS scores satisfactory (see above)

Computer Science Program Learning Outcomes:

1. Students will be able to write correct and robust software.
 - ETS scores satisfactory (see above)
 - CSC254 signature assignment to begin in 2011-12
2. Students will use the theory of algorithms and computation to solve problems.
 - ETS scores satisfactory (see above)
 - ETS subscore for Structures and Algorithms at the 90th percentile for the CS majors.
3. Students will analyze the interaction between hardware and software.
 - ETS scores satisfactory (see above)
 - ETS subscore for Architecture and Operating Systems at the 65th percentile for the CS majors. Note we see a cyclical pattern in these scores due to the alternating nature of our curriculum (e.g. the year before this score was in the 90th percentile).
 - CSC314 signature assignment to begin in 2011-12
4. Students will be able to apply their technical knowledge to solve problems.
 - ETS scores satisfactory (see above)
 - CSC493 signature assignment to begin in 2012-13
8. Graduates will be prepared for:
 - a. careers that use computer science in business, industry, government and the non-profit sector; and
 - b. graduate study in fields related to computer science.
 - ETS scores satisfactory (see above)

Mathematics Program Learning Outcomes:

1. Students will be able to demonstrate facility with analytical concepts.
 - ETS scores satisfactory (see above)
 - ETS subscore for Calculus 70th percentile for the Mathematics majors.
2. Students will be able to write proofs.
 - ETS scores satisfactory (see above)
 - MTH242 signature assignment used spring of 2011 (see details in Other Assessments)
3. Students will be able to demonstrate facility with algebraic structures.
 - ETS scores satisfactory (see above)

- ETS subscore for Algebra 90th percentile for Mathematics majors.
4. Students will be able to apply their mathematical knowledge to solve problems.
 - ETS scores satisfactory (see above)
 - ETS subscore for Applied 70th percentile for Mathematics majors.
 9. Graduates will be prepared for:
 - a. careers that use mathematics in business, industry, government and the non-profit sector;
 - b. graduate study in fields related to mathematics; and
 - c. teaching mathematics and computer science at the secondary level.
 - ETS scores satisfactory (see above)

Senior Seminar Oral Presentations and Written Reports

In the spring of 2011, 20 seniors participated in the Senior Seminar. Over the last few years we have continued to refine the rubrics that we are using to score students in this class. Below is the data summarizing the faculty evaluations of their written and oral presentations.

Oral Presentation:

	Average Score	Percent of students with an average of 2.5 or more
Background	3.29	95%
Organization	3.06	85%
Speaking Skills	3.21	90%
Presentation Tools	3.37	100%
Ability to field questions	2.92	100%

Written Report:

	Average Score	Percent of students with an average of 2.5 or more
Bibliography and support	2.63	55%
Organization	2.87	65%
Grammar and Spelling	2.73	60%
Depth of Information	2.65	50%
Clarity of Writing	2.91	70%

The data indicates that the department goal of at least 80% of the students earning a score of 2.5 or more in each major category was satisfied in the oral presentations. It was satisfied in none of the written report categories. We have been increasing the standards for writing in senior seminar in the last few years and this year the class had a number of particularly weak writers. Some of the difficulty arose from the students not using the rubric in preparing their final papers (e.g. the references were not cited correctly, abstracts were missing, etc.) We need to reinforce the use of the rubric as well as evaluate what can be done in earlier classes to strengthen writing.

Computer Information Systems

Oral Presentation:

	Average Score	Percent of students with an average of 2.5 or more
Background	3.10	83%
Organization	2.73	67%
Speaking Skills	2.88	67%
Presentation Tools	3.23	100%
Ability to field questions	2.56	100%

Written Report:

	Average Score	Percent of students with an average of 2.5 or more
Bibliography and support	2.21	33%
Organization	2.58	50%
Grammar and Spelling	2.29	50%
Depth of Information	2.29	67%
Clarity of Writing	2.65	67%

Computer Science

Oral Presentation:

	Average Score	Percent of students with an average of 2.5 or more
Background	3.33	100%
Organization	3.18	86%
Speaking Skills	3.28	100%
Presentation Tools	3.34	100%
Ability to field questions	3.59	100%

Written Report:

	Average Score	Percent of students with an average of 2.5 or more
Bibliography and support	2.63	55%
Organization	2.83	60%
Grammar and Spelling	2.74	60%
Depth of Information	2.60	45%
Clarity of Writing	2.86	65%

Mathematics

Oral Presentation:

	Average Score	Percent of students with an average of 2.5 or more
Background	3.33	100%
Organization	3.17	100%
Speaking Skills	3.33	100%
Presentation Tools	3.45	100%
Ability to field questions	2.52	100%

Written Report:

	Average Score	Percent of students with an average of 2.5 or more
Bibliography and support	2.79	71%
Organization	3.05	71%
Grammar and Spelling	2.89	71%
Depth of Information	2.96	57%
Clarity of Writing	3.20	86%

Looking at longitudinal data, the scores have been fairly consistent, but the effect of the faculty raising the standards on written reports is evident.

Oral Presentation	2010-11	2009-10	2008-09	2007-08	2006-07	2005-06	2004-05
Background	95%	100%	88%	94%	94%	80%	92%
Organization	85%	100%	94%	94%	94%	80%	92%
Oral presentation skills	90%	100%					
Presentation Tools	100%	100%	94%	88%	94%	80%	83%
Ability to field questions	100%	100%	100%	81%	94%	80%	92%

Written Report	2010-11	2009-10	2008-09	2007-08	2006-07	2005-06	2004-05
Bibliography and support	55%	88%	75%	69%	88%	60%	82%
Organization	65%	63%	88%	100%	94%	87%	91%
Grammar and Spelling	60%	81%	75%	94%	88%	73%	91%
Depth of Information	50%	88%	88%	81%	88%	60%	82%
Clarity of Writing	70%	81%	69%	94%	94%	80%	82%

Summary of Program Learning Outcome Information from the Senior Seminar Scores:

Computer Information Systems Program Learning Outcomes:

4. Students will be able to speak about their work with precision, clarity and organization.
 - Goal of 80% of the students scoring a 2.5 or higher was met in three of the five categories.
5. Students will be able to write about their work with precision, clarity and organization.
 - Goal of 80% of the students scoring a 2.5 or higher was met in none of the five categories.

Computer Science Program Learning Outcomes:

4. Students will be able to speak about their work with precision, clarity and organization.
 - Goal of 80% of the students scoring a 2.5 or higher was met in all five categories.
5. Students will be able to write about their work with precision, clarity and organization.
 - Goal of 80% of the students scoring a 2.5 or higher was met in none of the five categories.

Mathematics Program Learning Outcomes:

5. Students will be able to speak about their work with precision, clarity and organization.
 - Goal of 80% of the students scoring a 2.5 or higher was met in all five categories.
6. Students will be able to write about their work with precision, clarity and organization.
 - Goal of 80% of the students scoring a 2.5 or higher was met in one of the five categories (with three additional categories above 70%)

It is clear that we need to continue to work on the abilities of our students to write. We have just begun to use the rubrics for writing and presentations in other classes in the curriculum. This should help to build their capacities and familiarity with our expectations.

Alumni Survey

In the spring of 2010, the department surveyed alumni who had graduated in the last 15 years. The response rate on the survey was 31.7% with the majority (80.9%) of the respondents having graduated in the last decade. A detailed summary analysis of the data can be found in Appendix: 2010 Alumni Survey Results Summary of our department's Program Review. This appendix summarizes the information contained in roughly 130 pages of SPSS output.

Demographic Information:

The data indicates that the majority of our alumni entered PLNU as freshmen (80%) and almost all worked part-time, with 27.4% of them working 16 hours per week or more. 50% of this group of respondents are in graduate school or have completed a graduate degree. But they also report that only half started graduate school immediately after graduating, so it is expected that this percentage will rise over time.

Curriculum:

Our department has instituted three changes in the last five years that seem to have had an impact on developing critical skills in our graduates:

- Increasing the expectations for written and oral presentations in senior seminar (this is in addition to the writing and oral presentations that are threaded throughout our curriculum)
- Requiring all seniors in our department to take the senior seminar class
- Requiring an "integrative experience" (internship, year-long service learning project or year-long honor research project) of all of our majors.

This has a direct impact on five skills listed in the table below. The question on the survey is listed above the table.

Please tell us if your departmental course work enhanced your abilities in the listed areas:

		Very much enhanced	Much enhanced	Enhanced	Not enhanced and N/A
Think analytically and logically	2000-2004	53.8%	26.9%	15.4%	3.8%
	2005-2009	64.0%	36.0%	0.0%	0.0%
Write effectively in the discipline	2000-2004	11.5%	23.1%	42.3%	23.1%
	2005-2009	16.0%	36.0%	36.0%	12.0%
Effective oral communication	2000-2004	3.8%	23.1%	46.2%	26.9%
	2005-2009	12.0%	12.0%	60.0%	16.0%
Solve problems using technology	2000-2004	19.2%	46.2%	26.9%	7.7%
	2005-2009	32.0%	56.0%	8.0%	4.0%
Integrate knowledge from different sources	2000-2004	15.4%	34.6%	38.5%	11.5%
	2005-2009	8.0%	52.0%	32.0%	8.0%

Base on survey results it appears that our curricular changes have increased students growth in these important skills.

We also asked alumni about their preparation for the next step in their professional development.

How well did the undergraduate curriculum prepare you for:

	Well or higher	OK	Poorly
Work in the field (if went into the field)	85.2%	14.8%	0.0%
Graduate school	76.5%	5.9%	17.6%
Teaching	80.0%	20.0%	0.0%

Overall, our alumni believe that they were well prepared. Further investigation indicates that the students (3) who said that they were "poorly" prepared for graduate school are all mathematics majors who are employed as teachers and appear to be getting education-related masters degrees while working full-time. The hypothesis is that the "lack of preparation" may be in education coursework and not mathematics.

Spiritual Life and Service

There is no significant difference based on graduation date reflected in how our alumni respond to questions about whether or not their experience at PLNU enhanced their spiritual life and their cultural awareness. Over 95% of the respondents said that their relationship to Christ, the desire to engage in a life of service and their value for all people was enhanced while at PLNU.

We have seen an increase in students in our department becoming involved in extra-curricular activities. This is an encouraging sign of their increasing participation in the larger PLNU community.

How many hours per week were you involved in extra-curricular activities?

	2000-2004	2005-2009
None	30.8%	12.0%
1-5 hours	30.8%	60.0%
5-15 hours	23.1%	24.0%
16 or more hours	3.8%	4.0%

Employment:

Current employment information is listed below. It is clear that our alumni are finding jobs in a variety of fields. Of the alumni surveyed, only 2 reported that they were without work and seeking employment.

What category best describes your current job?

	2000-2004	2005-2009
Computer industry	24.0%	30.4%
Business (not in a computer related job)	12.0%	8.7%
Teaching	36.0%	21.7%
Industrial mathematics (actuary, mathematician, etc)	0.0%	4.3%
Other	28.0%	34.8%

Summary of the Program Learning Outcomes Information from the Alumni Survey (note that we did not disaggregate survey responses by major)

Computer Information Systems Program Learning Outcomes:

4. Students will be able to apply their technical knowledge to solve problems.
5. Students will be able to speak about their work with precision, clarity and organization.
6. Students will be able to write about their work with precision, clarity and organization.

Computer Science Program Learning Outcomes:

4. Students will be able to apply their technical knowledge to solve problems.
5. Students will be able to speak about their work with precision, clarity and organization.
6. Students will be able to write about their work with precision, clarity and organization.

Mathematics Program Learning Outcomes:

4. Students will be able to apply their mathematical knowledge to solve problems.
5. Students will be able to use technology to solve problems.
6. Students will be able to speak about their work with precision, clarity and organization.
7. Students will be able to write about their work with precision, clarity and organization.

Data from the Alumni Survey says that our graduates believe that their coursework in our department has enhanced:

- Their ability to write effectively (88% for those who graduated in 2005-09, 77% for those who graduated in 2000-04)
- Their ability to communicate orally in the discipline (84% for those who graduated in 2005-09, 73% for those who graduated in 2000-04)
- Their ability to solve problems using technology (96% for those who graduated in 2005-09, 92% for those who graduated in 2000-04)

Computer Information Systems Program Learning Outcomes:

8. Graduates will be prepared for:
 - a. careers that use computer information systems in business, industry, government and the non-profit sector ; and
 - b. graduate study in fields related to computer information systems.

Computer Science Program Learning Outcomes:

- 8. Graduates will be prepared for:
 - a. careers that use computer science in business, industry, government and the non-profit sector ; and
 - b. graduate study in fields related to computer science.

Mathematics Program Learning Outcomes:

- 9. Graduates will be prepared for:
 - a. careers that use mathematics in business, industry, government and the non-profit sector;
 - b. graduate study in fields related to mathematics; and
 - c. teaching mathematics and computer science at the secondary level.

Data from the Alumni Survey says that our graduates believe that they are well prepared for careers, teaching and graduate school (see details in the narrative above).

Signature Assignment Assessment for the Majors

This year we focused on refining out assessment efforts for GE and Liberal Studies classes (see section below). However, we did begin the use of one signature assignment and the associated rubric.

MTH242: Proof Writing Assignment

The students were given a signature assignment in proof writing near the end of the course. They were assessed in four areas with 1 being a low score and 4 representing outstanding.

	Average Score	Percent of students with an average of 2.5 or more
Statement of Problem	4.00	100%
Logic	4.00	100%
Symbolism	3.43	100%
Justification	3.00	86%

The criteria for success of 80% scoring over 2.5 in each area was met.

Assessment for Service Courses

Liberal Studies:

As part of our department's involvement in the preparation of multiple subject (elementary school) teachers, we have been assessing MTH213 and MTH223. Assessment is done via specific questions placed on the final exam. The problems align with Liberal Studies learning outcomes. In the spring of 2011 the department worked on building a standard set of questions to be inserted into the finals for each class. The scale for these problems runs from 0-4 with 4 being the best.

MTH213

	Students will be able to demonstrate a facility with operations on the integers (1b, 1c).	Students will be able to demonstrate a facility with operations on the rational numbers (1b, 1c).	Students will be able to apply concepts from number theory to solve problems (1a, 1b, 1c).
Fall 2008	3.40	2.96	3.16
Fall 2009	3.96	3.67	3.00
Fall 2010	3.78	4.00	3.66

MTH223

	Students will be able to construct geometric figures using a compass and straight edge (1b, 1c).	Students will be able to select and use the appropriate units for computing length, area and volume (1b, 1c).	Students will be able to distinguish between the appropriate uses of probability and statistics to solve problems (1a, 1b, 1c).
Spring 2009	4.00	3.11	3.78
Spring 2010	2.32	3.25	3.86
Spring 2011	3.29	3.03	1.81

Based on this longitudinal data, the students appear to be mastering basic concepts. It was clear as we were grading that the students are having trouble mastering basic probability. We need to look at both the curriculum and at the way that the question used in the spring of 2011 was phrased.

Calculus for General Education:

The department teaches two calculus general education classes, MTH144 and MTH164. We use the same learning outcomes for all GE classes but the questions used for the calculus classes are different from the questions used for MTH303 Problem Solving (see below). In the spring of 2011, the department worked on creating standardized questions to ask on exams. Before the spring of 2011, a variety of questions were asked on exams. Note that some of the variability of the longitudinal data is due to the lack of a standardized set of questions. The rubric is scored on 0-4 points with 4 being the highest. Reviewing the students' answers to the second problem in the spring of 2011, indicates that we need to make some adjustments to the wording of the problem.

		Students will be able to formulate a mathematical model from a verbal description of a problem.	Students will be able to solve non-routine problems using logic and quantitative techniques.	Students will be able to construct solutions to problems using computational techniques.
MTH144	Spring 2010	3.27	3.17	3.37
MTH144	Spring 2011	2.05	1.88	3.10
MTH164	Fall 2009	2.92	2.85	1.62
MTH164	Fall 2010	2.48	2.52	1.24

Note that our desire is that on average the students are performing at the satisfactory (2) or higher level. A review of the data indicates that the lower scores may be a function of the wording of some of the questions asked. This will be tracked moving forward with the standardized questions.

Problem Solving for General Education:

The students in majors that do not require calculus typically take MTH303 Problem Solving to meet their general education requirement. In the spring of 2011 we standardized the questions that would be asked in all problem solving courses for assessment purposes (before that date, the classes were not standardized across sections).

		Students will be able to formulate a mathematical model from a verbal description of a problem.	Students will be able it solve non-routine problems using logic and quantitative techniques.	Students will be able to construct solutions to problems using computational techniques.
MTH303	Fall 2007	2.19	3.14	2.22
MTH303	Spring 2008	3.32	2.82	3.42
MTH303	Fall 2008	3.63	3.30	3.50
MTH303	Spring 2009	3.37	3.07	2.93
MTH303	Fall 2009	2.78	2.78	3.22
MTH303	Spring 2010	3.16	3.26	3.61
MTH303	Fall 2010	3.28	2.73	3.55
MTH303	Spring 2011	2.66	2.79	2.96

Note that the students on average are consistently performing in our target range of satisfactory (2) or higher.

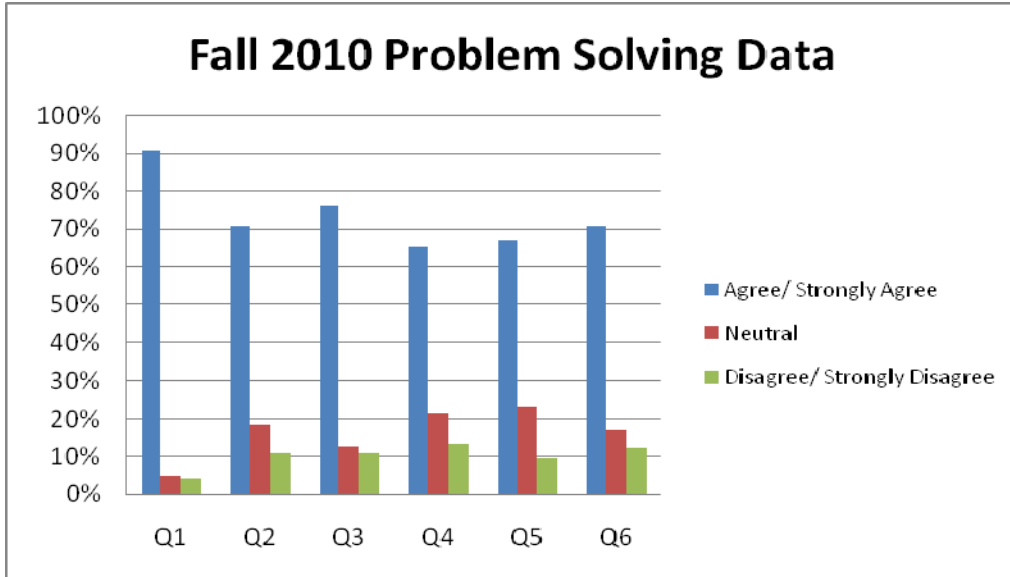
In addition to scoring student work in problem solving, we also administer an attitudinal survey about the course. This survey is aligned with some of our course goals. The results for the surveys are given below.

Survey:

The students were given a five point scale ranging from strongly agree to strongly disagree and asked to respond to the following questions:

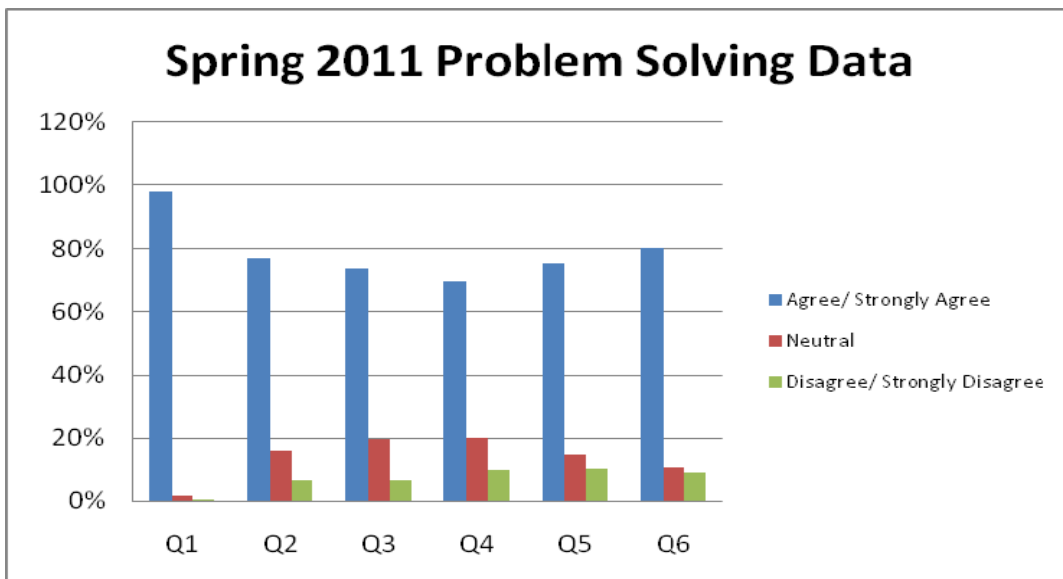
1. In this class we have been directly involved in problem solving activities.
2. This class has contributed to my ability to solve different types of problems.
3. This class has expanded my methods of exploration in problem solving.
4. This class has contributed to my ability to make educated guesses and check their correctness by analyzing their implications.
5. This class has helped me to understand major concepts, methods and applications of critical thinking.
6. This class has helped me to see the importance of problem solving in our modern society.

Fall 2010 (164 responses):



Fall 2010 Questions	Agree/ Strongly Agree	Neutral	Disagree/ Strongly Disagree
Q1: Involved in problem solving activities	91%	5%	4%
Q2: Contributed to problem solving ability	71%	18%	11%
Q3: Expanded methods of exploration	76%	13%	11%
Q4: Ability to make educated guesses and analyze	65%	21%	13%
Q5: Concepts, applications and methods of critical thinking	67%	23%	10%
Q6: See importance of problem solving	71%	17%	12%

Spring 2011 (179 responses):



Spring 2011 Questions	Agree/ Strongly Agree	Neutral	Disagree/ Strongly Disagree
Q1: Involved in problem solving activities	98%	2%	1%
Q2: Contributed to problem solving ability	77%	16%	7%
Q3: Expanded methods of exploration	74%	20%	7%
Q4: Ability to make educated guesses and analyze	70%	20%	10%
Q5: Concepts, applications and methods of critical thinking	75%	15%	10%
Q6: See importance of problem solving	80%	11%	9%

This data indicates that based on student perceptions, our course objectives are on some level being achieved. This pattern of responses is very consistent across the years (see the most recent five years of longitudinal data below). There have been some slightly lower scores in recent years for questions four and five and we need to watch that trend. We have made curricular changes to emphasize more financial management (savings, loans, retirement plans, credit cards and budgeting) and certainly those topics lead to less “educated guessing” than some of the other material covered in the course.

Most Recent Five Year of Longitudinal Problem Solving Data (Agree and Strongly Agree)

	2006-07		2007-08		2008-09		2009-10		2010-11	
	Fall 06	Spring 07	Fall 07	Spring 08	Fall 08	Spring 09	Fall 09	Spring 10	Fall 10	Spring 11
Q1: Involved in problem solving activities	97%	98%	95%	99%	95%	99%	96%	97%	91%	98%
Q2: Contributed to problem solving ability	82%	82%	82%	93%	86%	93%	86%	82%	71%	77%
Q3: Expanded methods of exploration	82%	80%	76%	89%	81%	89%	82%	76%	76%	74%
Q4: Ability to make educated guesses and analyze	75%	80%	75%	82%	76%	82%	78%	71%	65%	70%
Q5: Concepts, applications and methods of critical thinking	76%	79%	81%	86%	84%	86%	78%	68%	67%	75%
Q6: See importance of problem solving	79%	79%	85%	86%	79%	86%	82%	81%	71%	80%

LEARNING OUTCOMES ASSESSMENT PLAN
DEPARTMENT OF MATHEMATICAL, INFORMATION AND COMPUTER SCIENCES
Updated Spring 2011

COMPUTER INFORMATION SYSTEMS MAJOR

Department Learning Outcome (Teach): *Graduates will have a coherent and broad-based knowledge of the discipline of Computer Information Systems.*

Means of assessment (annual): Require students to take the ETS Major Field Test in Computer Science as the mid-term exam in ISS481, Senior Seminar in Information Systems.

Criteria of success: 50% of our students achieve above the 25th percentile on the exam.

Program Learning Outcomes (Teach):

1. Students will be able to write correct and robust software.

Means of Assessment (annual): CSC254 Signature Assignment (assignment and rubric to be developed)

Criteria for Success: *To be determined.*

2. Students will analyze the interaction between hardware and software.

Means of Assessment (every 2 years): CSC314 Signature Assignment (assignment and rubric to be developed)

Criteria for Success: *To be determined.*

3. Students will use information management as a tool to support decision making in business environments.

Means of Assessment (every 2 years): ISS414 Signature Assignment (assignment and rubric to be developed)

Criteria for Success: *To be determined.*

Department Learning Outcome (Shape): *Students will develop characteristics necessary to be effective members of the communities where they work and live.*

Program Learning Outcomes (Shape):

4. Students will be able to apply their technical knowledge to solve problems.

Means of Assessment (every 2 years): ISS414 Signature Assignment (assignment and rubric to be developed)

Criteria for Success: *To be determined.*

5. Students will be able to speak about their work with precision, clarity and organization.

Means of Assessment (annual): Each student will be required to give a 20-minute oral presentation on a topic in their field as a part of their participation in the Senior Seminar. The

audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Command of background material
- Organization
- Oral presentation skills (added as part of the new rubric in the spring of 2010)
- Use of presentation tools
- Ability to field questions from the audience

Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

6. Students will be able to write about their work with precision, clarity and organization.

Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Bibliography and other supporting documentation
- Organization
- Grammar and spelling
- Depth of information
- Clarity of writing

Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

7. Students will collaborate effectively in teams.

Means of Assessment (annual): CSC324 Signature Assignment (assignment and rubric to be developed).

Criteria for Success: *To be determined.*

Department Learning Outcome (Send): *We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities.*

Program Learning Outcomes (Send):

8. Computer Information Systems graduates will be adequately prepared for entry into graduate school or jobs in the computing profession.

Means of assessment (annual): Require students to take the ETS Major Field Test in Computer Science as the mid-term exam for the capstone course, Computer Science 481, Senior Seminar in Computer Science.

Criteria of success: 50% of our students achieve above the 50th percentile on the exam.

Means of assessment (every 5 years): Alumni will be surveyed every five years. They will be asked at least the following questions:

- If you have a job in Computer Science: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Science curriculum at PLNU prepared you for your work in the field?
- If you are going to graduate school or went to graduate school: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Science curriculum at PLNU prepared you for graduate school?

Criteria of success: An average response of 2 for each question.

COMPUTER SCIENCE MAJOR

Department Learning Outcome (Teach): *Graduates will have a coherent and broad-based knowledge of the discipline of computing.*

Means of assessment (annual): Require students to take the ETS Major Field Test in Computer Science as the mid-term exam for the capstone course, Computer Science 481, Senior Seminar in Computer Science.

Criteria of success: 50% of our students achieve above the 50th percentile on the exam.

Program Learning Outcomes (Teach):

1. Students will be able to write correct and robust software.

Means of Assessment (annual): CSC254 Signature Assignment (assignment and rubric to be developed)

Criteria for Success: *To be determined.*

2. Students will use the theory of algorithms and computation to solve problems.

Means of Assessment (annual): ETS Major Field Test in Computer Science: Structures and Algorithms subscore

Criteria for Success: *To be determined.*

3. Students will analyze the interaction between hardware and software.

Means of Assessment (annual): ETS Major Field Test in Computer Science: Computer Organization, Architecture and Operating Systems subscore and CSC314 Signature Assignment (assignment and rubric to be developed).

Criteria for Success: *To be determined.*

Department Learning Outcome (Shape): *Students will develop characteristics necessary to be effective members of the communities where they work and live.*

Program Learning Outcomes (Shape):

4. Students will be able to apply their technical knowledge to solve problems.

Means of Assessment (every 2 years): CSC493 Signature Assignment (assignment and rubric to be developed)

Criteria for Success: *To be determined.*

5. Students will be able to speak about their work with precision, clarity and organization.

Means of Assessment (annual): Each student will be required to give a 20-minute oral presentation on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated

by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Command of background material
- Organization
- Oral presentation skills (added as part of the new rubric in the spring of 2010)
- Use of presentation tools
- Ability to field questions from the audience

Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

6. Students will be able to write about their work with precision, clarity and organization.

Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Bibliography and other supporting documentation
- Organization
- Grammar and spelling
- Depth of information
- Clarity of writing

Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

7. Students will collaborate effectively in teams.

Means of Assessment (annual): CSC324 Signature Assignment (assignment and rubric to be developed).

Criteria for Success: *To be determined.*

Department Learning Outcome (Send): *We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities.*

Program Learning Outcomes (Send):

8. Computer Science graduates will be adequately prepared for entry into graduate school or jobs in the computing profession.

Means of assessment (annual): Require students to take the ETS Major Field Test in Computer Science as the mid-term exam for the capstone course, Computer Science 481, Senior Seminar in Computer Science.

Criteria of success: 50% of our students achieve above the 50th percentile on the exam.

Means of assessment (every 5 years): Alumni will be surveyed every five years. They will be asked at least the following questions:

- If you have a job in Computer Science or Computer Information Systems: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Information Systems curriculum at PLNU prepared you for your work in the field?

- If you are going to graduate school or went to graduate school: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Information Systems curriculum at PLNU prepared you for graduate school?

Criteria of success: An average response of 2 for each question.

MATHEMATICS MAJOR

Department Learning Outcome (Teach): *Graduates will have a coherent and broad-based knowledge of the discipline of mathematics.*

Means of assessment (annual): Require students to take the ETS Major Field Test in Mathematics as the mid-term exam for the capstone course, Mathematics 481, Senior Seminar in Mathematics.

Criteria of success: 50% of our students achieve above the 50th percentile on the exam.

Program Learning Outcomes (Teach):

1. Students will be able to demonstrate facility with analytical concepts.

Means of Assessment (annual): ETS Major Field Test in Mathematics: Calculus subscore

Criteria for Success: *To be determined.*

2. Students will be able to write proofs.

Means of Assessment (annual): MTH242 Signature Assignment

Criteria for Success: 80% of the students to score a 2.5 or higher (on a scale of 1-4) in each of the four areas:

- Statement of the problem
- Logic
- Symbolism
- Justification

3. Students will be able to demonstrate facility with algebraic structures.

Means of Assessment (annual): ETS Major Field Test in Mathematics: Algebra subscore

Criteria for Success: *To be determined.*

Department Learning Outcome (Shape): *Students will develop characteristics necessary to be effective members of the communities where they work and live.*

Program Learning Outcomes (Shape):

4. Students will be able to apply their mathematical knowledge to solve problems.

Means of Assessment (annual): ETS Major Field Test in Mathematics: Applied subscore

Criteria for Success: *To be determined.*

5. Students will be comfortable using technology to solve problems.

Means of Assessment (annual): MTH382 Signature Assignment (assignment and rubric to be developed)

Criteria for Success: *To be determined.*

6. Students will be able to speak about their work with precision, clarity and organization.

Means of Assessment (annual): Each student will be required to give a 20-minute oral presentation on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Command of background material
- Organization
- Oral presentation skills (added as part of the new rubric in the spring of 2010)
- Use of presentation tools
- Ability to field questions from the audience

Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

7. Students will be able to write about their work with precision, clarity and organization.

Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Bibliography and other supporting documentation
- Organization
- Grammar and spelling
- Depth of information
- Clarity of writing

Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

8. Students will collaborate effectively in teams.

Means of Assessment (annual): MTH352 Signature Assignment (assignment and rubric to be developed).

Criteria for Success: *To be determined.*

Department Learning Outcome (Send): *We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities.*

Program Learning Outcome (Send):

9. Mathematics graduates will be adequately prepared for graduate study, teaching and careers using Mathematics.

Means of assessment (annual): Require students to take the ETS Major Field Test in Mathematics as the mid-term exam for the capstone course, Mathematics 481, Senior Seminar in Mathematics.

Criteria of success: 50% of our students achieve above the 50th percentile on the exam.

Means of assessment (annual): Fieldwork evaluations of prospective teachers in EDU304. The students are rated in several areas of competence using a three point rubric (weak =1, acceptable =2 and strong =3). From these scores an overall rating is computed by taking the mean.

Criteria of success: 50% of the students will have an average score of 2.5 or higher.

Means of assessment (every 5 years): Alumni will be surveyed every five years. They will be asked at least the following questions:

1. If you have a job in industry: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Mathematics curriculum at PLNU prepared you for your work in the field?
2. If you are going to graduate school or went to graduate school: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Mathematics curriculum at PLNU prepared you for graduate school?
3. If you are in a teaching credential program or working as a teacher: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Mathematics curriculum at PLNU prepared you for teaching?

Criteria of success: An average response of 2 for each question.

Senior Seminar Oral Presentation Rubric (4/16/11)

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Command of background material	<input type="checkbox"/> Clearly knows material and key facts by memory <input type="checkbox"/> Expands on PPT slides <input type="checkbox"/> Content appropriate for audience	<input type="checkbox"/> Clearly knows key facts with a few memory slips <input type="checkbox"/> Some expansion on PPT slides <input type="checkbox"/> Partial audience adaptation of content	<input type="checkbox"/> Reads some information; knows some facts from memory <input type="checkbox"/> No expansion of PPT slide content <input type="checkbox"/> Little audience adaptation of content	<input type="checkbox"/> Reads sentences from slides <input type="checkbox"/> Dependent on notes <input type="checkbox"/> Lacks audience adaptation of content
Organization	<input type="checkbox"/> Clear and concise outline <input type="checkbox"/> Relevant graphics and key text items on slides <input type="checkbox"/> Presentation length is +/- 30 seconds of time limit	<input type="checkbox"/> Clear outline <input type="checkbox"/> Too much information on slides (not concise) <input type="checkbox"/> +/- 1 minute of time limit	<input type="checkbox"/> Some sense of outline <input type="checkbox"/> Too much detailed information on slides <input type="checkbox"/> +/- 1:30 of time limit	<input type="checkbox"/> No clear outline <input type="checkbox"/> Slides are in paragraphed; too much detailed information on one slide <input type="checkbox"/> +/- 2 minutes of time limit
Oral Presentation skills	<input type="checkbox"/> Clearly has practiced several times; smooth transitions <input type="checkbox"/> Engages audience in content more than two times (questions, examples, etc) <input type="checkbox"/> Free of disfluencies (ah, umh, like, basically) <input type="checkbox"/> Is clearly heard in the room and makes an uses inflection for emphasis <input type="checkbox"/> Engaged audience through eye contact <input type="checkbox"/> Engaged audience through gestures	<input type="checkbox"/> Has practiced but transitions are not smooth <input type="checkbox"/> Engages audience twice in content (questions, examples, etc.) <input type="checkbox"/> A few disfluencies (ah, umh, er, like, basically) <input type="checkbox"/> Can be understood most of the time and uses some inflection <input type="checkbox"/> Some engagement of audience through eye contact <input type="checkbox"/> Some engagement of audience through gestures	<input type="checkbox"/> Has practiced presentation but cannot verbally make transitions between slides <input type="checkbox"/> Engages audience once with content (questions, examples, etc.) <input type="checkbox"/> Many disfluencies (ah, umh, er, like, basically) <input type="checkbox"/> Can sometimes be understood and uses little inflection <input type="checkbox"/> Infrequent eye contact <input type="checkbox"/> Distracting gestures or mannerisms	<input type="checkbox"/> Clearly did not practice presentation; Does not anticipate content of next slide <input type="checkbox"/> No audience involvement (questions, examples, etc.) <input type="checkbox"/> Disfluencies (ah, umh, er, like basically) detract from presentation <input type="checkbox"/> Can not be heard and/or speaks in a monotone <input type="checkbox"/> Little audience awareness or eye contact <input type="checkbox"/> Frequent distracting gestures or mannerisms
Use of Presentation Tools	<input type="checkbox"/> PPT background is matched to content, legible font, seamless transitions <input type="checkbox"/> Graphics imbedded and matched to topic, necessary hyperlinks work	<input type="checkbox"/> Appropriate PPT slide backgrounds, transitions & font <input type="checkbox"/> Most graphics imbedded and matched to topic, most necessary hyperlinks work	<input type="checkbox"/> Distracting PPT slide backgrounds and transitions, font hard to read <input type="checkbox"/> Some inappropriate graphics or use of PPT embellishments, necessary hyperlinks don't work	<input type="checkbox"/> No attention given to PPT slide backgrounds and transitions, font illegible <input type="checkbox"/> Distracting use of embellishments, graphics not connected to topic
Ability to field questions	<input type="checkbox"/> Able to answer questions clearly and without hesitation and prepared material to answer anticipated questions	<input type="checkbox"/> Can answer all questions with some hesitation	<input type="checkbox"/> Able to answer half of the questions with hesitation	<input type="checkbox"/> Unable to answer any questions

Senior Seminar Written Presentation Rubric (5/6/11)

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Bibliography and supporting documents	<input type="checkbox"/> Multiple references from distinct reputable sources <input type="checkbox"/> References cited in the body of the document	<input type="checkbox"/> Most references from distinct reputable sources <input type="checkbox"/> Some citation of references in the body of the document	<input type="checkbox"/> Some references from reputable sources <input type="checkbox"/> Limited citation of references in the body of the document	<input type="checkbox"/> No bibliography or all references from untrusted sites on the internet <input type="checkbox"/> No citation of references in the body of the document
Organization	<input type="checkbox"/> Conveys a central theme with all ideas connected, arrangement of ideas clearly related to topic <input type="checkbox"/> Clear introduction, body (with sections), and conclusion includes summary and closure <input type="checkbox"/> Includes both an abstract and table of contents	<input type="checkbox"/> Conveys a central idea or topic with some ideas connected to the topic <input type="checkbox"/> Includes introduction, body and conclusion <input type="checkbox"/> Includes abstract and table of contents (one partial and one complete)	<input type="checkbox"/> Attempts to focus on an idea or topic with many ideas not connected to the topic <input type="checkbox"/> Introduction, body, conclusion detectable but not clear <input type="checkbox"/> Includes partial abstract and partial table of contents	<input type="checkbox"/> Has little or no focus on central idea or topic <input type="checkbox"/> Introduction, body or conclusion absent <input type="checkbox"/> No abstract or table of contents
Grammar and spelling	<input type="checkbox"/> No use of first- person tense <input type="checkbox"/> No grammatical or spelling errors	<input type="checkbox"/> Few uses of the first- person tense <input type="checkbox"/> Few grammatical and spelling errors	<input type="checkbox"/> Several uses of the first-person tense <input type="checkbox"/> Some grammatical and spelling errors	<input type="checkbox"/> Written in first-person tense <input type="checkbox"/> Many grammatical and spelling errors
Depth of information	<input type="checkbox"/> Appropriately synthesizes information from multiple distinct sources <input type="checkbox"/> Draws conclusions and personal insights from synthesis	<input type="checkbox"/> Synthesis of information from at least three distinct sources <input type="checkbox"/> At least two personal insights or conclusions stated	<input type="checkbox"/> Synthesis of information from at least two distinct sources <input type="checkbox"/> At least one personal insight or conclusion stated	<input type="checkbox"/> Summary reporting of information without synthesis <input type="checkbox"/> No personal insights
Clarity of writing	<input type="checkbox"/> Sentences flow <input type="checkbox"/> Smooth transitions between paragraphs <input type="checkbox"/> Any and all terms and acronyms are defined <input type="checkbox"/> Provides evidence to support points	<input type="checkbox"/> Good sentence structure <input type="checkbox"/> Adequate transitions between paragraphs <input type="checkbox"/> Most terms and acronyms are defined <input type="checkbox"/> Lacks support for some points	<input type="checkbox"/> Occasional poor sentence structure <input type="checkbox"/> Transitions between paragraphs unclear <input type="checkbox"/> Some terms and acronyms are defined <input type="checkbox"/> Provides minimal support for points	<input type="checkbox"/> Frequent poor sentence structure <input type="checkbox"/> Lacked transitions between paragraphs <input type="checkbox"/> Many terms and acronyms are undefined <input type="checkbox"/> Ideas not supported

MTH213 Liberal Studies Learning Outcomes Rubric

	Unsatisfactory	Low Satisfactory	Satisfactory	High Satisfactory	Outstanding
Students will be able to demonstrate a facility with operations on the integers (1b, 1c).	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to demonstrate a facility with operations on the rational numbers (1b, 1c).	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to apply concepts from number theory to solve problems (1a, 1b, 1c).	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct

- 0 Unsatisfactory - Completely Incorrect
- 1 Low Satisfactory - Missed more than one key concept or step
- 2 Satisfactory - Missed one key concept or step
- 3 High Satisfactory - Made a minor error
- 4 Outstanding - Completely correct

MTH223 Liberal Studies Learning Outcomes Rubric

	Unsatisfactory	Low Satisfactory	Satisfactory	High Satisfactory	Outstanding
Students will be able to construct geometric figures using a compass and straight edge (1b, 1c).	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to compute area and volume (1b, 1c).	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to use probability and statistics to solve problems (1a, 1b, 1c).	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct

- 0 Unsatisfactory - Completely Incorrect
- 1 Low Satisfactory - Missed more than one key concept or step
- 2 Satisfactory - Missed one key concept or step
- 3 High Satisfactory - Made a minor error
- 4 Outstanding - Completely correct

MTH242 Proof Rubric

	Unsatisfactory	Low Satisfactory	High Satisfactory	Outstanding
Statement of the Problem	Can not determine what is given and what needs to be proved	Misses one part of the hypothesis or the conclusion	Makes one minor error in identifying hypothesis or conclusion	Understands what is given and what is to be proved
Logic	Proof has major flaws that make it invalid.	Proof misses more than one major element.	Proof has the main flow of the logic correct but misses one major element	Statements flow logically from one another
Symbolism	There are many errors in the use of symbolic notation	There are more than two errors in symbolic notation	There are two or fewer minor errors in symbolic notation (e.g. missing parentheses)	All symbols are used correctly
Justification	There are several errors in the justification	There is one major mistake in justification or more than two minor errors.	There are two or fewer minor errors in justification for the steps.	Every logical step has the appropriate reason (theorem, definition, lemma, etc.)

General Education Mathematics Rubric (MTH144, MTH164, MTH303)

	Unsatisfactory	Low Satisfactory	Satisfactory	High Satisfactory	Outstanding
Students will be able to formulate a mathematical model from a verbal description of a problem.	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to solve non-routine problems using logic and quantitative techniques.	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to construct solutions to problems using computational techniques.	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct

- 0** Unsatisfactory - Completely Incorrect
- 1** Low Satisfactory - Missed more than one key concept or step
- 2** Satisfactory - Missed one key concept or step
- 3** High Satisfactory - Made a minor error
- 4** Outstanding - Completely correct

Problem Solving Survey

Strongly Agree
Agree
Neutral
Disagree
Strongly Disagree

1	In this class, we have been directly involved in problem solving activities.	SA	A	N	D	SD
2	This class has contributed to my ability to solve different types of problems.	SA	A	N	D	SD
3	This class has expanded my methods of exploration in problem solving.	SA	A	N	D	SD
4	This class has contributed to my ability to make educated guesses and check their correctness by analyzing their implications.	SA	A	N	D	SD
5	This class has helped me to understand major concepts, methods and applications of critical thinking.	SA	A	N	D	SD
6	This class has helped me to see the importance of problem solving in our modern society.	SA	A	N	D	SD
7	The number of years of high school level mathematics (Algebra I and higher) I have taken is:	1	2	3	4	5+
8	I have taken PLNU MTH113 Intermediate Algebra (or an equivalent class at another college or university).	Yes	No	Tested Out		
9	I have taken PLNU MTH123 Elementary Functions (or an equivalent class at another college or university).	Yes	No	Tested Out		
10	I have taken PLNU MTH203 Statistics (or an equivalent class at another college or university).	Yes	No	Tested Out		
11	I have taken PLNU MTH213 or MTH223 Fundamentals of Elementary Mathematics (or MTH314/324 or an equivalent class at another college or university).	Yes	No			