What Math Do Students Need to Succeed at a Public Oregon University?

Oregon University System

A Survey of OUS Faculty Teaching Entry Level Classes that Require Mathematics

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OREGON DEPARTMENT OF EDUCATION

Purpose of the Survey

The survey was intended to identify the kind of math needed in entry-level university courses that use math, but are not math courses themselves. It consists of a set of 50 specific math problems that faculty teaching Biology, Business, Chemistry, Computer Science, Economics, Engineering, Environmental Science, Geology, or Physics rated on importance for success in their courses.

How the survey was administered

- The survey was conducted electronically in Spring 2009
- A total of 335 Oregon University System faculty received the survey
- The response rate was 27%

How survey results were analyzed

- Each survey question was given a score of 1 to 5, based on the importance of the skill it represents for success in an individual faculty member's entry level course: 1 =Least important; 5 = Most important

- The mean rating for each question was calculated for each discipline separately and for all disciplines combined.

- A standard deviation was calculated for each mean.

- Questions were ranked according to their means, with high numerical values corresponding to questions/skills that faculty say are important for success in their courses. Means between 1.00 and 2.33 indicate that 2/3 of the faculty respondents rated the skill as unimportant; whereas means between 3.67 and 5.0 indicate that 2/3 rated it as important.

- To determine whether different disciplines require a common set of math skills, the mean scores on individual questions were compared across disciplines.

- Survey questions were assigned to broad math subject areas, using two independent methods and the results for each method are presented separately.

  Method 1. Categorized by Math Subject Areas The survey administrator assigned each question to one of 6 math subject areas commonly differentiated in national studies: Calculations, Algebra (= Basic Algebra), Statistics, Geometry, Trigonometry, and Advanced Algebra. This method allows comparison of the survey results with studies outside Oregon.

Method 2. **Categorized by Oregon Mathematics Standards** Seven high school math teachers, who participated in writing the current 2009 Oregon Math Standards, individually matched each survey question to a specific Oregon Math Standard. The results, shown in Table 5 on pages 16-18, were used by the survey administrator to assign each question to the broader math subject area that includes the relevant standard. In cases of disagreement in the assignment of questions to standards, a consensus subject area was chosen, or a hybrid of multiple subject areas was created. This method yields a set of subject areas that are complicated because of partial overlaps. Patterns nonetheless emerge from the analysis and the method is useful because it allows direct comparison of the survey results with the Oregon Math Standards.

How survey results are presented

- Results are presented in tabular and graphical form, as follows:

Method 1. Categorized by Math Subject Areas

Table 1 and Figures 1a through 1d group the survey questions according to Method 1, and show the relative importance of particular math subject areas for each of the disciplines included in the survey. The "All Discipline" average is included in each set of bar graphs to facilitate comparison among sets.

Tables 2 and 3 list the questions rated among the top ten (Table 2) or bottom ten (Table 3) in importance by each discipline. This permits side by side comparison of different disciplines' ranking of individual questions and math skill areas.

Table 4 lists all of the survey questions, grouped according to Method 1, and shows the mean score for each question by discipline.

Method 2. Categorized by Oregon Mathematics Standards

Table 5 and Figures 2a through 2d group the survey questions according to Method 2, and show the relative importance of particular math subject areas, as defined by the Oregon Math Standards, for each of the disciplines included in the survey.

Preliminary Conclusions

- Although there are differences in the math proficiencies required by different disciplines, there is a core of skills that are commonly required for entry-level university courses in all of them. Moreover, despite the use of different categories in Methods 1 and 2, and considerable variability of category assignment in Method 2, there is remarkable agreement on the core of important math skills. Specifically, Methods 1 and 2 both show that
    - Most disciplines agree on the importance of Calculations/Middle School math, Basic Algebra and Statistics
    - Most disciplines agree on the relative un-importance of Geometry and Advanced Algebra. Trigonometry, a category not represented in Method 2, was also rated low in importance by most disciplines.
- No single discipline regards all of the math skills in the survey as important, although Engineering and Physics come extremely close.

Anticipated Use of the Survey

Upon its completion, the analysis will be transmitted to the Oregon Department of Education for their consideration as they establish the proficiencies needed to fulfill the Math Essential Skills requirement of the new Oregon High School Diploma

Results Method 1. Categorized by Math Subject Areas

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Tables 2 and 3 list the questions rated among the top ten (Table 2) or bottom ten (Table 3) in importance by each discipline. This permits side by side comparison of different disciplines' ranking of individual questions and math skill areas.

Table 4 lists all of the survey questions, grouped according to Method 1, and shows the mean score for each question by discipline.

Table 1: Importance of Broad Math Subject Areas for Entry-level Classes in 9 Disciplines

The shaded boxes are those with math subject areas with importance rankings below 2.33, which indicates that at least 2 of every 3 respondents in the discipline rated this math subject area to be of low importance for student success.

		All Math Areas	Calculations	Algebra	Statistics	Geometry	Trigonometry	Adv Algebra
Engineering	Mean	3.32	3.38	3.68	2.84	3.27	3.90	3.14
	Std Dev	0.62	0.64	0.31	0.68	0.50	0.14	0.73
Physics	Mean	2.80	3.28	3.19	2.70	2.38	2.62	2.59
	Std Dev	0.62	0.45	0.37	0.26	0.72	0.04	0.65
Computer Science	Mean	2.76	3.21	3.12	2.72	2.37	1.88	2.61
	Std Dev	0.56	0.45	0.32	0.21	0.52	0.18	0.56
Chemistry	Mean	2.50	3.19	3.29	2.47	1.90	1.73	2.14
	Std Dev	0.83	0.57	0.45	0.60	0.59	0.13	0.60
Geology	Mean	2.45	3.19	2.97	2.87	2.24	2.17	1.70
	Std Dev	0.89	0.39	0.71	0.98	0.78	0.23	0.68
Business	Mean	2.42	2.66	2.89	2.69	1.84	1.56	1.97
	Std Dev	0.77	0.68	0.62	0.71	0.95	0.47	0.56
Biology	Mean	2.37	3.09	2.72	3.13	1.79	1.13	1.82
	Std Dev	0.94	0.36	0.61	0.29	0.98	0.29	0.71
Economics	Mean	2.30	2.03	3.08	3.03	1.98	1.33	1.92
	Std Dev	0.97	0.90	0.74	0.32	1.02	0.00	0.87
Environ Science	Mean	2.30	3.00	2.60	1.95	1.78	1.25	1.43
	Std Dev	0.97	0.64	0.82	1.25	0.76	0.00	0.53
All Disciplines	Mean		2.94	3.06	2.69	2.13	1.82	2.15
	Std Dev		0.40	0.40	0.49	0.65	0.04	0.47

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Figure 1 a through d: Importance of Broad Math Subject Areas for Entry-level Classes in 9 Disciplines

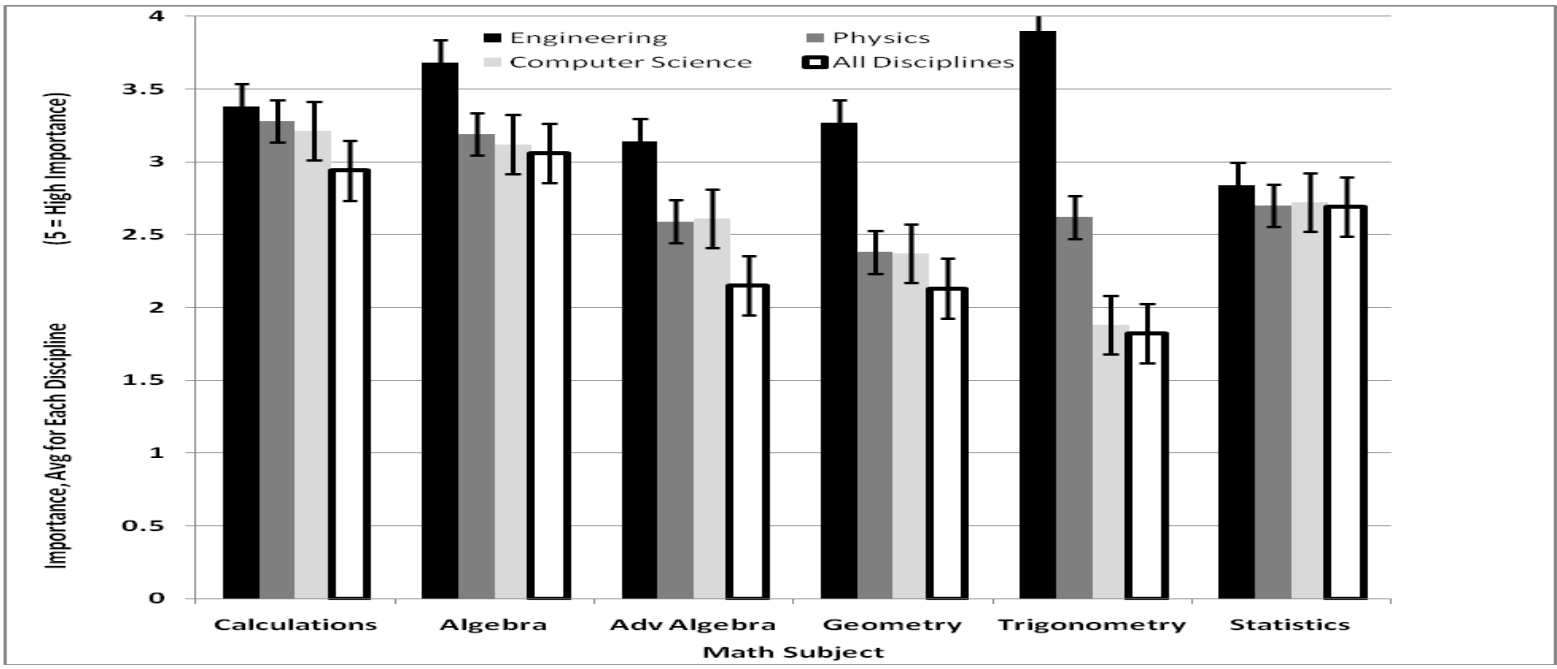

Figure 1 a: 3 of the 9 Disciplines (Engineering, Physics and Computer Science, and the All Discipline Average.

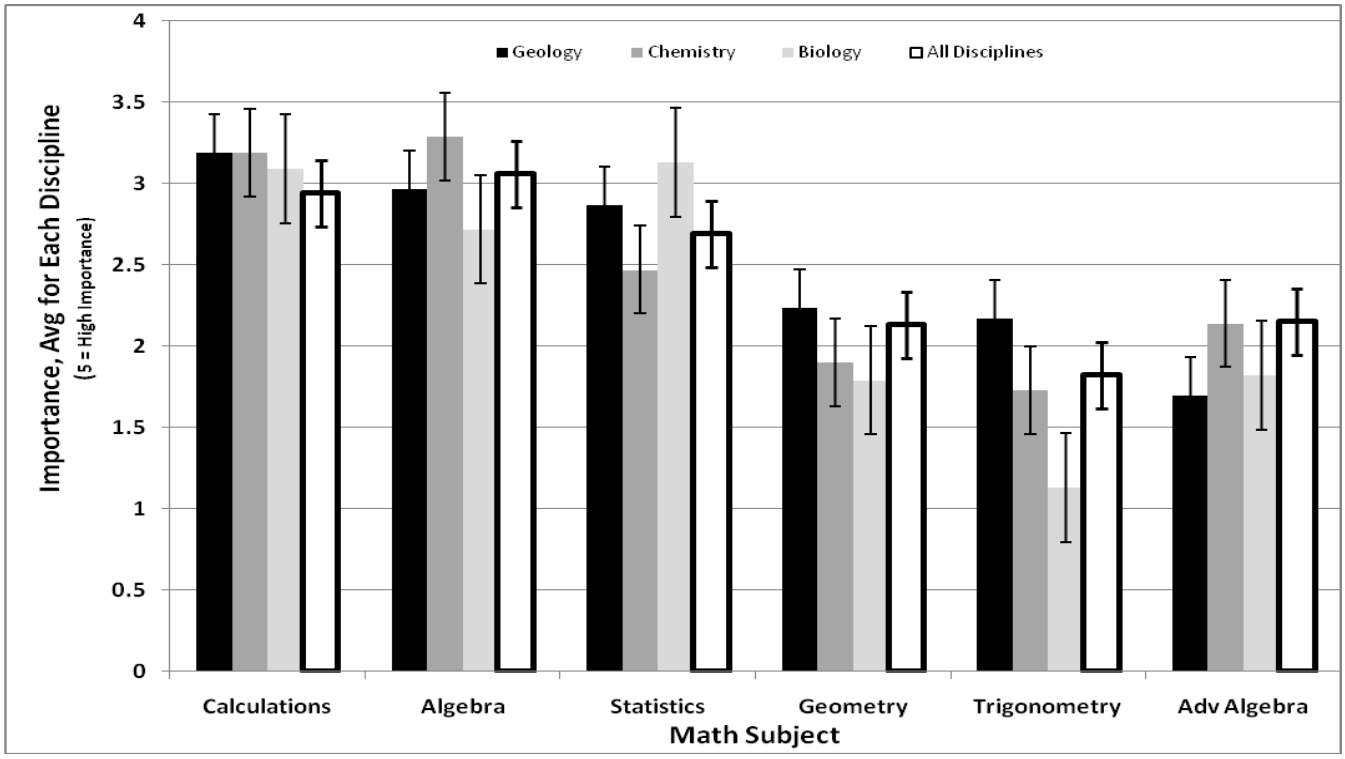

Figure 1 b: 3 of the 9 Disciplines (Geology, Chemistry and Biology), and the All Discipline Average

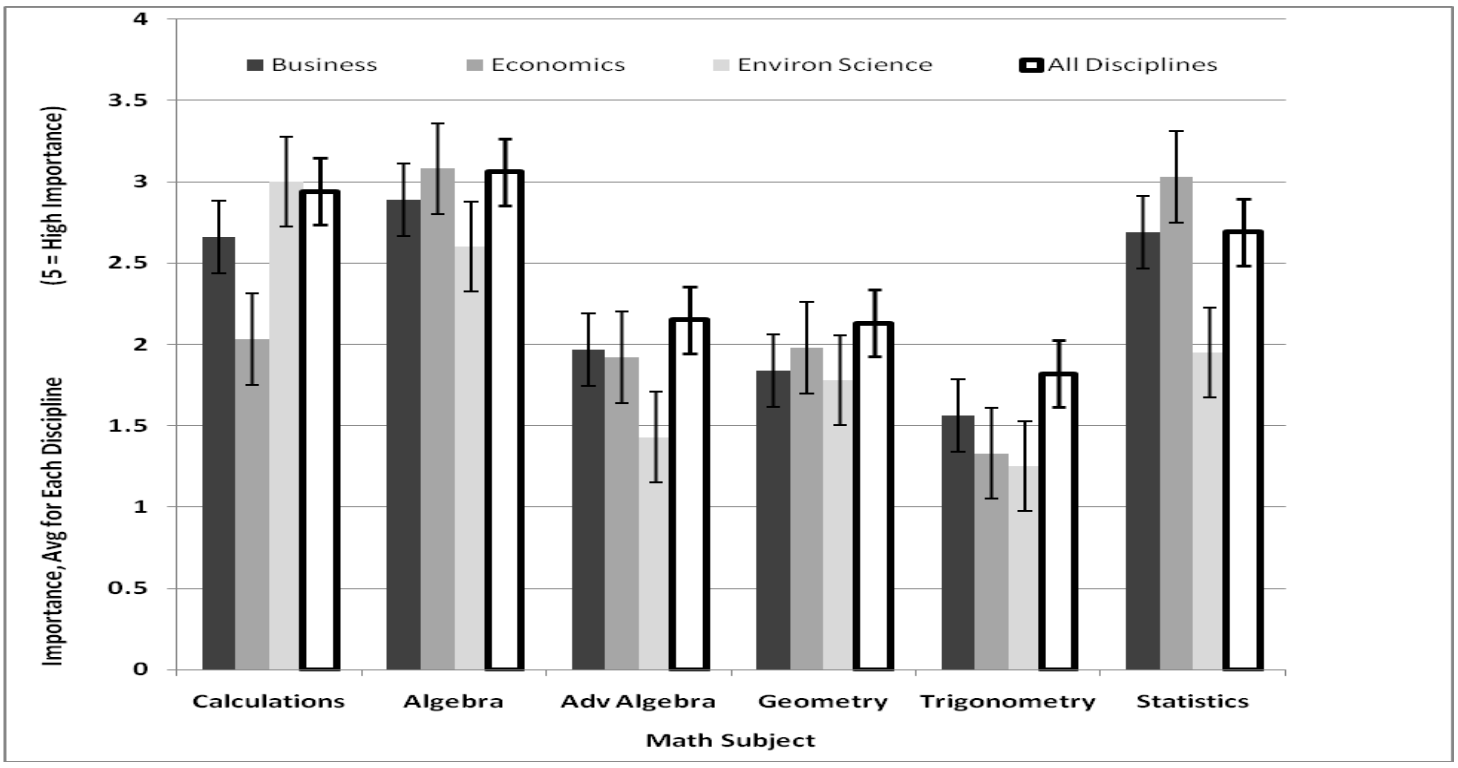

Figure 1c: 3 of the 9 Disciplines (Business, Economics and Environmental Science), and the All Discipline Average

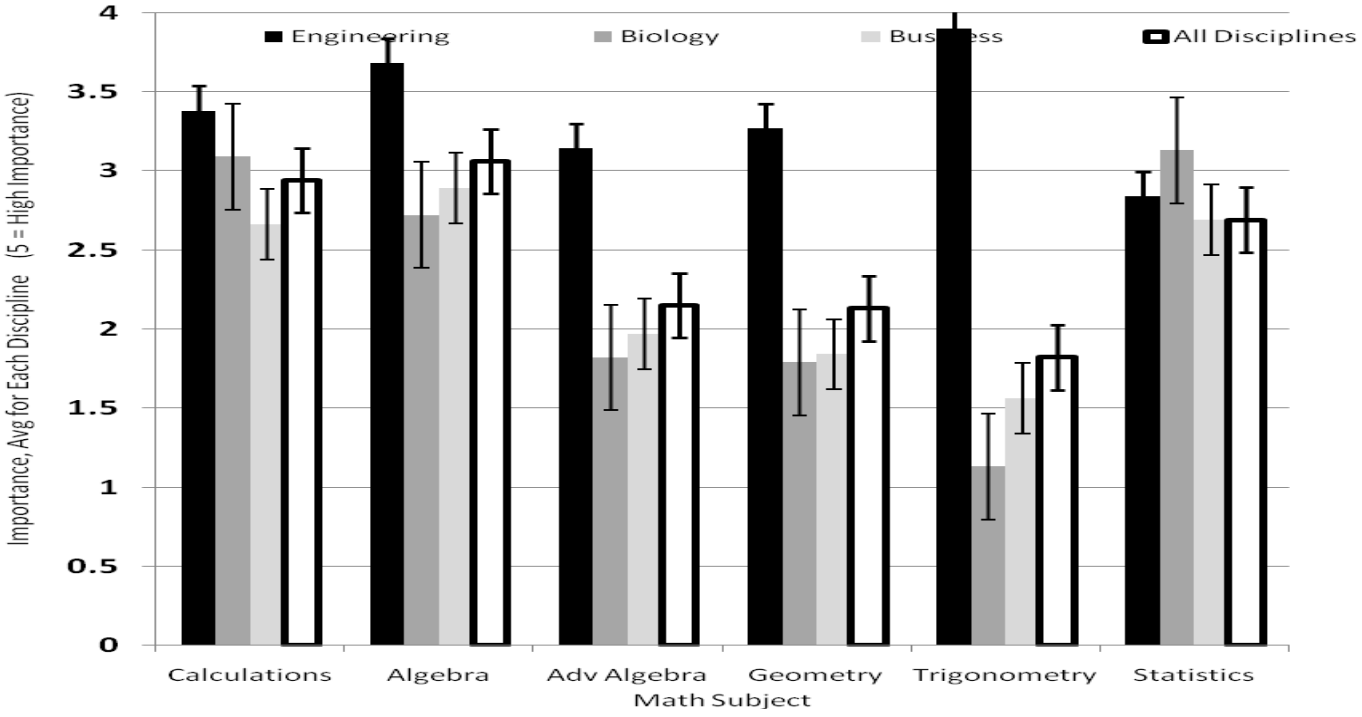

Figure 1 d: 3 of the 9 Disciplines selected for rating math of high (Engineering), middle (Biology) and low (Environmental Science) importance, and the All Discipline Average

. Table 2: Specific Questions Rated MOST Important for Entry-level Classes in 9 Disciplines

The 10 survey questions given the highest scores in each discipline are listed below. An "X" under a discipline indicates that the question was among the top 10 for that discipline. The rightmost column shows the % of disciplines that ranked the question in the top 10. Shading indicates ≥ 50% agreement on this ranking. The shaded problems are shown on pages 21 and 22.

Question Number	Math Subject Area	Engineering	**Computer Science**	Physics	Chemistry	Biology	Geology	Environmental Science	Business	Economics	**% Agreement**
1	Calculate/No	X	X	X		X	X	X	X	X	89%
21	Calculate/Est	X	X	X	X	X		X			67%
4	Calculate/No		X	X			X	X	X		56%
7	Calculate/Sci	X		X	X	X		X			56%
2	Calculate/Est							X			11%
36	Calculate/Est		X								11%
41	Calculate/Dil				X						11%
5a	Alg/Relations	X	X	X	X	X	X	X	X		89%
8	Alg/Relations				X	X	X	X	X	X	67%
20	Alg/LinearRel	X	X	X	X		X			X	67%
3	Alg/Relations					X	X	X	X	X	56%
11	Alg/Exponent			X	X				X		33%
31	Alg/Relations		X				X			X	33%
5b	Alg/Relations		X		X						22%
6	Alg/Relations	X								X	22%
10	Alg/Exponent			X	X						22%
49	Alg/LinearRel									X	11%
18	Stats/DatAnal						X	X	X	X	44%
39	Stats/DatAnal					X	X		X		33%
27	Stats/Prob					X					11%
38	Geo/AnalFig			X		X	X	X	X		56%
32	Geo/AnalFig									X	11%
16	Trig/Triangle	X									11%
35	AdvAlg/Logs	X	X	X	X	X			X		67%
12	AdvAlg/Relations	X	X							X	33%
34a	AdvAlg/SystEquat	X									11%

Table 3 : Specific Questions Rated LEAST Important for Entry-level Classes in 9 Disciplines

The 10 survey questions given the lowest scores in each discipline are listed below. An "X" under a discipline indicates that the question was among the bottom 10 for that discipline. The rightmost column shows the % of disciplines that ranked the question in the bottom 10. Shading indicates ≥ 50% agreement on this ranking. The shaded problems are shown on page 23.

Question Number	Math Subject Area	Engineering	**Computer Science**	Physics	Chemistry	Biology	Geology	Environmental Science	Business	Economics	**% Agreement**
41	Calculate/Dil								X	X	22%
46	Calculat/Est	X							X		22%
2	Calculations	X									11%
7	Calculate/Sci								X		11%
12	Calculate/AbsNo.							X			11%
27	Stats/Prog	X			X			X			33%
37	Stats/Prob	X									22%
43	Geo/Anal	X	X	X	X	X	X	X	X		89%
25	Geo3D		X	X		X		X	X	X	67%
24	Geo/3D		X	X		X			X	X	56%
22	Geo/AnalFig				X	X	X				33%
26	Geo/Polygon			X	X	X					33%
23	Geometry			X			X				22%
30	Geometry									X	11%
32	Geo/AnalFig		X								11%
15	Trig		X		X	X		X			44%
16	Trig/SimTri		X					X		X	33%
48	AdvAlg/Mtrx	X	X	X	X	X	X	X		X	89%
14	AdvAlg/Polyno	X	X	X		X	X	X			67%
45	AdvAlg/Log	X		X	X		X		X		56%
50	AdvAlg/Factor	X	X	X				X	X		56%
40	AdvAlg/Log	X					X		X	X	44%
44	AdvAlg/RelatFnct			X	X	X		X			44%
47	AdvAlg/Func		X		X				X	X	44%

Table 3 (continued): Specific Questions Rated LEAST Important for Entry-level Classes in 9 Disciplines

The 10 survey questions given the lowest scores in each discipline are listed below. An "X" under a discipline indicates that the question was among the bottom 10 for that discipline. The rightmost column shows the % of disciplines that ranked the question in the bottom 10. Shading indicates ≥ 50% agreement on this ranking. The shaded problems are shown on page 23.

13	AdvAlg/Log						X			X	22%
23	AdvAlg/Relate				X	X					22%
28	AdvAlg/Quad						X			X	22%
19	AdvAlg/Fact						X				11%

Table 4: Relative importance of All Survey Questions by Discipline

Questions are grouped according to the broad math subject area to which they belong. Within each subject area, questions are ranked in descending order of importance, based on the "All Disciplines" means.

Quest #	Math Subject Area			ALL DISCIP-LINES	Engineer -ing	Computer Sci	Physics	Chemistry	Biology	Geology	Environ Science	Economics	Business
		Mean ==>		2.54	3.32	*2.76*	2.81	2.54	2.32	2.45	2.05	2.30	2.32
		Std Dev ==>		0.63	0.62	*0.56*	0.62	0.79	0.88	0.89	0.93	0.97	0.80
		# of Responders =>		(85)	(10)	*(11)*	(28)	(14)	(22)	(13)	(11)	(8)	(13)
1	Calculate/No.			**3.61**	3.8	*3.75*	3.68	3	3.58	3.83	4	3.33	3.56
4	Calculate/No.			**3.46**	3.8	*3.87*	3.5	3.55	2.83	3.5	3.25	3.17	3.67
21	Calculate/Est.			**3.19**	4	*3.37*	3.77	3.82	3.58	3.33	3	1.83	2
7	Calculate/Sci			**3.00**	4	*2.87*	3.73	3.64	3.25	3	3	1.17	2.33
2	Calculate/No.			**2.78**	2.6	*3*	2.95	2.55	2.83	3	3.5	2.4	2.22
46	Calculate/Est.	for this Math Subject Area:		**2.68**	2.6	*2.86*	2.57	2.9	3	3.17	3	1.17	2.89
36	Calculate/Est	Mean	Std Dev	**2.66**	3.2	*3.37*	3.05	2.36	2.58	2.5	2	2.17	2.75
41	Calculate/Dil	3.00	0.38	**2.63**	3	*2.62*	2.95	3.73	3.08	3.17	2.25	1	1.89
8	Alg/ Numrcy			**3.63**	3.8	*3.25*	3.14	3.64	3.17	4	3.75	4	3.89
5. a	Alg/ Numrcy			**3.60**	4	*3.5*	3.5	4	3.25	4	3.5	2.83	3.78
3	Alg/Graph			**3.53**	3.8	*3.12*	3.32	3.36	3.42	3.67	4	3.5	3.57
20	Alg/LinearRel			**3.27**	4	*3.5*	3.68	3.64	2.67	3.33	2.25	3.5	2.89
31	Alg/ Numrcy			**3.19**	3.6	*3.37*	3.33	3.18	2.83	3.5	3	3.33	2.56
49	Alg/LinearRel			**3.14**	3.8	*3*	3.27	2.82	3	2.5	3	4	2.89
5. b	Alg/Numrcy			**2.95**	3.2	*3.5*	2.81	3.45	2.83	3	2	2.67	3.12
11	Alg/Exponent			**2.88**	3.6	*3*	3.45	3.55	2.5	2.5	2.25	2	3.11
6	Alg/Graph	for this Math Subject Area		**2.83**	4	*2.5*	2.91	2.82	3.08	2.5	1.75	3.83	2.12
10	Alg/Exponent			**2.80**	3.6	*3.12*	3.59	3.45	2.75	2.33	2.25	1.83	2.25
34. b	Alg/EquaFnct	Mean	Std Dev	**2.52**	3.8	*2.75*	2.91	3.18	1.58	1.83	2	2.5	2.11
42	Alg/EquaFnct	3.06	0.40	**2.40**	3	*2.87*	2.41	2.36	1.5	2.5	1.5	3	2.44
18	Stat/DatAnal			**3.28**	3.4	*2.87*	2.95	2.82	3.08	3.67	3.75	3.5	3.44
39	Stat/DatAnal	for this Math Subject Area		**3.20**	3.4	*3*	3	3.18	3.33	4	2.75	3.17	3
17	Stat/Prob			**2.62**	3.2	*2.5*	2.64	2.64	3.17	2.83	1.25	2.83	2.56
27	Stat/Prob	Mean	Std Dev	**2.28**	2	*2.62*	2.41	1.8	3.42	1.67	0.75	3	2.89
37	Stat/Prob	2.71	0.51	**2.17**	2.2	*2.62*	2.5	1.91	2.67	2.17	1.25	2.67	1.56

Table 4 (continued): Relative importance of All Survey Questions by Discipline

Questions are grouped according to the broad math subject area to which they belong. Within each subject area, questions are ranked in descending order of importance, based on the "All Disciplines" means.

16	**Trig/SimTri**			**1.99**	**4**	**2**	**2.64**	**1.82**	**1.33**	**2.33**	**1.25**	**1.33**	**1.22**
15	**Trig**	**1.95**	**0.06**	**1.91**	**3.8**	**1.75**	**2.59**	**1.64**	**0.92**	**2**	**1.25**	**1.33**	**1.89**
38	Geo/AnalFig			**3.35**	3.2	*3.12*	3.45	2.64	3.75	3.83	3.25	3.17	3.75
33	Geo/2dFig			**2.72**	3.6	*2.62*	3	2.36	2.67	2.67	2.25	3	2.33
32	Geo/AnalFig			**2.61**	3.6	*2.25*	2.68	2.55	2.25	2	2.25	3.33	2.56
30	Geo			**2.33**	3.6	*2.62*	3	2.09	2.08	2.67	2.25	1.67	1
22	Geo/AnalFig			**2.08**	3.8	*2.75*	2.27	1.36	1.17	1.5	1.25	2.5	2.11
26	Geo/Polygon	for this Math		**1.80**	3.4	*2.75*	1.59	1.2	1.08	1.83	1.5	1.33	1.56
25	Geo/3D	Subject Area		**1.72**	3.2	*1.75*	2.14	1.91	1.25	2.33	1	1	0.89
24	Geo/3D	Mean	Std Dev	**1.71**	2.8	*1.87*	2.05	2	1.17	2.17	1.25	1.17	0.89
43	Geo/Transf	2.17	0.65	**1.23**	2.2	*1.62*	1.23	1	0.67	1.17	1	0.67	1.5
35	AdvAlg/Logs			**3.26**	4	*3.87*	3.95	2.55	3.5	3.33	2.67	2	3.44
12	AdvAlg/Numr			**2.81**	4	*3.62*	3.27	3.09	1.75	2.33	1.25	3.83	2.11
9	AdvAlg/Equat			**2.70**	3.8	*2.62*	3.14	2.82	2.42	2.17	1.75	3	2.56
34. a	AdvAlg/Equat			**2.43**	4	*2.37*	3.23	2.09	1.58	2.33	1.25	2.67	2.33
29	AdvAlg/logs			**2.22**	2.8	*2.5*	2.55	2.1	2.75	1.67	2.25	1.67	1.67
13	AdvAlg/logs			**2.20**	2.8	*2.62*	2.55	2.73	2.5	1.33	1.75	2	1.56
19	AdvAlg/Fact			**2.16**	3.8	*3*	2.64	2	1.58	1.33	1.25	1.5	2.37
28	AdvAlg/Quad			**2.15**	3.8	*2.5*	3	2.7	1.33	1.33	1.25	2	1.44
40	AdvAlg/Logs			**2.11**	2.4	*2.87*	2.36	2.91	2.5	1.33	2	1.17	1.44
23	AdvAlg/RelaF			**2.10**	3.4	*2.75*	2.23	1.45	1.17	1.5	1.25	3	2.11
44	AdvAlg/RelaF			**1.95**	3.2	*2.43*	2.05	1.64	1.25	2.17	1	2	1.78
47	AdvALg/Func			**1.87**	3.4	*2*	2.95	1.55	1.75	2	1.25	0.67	1.22
14	AdvAlg/Plyno	for this Math		**1.74**	2.2	*2*	2.05	2	1.08	1.17	1.25	1.83	2.11
45	AdvAlg/logs	Subject Area		**1.72**	2.2	*2.71*	1.86	1.82	1.58	1.33	1.25	0.83	1.89
50	AdvAlg/Fact	Mean	Std Dev	**1.68**	2.2	*2.12*	2.19	1.82	1.42	1.5	1	0.8	2.11
48	AdvAlg/Mtrx	2.15	0.49	**1.24**	2.2	*1.75*	1.36	1	1	0.33	0.5	1.67	1.33

Method 2. Categorized by Oregon Mathematics Standards

Table 5 and Figures 2a through 2d group the survey questions according to Method 2, and show the relative importance of particular math subject areas, as defined by the Oregon Math Standards, for each of the disciplines included in the survey.

State of Oregon High School Mathematics Academic Content Standards
Approved June 2009 by the State Board of Education

Algebra

H.1A Algebra and Numeracy: Demonstrate a deep understanding of real numbers and algebraic symbols by fluently creating, manipulating, computing with, and determining equivalent expressions, both numeric and symbolic.
H.2A Algebra: Use linear equations and functions to represent relationships and solve linear equations, linear inequalities, systems of linear equations, and systems of linear inequalities
H.3A Algebra: Use quadratic and exponential equations and functions to represent relationships.

Geometry

H.1G Geometry: Apply properties of two-dimensional figures.
H.2G Geometry: Apply properties of three-dimensional solids.
H.3G Geometry: Transform and analyze figures.

Statistics

H.1S Data Analysis: Analyze and interpret empirical data.
H.2S Probability: Apply basic principles of probability.

State of Oregon Knowledge and Skills for High School Mathematics
Approved June 2009 by the State Board of Education
(Discrete Math and Calculus Knowledge and Skills are not included in this summary, but were also approved in June, 2009)

Advanced Algebra

adv.A.1 Relations and Functions: Analyze functions and relations (e.g. polynomial, absolute value, rational, radical, logarithmic, exponential, algebraic, piece-wise, and step functions).
adv.A.2 Inequalities, Piece-wise Functions, and Absolute Value Functions: Model and analyze piece-wise and absolute value functions. Solve inequalities and absolute value equations.
adv.A.3 Quadratic functions and other Conic Sections: Model and analyze quadratic functions. Solve quadratic equations and problems involving conics.
adv.A.4 Polynomial Functions: Model and analyze polynomial functions. Solve polynomial equations.
adv.A.5 Radical Functions: Model and analyze radical functions. Solve radical equations.
adv.A.6 Rational Functions: Model and analyze rational functions. Solve rational equations.
adv.A.7 Logarithmic and Exponential Functions: Model and analyze logarithmic and exponential functions. Solve logarithmic and exponential equations.
adv.A.8 Matrices, Systems of Equations and Inequalities: Analyze and apply various methods to graph and solve systems of equations and inequalities.
adv.A.9 Sequences and Series: Analyze and evaluate sequences and series.1
adv.A.10 Parametric Equations: Model and analyze parametric equations.

Trigonometry

T.1 Triangle Trigonometry: Analyze and solve problems involving triangles.
T.2 Trigonometric Functions: Develop, apply, and graph the six trigonometric functions and their inverses in radians and degrees.
T.3 Trigonometric Identities and Equations: Derive and apply basic trigonometric identities and solve trigonometric equations.
T.4 Vectors in Two Dimensions: Solve problems involving vectors in the coordinate plane.
T.5 Polar Coordinates and Complex Numbers: Understand and apply polar coordinates and complex numbers and their connection to trigonometric functions.

Statistics

adv.S.1 Exploratory Data: Analyze summary measures of sets of data.
adv.S.2 Sampling and Experimentation: Plan, conduct, and analyze well-designed methods of data collection.
adv.S.3 Anticipating Patterns: Understand how probability can be applied as a tool used for anticipating what the distribution of data should look like under a given model.
adv.S.4 Statistical Inference: Estimate population parameters and test hypotheses

Table 5: Assignment of Survey Problems to Subject Areas Defined by Oregon Math Standards

Numbers in the body of the table are the number of high school teachers who aligned the indicated survey question with a particular Oregon Math Standard within the broad math area listed in the column heading. Based on this information, each survey question was assigned to a single consensus subject area, or to a hybrid, as indicated in the rightmost column. The abbreviations are used in the Figures (2a – 2d) that show how the questions were rated in the survey.

Survey Problem Number	Middle School Grade			Algebra I Standard Area			Geometry Standard Area			Statistics Std Area		Adv Alg	Consensus or Hybrid Subject Area [Abbreviation]
	6	7	8	H.1 A	H.2 A	H.3 A	H.1 G	H.2 G	H.3 G	H.1 S	H.2 S	Std	
1	2	2		3									Middle School to Algebra I [MS, Alg I]
8	1	2		2	2								Middle School to Algebra I [MS, Alg I]
21		3		3	1								Middle School to Algebra I [MS, Alg I]
41b	1	1											Middle School to Algebra I [MS, Alg I]
2			1	6									Algebra I & some Middle School [Alg I (MS)]
4		1		5		1							Algebra I & some Middle School [Alg I (MS)]
5a		2	1	1	2							1	Algebra I & some Middle School [Alg I (MS)]
5a		2	1	1	2							1	Algebra I & some Middle School [Alg I (MS)]
6		1		2	4								Algebra I & some Middle School [Alg I (MS)]
7		1		5	1								Algebra I & some Middle School [Alg I (MS)].
9		1		2	4								Algebra I & some Middle School [Alg I (MS)]
10		2		4	1								Algebra I & some Middle School [Alg I (MS)]
11				5	2								Algebra I & some Middle School [Alg I (MS)]
12				7									Algebra I & some Middle School [Alg I (MS)].
20		1	1	2	2					1			Algebra I & some Middle School [Alg I (MS)].
35				5	2								Algebra I & some Middle School [Alg I (MS)].
36	1			2	3		1						Algebra I & some Middle School [Alg I (MS)].

Table 5 (continued): Assignment of Survey Problems to Subject Areas Defined by Oregon Math Standards

Survey Problem Number	Middle School Grade			Algebra I Standard Area			Geometry Standard Area			Statistics Std Area		Adv Alg	Consensus or Hybrid Subject Area [Abbreviation]
	6	7	8	H.1 A	H.2 A	H.3 A	H.1 G	H.2 G	H.3 G	H.1 S	H.2 S	Std	
33		1	2	1	4								Algebra I & some Middle School [Alg I (MS)].
49			2		4							1	Algebra I & some Middle School [Alg I (MS)].
3				1		5				1			Algebra I
34a					5			1				1	Algebra I
5b				3								1	Algebra I, Algebra II (Alg I & II)
13				3								4	Algebra I, Algebra II (Alg I & II)
14				2		1						4	Algebra I, Algebra II (Alg I & II)
29				1							2	4	Algebra I, Algebra II (Alg I & II)
30				2		1						1	Algebra I, Algebra II (Alg I & II)
42b												2	Algebra I, Algebra II (Alg I & II)
46		1		1						3		3	Algebra I, Algebra II (Alg I & II)
47		1				3						3	Algebra I, Algebra II (Alg I & II)
19		1		3						1	1	1	Algebra I, Algebra II (Alg I & II)
31		1		1	3							2	Algebra I, Algebra II (Alg I & II)
41a	```				3							2	Algebra I, Algebra II (Alg I & II)
16			2	1			3						Algebra I, Geometry
44				1	3				4			1	Algebra I, Geometry
15			3	1			1					2	Algebra I, Geometry & some Algebra II [Alg I, Geo, (Alg II)]
32					5		2						Algebra I, Geometry & some Algebra II [Alg I, Geo, (Alg II)]

Table 5 (continued): Assignment of Survey Problems to Subject Areas Defined by Oregon Math Standards

Survey Problem Number	Middle School Grade			Algebra I Standard Area			Geometry Standard Area			Statistics Std Area		Adv Alg	Consensus or Hybrid Subject Area [Abbreviation]
	6	7	8	H.1 A	H.2 A	H.3 A	H.1 G	H.2 G	H.3 G	H.1 S	H.2 S	Std	
28							1		1			5	Algebra II (Alg II)
40				1								6	Algebra II (Alg II)
42a					1	1						5	Algebra II (Alg II)
43										2		5	Algebra II (Alg II)
45					1					1		5	Algebra II (Alg II)
48												6	Algebra II (Alg II)
50												6	Algebra II (Alg II)
22		2		1					4				Geometry
23		2							5				Geometry
26	1						**2**	**2**	2				Geometry
24								4	**3**				Geometry
25								5	**2**				Geometry
34b					1				**1**				Geometry
17	1						3				3		Statistics (Stats)
18				2			2			2	1		Statistics (Stats)
27								2			5		Statistics (Stats)
37					2						5		Statistics (Stats)
38			3							3			Statistics (Stats)
39			1	2						4			Statistics (Stats)

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PROBLEMS RATED MOST IMPORTANT

Survey Problem #	Consensus Subject Area
1	Middle School /Algebra I
8	
21	
4	Algebra I/ Middle School
5a	
7	
20	
35	
3	Algebra I
38	Statistics

PROBLEMS RATED LEAST IMPORTANT

Survey Problem #	Consensus Subject Area
14	Algebra II/Algebra I
43	Algebra II
45	
48	
50	
24	Geometry
25	

Table 1: Alignment of Survey Problems to Oregon Math Standards

The consensus subject area is the result of individually asking seven Oregon high school math teachers who participated in the Math Panels that established the Oregon Math Standards to align each survey problem with an Oregon Math Standard. The survey problem numbers in the left table are those rated most important for success in entry level university classes that require math by the university faculty who teach those courses, and the problems in the right table are those rated least important by these university faculties for student success in their entry level courses that require math.

Questions consistently rated MOST Important by OUS Faculty (Agreement ≥ 50%)

(Bold, Italicized, Underlined and Shaded Text = Oregon Math Standard Alignment
by Oregon High School Math Teachers Who Participated in Math Standards Development)

1. One hundred is multiplied by a number between 0 and 1. The answer has to be

A. less than 0.

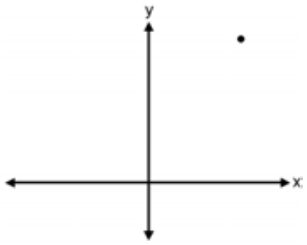
C. between 0 and 100 but not 50.

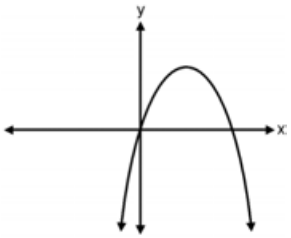
B. between 0 and 50 but not 25.

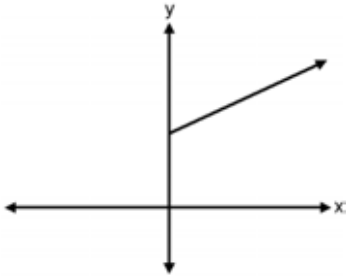
D. between 0 and 100.

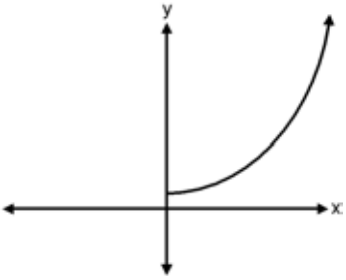
1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Middle School /Algebra I***

3. Which of the following is an example of a graph showing exponential growth?

A. 

B. 

C. 

D 

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra I***

4. If **a** is a positive number and **b** is a negative number, which expression is always positive?

A. $a-b$ B. $a+b$ C. $a\times b$ D. $a\div b$

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra I/ Middle School***

5. a. Len runs a mile in 8 minutes. At this rate how long will it take him to run a 26-mile marathon?

A. 3.25 minutes B. 3.25 hours C. 3.47 minutes D. 3.47 hours

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra I/ Middle School***

Questions consistently rated MOST Important by OUS Faculty (Agreement ≥ 50%)

(Bold, Italicized, Underlined and Shaded Text = Oregon Math Standard Alignment
by Oregon High School Math Teachers Who Participated in Math Standards Development)

7. The radius of the earth's orbit is 150,000,000,000 meters. What is this number in scientific notation?

A. 15×10^{-11} B. 1.5×10^{11} C. 1.5×10^{10} D. 15×10^{9}

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra I/ Middle School***

8. The cost of an afternoon movie ticket last year was $4.00. This year an afternoon movie ticket costs $5.00. What is the percent increase of the ticket from last year to this year?

A. 10% B. 20% C. 25% D. 40%

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Middle School /Algebra I***

20. Solve for x. $2x - 3 = 7$

A. −5 B. −2 C. 2 D. 5

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra I/ Middle School***

21. One millimeter is—

A. 1/1000 of a meter B. 1/100 of a meter. C. 100 meters. D. 1000 meters.

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Middle School /Algebra I***

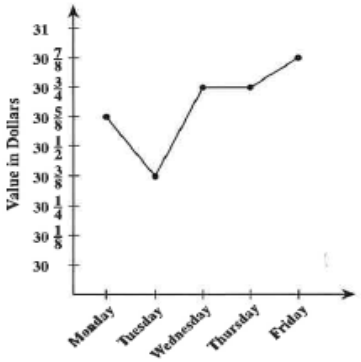
35. Which of the following is smallest?

A. 10^{10} B. 10^{0} C. 10^{-1} D. 10^{-10}

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ Algebra I/ Middle School

38. The graph on the right represents the closing price of a share of a certain stock for each day of a week.

Which day had the greatest increase in the value of this stock over that of the previous day?



A. Tuesday B. Wednesday

C. Thursday D. Friday

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Statistics***

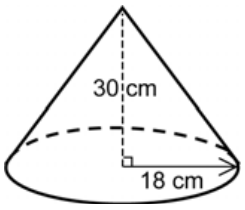
Questions consistently rated LEAST Important by OUS Faculty (Agreement ≥ 50%)

(Bold, Italicized, Underlined and Shaded Text = Oregon Math Standard Alignment
by Oregon High School Math Teachers Who Participated in Math Standards Development)

14. Factor. One factor is given. $f(x) = 4x^3 - 4x^2 + 120x$ Factor: $x + 5$

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra II/Algebra I***

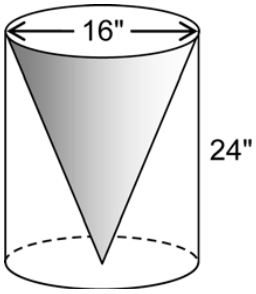
24. The volume of the cone is __?__ cm3.



A. 2592π B. 3240π

C. 7776π D. 9720π

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Geometry***



25. What is the volume left in the cylinder after the shaded cone region is removed?

A. 1,024π in3 C. 2,048π in3

B. 1,536π in3 D. 4,096π in3

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Geometry***

43. Find the center, foci, vertices and co-vertices of this ellipse:

$\frac{(X - 2)^2}{25} + \frac{(Y + 6)^2}{9} = 1$

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra II I***

45. Calculate: $\log_2 16 + \log_2 32$ $\log_3 9 + \log_3 27$

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra II I***

48. Use an inverse matrix to solve the linear system:

$-9X + 7Y = -132$ $-3X - 1Y = -24$

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra II***

50. Solve this equation by factoring: $7\frac{1}{2}\ X^2 + 30X - 157\frac{1}{2} = -67\frac{1}{2}$

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ ***Algebra II***

Figure 2 a through d: Importance of Oregon Math Standard Areas for Entry-level Classes in 9 Disciplines

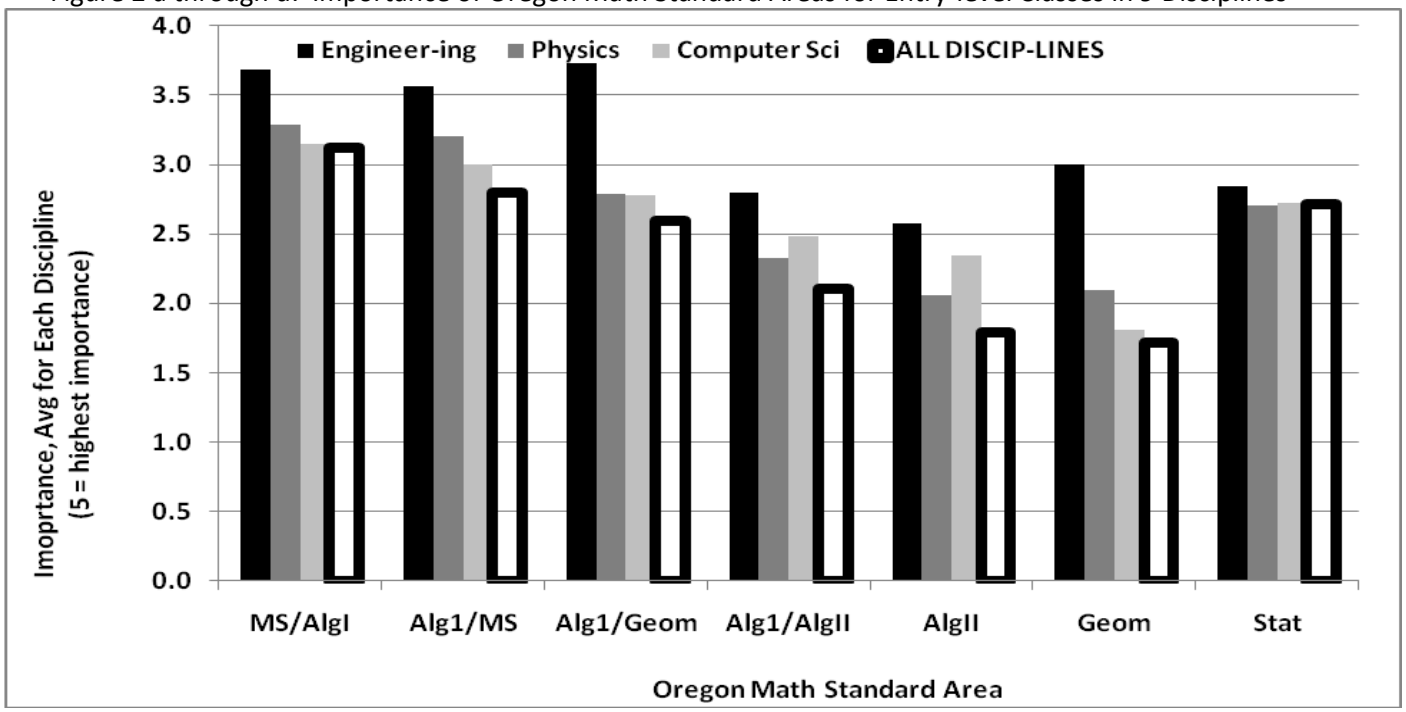


Figure 2a: 3 of the 9 Disciplines (Engineering, Physics and Computer Science, and the All Discipline Average

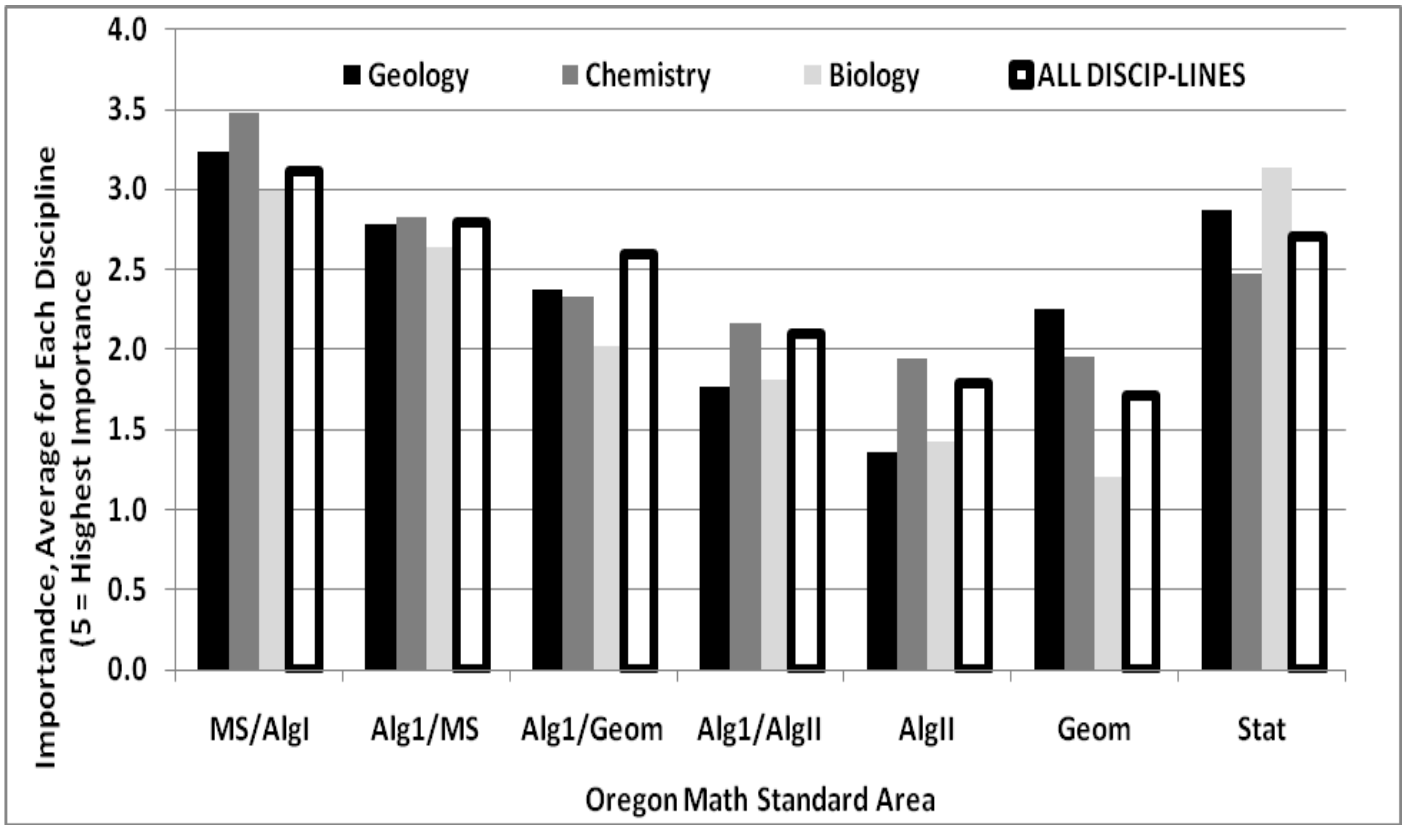


Figure 2b: 3 of the 9 Disciplines (Geology, Chemistry and Biology), and the All Discipline Average

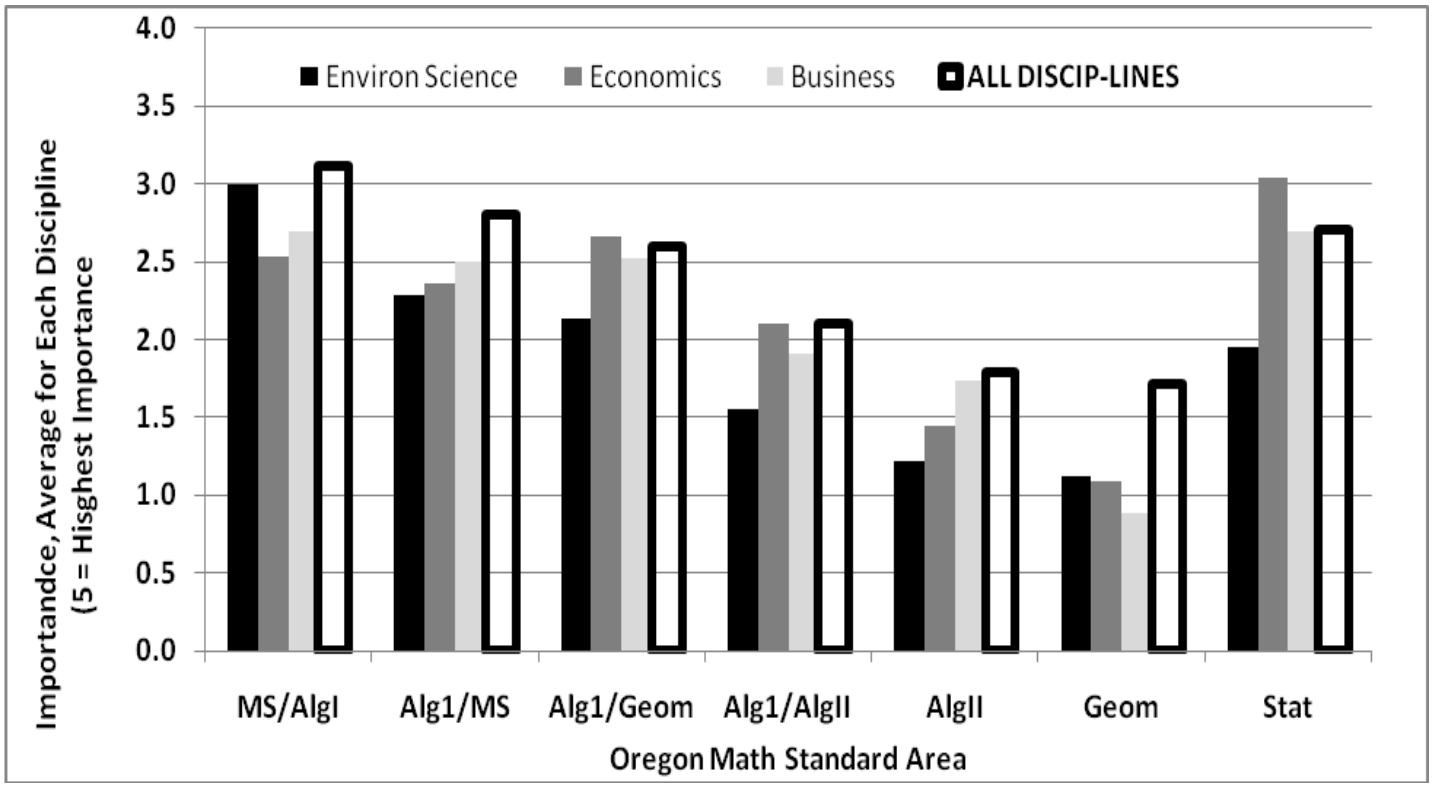


Figure 2c: 3 of the 9 Disciplines (Business, Economics and Environmental Science), and the All Discipline Average

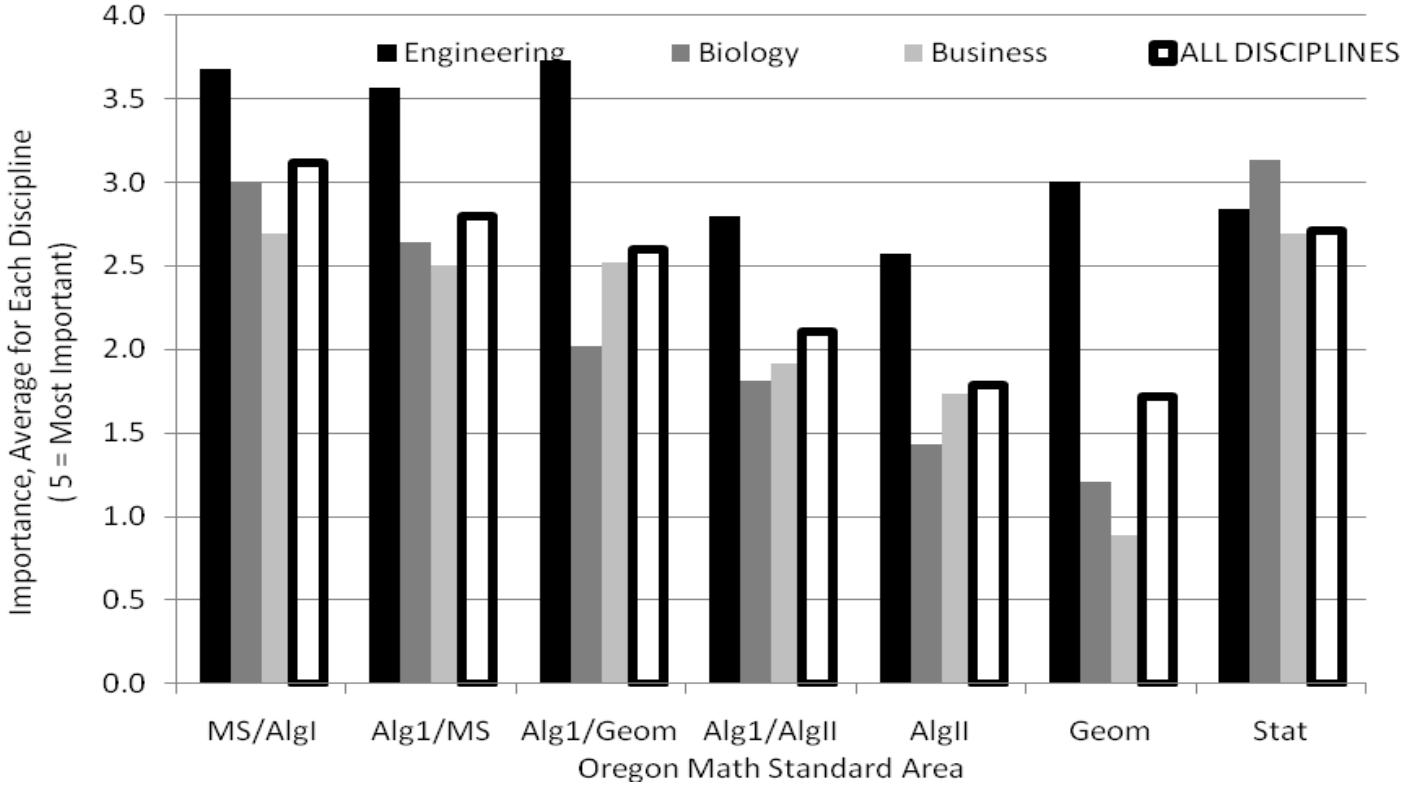


Figure 2d: 3 of the 9 Disciplines selected for rating math of high (Engineering), middle (Biology) and low (Environmental Science) importance, and the All Discipline Average

Key to Abbreviations Used in the Report

ABBREVATIONS:	Math Topic Indicated by the Abbreviation
Calculate/Dil	Calculation of dilution
Calculate/Est.	Estimation
Calculate/No.	Number value
Calculate/Sci	Scientific Notation
Alg/EquaFnct	Equations and functions
Alg/Exponent	Exponents
Alg/LinearRel	Linear Relationships
Alg/Numrcy	Numeracy
Stat/DatAnal	Data Analysis
Stat/Prob	Probability
Trig	Trigonometry
Trig/SimTri	Similar Triangles
Geo	Geometry
Geo/2dFig	Properties of 2 dimensional figures
Geo/3D	Properties of 3dimensional figures
Geo/AnalFig	Analysis of figures
Geo/Polygon	Types and features of polygons
AdvAlg/Equat	Equations
AdvAlg/Fact	Factoring
AdvALg/Func	Functions
AdvAlg/Logs	Logarithms
AdvAlg/Mtrx	matrices
AdvAlg/Plyno	polynomials
AdvAlg/Quad	quadratics
AdvAlg/RelaF	Relationships and functions
AdvAlg/Numr	numeracy
Alg I & II	Algebra I, Algebra II
Alg I, Geo, (Alg II)	Algebra I, Geometry & some Algebra II
Alg I (MS)	Algebra I & some Middle School Math
MS, Alg I	Middle School Math to Algebra I