

STATE BOARD OF EDUCATION

HEARING TYPE: X INFORMATION/NO ACTION

DATE: November 2, 2007

SUBJECT: **MATH STANDARDS REVISION AND SBE REVIEW OF MATH
CONTENT AND THIRD MATH CREDIT**

SERVICE UNIT: Edie Harding, Executive Director
State Board of Education

PRESENTERS: George Bright, K-12 Mathematics Curriculum Specialist, OSPI
Jessica Vavrus, Teaching and Learning Administrator, OSPI

Steve Floyd, Math Lead, SBE
Linda Plattner, Strategic Teaching

BACKGROUND:

Math Standards Revision

The SBE approved the Math Standards Review report by Strategic Teaching at its September meeting and sent a letter to OSPI with the report's recommendations. These recommendations included:

Recommendations one and two focus on improving math content and rigor, to make sure students receive a complete math education that prepares them for the work force and college. Specifically, the recommendations call for the new standards to:

- 1) Set higher expectations for Washington's students by fortifying content and increasing rigor.*
- 2) Make clear the importance of all aspects of mathematics content including the standard algorithms, conceptual understanding of the content, and the application of mathematical processes within content.*

Recommendations three, four and five focus on improving the standards by giving teachers better guidance on what math topics to prioritize and when to teach them. Specifically, the recommendations call for the new standards to:

- 3) Identify those topics that should be taught for extended periods at each grade level and better show how topics develop over grade levels.*

- 4) *Increase the clarity, specificity, and measurability of the Grade Level Expectations (GLEs).*
- 5) *Write Essential Academic Learning Requirements (EALRs) that restructure the standards to clarify grade-level priorities and reflect both the conceptual and procedural sides of mathematics.*
- 6) *Create a standards document that is easily used by most people.*

And finally, the last recommendation is designed to help OSPI successfully take on the task of re-writing the standards based on the recommendations.

- 7) *Create small, expert Standards Revision Teams for each grade band and systematically collect feedback on the revised standards.*

SBE has retained the services of Strategic Teaching to continue to work with the SBE and Math Panel to review the OSPI standards rewrite. The Math Panel will meet in December and February to discuss the standards rewrite.

OSPI has hired the Dana Center to conduct the work and Dr. George Bright, who will serve as the liaison between OSPI and the Dana Center. OSPI has also selected members for its teams (standards revision, editorial and articulation) that will assist with the work. Dr. Bright and Jessica Vavrus from OSPI will brief you on their progress. The standards rewrite is due January 31, 2008. OSPI briefed the Math Panel on October 17 at its meeting. You will receive a similar from them at the Board meeting.

SBE Review of Math Credit and Content

The Legislature asked the SBE to “revise the high school graduation requirements...to include a minimum of three credits of mathematics, one of which may be a career and technical course equivalent in mathematics, and prescribe the mathematic content in the three credits”¹ by December 1, 2007.

Enclosed is a memo that updates you on the Math Credit and Content issues. You will have a presentation at your meeting. Staff recommends that you complete your public outreach and take action at the January meeting on the math credit and content issue.

¹ 2SHB1906 SL 2006

Mathematics Standards Revision Teams
October 2007 – January 2008

Team Name and Composition	Description of Activities	Time Commitments	WA State and National Participants (name, affiliation, current role)
Project Management Team OSPI and Dana Center	Oversee the work of the Dana Center on this project	October 2007 – January 2008	OSPI Mathematics Lead: George Bright, Professor Emeritus of Mathematics Education, Special Assistant to the Superintendent OSPI Operational Lead: Jessica Vavrus, Teaching and Learning Operations and Programs Administrator Dana Center Leads: Cathy Seeley Susan Hudson Hull
Standards Revision Team (SRT) Teachers, mathematicians, curriculum experts, mathematics education faculty, business and community leaders (as possible) Includes Project Management, Articulation, and Editorial Teams	Provide broad vision for the nature of revisions needed in response to the SBE Review and Recommendations Report. Organized by four grade bands: K-2, 3-5, 6-8, and 9-12.	8 days total Two 3-day meetings: - October 3-5, 2007 - October 31 – Nov. 2, 2007 One 2-day meeting: - January 7-8, 2008	K-2 Team: - Dana Anderson, Stanwood-Camano School District, Instructional Facilitator - Tricia Hukee, Sumner School District, Classroom Teacher - Terry Rose, Everett School District, Curriculum Director - Allen Seneear, Seattle Schools, Parent 3-5 Team: - Millie Brezinski, Nine Mile Falls School District, Instructional Facilitator - Jewel Brumley, Yakima School District, Curriculum Expert - John Firkins, Gonzaga University(retired), Mathematician - Katherine Hansen, Bethel School District, Classroom Teacher - Rosalyn O'Donnell, Ellensburg School District, Classroom Teacher 6-8 Team: - Tim Bartlett, Granite Falls School District, Instructional Facilitator - Jane Broom, Microsoft, Group Manager of Microsoft Education Programs - Angela English, Arlington School District,

Team Name and Composition	Description of Activities	Time Commitments	WA State and National Participants (name, affiliation, current role)
			Classroom Teacher / Instructional Facilitator - Russ Gordon, Whitman College, Mathematician - Michael Janski, Cascade School District, Classroom Teacher - Russ Killingsworth, Seattle Pacific University, Post-Secondary Math Educator 9-12 Team: - John Burke, Gonzaga University, Post-Secondary Math Educator - Shannon Edwards, Chief Leschi School, Instructional Facilitator - James King, University of Washington, Mathematician - Kristen Maxwell, Educational Service District 105, ESD Math Coordinator - M. Cary Painter, Chehalis School District, Classroom Teacher - Patrick Paris, Tacoma School District, Instructional Facilitator - Tom Robinson, Lake Chelan School District, Classroom Teacher - Kimberly Vincent, Washington State University, Clinical Assistant Professor of Mathematics
Articulation Team Mathematicians, mathematics educators mathematics teachers	Review major drafts of standards to a coherent scope and sequence across grades K-12, and to ensure rigor, relevance, clarity, specificity, measurability throughout the revised standards in alignment with SBE Review and Recommendations Report. Participate in SRT Meetings.	Approx. 12 days total: With SRT: Two 3-day meetings: - October 3-5, 2007 - October 31 – Nov. 2, 2007 One 2-day meeting: - January 7-8, 2008 Apart from SRT: - Video and tele-conferences to be determined as necessary	Philip Daro, Dana Center Consultant Bonnie McNemar, Dana Center Consultant Susan Eddins, Illinois Math and Science Academy (retired) Wade Ellis, West Valley College, CA Jane Schielack, Texas A&M University Kurt Krieth, University of California at Davis Mike Gilbert, Eastern Washington University Lorna Spear, Spokane School District

Team Name and Composition	Description of Activities	Time Commitment	WA State and National Participants (name, affiliation, current role)
Editorial Team Mathematicians, mathematics educators, mathematics teachers	Develop and write drafts of revised standards based on the recommendations of the SRT and based on the SBE Review and Recommendations Report.	Approx. 14.5 days total With SRT: Two 3-day meetings: - October 3-5, 2007 - October 31 – Nov. 2, 2007 One 2-day meeting: - January 7-8, 2008 Apart from SRT: - 3, 1-2 day writing meetings	K-2 Team: Dinah Chancellor, Dana Center Consultant Angela Andrews, National Louis University Virginia Warfield, University of Washington 3-5 Team: Maggie Myers, University of Texas – Austin Mary Altieri, Dana Center Consultant Sharon Young, Seattle Pacific University 6-8 Team: Cathy Brown, Oregon Department of Education (retired) Carmen Whitman, Dana Center Consultant Art Mabbott, Seattle Schools 9-12 Team: Diane Briars, Pittsburgh Schools (retired) Bill Hopkins, Dana Center David Molina, Dana Center Consultant Lynn Raith, Pittsburgh Schools (retired) David Thielk, Central Kitsap School District
Focus Groups	Provide feedback on interim and subsequent drafts of revised standards.	December 2007 – January 2008 Specific dates: to be determined	Targeted Groups: SBE Math Panel and Board, OSPI Superintendent's Advisory Committee, ESD Math Coordinators, Curriculum Advisory and Review Council (CARC), Washington Education Research Association conference participants, OSPI January Conference, other targeted constituencies

Project Schedule

Key Activities and Deliverables	Due Date
Contract is awarded and work begins.	Sept. 24, 2007
Finalize Editorial and Articulation Team members; work with Washington OSPI to select Standards Revision Team members and Washington members of the Editorial and Articulation Teams.	Sept. 26, 2007
Treisman, Seeley, Hull (and others) meet with representatives of the Washington business community	Oct. 2, 2007
Standards Revision Team, with representatives of the Advisory and Editorial teams, meets for 3 days in Washington to structure standards revision process, produce exemplar GLEs, etc.	Oct. 3–5, 2007
Editorial and Articulation Teams develop skeleton of standards document, course content descriptions, grade level focal points, and sample GLEs; this process includes review and feedback from the Standards Revision Team.	Oct. 6–30, 2007
Standards Revision Team, with representatives of the Advisory and Editorial teams, meets for 3 days in Washington to outline Draft 1.	Oct. 31–Nov. 2, 2007
Editorial Team refines and edits draft standards and sends interim draft to Standards Revision Team and Superintendent Bergeson for review and feedback.	Nov. 15, 2007
Incorporating feedback from the Standards Revision Team and Superintendent Bergeson, refine draft and circulate for selective feedback both inside and outside Washington and post materials on the project website.	Dec. 4, 2007
Convene one or more focus groups to provide feedback on the draft, including meeting at the Washington Educational Research Association and other scheduled meetings of interested constituencies	Dec. 5–31, 2007
Complete recommended plans for critical next steps outside the scope of the proposed contract, including development of course descriptions at the high school level, determining how best to connect with the preschool and post-secondary communities, etc.	Dec. 5, 2007 — Jan. 21, 2008
Dana Center staff processes and summarizes feedback.	Jan. 2–4, 2008
Standards Revision Team, with representatives of the Advisory and Editorial teams, meets for 2 days in Washington to examine feedback, and revise draft.	Jan. 7–8, 2008
Editorial Team refines and edits draft.	Jan. 8–14, 2008
Revised draft presented to Superintendent Bergeson and the Standards Revision Team for feedback.	Jan. 14, 2008
Present proposed revised standards to Superintendent Bergeson, along with plans for critical next steps.	Jan. 21, 2008
Superintendent Bergeson approves document.	Jan. 28, 2008

K-12 Mathematics Standards Revision Process Update

Presented to:
State Board of Education
November 1, 2007

Introductions and Roles

George W. Bright

Professor Emeritus of Mathematics Education,
University of North Carolina - Greensboro and
Special Assistant to Dr. Terry Bergeson

Jessica Vavrus

OSPI Teaching and Learning
Operations and Programs Administrator

K-12 Mathematics Standards Revision Process

September 19, 2007

Final report and recommendations completed and
approved by State Board of Education and
presented to Dr. Bergeson.

January 31, 2008

Dr. Bergeson presents final draft of revised K-12
mathematics standards to the WA State
Legislature.

Contractor Selection

- Competitive Request for Proposal Process publicized August 10, 2007.
- Due to OSPI September 12, 2007
- Twelve firms were directly sent the solicitation; publicized nationally via Education Week periodical
- **Three proposals were received:** StandardsWork, University of Texas – Dana A. Center for Mathematics and Science Education, WestEd
- University of Texas – Dana A. Center for Mathematics and Science Education was selected as the contractor for the standards revision (October 2007 – January 2008).

Contractor Selection – Review and Scoring of Proposals

1. Evaluation of Written Proposals
2. Oral Interviews with Firms
3. Reference Checks
4. Determination of Apparent Successful
5. Debriefing Conferences
6. Contract Negotiation

Selection of Contractor: University of Texas – Dana A. Center for Mathematics and Science Education

- Quality, breadth, and balance of proposal
- Extensive and comprehensive team of national mathematics expertise
- Strong involvement of Washington State educators, mathematics stakeholders, and SBE throughout the process
- Clear understanding of Washington context
- Strong project management team with experience with mathematics standards, alignment, and assessment

Role of the Dana Center

- Manage and facilitate the standards revision process to assure fidelity and alignment with the SBE Review and Recommendations report.
- Develop comprehensive drafts of the revised standards by compiling the work of the Standards Revision Team, Editorial and Articulation Teams.

Mathematics Standards Revision Process: October 2007 – January 2008

Standards revision – diverse and representative teams:

- Project Management Team – OSPI, University of Texas - Dana Center
- Standards Revision Team
- Editorial Team
- Articulation Committee

Public and stakeholder input:

- SBE Math Panel
- Targeted focus groups and conferences (WERA, OSPI January Conference, etc.)
- Online public drafts for comment

Standards Revision Team (SRT)

Selection

- Applications disseminated statewide Sept. 21, 2007; Due Sept. 27, 2007
- Selection of SRT members – October 1, 2007
- Representative membership consistent with Strategic Teaching's Recommendations (including mathematicians, mathematics educators, teachers from all levels, curriculum experts, and business/community representatives, as well as, geographic, gender, and ethnic diversity)

Function

- Set broad vision for revision
- Identify "big ideas" by grade level
- Identify some performance expectations
- Provide detailed feedback on drafts

Summary Agenda: First SRT Meeting

Day 1

- Opening remarks: Bergeson, Triesman, Seeley
- Small group analysis of SBE Review and Recommendations Report, discussion of Major Recommendations
- Small group analysis of example standards - those used in the SBE Recommendation Report and others

Days 2 and 3

- Grade-band discussions and identification of big ideas; writing of sample performance expectations

SRT: Progress to Date

- Set broad vision for revision
Acknowledges need to respond to recommendations from the SBE Review and Recommendations Report
- Identify big ideas by grade level
Refinement of big ideas will happen at second meeting.
- Identify some performance expectations
Much more of this will happen at second meeting.

Editorial Team Meetings – October Start

- Four teams, by grade band: K-2, 3-5, 6-8, 9-12
- Each team has a member from WA.
- Initial meetings scheduled during Oct 10-28.
- Product will be pieces of initial draft of revised standards.
- Format will be explored by Project Management and Editorial Teams.

SRT: Second Meeting (Oct. 31 – Nov. 2, 2007)

- Members will receive and review a compiled draft, created from the products of Editorial Teams.
- Major work includes continuing discussion of critical issues (e.g., algorithms, rigor) and analysis of details of the compiled draft.
- Product will be refinement of “big ideas” and performance expectations, along with directions to Editorial Teams on how to finish the first draft.

Creating the First Draft

Editorial Teams will meet again in early November to complete their parts of the First Draft.

Project Management Team will compile the First Draft, share it with SRT members and others, and post it on the project website.

- The website will allow public comment on all aspects of the First Draft.

December 2007 – Continued Work

- December: Comments will be compiled by Project Management Team and shared with OSPI and others in WA.
- Editing of the First Draft will continue.
- A modified First Draft, along with a summary of comments, will be shared with the SRT in preparation for the January meeting.

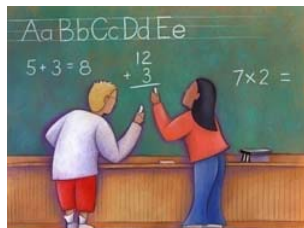
January 2008

- **Second Draft:**
Created after the January meeting of the SRT (January 7- 8, 2008).
 - This draft will be edited and revised before the Final Version is submitted to Dr. Bergeson on January 28.
- **January 31, 2008:**
Presentation of revised K-12 Mathematics Standards to State Legislature

Opportunities for Input and Comment

- Project Website – “live” in November
- Targeted Focus Groups:
 - OSPI Curriculum Advisory and Review Committee + ESD Mathematics Coordinators, November 30
 - WERA Conference, December 6
 - OSPI Superintendent’s Advisor Committee
 - OSPI January Conference (January 29-31, 2008)
- Additional Project Updates:
 - State Board Meeting – November 1
 - SBE Math Panel – December 13
 - Legislative Staff updates – as requested
 - Other?

Thank you!





WASHINGTON STATE BOARD OF EDUCATION

OLD CAPITOL BUILDING, •ROOM 253, •P.O. Box 47206, •600 S.E. WASHINGTON, •OLYMPIA, WA 98504-7206

October 22, 2007

TO: State Board of Education Board Members

FROM: Edie Harding, Executive Director

SUBJECT: **Third High School Math Credit and Prescribed Content for High School Mathematics**

During the last session, the legislature requested the State Board of Education to "revise high school graduation requirements to include a minimum of three credits of mathematics, one of which may be a career and technical course equivalent in mathematics, and prescribe the mathematics content in the three required credits." ¹ The Board is supposed to do this work by December 1, 2007. I recommend that you review the information presented at the November Board meeting and continue your outreach meetings to gather public comment. I think you should wait until your January board meeting for a decision.

I read the request this way: The legislature wants students to take more than two credits of math. They would like the third credit to be earned by students graduating in the Class of 2012. They want to be sure there are ways to "cross credit" career and technical education (CTE) courses with math content that could count as a math credit. They also want the SBE to outline the core concepts needed for high school courses such as Algebra I, Geometry, and Algebra II (as well as integrated versions such as Integrated I, II, and III).

There are two key questions for you to consider and that we have posed to others in our work sessions:

1. What should the third credit of math look like?
2. What are the implications for CTE math courses?

¹ 2SHB 1906 from the 2007 Legislative Session

A Third Mathematics Credit

In our work to examine alignment of high school credits with the requirements to enter (and be successful in) postsecondary education, we looked at the kind of math required so that students do not need to take remedial courses. Intermediate algebra (Algebra II) is the math students must master to place into credit bearing classes. To align with postsecondary requirements and success in college, you would need to adopt a math credit that was aligned with the grade level expectations (GLEs) for 11th and 12th grade. OSPI is currently revising these GLEs and they will contain Algebra II. We do not know what else the new GLEs will contain nor do we have a way to determine the amount of Algebra II that should be a part of a credit. The Higher Education Coordinating Board now requires a quantitative course (it can be a math based course in science or math) for a high school student's senior year (unless they have completed math through pre-calculus) for minimum college admission. You may want to consider requiring the third credit of math for the senior year as well so that students do not lose their math skills.

Implications for CTE

One challenge with CTE math courses is how much math is in them and is the math aligned to the 9th and 10th grade level expectations. We do not currently have the answers to these questions. In addition we believe that none of the current CTE courses align with grade level expectations beyond 10th grade, which means new CTE courses would need to be created. We have also looked at Career Pathways and CTE courses that lead to certificates. What is clear is that the certificates earned at community and technical colleges that pay the higher wage jobs (e.g., health, engineering technologies, information technology, and protective services) all require Algebra II. The certificates from programs with lower wage jobs (e.g., early childhood, culinary arts, and nursing assistance) require Algebra I and Geometry. Math needed for jobs requiring only a high school education or for apprenticeship programs is highly varied.

Work to Date

The Board has contracted with Linda Plattner of Strategic Teaching to develop the core mathematical concepts that are included in commonly taught courses. A draft of these core concepts has been developed for Algebra I, Geometry, and Algebra II, and a draft of the integrated series is in progress. She is sharing this information with OSPI as they rewrite the standards (we are caught in a conundrum since the legislature is requiring something more specific than the standards before they have been rewritten). OSPI has just begun its work on rewriting the standards and will not be done until the end of January.

Linda is examining ways that career and technical education courses may be used to meet these requirements. Linda is consulting with OSPI mathematics staff and other mathematicians and career and technical education teachers as she prepares this work. We have also asked Linda to determine what kind of mathematics is necessary to enter an apprenticeship program and to determine what kind of math allows students to begin their post high school education with credit bearing courses. We shared this content at our meetings on October 17th with the Math Panel and October 18th with the Meaningful High School Diploma advisors. There was no clear consensus from those meetings.

The Board will have an overview of the math credit issue and listen to Linda's presentation at its November 1, 2007 meeting on the third credit of math and will receive public comment. It will also conduct outreach to listen to the public on math as part of its high school diploma discussion this fall across the state. Currently, the Board requires that the two high school math credits align with 9th and 10th grade level expectations. As part of its pending adoption, the Board will need to decide whether the third credit of math must align with 11th and/or 12th grade level expectations and whether it wants to require math in the senior year. Attached is a list of the math requirements needed for degree and certificate programs at community and technical colleges as well as the minimum math requirements needed for admission to four-year public colleges in Washington.

Attachments



THE NEW STATE BOARD OF EDUCATION
Accountability | World-Class Math and Science Standards | Meaningful Diploma

Work Session on the Third Credit of Math and Math Content

Framing the Issues



The New State Board

A Catalyst for Improvement



Our Goals

- Improve student performance dramatically.
- Provide all students the opportunity to succeed in postsecondary education, the 21st century world of work and citizenship.

Joint Math Action Plan – An Achievable Vision for 2011



A highly collaborative effort: OSPI, SBE and PESB

- Clear, world-class standards
- A new generation of assessments
- Curriculum aligned to standards
- Rigorous graduation course requirements
- Excellent, aligned teacher preparation and professional development

Meaningful H.S. Diploma

Strengthening the Diploma

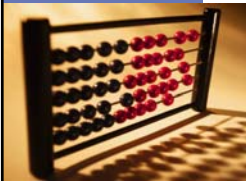


Legislative Requirements for SBE

- **Purpose of Diploma:** Propose revised definition.
 - Report to Legislature: December 1, 2007 (E2SHB 3098)
- **Math:** Revise high school graduation requirement to include 3 credits, prescribing math content in required credits, including a CTE equivalency. This math credit will become effective for the class of 2012.
 - Report to Legislature: December 1, 2007 (2SHB 1906)

Meaningful H.S. Diploma

Current Context



- Washington State Minimum High School Graduation Credits have not changed since 1985
- Employers are looking for higher skilled, better trained and educated workers.
- Livable wage jobs in today's economy require more education and higher skills.
- Over one third of students who attend *either* 2 and 4 year colleges directly from high school enroll in a remediation course; in community and technical colleges alone, the percentage is higher.

Meaningful H.S. Diploma

Washington Requires Fewer Credits Than Most States



How Do Washington's Graduation Requirements Compare?

- Fourteen states have set their course requirements at a level that will prepare high school graduates for success in college and the workplace. Another 15 states are working toward similar alignment.
- Only 8 states, including Washington, require fewer than 20 credits; however, Washington districts' requirements *average* 24 credits.
- 44 states with state level graduation requirements have a median number of 3 math credits required, some are moving to 4 credits.

Meaningful H.S. Diploma

Current Graduation Requirements



Subject	Current Graduation Requirements
English	3
Math	2
Science	2 (1 lab science)
Social Studies	2.5
World Language	0
Arts	1
Health and Fitness	2
Occupational Education	1
Electives	5.5
Total	19 (13.5 core + 5.5 electives)

Meaningful H.S. Diploma

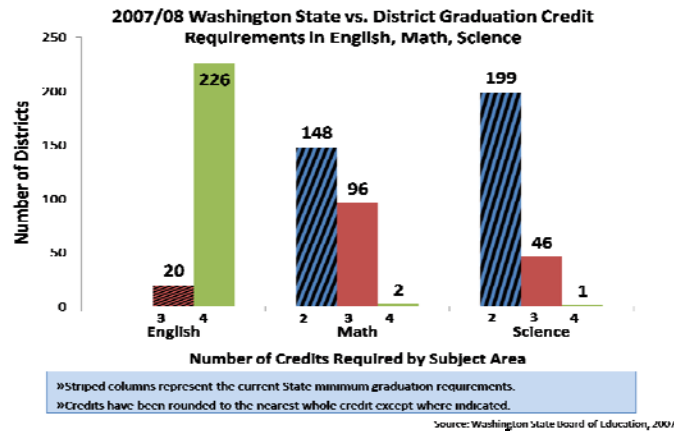
Current Graduation Requirements vs. College Math Credit Requirements



Subject	Current Graduation Requirements	Two-year and Four Year Public College for Credit Bearing Classes
Math	2 credits aligned with the 9 th and 10 th level GLEs	Mastery of Algebra I, Geometry, and Algebra II

Meaningful H.S. Diploma

Most Districts Exceed State Minimum in English; Meet Minimums in Math & Science



Meaningful H.S. Diploma

Valuing Public Input



The Board...

- Developed preliminary draft concepts for extensive and formative public input and refinement.
- Acknowledged magnitude of the implementation challenges that these proposals may present.
- Recognized the need to be especially sensitive to identifying potential implementation barriers as well as strategies for dealing with them.

Meaningful H.S. Diploma

Purposes For A Diploma



- Ready for success in postsecondary education, gainful employment, and citizenship.
- Meet personalized education needs of student as well as society's needs.

Meaningful H.S. Diploma

One Diploma For All



- Send clear message to all students about what they need to succeed after high school.
- Ensure that diploma means that students have met certain standards.
- Give appropriate recognition to special education students with IEPs.

Meaningful H.S. Diploma

Key Principles and Critical Elements



- Overarching expectations/essential skills needed for student lifelong learning.
- Equivalency or competency credits (cross credits between subjects, ability to demonstrate competencies in a variety of subjects—world language, Career and Technical Education, etc).

Meaningful H.S. Diploma

Key Principles and Critical Elements



- Comprehensive integrated graduation requirement package:
 - o High school and beyond plan
 - o High quality courses
 - o Application of learning through a culminating project
 - o CAA/CIA
- Alignment with postsecondary education minimum entry requirements.

State Board of Education: Next Steps



Questions for the Board:

- What should the third credit of math look like?
- What are the implications for CTE math courses?



**Washington State
Board of Education**



Working to Raise Student Achievement Dramatically

**Higher Education Coordinating Board
Minimum Math Requirements for Admission to
Washington Four-year Public Institutions**

Revise the proposed math requirement to include at least three credits of math

The revised standards would maintain the current requirement that students take math at least through Intermediate Algebra (Algebra II), or its equivalent Integrated Math III. In addition, passing the 10th grade WASL-M would fulfill the first two CADR requirements in math.

Require one credit of quantitative coursework in the senior year

Math heightens mental acuity and makes students sharper in all subjects. The proposed revisions in math include a requirement that students engage in quantitative coursework in their senior year of high school. The intent is to ensure that students build and retain their math skills throughout high school. As a result, students may complete a higher level of math than they would have under the previous standards. However, the revised proposal *does not require* students to complete a higher level of math than was required in the existing minimum admission standards (Intermediate Algebra or Integrated Math III). The only change is to require that students take a math or other math-based quantitative course during their senior year.

Students could choose from several options to meet the proposed requirement:

- ⌚ They may take Intermediate Algebra (Algebra II) or Integrated Math III in their senior year.
- ⌚ They could move to a higher level of math (pre-calculus) if they have completed Intermediate Algebra or Integrated Math III.
- ⌚ They could take the required algebra-based science course in their senior year.
- ⌚ They could take another course during their senior year of high school in which they apply their math knowledge/skills (such as statistics, applied math, appropriate career and technical courses, or another algebra-based science) if the high school determines the course meets the guidelines for designation as a math CADR.
- ⌚ Students who successfully complete math through pre-calculus would meet the math requirements and be exempt from the senior year math requirement, even if they complete pre-calculus before their fourth year of high school.

Math Skills Needed at Washington State Community and Technical Colleges

As "open door" institutions, community and technical colleges provide educational opportunities for all regardless of their educational background. **High school graduates** are able to complete their program quickly and **at the lowest cost** by following the **recommended course pattern while in high school (Algebra II/Algebra-Trig/Integrated Math 3)** level math skills, **at least two years of Science, 3-4 years of English** and, if planning a bachelor's degree at some time in the future, **at least two years of a Foreign Language**. Colleges may require those who have not followed the recommended pattern to complete pre-college course work, at their own expense, prior to beginning their degree/certification program, thus adding to the time needed to complete a degree or certificate.

Recommended Math Skill for Entering into Degree and Certificate Programs Offered by Community and Technical College in the State of Washington

As indicated in the tables that follow, most degrees and many certificates require mastery of **high school level Algebra II/Algebra-Trig/Integrated Math 3** skills prior to enrolling in the required college-level course in math or other quantitative skills course, others require **Geometry** level math skills and all require a minimum of **Introductory Algebra/Integrated Math 2** skills. Although these levels are not required for admission, they are required for the entrance into classes in math or other quantitative skills in the degree and certificate programs. ***These math skills are critical for successful program completion.***

Math Requirements- Transfer Degrees: Students starting at a community college with the specific goal of transfer to a bachelor's degree program have the following math requirements: Three years of mathematics study are required prior to taking the college-level math or other quantitative skills class in the associate transfer degree. These three years need to result in mastery of the skills covered in the integrated math 1-3 classes or in the series of algebra, geometry, and algebra II/algebra-trig classes. More advanced mathematics courses are recommended, such as trigonometry, mathematical analysis, elementary functions, and calculus. Arithmetic, pre-algebra, business mathematics, and statistics courses are not sufficient preparation for the associate transfer degree.

- **Associate in Arts or Associate in Arts & Sciences (AA and AAS)** – prerequisite high school course is Algebra II/Algebra-Trig/Integrated Math 3. To complete some arts degrees within two years, for example preparation for transfer in business, students should master math through pre-calculus while in high school.
- **Associate in Science-Transfer (AS-T)** - to complete the degree in two years, students need to be ready for calculus when they enter college. Students should master math through pre-calculus while in high school.

Algebra II/Algebra-Trig/Integrated Math 3 Prerequisite Workforce Programs: The following areas of study typically require at least one college-level math course with mastery of Algebra II/Algebra-Trig/Integrated Math 3 skills as a prerequisite and the typical graduate earns \$15.50 per hour in the first year after completing their program.

Higher Wage Workforce Degrees/Certificates:

Allied Health

- Associate Degree Nursing - RN
- Cardiac Invasive Technical
- Clinical/Medical Laboratory Technology
- Dental Hygienist
- Denture Technician
- Diagnostic Medical Sonography/Ultrasound Technology
- Echocardiographic Technician
- Emergency Medical Technician (Paramedic)
- Health Information/Medical Records Technology
- Hemodialysis Technician
- Hospital Central Service Technology
- Medical Radiologic Technology
- Nuclear Medical Technology

- Occupational Safety & Health Tech
- Occupational Therapy Assistant
- Optician/Ophthalmic Dispensing Optician
- Orthotics/Prosthetics
- Paramedic EMT
- Physical Therapy Assistant
- Practical Nursing
- Respiratory Care Therapy
- Surgical Technology

Engineering Technologies

- Architectural Engineering Technology
- Biomedical Technology
- Civil Engineering Technology
- Computer Software Technology
- Computer Tech/Computer Systems Technology
- Drafting & Design Technology
- Electrical, Electronics & Communications Eng Tech
- Electromechanical Technology
- Electronic/Fire Security Technician
- Engineering Technology
- Environmental Engineering Technology
- Geographic Information Systems
- Hydraulics & Fluid Power Technology
- Industrial Technology
- Instrumentation Technology
- Manufacturing Technology
- Mechanical Technology
- Occupational Safety & Health Technology
- Semi-Conductor Tech/Computer Electronics
- Surveying Technology
- Telecommunications Technology
- Water Quality & Wastewater Mgmt & Recycling Tech

Information Technology

- Animation, Interactive Tech, Video Graphics & Spc Effects
- Computer & Information Systems Security
- Computer Graphics
- Computer Programming
- Computer Systems Networking & Telecommunications
- Data Warehousing/Mining & Database Admin
- Digital media: Web Page, Digital/Multimedia & Info Res Des
- Information Processing
- Microcomputer applications
- System, Networking & LAN/WAN Mgmt
- Technical Support/Support Services
- Technical Writing/Communications
- Web/Multi-media management & Webmaster
- Word Processing

Taken from:
2005-2007 Higher Education Book
Put Together by:
Washington Council for High School-College Relations

Protective Services

- Correctional Mental Health
- Corrections
- Criminal Justice/Law Enforcement Administration
- Emergency Dispatcher
- Emergency Management
- Fire Science/Administration
- Forensic Technology
- Forest Fire Supervision & Management
- Security & Loss Prevention Services

Other

- Airframe/Powerplane Mechanics/ Aircraft Maint Tech
- Appliance Install Repair Technician
- Aviation/Airway Management & Operations
- Business Machine Repair
- Commercial Helicopter Pilot
- Communication Systems Install/Repair
- Computer Install/Repair
- Computerized Numerical Control Manufacturing
- Electrical/Electronics Equipment Install/Repair
- Habitat Technician
- Heavy Equipment Maintenance Technology
- Industrial Electronics Technology
- Legal Assistant/Paralegal
- Machine Tool Technology
- Merchant Marine Officer
- Parks, Recreation & Leisure Facilities Management
- Processing Machinery Maint & Repair Technology
- Sheet Metal Technology
- Sign Language Interpretation & Translation
- Stationary Energy Sources Installer/Operator
- Truck & Bus Driver/Commercial Vehicle Operation
- Welding Technology
- Wood Science & Wood Products/Pulp & Paper Technology

Algebra II/Algebra-Trig/Integrated Math 3 or Algebra/Geometry

Prerequisite Workforce Programs: Degrees in the following areas typically *require* the same math level as the Higher Wage programs. Certificates typically require college-level math courses with a minimum prerequisite of mastery of the skills of high-school level of Integrated Math 2 or Introductory Algebra/Geometry. Some students enter these fields with a short-term goal of immediate employment and a longer-term goal of returning to further education to move up the career ladder. Those students should complete the same high school math as required for the transfer degrees. The *typical graduate earns* \$12.00 per hour in the first year after completing their program.

Middle Wage Workforce Degrees/Certificates

- Accounting Technician & Bookkeeping
- Agricultural Mechanics & Operation
- Air Traffic Controller
- Airline/Commercial Pilot & Flight Crew
- Autobody
- Biological Lab Technology
- Building/Construction Management
- Business Administration/Management
- Cabinetmaking & Millwork
- Carpentry/Electrician – non-apprenticeship
- Communication Technology
- Commercial/Professional Pilot
- Computer Integrated Manufacturing
- Construction Engineering Technology
- Dental Assistant
- Dental Laboratory Technician
- Dietetic Technician

- Electrical Design Technology
- Golf Management
- Heating/AC/Ventilation /Refrigeration Maintenance Tech
- Industrial Mechanics & Maintenance Technology
- Industrial Plant Services
- Marine Maintenance/Fitter & Ship Repairer
- Massage Therapist
- Medical Insurance Specialist
- Medical/Clinical Assistant
- Musical Instrument Fabrication & Repair
- Pharmacy Technician
- Phlebotomy
- Plastics Engineering Technology
- Restaurant, Culinary & Catering Management
- Small Engine Mechanics & Repair Technology
- Speech/Hearing Therapy Aid
- Sports & Fitness Management
- Upholstery
- Visual/Performing Arts
- Watchmaking & Jewelrymaking
- Water, Wetlands & Marine Resources Management

Integrated Math 2/Introductory Algebra/Geometry Prerequisite

Workforce Programs: The following programs typically *require* college-level math courses or math skills with mastery of skills in Introductory Algebra and often Geometry or Integrated Math 2 as a prerequisite. Some students enter these fields with a short-term goal of immediate employment and a longer-term goal of returning to further education to move up the career ladder. Those students should complete the same high school math as required for the transfer degrees. The *typical graduate earns* \$10.00 per hour in the first year after completing their program.

Lower Wage Degrees/Certificates

- Administrative Support
- Agricultural Business/Production
- Cosmetology
- Court Reporting
- Culinary Arts/Chief Training/Baking & Pastry Arts
- Custodial/Building Services
- Early Childhood Education & Teaching
- Electronics Assembly
- Fisheries
- Forestry
- Geriatric Aide
- Hearing Instrument Fitter & Dispenser
- Horticulture/Landscaping
- Human Service Training
- Interior Design
- Library Assistant
- Marketing & Sales
- Mental Health Services Technician
- Natural Resources/Conservation
- Nursing Assistant
- Optometric Assistant
- Recreational Therapy Aide
- Rehabilitation Counseling
- Substance Abuse/Addiction
- Teaching Assistant/Paraeducator
- Tourism & Travel Service Mgmt
- Tree Fruit Production
- Turf & Turfgrass Mgmt
- Veterinary Assistant
- Viticulture

**Earnings of 2000-01 Workforce Completers in the Year After College by Field of Study
as provided by the Washington State Board of Community and Technical Colleges¹**

Programs with Algebra II/Algebra-Trig/Integrated Math 3 as Prerequisite

	<u>Median Wage</u>	<u>Annual Earnings</u>
Aircraft Mechanic/Airframe Power Plant	\$15.00	\$28,463
Associate Degree Nurse - RN	\$24.00	\$42,039
Computer Maintenance Tech	\$14.00	\$27,156
Criminal Justice/Law Enforcement	\$16.00	\$34,008
Dental Hygienist	\$39.00	\$54,147
Drafting	\$14.00	\$30,685
Electrical Equipment Repair	\$14.00	\$26,251
Electronics Technology	\$14.00	\$27,552
Engineering Technology	\$14.00	\$24,169
Industrial Technology	\$15.00	\$47,995
Information Technology	\$15.00	\$25,545
Legal Assistant	\$14.00	\$27,029
Machinist	\$14.00	\$26,327
Med LabTech /Histologic	\$17.00	\$33,514
Medical X-Ray	\$24.00	\$50,159
Occupational Therapy	\$16.00	\$25,949
All Other Health Tech	\$15.00	\$28,574
Paramedic EMT, Surgical Tech	\$15.00	\$26,384
Physical Therapy Assistant	\$15.00	\$25,732
Practical Nurse	\$17.00	\$29,819
Transportation Operator	\$13.00	\$21,645
Welding	\$14.00	\$25,429

Programs with a minimum of Introductory Algebra/Geometry or Integrated Math 2 as prerequisite

	<u>Median Wage</u>	<u>Annual Earnings</u>
Accounting	\$13.00	\$21,231
Auto Diesel	\$12.00	\$22,653
Commercial & Graphics Art	\$11.00	\$18,474
Construction Trades	\$14.00	\$21,240
Dental Assisting	\$12.00	\$20,862
Managerial and Managerial Support	\$15.00	\$27,413
Medical Assisting	\$12.00	\$20,755
Other Health Services	\$13.00	\$21,936
All Other Technical	\$13.00	\$23,297
Pharmacy Assisting	\$13.00	\$24,441
Precision, Production, Crafts	\$14.00	\$25,643

Programs with Introductory Algebra/Geometry or Integrated Math 2 as prerequisite

	<u>Median Wage</u>	<u>Annual Earnings</u>
Administrative Support	\$11.00	\$18,616
Agriculture, Forestry and Fisheries	\$11.00	\$18,671
Cosmetology	\$10.00	\$14,719
Culinary Arts	\$11.00	\$18,705
Early Childhood Ed	\$11.00	\$16,660
Marketing and Sales	\$10.00	\$16,048
Nursing Assistant	\$10.00	\$15,338
Other Services	\$11.00	\$16,497
Social Services	\$10.00	\$13,475
Teaching/Library Assistant	\$10.00	\$12,231
Veterinarian Assistant	\$11.00	\$16,915

(Footnotes) See **Job Training Results** at <http://www.wtb.wa.gov/jtr/> for more detailed earnings information by program by college.