Quality Instructional Materials Review Tool: High School Mathematics

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INTRODUCTION

The Common Core State Standards (CCSS), informed by three decades of knowledge around learning, created an unprecedented opportunity to improve student achievement nationwide. However, simply adopting the CCSS and working with teachers on the instructional shifts does not directly translate into student success.

Evidence indicates that instructional materials have a significant effect on student outcomes with impact as large as teacher quality. However, schools, districts, and states lack trusted, transparent information about the quality of the materials and tools they use to guide instruction. Current state adoption processes yield inconsistent findings and provide limited evidence to support districts in selecting materials. Due to the lack of information, selection decisions often privilege factors other than alignment or quality. Just 18 percent of teachers strongly agreed that their textbooks and main curricular materials are aligned to the common core. In one study, the average cost-effectiveness ratio of switching to higher quality curriculum was almost 40 times that of class-size reduction.

ABOUT EDREPORTS

Our Vision: All students and teachers in the United States will have access to the highest-quality instructional materials that will help improve student learning outcomes.

Our Mission: EdReports.org is an independent nonprofit designed to improve K-12 education. EdReports.org increases the capacity of teachers, administrators, and leaders to seek, identify, and demand the highest-quality instructional materials. Drawing upon expert educators, EdReports.org's evidence-based reviews of instructional materials and support of smart adoption processes will equip teachers with excellent materials nationwide.

Our Theory of Action: Credible information against quality criteria in a quickly changing marketplace helps educators make better purchasing decisions and improve student performance. Identifying excellence and improving demand for credible information will improve the supply of quality materials over time, leading to better student achievement outcomes.

ABOUT THIS TOOL

EdReports.org developed this tool to provide educators, stakeholders and leaders with independent and useful information about the quality of instructional materials (whether digital, traditional textbook or blended) from those who will be using them in classrooms. Educators use the tool to evaluate full sets of instructional materials in mathematics against non-negotiable criteria (see Figure 1). The tool builds on the experience of educators, curriculum experts and leading rubric developers and organizations – such as Achieve, Inc., the Council of Great City Schools, the Dana Center, Illustrative Mathematics Project, the National Council of Teachers of Mathematics and Student Achievement Partners, among others – that have conducted reviews of instructional materials, lessons and tasks.

To create the evaluation tool, EdReports.org conducted research into the use of commonly-used rubrics, gathered input from more than 500 educators during a nationwide listening tour on criteria and rubrics, interviewed professors of mathematics and mathematics education along with publishers of materials and convened an Anchor Educator Working Group (AEWG) of practitioners to inform the creation of the instrument. Continuous improvement was important to this development, and the AEWG had the opportunity to refine the tool after the initial round of implementation. The tool has three major gateways (see Figure 1) to guide the evaluation process. Reviewers apply the three gateways sequentially to ensure the extent to which materials are CCSS-aligned and usable by educators. Those materials that meet or partially meet the expectations for Gateway 1 (CCSS Focus and Coherence) will move to Gateway 2. Only those materials that meet the expectations for both Gateway 1 and Gateway 2 (Rigor and Mathematical Practices) will move to Gateway 3 (Usability Indicators).

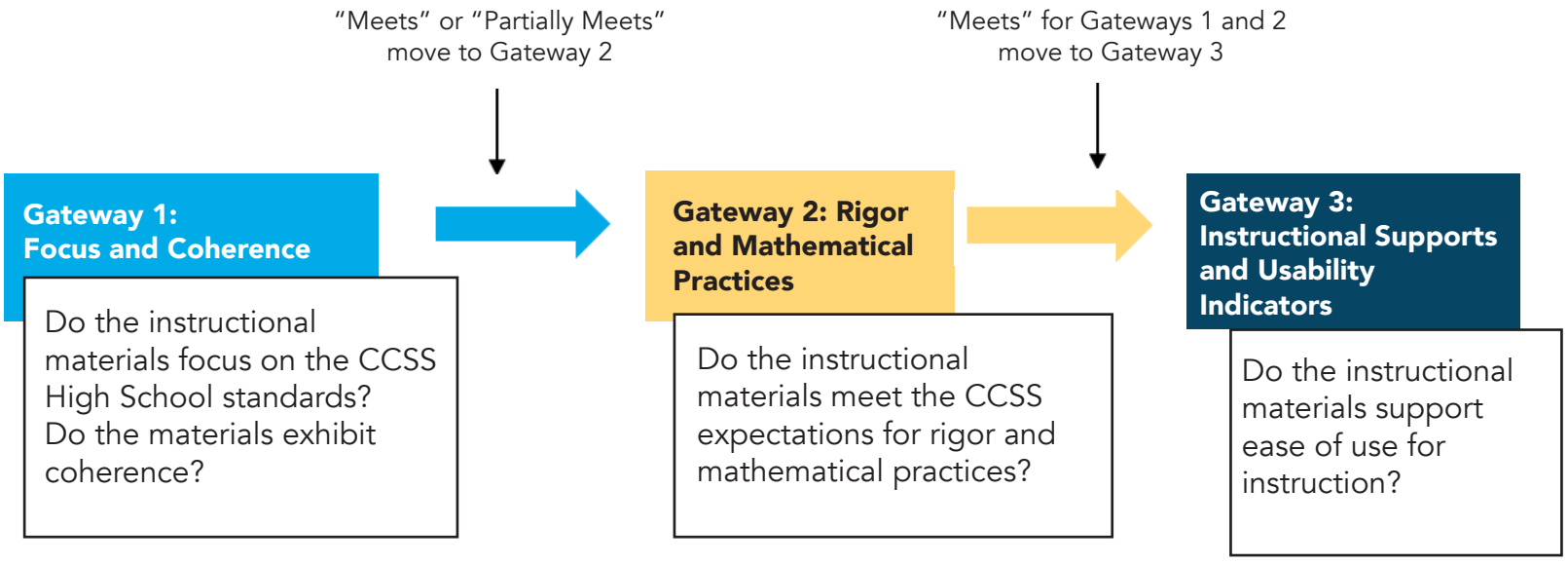

Figure 1: Gateway Evaluation Process for Review of Mathematics Materials

THE QUALITY INSTRUCTIONAL MATERIALS REVIEW TOOL

GATEWAY 1: FOCUS AND COHERENCE

In this gateway, reviewers consider how well the materials are coherent and consistent with the high school standards that specify the mathematics which all students should study in order to be college and career ready, including the modeling standards that appear throughout the high school Common Core standards, as indicated by a star (*). We use the specific definition of modeling that appears in the standards to inform our evidence collection and scoring.

Guiding review questions:

- Do the instructional materials focus on "the high school standards that specify the mathematics which all students should study in order to be college and career ready" (p. 57 of CCSSM)?
- Do the instructional materials exhibit coherence within and across courses/grade levels that is consistent with a logical structure of mathematics?

Rating Sheet 1: Focus and Coherence

CRITERION	INDICATORS of the criterion	POINTS
Focus and Coherence: The instructional materials are coherent and consistent with "the high school standards that specify the mathematics which all students should study in order to be college and career ready". Earned: _____ of 18 points Meets expectations (14-18 points) Partially meets expectations (10-14 points) Does not meet expectations (<10 points)	1a. The materials focus on the high school standards.[3]	
	1ai. The materials attend to the full intent of the mathematical content contained in the high school standards for all students.[4]	0 2 4
	1aii. The materials attend to the full intent of the modeling process when applied to the modeling standards.[5]	0 1 2
	1b. The materials provide students with opportunities to work with all high school standards and do not distract students with prerequisite or additional topics.	
	1bi. The materials, when used as designed, allow students to spend the majority of their time on the content from CCSSM widely applicable as prerequisites for a range of college majors, postsecondary programs, and careers.	0 1 2
	1bii. The materials when used as designed allow students to fully learn each standard.	0 2 4
	1c. The materials require students to engage in mathematics at a level of sophistication appropriate to high school.	0 1 2
	1d. The materials are mathematically coherent and make meaningful connections in a single course and throughout the series, where appropriate and where required by the Standards.	0 1 2
	1e. The materials explicitly identify and build on knowledge from Grades 6-8 to the High School Standards.	0 1 2
	1f. The plus (+) standards, when included, are explicitly identified and coherently support the mathematics which all students should study in order to be college and career ready.	**Unrated**

3 In this tool, the phrase "high school standards" refers to the standards that "specify the mathematics that all students should study in order to be college and career ready" (p. 57). These standards do not have a plus (+) symbol. Those standards that encompass additional mathematics for advanced courses and are indicated by a (+) symbol in the CCSS are considered in indicator 1g.

4 For those standards indicated as modeling standards, this indicator will not examine how the modeling process is used with them. The examination of the modeling process with specific modeling standards will occur in indicator 1aii.

5 In the CCSSM, "specific modeling standards appear throughout the high school standards indicated by a star symbol" (p. 57), and the modeling process includes 6 steps and is defined to be a "process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions" (p. 72).

Overall Gateway 1 Rating: Focus and Coherence

- Reviewers should use data recorded in Rating Sheet 1 to determine the Gateway 1 final rating

	CRITERIA	RATING SCORE
GATEWAY 1: FOCUS AND COHERENCE – The instructional materials are coherent and consistent with the "high school standards that specify the mathematics which all students should study in order to be college and career ready" (p. 57 of CCSSM) Earned: _____ out of 18 points ☐ Meets expectations (14-18 points) ☐ Partially meets expectations (10-13 points) ☐ Does not meet expectations (< 10 points)	**1a-1e.** The instructional materials are coherent and consistent with "high school standards that specify the mathematics which all students should study in order to be college and career ready" (p. 57 of CCSSM)	Point Totals from Rating Sheet(s):

MATERIALS MUST MEET EXPECTATIONS OR PARTIALLY MEET EXPECTATIONS FOR GATEWAY 1 TO MOVE ON TO GATEWAY 2

GATEWAY 2: RIGOR AND MATHEMATICAL PRACTICES

Rigor determines if a series instructional materials reflect the balances in the standards by helping students develop conceptual understanding, procedural skill and fluency, and application. Mathematical Practices determine how well materials meaningfully connect the Mathematical Content Standards and the Mathematical Practice Standards.

Guiding review questions:

- Do the instructional materials engage students with all aspects of rigor: conceptual understanding, procedural skill and fluency, and application in a balanced way?
- Do the Mathematical Practices connect to the Mathematical Content Standards in meaningful and deliberate ways?

Rating Sheet 1: Rigor and Balance

CRITERION	INDICATORS	POINTS
Rigor and Balance: The instructional materials reflect the balances in the Standards and help students meet the Standards' rigorous expectations, by giving appropriate attention to: developing students' conceptual understanding; procedural skill and fluency; and engaging applications.[6] Earned: ____ of 8 points Meets expectations (7-8 points) Partially meets expectations (5-6 points) Does not meet expectations (<5 points)	2a. Attention to Conceptual Understanding: The materials support the intentional development of students' conceptual understanding of key mathematical concepts, especially where called for in specific content standards or clusters.	0 1 2
	2b. Attention to Procedural Skill and Fluency: The materials provide intentional opportunities for students to develop procedural skills and fluencies, especially where called for in specific content standards or clusters.	0 1 2
	2c. Attention to Applications: The materials support the intentional development of students' ability to utilize mathematical concepts and skills in engaging applications, especially where called for in specific content standards or clusters.	0 1 2
	2d. Balance: The three aspects of rigor are not always treated together and are not always treated separately. The three aspects are balanced with respect to the standards being addressed.	0 1 2
Practice-Content Connection: Materials meaningfully connect the Standards for Mathematical Content and the Standards for Mathematical Practice.[7] Earned: ____ of 8 points Meets expectations (7-8 points) Partially meets expectations (4-6 points) Does not meet expectations (<4 points)	2e. The materials support the intentional development of overarching, mathematical practices (MPs 1 and 6), in connection to the high school content standards, as required by the mathematical practice standards.	0 1 2
	2f. The materials support the intentional development of reasoning and explaining (MPs 2 and 3), in connection to the high school content standards, as required by the mathematical practice standards.	0 1 2
	2g. The materials support the intentional development of modeling and using tools (MPs 4 and 5), in connection to the high school content standards, as required by the mathematical practice standards.	0 1 2
	2h. The materials support the intentional development of seeing structure and generalizing (MPs 7 and 8), in connection to the high school content standards, as required by the mathematical practice standards.	0 1 2

6 Refer also to Criterion #2 (pages 9-10) in the HS Mathematics Publisher's Criteria.

7 Refer also to Criterion #5 (pages 12-13) in the HS Mathematics Publisher's Criteria. Not all items need to align to a Mathematical Practice. In addition, there is no requirement to have an equal balance among the Mathematical Practices in any set of materials or grade.
to improve decisions" (p. 72).

Overall Gateway 2 Rating: Rigor and Mathematical Practices

- Reviewers should use data recorded in Rating Sheet 1 and 2 to determine the Gateway 2 final rating

	CRITERIA	RATING SCORE
GATEWAY 2: RIGOR AND MATHEMATICAL PRACTICES – The instructional materials align with CCSS expectations for rigor and mathematical practices. Earned: _____ out of 16 points ☐ Meets expectations (14-16 points) ☐ Partially meets expectations (10-13 points) ☐ Does not meet expectations (< 10 points)	**2a-2d.** The instructional materials reflect the balances in the Standards and help students meet the Standards' rigorous expectations by helping students develop conceptual understanding, procedural skill and fluency, and application.	Point Totals from Rating Sheet(s):
	2e-2h. Materials meaningfully connect the Standards for Mathematical Content and the Standards for Mathematical Practice.	Point Totals from Rating Sheet(s):

MATERIALS MUST MEET EXPECTATIONS OR PARTIALLY MEET EXPECTATIONS FOR GATEWAY 1 AND 2 TO MOVE ON TO GATEWAY 3

GATEWAY 3: INSTRUCTIONAL SUPPORTS AND USABILITY INDICATORS

Gateway 3 Rating Sheets include some Indicators that are rated and some that are not rated. In cases where Indicators are not rated, the evidence collected provides valuable information about instructional materials, although the indicator is not scored and does not affect the rating for the Criterion or Gateway. [8]

Rating Sheet 3.1: Use and Design to Facilitate Student Learning

CRITERION	INDICATORS	RATING	EVIDENCE
Use and design facilitate student learning: Materials are well designed and take into account effective lesson structure and pacing. Earned: _____ of 8 points ☐ **Meets expectations (7-8 points)** ☐ **Partially meets expectations (5-6 points)** ☐ **Does not meet expectations (<5 points)**	**3a.** The underlying design of the materials distinguishes between problems and exercises. In essence, the difference is that in solving problems, students learn new mathematics, whereas in working exercises, students apply what they have already learned to build mastery. Each problem or exercise has a purpose.	0 1 2	
	3b. Design of assignments is not haphazard: tasks are given in intentional sequences.	0 1 2	
	3c. There is variety in how students are asked to present the mathematics.	0 1 2	
	3d. Manipulatives, both virtual and physical, are faithful representations of the mathematical objects they represent and when appropriate are connected to written methods.	0 1 2	
	3e. The visual design (whether in print or digital) is not distracting or chaotic, but supports students in engaging thoughtfully with the subject.	**Unrated**	

Rating Sheet 3.2: Teacher Planning and Learning for Success with CCSS

CRITERION	INDICATORS	RATING	EVIDENCE
Teacher Planning and Learning for Success with CCSS: Materials support teacher learning and understanding of the Standards. Earned: _____ of 8 points ☐ **Meets expectations (7-8 points)** ☐ **Partially meets expectations (5-6 points)** ☐ **Does not meet expectations (<5 points)**	**3f.** Materials support teachers in planning and providing effective learning experiences by providing quality questions to help guide students' mathematical development.	0 1 2	
	3g. Materials contain a teacher's edition with ample and useful annotations and suggestions on how to present the content in the student edition and in the ancillary materials. Where applicable, materials include teacher guidance for the use of embedded technology to support and enhance student learning.	0 1 2	
	3h. Materials contain a teacher's edition that contains full, adult-level explanations and examples of the more advanced mathematics concepts and the mathematical practices so that teachers can improve their own knowledge of the subject, as necessary.	0 1 2	
	3i. Materials contain a teacher's edition that explains the role of the specific mathematics standards in the context of the overall series.	0 1 2	
	3j. Materials provide a list of lessons in the teacher's edition, cross-referencing the standards addressed and providing an estimated instructional time for each lesson, chapter and unit (i.e., pacing guide).	**Unrated**	
	3k. Materials contain strategies for informing students, parents, or caregivers about the mathematics program and suggestions for how they can help support student progress and achievement.	**Unrated**	
	3l. Materials contain explanations of the instructional approaches of the program and identification of the research-based strategies.	**Unrated**	

8 - Gateway 3 Rating Sheets include some Indicators that are rated and some that are not rated. In cases where Indicators are not rated, the evidence collected provides valuable information about instructional materials, although the indicator is not scored and does not affect the rating for the Criterion or Gateway.

Rating Sheet 3.3: Assessment

CRITERION	INDICATORS	RATING	EVIDENCE
Assessment: Materials offer teachers resources and tools to collect ongoing data about student progress on the Standards. Earned: _____ of 10 points ☐ **Meets expectations (9-10 points)** ☐ **Partially meets expectations (6-8 points)** ☐ **Does not meet expectations (<6 points)**	**3m.** Materials provide strategies for gathering information about students' prior knowledge within and across grade levels/ courses.	**0 1 2**	
	3n. Materials provide support for teachers to identify and address common student errors and misconceptions.	**0 1 2**	
	3o. Materials provide support for ongoing review and practice, with feedback, for students in learning both concepts and skills.	**0 1 2**	
	3p. Materials offer ongoing assessments:		
	i. Assessments clearly denote which standards are being emphasized.	**0 1 2**	
	ii. Assessments provide sufficient guidance to teachers for interpreting student performance and suggestions for follow-up.	**0 1 2**	
	3q. Materials encourage students to monitor their own progress.	**Unrated**	

Rating Sheet 3.4: Differentiated Instruction

CRITERION	INDICATORS	RATING	EVIDENCE
Differentiated instruction: Materials support teachers in differentiating instruction for diverse learners within and across courses. Earned: _____ of 10 points ☐ **Meets expectations (9-10 points)** ☐ **Partially meets expectations (6-8 points)** ☐ **Does not meet expectations (<6 points)**	**3r.** Materials provide teachers with strategies to help sequence or scaffold lessons so that the content is accessible to all learners.	**0 1 2**	
	3s. Materials provide teachers with strategies for meeting the needs of a range of learners.	**0 1 2**	
	3t. Materials embed tasks with multiple entry-points that can be solved using a variety of solution strategies or representations.	**0 1 2**	
	3u. Materials provide support, accommodations, and modifications for English Language Learners and other special populations that will support their regular and active participation in learning mathematics (e.g., modifying vocabulary words within word problems).	**0 1 2**	
	3v. Materials provide support for advanced students to investigate mathematics content at greater depth.	**0 1 2**	
	3w. Materials provide a balanced portrayal of various demographic and personal characteristics.	**Unrated**	
	3x. Materials provide opportunities for teachers to use a variety of grouping strategies.	**Unrated**	
	3y. Materials encourage teachers to draw upon home language and culture to facilitate learning.	**Unrated**	

Rating Sheet 3.5: Effective Technology Use

CRITERION	INDICATORS	RATING	EVIDENCE
Effective technology use: Materials support effective use of technology to enhance student learning. Digital materials are accessible and available in multiple platforms.	**3z.** Materials integrate technology such as interactive tools, virtual manipulatives/objects, and/or dynamic mathematics software in ways that engage students in the Mathematical Practices.	**Unrated**	
	3aa. Digital materials (either included as supplementary to a textbook or as part of a digital curriculum) are web- based and compatible with multiple internet browsers (e.g., Internet Explorer, Firefox, Google Chrome, etc.). In addition, materials are "platform neutral" (i.e., are compatible with multiple operating systems such as Windows and Apple and are not proprietary to any single platform) and allow the use of tablets and mobile devices.	**Unrated**	
	3ab. Materials include opportunities to assess student mathematical understandings and knowledge of procedural skills using technology.	**Unrated**	
	3ac. Materials can be easily customized for individual learners.		
	i. Digital materials include opportunities for teachers to personalize learning for all students, using adaptive or other technological innovations.	**Unrated**	
	ii. Materials can be easily customized for local use. For example, materials may provide a range of lessons to draw from on a topic.		
	3ad. Materials include or reference technology that provides opportunities for teachers and/or students to collaborate with each other (e.g. websites, discussion groups, webinars, etc.).	**Unrated**	

Overall Gateway 3 Rating: Instructional Supports and Usability Indicators

- Reviewers should use data recorded in Rating Sheet 3.1 – 3.5 to determine the Gateway 3 overall rating

	CRITERIA	RATING SCORE
GATEWAY 3: INSTRUCTIONAL SUPPORTS AND USABILITY INDICATORS – Materials support student learning and engagement and support teacher learning and understanding of the Standards. Materials also offer supports to differentiate instruction for diverse learners and enrich instruction through technology. Earned: _____ out of 36 points ☐ Meets expectations (30-36 points) ☐ Partially meets expectations (22-29 points) ☐ Does not meet expectations (< 22 points)	**3a-3e**. Materials are well designed and take into account effective lesson structure and pacing to facilitate student learning.	Point Totals from Rating Sheet(s):
	3f-3l. Materials support teacher learning and understanding of the Standards.	Point Totals from Rating Sheet(s):
	3m-3q. Materials offer teachers resources and tools to collect ongoing data about student progress on the Standards.	Point Totals from Rating Sheet(s):
	3r-3y. Materials support teachers in differentiating instruction for diverse learners within and across grades.	Point Totals from Rating Sheet(s):
	3z-3ad. Materials support effective use of technology to enhance student learning.	Point Totals from Rating Sheet(s):

CONDUCTING HIGH-QUALITY INSTRUCTIONAL MATERIALS REVIEWS

REFERENCE MATERIALS TO SUPPORT QUALITY REVIEWS

In addition to the EdReports.org Quality Instructional Materials Review Tool: High School Mathematics, reviewers have a toolkit with the following materials as references for reviews:

- CCSS for Mathematics (High School standards begin on page 57)
- High School Publishers' Criteria for the Common Core State Standards for Mathematics (Spring 2013)
- High School Progression Documents
- Standards for Mathematical Practices: Commentary and Illustrations for High School

USING THE TOOL AND EVIDENCE GUIDES

The Quality Instructional Materials Review Tool and the High School Evidence Guides work in tandem to provide educator reviewers with the criterion, indicators, and guidance to identify, collect, calibrate, and report on instructional material alignment to the standards for mathematical content, the standards for mathematical practice, and the usability of the instructional materials.

The Evidence Guides are organized by Indicator and identify:

The Guiding Question(s) that frame evidence collection

The Purpose of the Indicator to contextualize the indicator within the criterion as well as how indicators work together to build a complete picture for the criterion.

Evidence Collection to help reviewers find evidence, and when appropriate, provides examples and counterexamples of evidence for an indicator.

Questions to Guide Discussion/Discussion Prompts to help reviewers prepare for their weekly meeting where they present their rationale and evidence for a given indicator.

The Scoring Criteria that defines what must be present in the rationale and evidence to support each level of score for a given indicator.

TABLE 1

Content from CCSSM Widely Applicable as Prerequisites for a Range of College Majors, Post-Secondary Programs and Careers [9]

NUMBERS AND QUANTITY	ALGEBRA	FUNCTIONS	GEOMETRY	STATISTICS AND PROBABILITY	APPLYING KEY TAKEAWAYS FROM GRADES 6-8
N-RN, Real Numbers: Both clusters in this domain contain widely applicable prerequisites . N-Q*, Quantities: Every standard in this domain is a widely applicable prerequisite. Note, this domain is especially important in the high school content standards overall as a widely applicable prerequisite.	Every domain in this category contains widely applicable prerequisites. Note, the A-SSE domain is especially important to the high school content standards overall as a widely applicable prerequisite.	F-IF, Interpreting Functions: Every cluster in this domain contains widely applicable prerequisites. Additionally, standards F-BF.1 and F-LE.1 are relatively important within this category as widely applicable prerequisites.	The following standards and clusters are relatively important within this category as widely and applicable prerequisites: - G-CO.1 - G-CO.9 - G-CO.10 - G-SRT.B - G-SRT.C Note, the above standards in turn have learning prerequisites within the Geometry category including: - G-CO.A - G-CO.B - G-SRT.A	The following standards are relatively important within this category as widely applicable prerequisites: - S-ID.2 - S-ID.7 - S-IC.1 Note, the above standards in turn have learning prerequisites within 6-8-SP.	Solving problems at a level of sophistication appropriate to high school by: - Applying ratios and proportional relationships - Applying percentages and unit conversions, e.g. in the context of complicated measurement problems involving quantities with derived or compound units - Applying basic function concepts by interpreting features by interpreting the features of a graph in the context of an applied problem. - Applying concepts and skills of geometric measurement e.g. when analyzing a diagram or schematic. - Applying concepts and skills of basic statistics and probability (see 6-8 SP) - Performating rational number of arithmetic fluently

9- Refer also to Table 1 (page 8) in the HS Mathematics Publisher's Criteria.