

## Best Practices in Grades 9–12 Mathematics

Look for	Best Practice	Highly Effective
<b>Program and Lesson Components</b>	<b>Plans and teaches lessons to support full implementation of district mathematics program</b>	<p>Use of <i>Teacher’s Guides</i> (<i>Discovering Algebra</i>, <i>Discovering Geometry</i>, <i>Discovering Advanced Algebra</i>, IMP 1, 2, 3), student books, and DPS Time Frames and Instructional Planning Guides to implement lessons as described below.</p> <p><b>Lesson Components</b></p> <ul style="list-style-type: none"> <li>• Lessons routinely incorporate the following elements.               <ul style="list-style-type: none"> <li>○ <b>Introduction and Homework Discussion</b> (approximately 20 minutes*)—Teacher leads class discussion on selected homework problems with student presentations as appropriate. Teacher then sets context for investigation, poses problem, and ensures that students understand terminology.</li> <li>○ <b>Investigation/Exploration</b> (approximately 25 minutes*)—Students work on investigation (or example) individually, in pairs, in small groups, or occasionally as large group to share ideas, search for patterns, gather data, conjecture, and develop new strategies. Teacher observes, assesses, encourages, and plans for Sharing and summarizing the mathematics.</li> <li>○ <b>Sharing and Closing</b> (approximately 15 minutes*)—Selected students or groups share findings with class. Teacher asks questions and elaborates on students’ ideas (as needed) to bring out the mathematics of the lesson.</li> </ul> </li> <li>• Lesson content and language objectives are posted.</li> </ul> <p>*Note: Times are based on 60-minute math period. For those teaching 90-minute daily blocks, the additional 30 minutes should be used to meet individual student learning needs. For example, provide more practice for students who need additional time and repetition with the lesson presented in the first 60 minutes. If students have misconceptions that obstruct learning the mathematics, small groups should be used to address these misconceptions.</p>
		<p><b>Differentiation</b></p> <ul style="list-style-type: none"> <li>• Teacher differentiates and scaffolds individual assignments to meet student needs (e.g., ELL, gifted and talented, special education) through:               <ul style="list-style-type: none"> <li>○ Selecting homework questions as practice exercises of lesson concepts, review of previously studied concepts, and/or extensions of lesson concepts based on individual learning needs.</li> <li>○ Utilizing accessibility strategies and/or scaffolding tools (e.g., graphic organizers, blank tables, partially completed graphs) that provide students with entry into the mathematics of the lesson.</li> <li>○ Providing explicit reading and vocabulary support for students.</li> </ul> </li> <li>• Teacher uses small group instruction to differentiate student learning.</li> </ul>
		<p><b>Pacing</b></p> <ul style="list-style-type: none"> <li>• Teacher follows district Time Frame documents. Any modifications made to time allotted per unit are based on course’s Big Ideas.</li> </ul>
<b>Classroom Environment</b>	<b>Establishes physical classroom environment to support mathematics learning</b>	<p><b>Rituals and Routines</b></p> <p>Teacher has established rituals and routines for:</p> <ul style="list-style-type: none"> <li>• Organizing student notebooks and supplies</li> <li>• Textbook use</li> <li>• Manipulative use</li> <li>• Calculator use</li> <li>• Student presentations and dialogue</li> <li>• Transition between lesson components that maximize student learning time</li> </ul>

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		<p><b>Arrangement</b></p> <ul style="list-style-type: none"> <li>Physical classroom arrangement supports both teacher-directed activities and student-to-student interactions and provides teacher with access to all students.</li> <li>Teacher and students move flexibly between whole class, small group, partner, and individual activities.</li> </ul>
		<p><b>Displays</b></p> <ul style="list-style-type: none"> <li>Current unit Big Ideas are posted in classroom.</li> <li>Current unit math word wall with visual cues is present.</li> <li>Up-to-date list of assignments is posted.</li> <li>Variety of current student work revealing student thinking is displayed.</li> </ul>
		<p><b>Tools</b></p> <ul style="list-style-type: none"> <li>Rulers, protractors, compasses, grid paper, and manipulatives are readily accessible to students.</li> <li>Calculators are available and system is in place for use.</li> </ul>
	<p><b>Establishes classroom climate or culture focused on student-centered learning</b></p>	<p style="text-align: center;"><b>Students' Self-Management of Learning</b></p> <p><b>Selection and Use of Strategies and Tools</b></p> <ul style="list-style-type: none"> <li>Students choose appropriate tools (e.g., manipulatives, pencil and paper, calculators, measurement tools) and use effectively to solve problems.</li> <li>Students use appropriate computer activities (e.g., Geometer's Sketchpad) as learning resources.</li> <li>Students choose appropriate solution strategies (e.g., mental math, diagrams, charts, models).</li> <li>Students use math artifacts and classroom displays for instructional guidance.</li> </ul>
		<p><b>Group Work</b></p> <ul style="list-style-type: none"> <li>Students use group members as resources and do not rely solely on teacher for direction or clarification.</li> <li>Groups focus on mathematics as they manage their own work.</li> </ul>
		<p style="text-align: center;"><b>Teacher Support for Students' Self-Management of Learning</b></p> <p><b>Teacher Questions</b></p> <ul style="list-style-type: none"> <li>Teacher asks questions that encourage students to: <ul style="list-style-type: none"> <li>Clarify and extend their thinking (How would you describe the problem in your own words? Could you explain it in another way?)</li> <li>Probe deeper (What would happen if...?)</li> <li>Make connections (How does it relate to...?)</li> <li>Prompting mathematical reflection (Does your answer seem reasonable? Why does your answer make sense?)</li> <li>Develop deep understanding of mathematical ideas (Is it true in all cases? Explain. How would you prove it?)</li> </ul> </li> <li>Teacher gives students sufficient and appropriate wait time to engage with questions to ensure all students' accountability and participation.</li> </ul>

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<b>Classroom Environment</b>	<b>Supports mathematical communication</b>	<p><b>Mathematical Discourse</b></p> <ul style="list-style-type: none"> <li>• During most of lesson, students discuss mathematical concepts with each other.</li> <li>• Students hold each other accountable, asking each other for explanations, justifications, and extensions.</li> <li>• Students’ questions to peers are frequent and focus on clarifying understanding of each others’ thinking.</li> <li>• Determination of correctness rests with students; teacher supports determination of right answers through facilitation.</li> <li>• Teacher focuses classroom talk on students’ mathematical thinking.</li> <li>• Teacher intentionally selects multiple-solution strategies and orchestrates student presentations of these strategies to build mathematical connections and support students as they make sense of these connections.</li> </ul>
		<p><b>Written Mathematical Communication</b></p> <ul style="list-style-type: none"> <li>• Students write to explain solutions and strategies, demonstrate understanding of the mathematics, and reflect on learning.</li> <li>• Teacher routinely incorporates a variety of writing assignments, including journals or logs, solutions to mathematics problems, explanations of mathematical ideas, writing about thinking processes, and/or Problems of the Week.</li> <li>• Teacher incorporates analysis of exemplary mathematical writing examples to support improved student writing.</li> <li>• Teacher provides feedback to support improved student writing.</li> </ul>
<b>Program Assessment Opportunities</b>	<b>Uses assessment to support student learning</b>	<p><b>Assessment Strategies</b></p> <p>Teacher incorporates balance of formative and summative standards-based assessments that routinely include:</p> <ul style="list-style-type: none"> <li>○ Observational assessment (e.g., group observations, class discussions, student presentations, individual conversations, homework discussions)</li> <li>○ Product (written) assessment (e.g., homework, constructed responses, exit slips, student self-assessments)</li> <li>○ Periodic assessment (e.g., quizzes, tests)</li> <li>○ Additional sources (e.g., portfolios, projects, Problems of the Week, investigations)</li> </ul>
		<p><b>Management and Use of Assessment Data</b></p> <ul style="list-style-type: none"> <li>• Teacher has system in place to collect, manage, and analyze assessment data to monitor progress for individual students.</li> <li>• Teacher closely links assessment and instruction to determine appropriate instructional strategies and support student progress and attainment of Big Ideas.</li> </ul>
		<p><b>Teacher Feedback</b></p> <p>Teacher provides feedback to students both as grades/scores and in written form to extend students’ learning, promote improvement, and help students self-monitor progress.</p>
		<p><b>Rubrics</b></p> <ul style="list-style-type: none"> <li>• Teacher uses rubrics to communicate expectations for high-quality work and provide student feedback.</li> <li>• Students use rubrics to understand expectations and produce work that matches these expectations.</li> </ul>