



WASHINGTON
Essential Academic Learning Requirements—Mathematics
Benchmark 3—Grade 10
MathScape: Seeing and Thinking Mathematically
Course 3 © 2005

STANDARDS	PAGE REFERENCES
1. The student understands and applies the concepts and procedures of mathematics. To meet this standard, the student will:	
1.1 Understand and apply concepts and procedures from number sense.	
Number and Numeration	
Understand and use properties and symbolic representations of rational numbers, powers, and roots.	SE: 150-151, 171, 173 #7, 196-197, 198-199, 216, 217, 296-297, 298-299, 300-301, 311-315 TG: 137, 137A, 137E, 197A, 295B
Compare and order rational numbers, powers, and roots.	SE: 8-9, 12-13, 35, 37, 138-139, 150-151, 160-161, 162-163, 166, 171, 175, 176, 296-297, 298-299, 300-301, 311-313 TG: 9A, 135E, 137, 160A, 162A, 163A
Understand concepts of and use processes involving prime and composite numbers, factors and multiples, and divisibility.	See Glencoe's <i>MathScape: Seeing and Thinking Mathematically Course 2</i> © 2005 SE: 116-117, 118-119, 120-121, 122-123, 132, 133, 134
Understand and apply the concepts of ratio and both direct and inverse proportion.	SE: 162-163, 176, 242-243, 244-245, 246-247, 250-251 TG: 240, 241, 246A, 248, 249, 250A
Computation	
Understand operations on rational numbers, powers, and roots.	SE: 79 #8, 104-105, 126, 144-145, 150-151, 160-161, 162-163, 167 #8, 169, 171, 173, 175, 176, 296-297, 298-299, 300-310, 311-313
Compute with rational numbers, powers, and roots.	SE: 144-145, 150-151, 162-163, 171, 173, 296-297, 298-299, 300-301, 311-313
Use mental arithmetic, pencil and paper, calculator, or computer as appropriate to the task involving real numbers.	SE: 138-139, 140-141, 150-151, 158-159, 167 #1, 168 #1-#2, 311 #11 TG: 140A, 158A
Estimation	
Identify situations involving rational numbers, powers, and roots in which estimation is sufficient and computation is not required.	SE: 22-23, 41, 52-53, 79, 144-145, 150-151, 166, 169 #10, 171, 310, 311
Use estimation to predict computation results and to determine the reasonableness of answers involving real numbers, <i>for example, estimating.</i>	SE: 22-23, 41, 52-53, 79, 138-139, 140-141, 150-151, 166, 169 #10, 170 #16, 175 #14d, 310, 311

STANDARDS	PAGE REFERENCES
1.2 Understand and apply concepts and procedures from measurement.	
Attributes and Dimensions	
Understand how changes in dimension affect perimeter, area, and volume.	SE: 110-111, 114-115, 116-117, 118-119, 129, 131, 132, 211 #8, 292, 310 TG: 113, 118A, 292A
Measure objects and events directly or use indirect methods such as finding the volume of a cone given its height and diameter.	SE: 50-51, 52-53, 78, 79, 108-109, 116-117, 118-119, 120-121, 128, 131, 132, 211 #8, 228-229, 230-231, 257, 258 TG: 51A, 52A, 118A
Calculate rate and other derived and indirect measurements.	SE: 50-51, 78, 79 #8, 162-163, 176, 246-247, 264 TG: 48, 157B
Approximation and Precision	
Understand precision and accuracy of measurement are affected by measurement tools and calculating procedures.	SE: 52-53, 79, 120-121, 133, 160-161, 175, 228-229, 238-239, 257, 261, 290-291, 309 TG: 228A
Know when to estimate and use estimation to obtain reasonable approximations, <i>for example, estimating how much paint is needed to paint the walls of a classroom.</i>	SE: 50-51, 52-53, 78, 79, 138-139, 144-145, 150-151, 166, 169, 171, 226-227, 228-229, 230-231, 256-258
Systems and Tools	
Understand the benefits of standard units of measurement and the advantages of the metric system.	SE: 50-51, 52-53, 78, 79, 118-119, 124, 132 TG: 118A
Compare, contrast, and use both the U.S. system and metric system.	SE: 50-51, 52-53, 78, 79, 118-119, 132, 226-227, 228-229, 256, 257 TG: 118A, 223E
Select and use tools that will provide an appropriate degree of precision and accuracy for the situation, <i>for example, using kilometers vs. light years.</i>	SE: 118-119, 132, 133, 226-227, 228-229, 252-253, 256, 257, 266 TG: 118A, 223E, 227A
1.3. Understand and apply concepts and procedures from geometric sense—properties and relationships and locations and transformations.	
Properties and Relationships	
Use geometric properties and relationships to compare, contrast, describe, and classify 2- and 3-dimensional geometric figures.	SE: 94-95, 96-97, 108-109, 114-115, 116-117, 120-121, 122, 130, 133, 236-237, 238-239, 247-248, 250-251, 260, 261, 264-266 TG: 91G, 92, 94A, 108A, 113, 232, 237A, 238A
Construct geometric models and scale drawings using tools as appropriate, <i>for example, building a model of a bridge.</i>	SE: 94-95, 108-109, 114-115, 120, 122, 130, 133, 228-229, 230-231, 252-253, 254-255, 257, 258, 266, 267 TG: 91G, 92, 94A, 109A, 114A, 223E
Understand and use properties of symmetry, congruence, and similarity.	SE: 120, 133 #4, 228-229, 252-253, 254-255, 257, 266, 267, 290-291, 309 TG: 120A, 229A, 252A
Perform complex geometric constructions using a variety of tools and technologies <i>such as paper folding, computer software, straightedge, compass.</i>	SE: 142-143, 168, 226-227, 228-229, 230-231, 252-253, 256, 257, 258, 266, 267 TG: 223H, 226A

STANDARDS	PAGE REFERENCES
Locations and Transformations	
Understand and use coordinate grids.	SE: 62-63, 83, 292-293 TG: 225
Understand and apply multiple geometric transformations using combinations of translations, reflections, and/or rotations.	SE: 228-229, 256, 259 #14, 290-291, 309 TG: 228A
1.4. Understand and apply concepts and procedures from probability and statistics.	
Probability	
Understand the properties of dependent and independent events.	The following pages can be used after definitions have been given. SE: 26-27, 28-29, 32-33, 42, 43, 45
Understand and use appropriate counting procedures to determine probabilities.	SE: 26-27, 28-29, 42, 43, 44 TG: 24, 25
Use both experimental and theoretical methods to determine probabilities.	SE: 26-27, 28-29, 30-31, 32-33, 42-45 TG: 24, 30A, 33A
Statistics	
Collect data using appropriate methods and technology.	SE: 6-7, 8-9, 10-11, 12-13, 16-17, 18-19, 20-21, 22-23, 34-41 TG: 3H, 4, 5, 6A, 7A
Organize and display data in appropriate forms <i>such as tables, graphs, scatter plots, and box and whisker plots.</i>	SE: 6-7, 8-9, 10-11, 12-13, 16-17, 18-19, 20-21, 22-23, 34-41 TG: 3H, 4, 5, 6A, 7A
Calculate and use the different measures of central tendency, variability, and range as appropriate to describe data.	SE: 6-7, 8-9, 10-11, 12-13, 16-17, 34-38, 170 #15, 173 #7 TG: 3G, 8A, 11A
Use statistics to support different points of view, <i>for example, in a debate or a position paper.</i>	SE: 6-7, 10-11, 16-17, 18-19, 20-21, 22-23, 34, 36, 38-41, 154-155, 170 #15, 173 #5
Prediction and Inference	
Predict outcomes and design and conduct experiments to verify or disprove predictions.	SE: 6-7, 8-9, 10-11, 26-27, 28-29, 30-31, 32-33, 34, 35, 36, 42-45, 144-145, 158-159, 160-161, 162-163, 164-165, 174-177 TG: 24, 25, 26A, 27A, 145A, 159A, 160A
Understand and make inferences based on the analysis of experimental results, statistical data, and graphical representations.	SE: 6-7, 8-9, 10-11, 26-27, 28-29, 30-31, 32-33, 34, 35, 36, 42-45, 144-145, 158-159, 160-161, 162-163, 164-165, 174-177 TG: 24, 25, 26A, 27A, 145A, 159A, 160A
1.5 Understand and apply concepts and procedures from algebraic sense.	
Patterns	
Recognize, extend, and create complex patterns and sequences.	SE: 138-139, 142-143, 144-145, 166-171, 173, 198-199, 217 TG: 135E, 146
Generalize and express rules describing patterns and sequences.	SE: 140-141, 142-143, 148-149, 167, 168, 170, 171, 173-177, 196-197, 198-199, 202-203, 216, 217, 298-299 TG: 135G, 135H, 146, 147, 203A

STANDARDS	PAGE REFERENCES
Representations	
Translate among tabular, symbolic, and graphical representations of relations using =, ≠, >, <, ≥, ≤.	The = sign is used in examples on the following pages: SE: 184-185, 186-187, 204-205, 206-207, 211, 212, 219, 221 Also see Glencoe's <i>MathScape: Seeing and Thinking Mathematically Course 2</i> © 2005 SE: 184-191, 213
Use variables to write expressions, equations, and inequalities.	SE: 188-189, 192-193, 196-197, 216, 217, 219 #10 TG: 179E, 179G, 190, 196A, 200
Operations	
Simplify and evaluate expressions and formulas.	SE: 54-55, 74-75, 114-115, 116-117, 127, 130 #10, 131 #12, 182-183, 184-185, 194-195, 196-197, 198-199, 210, 211, 213, 215-217 TG: 47B, 48, 68, 112, 191, 199A
Solve equations and inequalities.	SE: 204-205, 206-207, 219, 220 TG: 204A, 205A, 207A
2. The student uses mathematics to define and solve problems. To meet this standard, the student will:	
2.1 Investigate situations.	
Search systematically for patterns in complex situations.	SE: 20-21, 22-23, 40, 41, 138-139, 142-143, 148-149, 154-155, 166, 167, 170, 173, 288-289, 296-297, 300-301, 308, 311, 313
Use multiple strategies.	SE: 10-11, 12-13, 62-63, 76-77, 83, 89, 120-121, 133, 138-139, 158-159, 166, 174, 184-185, 208-209, 221 TG: 10A, 120A, 158A, 185A
Identify what information is missing or extraneous and compensate for it.	SE: 56-57, 66-67, 81, 84, 160-161, 162-163, 164-165, 174-176 TG: 180
Analyze an unproductive approach and attempt to modify it or try a new approach.	SE: 20-21, 22-23, 32-33, 40, 41, 45, 56-57, 62-63, 66-67, 81, 83, 84, 158-159, 160-161, 162-163, 174-176 TG: 159A, 160A, 161A
2.2 Formulate questions and define the problem.	
Identify questions to be answered in complex situations.	SE: 6-7, 10-11, 34, 36, 62-63, 78 #13, 83, 94-95, 96-97, 274-275, 276-277, 282-283, 284-285, 303, 304 TG: 7A, 11A, 92
Define problems in complex situations.	SE: 194-195, 196-197, 202-203, 215, 216, 218, 272-273, 274-275, 276-277, 280-281, 282-283, 296-297, 298-299, 302-306, 311-312
Identify the information that is known and unknown in complex situations.	SE: 50-51, 56-57, 62-63, 78, 81, 83, 138-139, 160-161, 162-163, 164-165, 166, 175-177, 182-183, 188-189, 198-199, 210, 213, 217, 292-293, 296-297, 310, 311 TG: 180

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2.3 Construct solutions.	
Organize and synthesize information from multiple sources.	SE: 6-7, 8-9, 20-21, 26-27, 30-31, 34, 35, 40, 66-67, 85 TG: 6A, 9A, 26A, 67A
Select and use appropriate mathematical tools.	SE: 60-61, 62-63, 66-67, 72-73, 82, 83, 85, 87, 226-227, 228-229, 246-247, 256, 257, 264 TG: 47H, 60A, 61A, 223H, 226A, 228A, 269G
Apply viable strategies and appropriate concepts and procedures to construct a solution.	SE: 70-71, 72-73, 86, 87, 138-139, 148-149, 150-151, 158-159, 162-163, 166, 167, 169, 170, 171, 174, 176, 228-229, 230-231, 257, 258 TG: 135G, 148A, 150A, 158A, 159A
3. The student uses mathematical reasoning. To meet this standard, the student will:	
3.1 Analyze information.	
Compare, contrast, interpret and integrate information from multiple sources.	SE: 6-7, 34, 50-51, 62-63, 64-65, 66-67, 72-73, 74-75, 76-77, 78, 83-85, 87-89, 138-139, 154-155, 158-159, 166, 173, 174 TG: 7A, 51A, 158A
Validate thinking and mathematical ideas using models, known facts, patterns, relationships, counter-examples, and proportional reasoning.	SE: 66, 83, 154-155, 158-159, 160-161, 162-163, 173-176, 184-185, 192-193, 202-203, 211, 214, 218, 228-229, 244-245, 257, 263, 300-301, 313 TG: 184A, 301A
3.2 Predict results.	
Make and explain conjectures based on analysis of problem situations.	SE: 236-237, 238-239, 246-247, 250-251, 260, 261, 264, 265 TG: 232, 233
3.3 Draw conclusions and verify results.	
Test conjectures by formulating a proof or by constructing a counterexample.	SE: 236-237, 238-239, 246-247, 264-265 TG: 232, 233
Support arguments and justify results using inductive and deductive reasoning.	SE: 169 #10, 176 #13, 175 #14, 216 #15, 262 #8, 264 #13, 267 #7, 302 #13, 308 #10
Check for reasonableness of results.	SE: 50-51, 52-53, 78, 79, 132 #13, 133 #6, 174 #9, 175 #14, 176 #13
Reflect on and evaluate procedures and results and make necessary revisions.	SE: 52-53, 62-63, 74-75, 76-77, 79, 83, 88, 89, 138-139, 154-155, 158-159, 160-161, 166, 173-175 TG: 51A, 75A, 163A
4. The student communicates knowledge and understanding in both everyday and mathematical language. To meet this standard, the student will:	
4.1 Gather information.	
Develop or select and follow an efficient system for collecting information.	SE: 6-7, 10-11, 16-17, 20-21, 22-23, 34, 36, 38, 40, 41, 50-51, 54-55, 56-57, 70-71, 76-77, 78, 80, 86, 89, 160-161, 162-163, 175, 176 TG: 20A, 162A

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Use reading, listening, and observation to access and extract mathematical information from multiple, self-selected sources <i>such as pictures, diagrams, physical models, oral narratives, and symbolic representations.</i>	SE: 56-57, 62-63, 70-71, 74-75, 81, 83, 86, 88, 138-139, 144-145, 158-159, 166, 169, 174, 198-199, 202-203, 217, 218 TG: 57A, 58, 59, 61A, 70A, 158A
Integrate the use of a variety of available technologies to browse, select, and retrieve mathematical information from multiple sources.	SE: 150-151, 158-159, 171, 174 TG: 47G, 47H, 135G, 140A <i>MathScape Online</i> 3, 179, 223, 269
4.2 Organize and interpret information.	
Organize, clarify, and refine mathematical information in multiple ways—reflecting, verbalizing, discussing, or writing.	SE: 138-139, 144-145, 154-155, 158-159, 164-165, 166, 169, 173-177, 272-273, 276-277, 282-283, 298-299, 302, 304, 305, 312 TG: 273A, 283A, 298A
4.3 Represent and share information.	
Express complex ideas and situations using mathematical language and notation in appropriate and efficient forms.	SE: 150-151, 160-161, 164-165, 171, 175, 177, 236-237, 238-239, 246-247, 260, 261, 264, 292-293, 298-299, 300-301, 310, 312, 313 TG: 151A, 232, 233, 238A, 293A, 298A
Explain or represent complex mathematical ideas and information in ways appropriate for audience and purpose.	SE: 138-139, 144-145, 160-161, 164-165, 166, 169, 175, 177, 236-237, 238-239, 246-247, 260-261, 264 TG: 160A, 232, 233, 238A
5. The student understands how mathematical ideas connect within mathematics, other subject areas, and real-life situations. To meet this standard, the student will:	
5.1 Relate concepts and procedures within mathematics.	
Relate and use conceptual and procedural understandings among multiple mathematical content strands.	SE: 236-237, 238-239, 246-247, 260-261, 264, 272-273, 274-275, 276-277, 302-304 TG: 232, 270, 271
Relate and use multiple equivalent mathematical models and representations.	SE: 20-21, 22-23, 26-27, 28-29, 30-31, 32-33, 40-45, 138-139, 144-145, 148-149, 154-155, 160-161, 166, 169, 170, 173, 175
5.2 Relate mathematical concepts and procedures to other disciplines.	
Extend mathematical patterns and ideas to other disciplines.	SE: 54-55, 56-57, 74-75, 80, 81, 88, 96-97, 123, 125 #13, 138-139, 144-145, 160-161, 162-163, 164-165, 166, 168, 175-177, 313 #19
Apply mathematical thinking and modeling in other disciplines.	SE: 54-55, 56-57, 74-75, 80, 81, 88, 96-97, 123, 160-161, 162-163, 164-165, 175-177
Describe examples of contributions to the development of mathematics <i>such as the contributions of women, men, and different cultures.</i>	SE: 42 #8, 123 #7, 126 #18, 130 #11, 168 #8, 261 #10, 267 #7

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5.3 Relate mathematical concepts and procedures to real-life situations.	
Identify situations in which mathematics can be used to solve problems with local, national, or international implications <i>such as calculating resources necessary for interstate highway maintenance.</i>	SE: 74-75, 88, 120, 123, 133, 138-139, 144-145, 160-161, 162-163, 166, 168, 175, 176, 177 #8, 264 #13
Investigate the mathematical knowledge and training requirements for occupational/career areas of interest.	SE: 8, 35, 62-63, 70-71, 74-75, 86, 87 #9, 88, 89 #10-#11, 125 #13, 138-139, 166 TG: 70A, 74A