



WASHINGTON
Essential Academic Learning Requirements—Mathematics
Benchmark 3—Grade 10
***Geometry: Concepts and Applications* © 2004**

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: 50-55, 56-61, 263-266, 548-553, 720, 721 TWE: EC 553 OEA 553 TT 549 <i>Practice Masters 7, 74</i> <i>Study Guide Masters 7, 74</i>
Compare and order rational numbers, powers, and roots.	SE: 47 #3, 53 #3, 87 #1, 276-281, 287 #2 TWE: EC 281 <i>Practice Masters 38</i> <i>Study Guide Masters 38</i>
Understand concepts of and use processes involving prime and composite numbers, factors and multiples, and divisibility.	SE: 46 SAT Example, 47 #6-#7, 87 #9, 225 #6, 273 #10
Understand and apply the concepts of ratio and both direct and inverse proportion.	SE: 350-355, 370, 372 #9-#14, 382-387, 389 ex 1, 407 #43 TWE: EC 355, 387 OEA 355 <i>Practice Masters 47, 50, 52</i> <i>Study Guide Masters 47, 50, 52</i>
Computation	
Understand operations on rational numbers, powers, and roots.	SE: 50-55, 56-61, 263-266, 548-553, 720, 721 TWE: EC 553 OEA 553 TT 549 <i>Practice Masters 7, 74</i> <i>Study Guide Masters 7, 74</i>
Compute with rational numbers, powers, and roots.	SE: 50-55, 56-61, 225 #2, 263-266, 548-553, 720, 721 TWE: EC 553 OEA 553 TT 549 <i>Practice Masters 7, 74</i> <i>Study Guide Masters 7, 74</i>

STANDARDS	PAGE REFERENCES
Use mental arithmetic, pencil and paper, calculator, or computer as appropriate to the task involving real numbers.	SE: 50-55, 56-61, 263-266, 548-553, 720, 721 TWE: EC 553 OEA 553 TT 549 <i>Practice Masters 7, 74</i> <i>Study Guide Masters 7, 74</i>
Estimation	
Identify situations involving rational numbers, powers, and roots in which estimation is sufficient and computation is not required.	SE: 171 #2, 267 #34, 347 #7, 414 ex 2, 416 #7, 417 #24, 424 #26, 447 #20
Use estimation to predict computation results and to determine the reasonableness of answers involving real numbers, <i>for example, estimating.</i>	SE: 171 #2, 267 #34, 347 #7, 414 ex 2, 416 #7, 417 #24, 424 #26, 447 #20
1.2 Understand and apply concepts and procedures from measurement.	
Attributes and Dimensions	
Understand how changes in dimension affect perimeter, area, and volume.	SE: 513 #1, 526 #23, 537 #2, 538 #17-#19, 539 #20, 542 #28, 543 #20, 583 #1
Measure objects and events directly or use indirect methods such as finding the volume of a cone given its height and diameter.	SE: 504-509, 510-515, 516-521, 522-527, 570-571 TWE: EC 509, 521 <i>Practice Masters 68, 69, 70, 71</i> <i>Study Guide Masters 68, 69, 70, 71</i>
Calculate rate and other derived and indirect measurements.	SE: 173 #27, 570-571
Approximation and Precision	
Understand precision and accuracy of measurement are affected by measurement tools and calculating procedures.	SE: 58, 59 #3, 60 #30, 428 TWE: EC 61
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: 171 #2, 267 #34, 347 #7, 414 ex 2, 416 #7, 417 #24, 424 #26, 447 #20
Systems and Tools	
Understand the benefits of standard units of measurement and the advantages of the metric system.	SE: 58 ex 2, 59 #2, 60 #23-#28
Compare, contrast, and use both the U.S. system and metric system.	SE: 58 ex 3, 60 #23-#28
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: 59 #3

STANDARDS	PAGE REFERENCES
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: 496-501, 508 #2, 509 #20, 513 #1, 520 #2 <i>Chapter 3 Investigation</i> 102-103 <i>Chapter 12 Investigation</i> 502-503 <i>Graphing Calculator Exploration</i> 504 <i>Hands-On Geometry</i> 65 TWE: EC 501 MTL 496 OEA 501 RA 497 <i>Practice Masters</i> 67 <i>Study Guide Masters</i> 67
Construct geometric models and scale drawings using tools as appropriate, <i>for example, building a model of a bridge.</i>	SE: 39 #11, 41, 358 ex 3, 360 #25, 361 #27, 571 #4 TWE: EC 361 RA 360
Understand and use properties of symmetry, congruence, and similarity.	SE: 203-207, 356-361, 362-367, 434-439, 444 #21, 448 #27-#30 TWE: EC 439 RA 365, 436 <i>Practice Masters</i> 48, 49, 59 <i>Study Guide Masters</i> 48, 49, 59
Perform complex geometric constructions using a variety of tools and technologies <i>such as paper folding, computer software, straightedge, compass.</i>	SE: 29-34, 102-103, 244-245, 380-381 <i>Hands-On Geometry</i> 65, 130-131, 162, 210, 228, 234-235, 474-475, 559 TWE: MTL 29 <i>Practice Masters</i> 5 <i>Study Guide Masters</i> 5
Locations and Transformations	
Understand and use coordinate grids.	SE: 68-73, 81 #36-#39, 83 #23-#30, 85 #9-#14, 87 #2, 168 ex 1-ex 2, 171 #4-#5, 172 #10-#15, 175 ex 5, 261 #47 TWE: EC 73 OEA 73 RA 71 <i>Practice Masters</i> 10 <i>Study Guide Masters</i> 10
Understand and apply multiple geometric transformations using combinations of translations, reflections, and/or rotations.	SE: 198-202, 207 #29-#31, 214 #24, 221 #16-#19, 223 #10-#12, 687-691, 692-696, 708-709 TWE: EC 201 MTL 198 OEA 202 RA 688 <i>Practice Masters</i> 27, 93 <i>Study Guide Masters</i> 27, 93

STANDARDS	PAGE REFERENCES
1.4. Understand and apply concepts and procedures from probability and statistics.	
Probability	
Understand the properties of dependent and independent events.	SE: 138-139, 351 #6, 438 #29, 484, 486 #24-#25, 545 #5, 629 #2
Understand and use appropriate counting procedures to determine probabilities.	SE: 85 #4, 138-139, 347 #2, 629 #2
Use both experimental and theoretical methods to determine probabilities.	SE: 139 #4, 347 #2, 438 #29, 451 #6, 484, 486 #24-#25, 545 #5, 629 #2
Statistics	
Collect data using appropriate methods and technology.	SE: 89, 184-185, 484
Organize and display data in appropriate forms <i>such as tables, graphs, scatter plots, and box and whisker plots.</i>	SE: 184-185, 225 #10, 339, 347 #10, 473 #31
Calculate and use the different measures of central tendency, variability, and range as appropriate to describe data.	SE: 22 #39, 224-225, 273 #9, 307 #5, 418 #30, 583 #8, 665 #32, 715 #4
Use statistics to support different points of view, <i>for example, in a debate or a position paper.</i>	SE: 473 #31
Prediction and Inference	
Predict outcomes and design and conduct experiments to verify or disprove predictions.	SE: 185 #1
Understand and make inferences based on the analysis of experimental results, statistical data, and graphical representations.	SE: 133 #32, 179 #38-#39, 184, 185 #1, 219 #29, 267 #34, 339, 347 #7, 715 #4
1.5 Understand and apply concepts and procedures from algebraic sense.	
Patterns	
Recognize, extend, and create complex patterns and sequences.	SE: 3, 9 #38, 17 #38, 47 #4, 72 #36, 73 #44, 133 #32, 161 #38, 185 #10, 273 #10, 399 #10, 493 #9-#10 <i>Hands-On Geometry</i> 283, 415
Generalize and express rules describing patterns and sequences.	SE: 4-9, 10-11, 17 #38, 22 #38, 42 #11-#13, 47 #4 TWE: EC 9 <i>Enrichment</i> 1 <i>Practice Masters</i> 1 <i>Study Guide Masters</i> 1
Representations	
Translate among tabular, symbolic, and graphical representations of relations using =, ≠, >, <, ≥, ≤.	SE: 35-40, 44 #33, 45 #25, 47 #1-#2, 55 #37, 677 ex 3, 680 #24-#25, 683 ex 3, 685 #29-#30, 715 #10 <i>Practice Masters</i> 6 <i>Study Guide Masters</i> 6
Use variables to write expressions, equations, and inequalities.	SE: 35-40, 44 #33, 45 #25, 47 #1-#2, 55 #37, 677 ex 3, 680 #24-#25, 683 ex 3, 685 #29-#30, 715 #10 <i>Practice Masters</i> 6 <i>Study Guide Masters</i> 6

STANDARDS	PAGE REFERENCES
Operations	
Simplify and evaluate expressions and formulas.	SE: 272, 273 #1, 422 #4-#6, 451 #8, 718
Solve equations and inequalities.	SE: 185 #5, 273 #8, 281 #39, 373 #30, 451 #5, 467 #41, 591 #32, 653 #13-#15, 722, 723, 724, 725
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: 3, 9 #38, 17 #38, 47 #4, 72 #36, 73 #44, 133 #32, 161 #38, 185 #10, 273 #10, 399 #10, 493 #9-#10 <i>Hands-On Geometry</i> 283, 415
Use multiple strategies.	SE: 35-40, 44 #32-#34 <i>Problem-Solving Workshop</i> 3, 49, 89, 141, 187, 227, 275, 309, 349
Identify what information is missing or extraneous and compensate for it.	SE: 35-40 <i>Problem-Solving Workshop</i> 3, 49, 89, 141, 187, 227, 275, 309, 349
Analyze an unproductive approach and attempt to modify it or try a new approach.	SE: 44 #32-#34 <i>Problem-Solving Workshop</i> 3, 49, 89, 141, 187, 227, 275, 309, 349
2.2 Formulate questions and define the problem.	
Identify questions to be answered in complex situations.	SE: 35-40, 44 #32-#34 <i>Problem-Solving Workshop</i> 3, 49, 89, 141, 187, 227, 275, 309, 349
Define problems in complex situations.	SE: 35-40, 44 #32-#34 <i>Problem-Solving Workshop</i> 3, 49, 89, 141, 187, 227, 275, 309, 349
Identify the information that is known and unknown in complex situations.	SE: 35-40, 44 #32-#34 <i>Problem-Solving Workshop</i> 3, 49, 89, 141, 187, 227, 275, 309, 349
2.3 Construct solutions.	
Organize and synthesize information from multiple sources.	SE: <i>Internet Connections</i> 9, 23, 41, 55, 95, 101, 115, 141, 178, 191 <i>Problem-Solving Workshop</i> 3, 49, 89, 187, 227
Select and use appropriate mathematical tools.	SE: <i>Graphing Calculator Exploration</i> 32, 79, 112, 170, 193, 290, 316, 371, 427, 478, 504, 574
Apply viable strategies and appropriate concepts and procedures to construct a solution.	SE: 35-40, 44 #32-#34 <i>Problem-Solving Workshop</i> 3, 49, 89, 141, 187, 227, 275, 309, 349
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: <i>Internet Connections</i> 9, 23, 41, 55, 95, 101, 115, 141, 178, 191 <i>Problem-Solving Workshop</i> 3, 49, 89, 187, 227

STANDARDS	PAGE REFERENCES
Validate thinking and mathematical ideas using models, known facts, patterns, relationships, counter-examples, and proportional reasoning.	SE: 6 ex 4, 8 #14, 9 #35, 17 #37, 25, 44 #32, 45 #16-#18, 209, 281 #33, 638
3.2 Predict results.	
Make and explain conjectures based on analysis of problem situations.	SE: 6-9, 65 #3, 193 #4, 317 #3-#4, 458 #37, 638-643, 670 #29, 671 #5-#6 TWE: HG 6 <i>Practice Masters</i> 86 <i>Study Guide Masters</i> 86
3.3 Draw conclusions and verify results.	
Test conjectures by formulating a proof or by constructing a counterexample.	SE: 6 ex 4, 8 #14, 9 #35, 17 #37, 25, 44 #32, 45 #16-#18, 209, 281 #33, 638, 644-648, 649-653, 654-659, 660-665, 670 #23-#24
Support arguments and justify results using inductive and deductive reasoning.	SE: 638-643, 644-648, 649-653, 654-659, 660-665 <i>Practice Masters</i> 86, 87, 88, 89, 90 <i>Study Guide Masters</i> 86, 87, 88, 89, 90
Check for reasonableness of results.	SE: 44 #32-#34 <i>Problem-Solving Workshop</i> 3, 49, 89, 141, 187, 227, 275, 309, 349
Reflect on and evaluate procedures and results and make necessary revisions.	SE: 44 #32-#34 <i>Problem-Solving Workshop</i> 3, 49, 89, 141, 187, 227, 275, 309, 349
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: <i>Internet Connections</i> 9, 23, 41, 55, 95, 101, 115, 141, 178, 191 <i>Problem-Solving Workshop</i> 3, 49, 89, 187, 227
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: <i>Internet Connections</i> 9, 23, 41, 55, 95, 101, 115, 141, 178, 191 <i>Problem-Solving Workshop</i> 3, 49, 89, 187, 227
Integrate the use of a variety of available technologies to browse, select, and retrieve mathematical information from multiple sources.	SE: <i>Internet Connections</i> 9, 23, 41, 55, 95, 101, 115, 141, 178, 191 <i>Problem-Solving Workshop</i> 3, 49, 89, 187, 227
4.2 Organize and interpret information.	
Organize, clarify, and refine mathematical information in multiple ways—reflecting, verbalizing, discussing, or writing.	TWE: OEA 22, 101, 147, 167, 202, 243, 255, 261, 295, 326, 338, 361, 378, 412, 424
4.3 Represent and share information.	
Express complex ideas and situations using mathematical language and notation in appropriate and efficient forms.	TWE: OEA 22, 101, 147, 167, 202, 243, 255, 261, 295, 326, 338, 361, 378, 412, 424

STANDARDS	PAGE REFERENCES
Explain or represent complex mathematical ideas and information in ways appropriate for audience and purpose.	SE: 53 #1, 59 #1, 79 #2, 92 #3 TWE: OEA 22, 101, 424, 473, 539, 605
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: 108 #10, 109 #23, 114 #4, 132 #7, 159 #12, 161 #5, 202 #29, 305 #23, 331 #45, 345 #25, 378 #31, 564-569, 572-577, 628-629, 651 #5
Relate and use multiple equivalent mathematical models and representations.	TWE: OEA 109, 192, 197, 233, 287, 315, 367, 418, 467, 597, 611, 690
5.2 Relate mathematical concepts and procedures to other disciplines.	
Extend mathematical patterns and ideas to other disciplines.	SE: 21 #8, 22 #31, 26 #9, 54 #10, 67 #22, 72 #35, 93 #8, 113 #7, 146 #49, 177 #12, 237 ex 7, 277 ex 2, 287 #23, 298 ex 4, 300 #2
Apply mathematical thinking and modeling in other disciplines.	SE: 21 #8, 22 #31, 26 #9, 54 #10, 67 #22, 72 #35, 93 #8, 113 #7, 146 #49, 177 #12, 237 ex 7, 277 ex 2, 287 #23, 298 ex 4, 300 #2
Describe examples of contributions to the development of mathematics <i>such as the contributions of women, men, and different cultures.</i>	SE: 3, 187, 200, 245, 401, 501 #33
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: 161 #30, 315 #36, 521 #18, 527 #26
Investigate the mathematical knowledge and training requirements for occupational/career areas of interest.	SE: <i>Math in the Workplace</i> 3, 23, 39, 41, 95, 115, 301, 379, 431, 445, 459, 623, 691

Codes Used for TWE Pages

EC	Extra Credit
HG	Hands-On Geometry
MTL	Motivating the Lesson
OEA	Open-Ended Assessment
RA	Reteaching Activity
TT	Teaching Tip