



WASHINGTON
Essential Academic Learning Requirements—Mathematics
Benchmark 3—Grade 10
***Algebra: 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: 52-53, 94-96, 336-337, 347, 362, 600-601, 604 #17-28, 619 #44-46, 673 #44-45
Compare and order rational numbers, powers, and roots.	SE: 52-53, 54 #5, 56 #17, 58-60, 98 #14-15, 104-105, 336, 347, 352, 691 TWE: RA 354
Understand concepts of and use processes involving prime and composite numbers, factors and multiples, and divisibility.	SE: 4, 336-337, 358, 360 #4-8, 420-423, 424 #5-10, 425 #56, 428-431, 638-641, 662-663
Understand and apply the concepts of ratio and both direct and inverse proportion.	SE: 188-191, 192 #16-36, 194-195, 196 #12, 198-201, 264-267, 270-273, 284-286 <i>Investigation</i> 410-411, 494-495
Computation	
Understand operations on rational numbers, powers, and roots.	SE: 8-10, 11 #4-7, 347-349, 362-363, 364 #13-32, 614-617, 618 #13-14, 638-640
Compute with rational numbers, powers, and roots.	SE: 64-67, 70-72, 75-77, 100-101, 140-143, 336-338, 341-343, 347-349, 614-617, 620-621
Use mental arithmetic, pencil and paper, calculator, or computer as appropriate to the task involving real numbers.	SE: 724-727 <i>Graphing Calculator Exploration</i> 26, 105, 214, 272 <i>Hands-On Algebra</i> 25, 66, 194 TWE: EA 163 RA 27
Estimation	
Identify situations involving rational numbers, powers, and roots in which estimation is sufficient and computation is not required.	SE: 362-363, 469 #3 TWE: TT 76
Use estimation to predict computation results and to determine the reasonableness of answers involving real numbers, <i>for example, estimating.</i>	SE: 24, 85 #44, 259 #9, 315 #39, 340 #43, 365 #37, 469-470 <i>Hands-On Algebra</i> 224, 362 TWE: TT 72

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: 27 #6, 29 #16, 439 #50, 654 #30 <i>Graphing Calculator Exploration</i> 338-339 <i>Hands-On Algebra</i> 25
Measure objects and events directly or use indirect methods such as finding the volume of a cone given its height and diameter.	SE: 15 #4, 85 #56, 176-177, 370 #34, 387 #56, 402 #7, 424 #21, 606-607 <i>Hands-On Algebra</i> 25 <i>Investigation</i> 262-263
Calculate rate and other derived and indirect measurements.	SE: 29 #17, 190, 192 #48, 204-205, 529 #71, 577 #34, 585 #26, 654 #31, 670-671
Approximation and Precision	
Understand precision and accuracy of measurement are affected by measurement tools and calculating procedures.	SE: 32-34, 207 #6, 532 TWE: EC 131 HOA 220 ICE 130
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: 24-25, 85 #44, 176-177, 259 #9, 315 #39, 340 #43, 362-363, 365 #37, 387 #62-65 <i>Hands-On Algebra</i> 224
Systems and Tools	
Understand the benefits of standard units of measurement and the advantages of the metric system.	SE: 190, 192 #39-46, 194-195, 344 #15 <i>Investigation</i> 262-263 TWE: TT 352
Compare, contrast, and use both the U.S. system and metric system.	SE: 174 #36, 190, 192 #39-46, 194-195, 344 #15 TWE: TT 352
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: 117-120, 174 #36, 724-727 <i>Hands-On Algebra</i> 66, 141
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: 27 #6, 386 #15 <i>Graphing Calculator Exploration</i> 338-339 <i>Hands-On Algebra</i> 25 <i>Investigation</i> 372-373, 426-427 TWE: F 19, 388
Construct geometric models and scale drawings using tools as appropriate, <i>for example, building a model of a bridge.</i>	SE: 194-195, 261 #54, 571 #50 <i>Hands-On Algebra</i> 141 <i>Investigation</i> 426-427, 540-541
Understand and use properties of symmetry, congruence, and similarity.	SE: 546, 547 #1, 610 #29, 611 #10 <i>Investigation</i> 30-31 TWE: RA 196
Perform complex geometric constructions using a variety of tools and technologies <i>such as paper folding, computer software, straightedge, compass.</i>	SE: 200 #6 <i>Hands-On Algebra</i> 25 <i>Investigation</i> 30-31, 308-309, 612-613

STANDARDS	PAGE REFERENCES
Locations and Transformations	
Understand and use coordinate grids.	SE: 58-60, 63 #37, 79 #49, 88 #62, 302-305, 535-537, 550-552, 606-607, 610 #31 <i>Graphing Calculator Exploration</i> 61
Understand and apply multiple geometric transformations using combinations of translations, reflections, and/or rotations.	SE: 69 #61, 77 #9, 78 #13, 79 #49, 88 #62 TWE: F 82
1.4. Understand and apply concepts and procedures from probability and statistics.	
Probability	
Understand the properties of dependent and independent events.	SE: 224-227, 228 #17, 327 #45-47, 406 #5, 539 #42, 649 #42
Understand and use appropriate counting procedures to determine probabilities.	SE: 146-147, 224, 242 #24, 315 #43-45, 327 #45-47, 333 #7, 406 #5, 467 #35, 539 #42 TWE: OEA 223
Use both experimental and theoretical methods to determine probabilities.	SE: 220-221, 222 #1, 223 #23 <i>Hands-On Algebra</i> 224
Statistics	
Collect data using appropriate methods and technology.	SE: 32-34, 35 #13, 36 #17, 37 #23, 158 #53-55
Organize and display data in appropriate forms <i>such as tables, graphs, scatter plots, and box and whisker plots.</i>	SE: 38-41, 42 #11, 43 #15-18, 74 #56, 264-265, 302-305, 306 #9, 307 #17 <i>Investigation</i> 210-211, 308-309
Calculate and use the different measures of central tendency, variability, and range as appropriate to describe data.	SE: 104-107, 108 #16-23, 109 #35, 127 #49, 135 #13, 158 #53-55, 281 #10 <i>Investigation</i> 210-211
Use statistics to support different points of view, <i>for example, in a debate or a position paper.</i>	SE: 43 #13, 83 #4, 104-107, 109 #34, 184, 235 #2, 302 <i>Investigation</i> 308-309 <i>Problem-Solving Workshop</i> 283
Prediction and Inference	
Predict outcomes and design and conduct experiments to verify or disprove predictions.	SE: 38-39, 42 #4-6, 62 #35, 219-221, 241 #8, 302-305, 417 #5 <i>Graphing Calculator Exploration</i> 491 <i>Investigation</i> 308-309, 674-675
Understand and make inferences based on the analysis of experimental results, statistical data, and graphical representations.	SE: 38-39, 42 #4-6, 43 #8, 219-221, 241 #8, 302-305 <i>Graphing Calculator Exploration</i> 491 <i>Investigation</i> 110-111, 308-309, 674-675
1.5 Understand and apply concepts and procedures from algebraic sense.	
Patterns	
Recognize, extend, and create complex patterns and sequences.	SE: 69 #73, 146-147, 302-303, 315 #40, 332 <i>Hands-On Algebra</i> 489 <i>Investigation</i> 110-111, 152-153, 308-309, 494-495
Generalize and express rules describing patterns and sequences.	SE: 146-147, 264-266, 270, 315 #40, 336-338 <i>Investigation</i> 110-111, 152-153, 308-309, 426-427, 494-495

STANDARDS	PAGE REFERENCES
Representations	
Translate among tabular, symbolic, and graphical representations of relations using =, ≠, >, <, ≥, ≤.	SE: 5, 6 #9-10, 95, 112-114, 504-506, 507 #31-38, 508 #41, 509-510, 512 #39-40, 514-515
Use variables to write expressions, equations, and inequalities.	SE: 4-6, 112-114, 188-191, 198-201, 204-207, 290-292, 296-298, 504-506, 524-526
Operations	
Simplify and evaluate expressions and formulas.	SE: 19-21, 113 #3, 188-191, 235 #5, 606-608, 614-617, 638-641, 656-659, 662-665 <i>Investigation 152-153</i>
Solve equations and inequalities.	SE: 117-119, 122-125, 128-130, 160-162, 165-168, 483-485, 509-511, 524-526, 624-627, 668-671
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: 146-147, 270, 315 #40, 336-338 <i>Investigation 30-31, 110-111, 152-153, 308-309, 426-427, 494-495</i>
Use multiple strategies.	SE: 24-25, 38-41, 168, 250-253, 302-303, 468-469, 519 <i>Problem-Solving Workshop 51, 93, 139</i>
Identify what information is missing or extraneous and compensate for it.	SE: 24-26, 32-33, 38-41, 146-147, 428-431 <i>Investigation 30-31, 80-81, 152-153</i> <i>Problem-Solving Workshop 93, 419</i>
Analyze an unproductive approach and attempt to modify it or try a new approach.	SE: 24-26, 32-34 TWE: EA 215, 247, 314, 364, 396, 443, 576, 609
2.2 Formulate questions and define the problem.	
Identify questions to be answered in complex situations.	SE: 24-26 <i>Investigation 30-31, 110-111, 210-211, 308-309, 410-411, 494-495, 540-541, 578-579, 674-675</i>
Define problems in complex situations.	SE: 24-26, 32-34 <i>Problem-Solving Workshop 93, 139, 187, 283, 381, 419, 503, 637</i>
Identify the information that is known and unknown in complex situations.	SE: 24-26, 32-33, 38-41, 146-147, 428-431 <i>Investigation 30-31, 80-81, 152-153</i> <i>Problem-Solving Workshop 93, 419</i>
2.3 Construct solutions.	
Organize and synthesize information from multiple sources.	SE: 24-26, 32-34, 38-41 <i>Investigation 30-31, 80-81, 152-153</i> <i>Problem-Solving Workshop 51, 93, 419, 637</i>
Select and use appropriate mathematical tools.	SE: 8-11, 32-34, 38-41, 58-60, 104-107, 194-197, 322-325, 366-368, 483-485, 724-727
Apply viable strategies and appropriate concepts and procedures to construct a solution.	SE: 24-25, 38-41, 168, 250-253, 302-303, 468-469, 519 <i>Problem-Solving Workshop 51, 93, 139</i>

STANDARDS	PAGE REFERENCES
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: 24-26, 32-34, 38-41 <i>Investigation</i> 30-31, 80-81, 152-153 <i>Problem-Solving Workshop</i> 51, 93, 419, 637
Validate thinking and mathematical ideas using models, known facts, patterns, relationships, counter-examples, and proportional reasoning.	SE: 117-119, 302-303, 388, 394, 554-557 <i>Hands-On Algebra</i> 25, 66, 428, 478, 489
3.2 Predict results.	
Make and explain conjectures based on analysis of problem situations.	SE: 42 #4-6, 62 #35, 219-221, 241 #8, 302-305, 417 #5 <i>Graphing Calculator Exploration</i> 491 <i>Investigation</i> 110-111, 308-309, 674-675
3.3 Draw conclusions and verify results.	
Test conjectures by formulating a proof or by constructing a counterexample.	SE: 16, 22 #34, 62 #35, 241 #8, 307 #17, 517 #38, 603 #2 <i>Hands-On Algebra</i> 220 <i>Investigation</i> 308-309, 674-675
Support arguments and justify results using inductive and deductive reasoning.	SE: 117-119, 302-304, 315 #40, 341-343, 388, 394, 554-557 <i>Hands-On Algebra</i> 489 <i>Investigation</i> 30-31, 494-495
Check for reasonableness of results.	SE: 24, 85 #44, 259 #9, 315 #39, 340 #43, 365 #37, 469-470 <i>Hands-On Algebra</i> 224, 362 TWE: TT 72
Reflect on and evaluate procedures and results and make necessary revisions.	SE: 24-26, 32-34, 38-41, 85 #44, 117-119, 259 #9, 315 #39, 340 #43, 365 #37, 469-470
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: 32-34, 35 #9, 36 #21, 37 #23, 104-107, 146-147 <i>Investigation</i> 80-81, 210-211, 308-309, 540-541, 612-613
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: 24-26, 32-35 <i>Investigation</i> 30-31, 110-111, 152-153, 210-211, 262-263, 612-613 TWE: ML 38 RA 55
Integrate the use of a variety of available technologies to browse, select, and retrieve mathematical information from multiple sources.	SE: 24-26, 32-35 <i>Investigation</i> 30-31, 110-111, 152-153, 210-211, 262-263, 612-613 TWE: ML 38 RA 55

STANDARDS	PAGE REFERENCES
4.2 Organize and interpret information.	
Organize, clarify, and refine mathematical information in multiple ways—reflecting, verbalizing, discussing, or writing.	SE: 4-6, 24-26, 32-34, 38-41, 146-148 TWE: OEA 37, 223, 301, 477, 619
4.3 Represent and share information.	
Express complex ideas and situations using mathematical language and notation in appropriate and efficient forms.	SE: 104-107, 362-363, 366-369, 483-485, 606-608 <i>Investigation</i> 30-31, 110-111, 308-309, 410-411, 540-541
Explain or represent complex mathematical ideas and information in ways appropriate for audience and purpose.	SE: 104-107, 362-363, 366-369, 483-485, 606-608 <i>Investigation</i> 30-31, 110-111, 308-309, 410-411, 540-541
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: 4-6, 8-10, 14-16, 112-114, 122-125, 160-162, 341-343, 388-391, 428-431, 509-511
Relate and use multiple equivalent mathematical models and representations.	SE: 4-6, 8-10, 14-16, 112-114, 122-125, 160-162, 341-343, 388-391, 428-431, 509-511
5.2 Relate mathematical concepts and procedures to other disciplines.	
Extend mathematical patterns and ideas to other disciplines.	SE: 60 #8, 119 #3, 207 #6, 265 #3, 349 #5, 354 #7, 359 #6, 406 #5, 460 #4, 557 #6
Apply mathematical thinking and modeling in other disciplines.	SE: 60 #8, 119 #3, 207 #6, 265 #3, 349 #5, 354 #7, 359 #6, 406 #5, 460 #4, 557 #6
Describe examples of contributions to the development of mathematics <i>such as the contributions of women, men, and different cultures.</i>	SE: 146, 194, 366, 425 #56 <i>Investigation</i> 410-411
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: 38 #1, 72 #9, 162 #8, 220 #1, 266 #4, 271 #1, 480 #3, 573 #3, 575 #5
Investigate the mathematical knowledge and training requirements for occupational/career areas of interest.	SE: <i>Math In the Workplace</i> 218, 346, 488, 591

Codes Used for TWE Pages

EA	Error Analysis
EC	Extra Credit
F	Focus
HOA	Hands-On Algebra
ICE	In-Class Example
ML	Motivating the Lesson
OEA	Open-Ended Assessment
RA	Reteaching Activity
TT	Teaching Tip