



**WASHINGTON**  
**Essential Academic Learning Requirements—Mathematics**  
**Benchmark 3—Grade 10**  
***Advanced Mathematical Concepts***  
***Precalculus with Applications* © 2004**

BENCHMARKS	PAGE REFERENCES
<b>1. The student understands and applies the concepts and procedures of mathematics.</b>	
<b>1.1 Understand and apply concepts and procedures from number sense.</b>	
Number and Numeration	
Understand and use properties and symbolic representations of rational numbers, powers, and roots.	SE: 206, 229, 695-703, 711 #32, 716 #18, 732 #67, 750 #11-#20 TWE: EC 702 F 704 FC 699 MTL 695 TT 696, 697, 698 <i>Study Guide and Practice</i> 197-198
Compare and order rational numbers, powers, and roots.	<i>Enrichment</i> 121
Understand concepts of and use processes involving prime and composite numbers, factors and multiples, and divisibility.	SE: 65 #9, 196 #48, 221 #45, 224 ex 3, 693 #2, 755 #10, 805 #44, 983 #10
Understand and apply the concepts of ratio and both direct and inverse proportion.	SE: 189-196, 200 #56-#58, 248 #35, 283 #72, 284-290, 298 #54, 677 #56, 692 ex 1, 693 #4 TWE: EC 196 OEA 196 <i>Study Guide and Practice</i> 53-54
Computation	
Understand operations on rational numbers, powers, and roots.	SE: 206, 229, 695-703, 711 #32, 716 #18, 732 #67, 750 #11-#20 TWE: EC 702 F 704 FC 699 MTL 695 TT 696, 697, 698 <i>Study Guide and Practice</i> 197-198
Compute with rational numbers, powers, and roots.	SE: 65 #3, 124 ex 1, 125 #2, 549 #7, 695-703 TWE: EC 702 FC 699 TT 696, 697, 698 <i>Assessment and Evaluation</i> 19-20 <i>Study Guide and Practice</i> 197-198

BENCHMARKS	PAGE REFERENCES
Use mental arithmetic, pencil and paper, calculator, or computer as appropriate to the task involving real numbers.	SE: 64 ex 1, 65 #3, 125 #2, 341 #3, 549 #7, 613 #5, 695-703 <i>Assessment and Evaluation</i> 19-20 <i>Study Guide and Practice</i> 197-198
Estimation	
Identify situations involving rational numbers, powers, and roots in which estimation is sufficient and computation is not required.	SE: 105 #62, 683 #37c, 744 #6c, 745 #14c, 974 #45
Use estimation to predict computation results and to determine the reasonableness of answers involving real numbers, <i>for example, estimating.</i>	SE: 272 ex 2, 744 #6c, 745 #14c, 747 #21d, 974 #45
<b>1.2 Understand and apply concepts and procedures from measurement.</b>	
Attributes and Dimensions	
Understand how changes in dimension affect perimeter, area, and volume.	SE: 366 #38, 782 #45, 828 #35, 833 #56
Measure objects and events directly or use indirect methods <i>such as finding the volume of a cone given its height and diameter.</i>	SE: 77 #28, 188 #56, 192 ex 5, 358 #51, 476 #40, 598 #38, 701 #68, 828 #35, 833 #56
Calculate rate and other derived and indirect measurements.	SE: 299 ex 2, 301 ex 4, 302 #9, 303 #23, 304 #29, 307 ex 4, 309 #14, 317 #31, 326 #41, 332 #34, 938 #1-#2, 961-968, 980 #39-#42 <i>Chapter 15 Test A70 #19</i> <i>Study Guide and Practice</i> 273-274
Approximation and Precision	
Understand that the precision and accuracy of measurement are affected by the measurement tools and calculating procedures.	SE: Standard error of the mean can be found on pages 927-928.
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: 272 ex 2, 744 #6c, 745 #14c, 747 #21d, 974 #45
Systems and Tools	
Understand the benefits of standard units of measurement and the advantages of the metric system.	This objective is covered in Glencoe's <i>Geometry</i> on pages 730-731.
Compare, contrast, and use both the U.S. system and metric system.	Both U.S. and metric measurements are used throughout the book for calculations.
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>	This objective is covered in Glencoe's <i>Geometry</i> on page 14.

BENCHMARKS	PAGE REFERENCES
<b>1.3 Understand and apply concepts and procedures from geometric sense.</b>	
Properties and Relationships	
Use geometric properties and relationships to compare, contrast, describe, and classify 2- and 3-dimensional geometric figures.	SE: 36 #11, 273 #3, 483 #3, 613 #3, 617 ex 3, 620 #23-#27, 640 #55, 652 #51, 688 #13, 887 #2, 948 #57 TWE: EC 621 TT 617 <i>Study Guide and Practice</i> 177-178
Construct geometric models and scale drawings using tools as appropriate, <i>for example, building a model of a bridge.</i>	SE: 95 #33, 234 #26
Understand and use properties of symmetry, congruence, and similarity.	SE: 92, 127-136, 151 #47, 158 #49, 198 #11-#18, 331 #69, 483 #8, 560 #62, 630 #56 TWE: MTL 127 TT 129, 130 <i>Enrichment</i> 25 <i>Study Guide and Practice</i> 39-40
Perform complex geometric constructions using a variety of tools and technologies, <i>such as paper folding, computer software, straightedge, compass.</i>	SE: 135 #40, 534 #2
Locations and Transformations	
Understand and use coordinate grids.	SE: 20 ex 1, 32 ex 1, 121 #28-#33, 272 ex 2, 470-476, 480 #48-#51, 615-622, 640 #55, 652 #51, 688 #11-#13, 887 #2 <i>Study Guide and Practice</i> 131-132, 177-178
Understand and apply multiple geometric transformations using combinations of translations, reflections, and/or rotations.	SE: 88-96, 104 #53, 121 #28-#33, 127-136, 138 ex 1, 149 #1, 228 #49, 535-542, 546 #53-#54 <i>Graphing Calculator Exploration</i> 87 TWE: EC 96 <i>Study Guide and Practice</i> 27-28, 151-152
<b>1.4 Understand and apply concepts and procedures from probability and statistics.</b>	
Probability	
Understand the properties of dependent and independent events.	SE: 837-845, 883 #35-#36 TWE: TT 838 <i>Study Guide and Practice</i> 239-240
Understand and use appropriate counting procedures to determine probabilities.	SE: 837-845, 846-851, 852-858, 859-867, 868-874, 875-880, 883 #27-#34, 884 #37-#40 TWE: MTL 846 <i>Study Guide and Practice</i> 239-240, 241-242, 243-244, 245-246
Use both experimental and theoretical methods to determine probabilities.	SE: 837-845, 846-851, 852-858, 859-867, 868-874, 875-880, 883 #27-#34, 884 #37-#40 TWE: MTL 846 <i>Study Guide and Practice</i> 239-240, 241-242, 243-244, 245-246
Statistics	
Collect data using appropriate methods and technology.	SE: 84 #49 <i>interNET Project</i> 937

BENCHMARKS	PAGE REFERENCES
Organize and display data in appropriate forms, such as tables, graphs, scatter plots, and box and whisker plots.	SE: 258-264, 270 #54-#55, 740-748, 889-896, 934 #11-#13 <i>Graphing Calculator Investigation</i> 265-266 <i>interNET Project</i> 73-74, 255-256, 937
Calculate and use the different measures of central tendency, variability, and range as appropriate to describe data.	SE: 111 #33, 150 #43, 897-907, 908-917, 934 #14-#18, 935 #19-#22, 937 #41, 939 #9 <i>Enrichment</i> 158, 159 <i>Study Guide and Practice</i> 257-258, 259-260
Use statistics to support different points of view, for example, in a debate or a position paper.	SE: <i>interNET Project</i> 885, 937
Prediction and Inference	
Predict outcomes and design and conduct experiments to verify or disprove predictions.	TWE: AIN 854, 877 FC 876 OEA 880
Understand and make inferences based on the analysis of experimental results, statistical data, and graphical representations.	SE: 927 <i>Graphing Calculator Exploration</i> 877
<b>1.5 Understand and apply concepts and procedures from algebraic sense.</b>	
Patterns	
Recognize, extend, and create complex patterns and sequences.	SE: 759-765, 766-773, 774-783, 793 #37-#38, 800 #53, 830 #11-#13, 845 #54, 867 #59 TWE: AIN 761, 779 EC 764, 773 <i>Enrichment</i> 133 <i>Study Guide and Practice</i> 215-216, 217-218
Generalize and express rules describing patterns and sequences.	SE: 769 ex 5, 815-821, 828 #30, 832 #45-#50 TWE: EC 821 <i>Enrichment</i> 140 <i>Study Guide and Practice</i> 229-230
Representations	
Translate among tabular, symbolic, and graphical representations of relations using =, ≠, >, <, ≥, ≤.	SE: 20-25, 29 #4, 30 #27, 44 #19, 46 ex 1 - ex 2, 49 #23, 50 #29, 52-56, 59 #31-#38 TWE: AIN 53 EC 25, 56 <i>Enrichment</i> 3 <i>Study Guide and Practice</i> 5-6, 15-16
Use variables to write expressions, equations, and inequalities.	SE: 27-31, 32-37, 44 #15, 51 #32, 55 #8a, 56 #30, 59 #39-#46 TWE: EC 37 <i>Study Guide and Practice</i> 7-8, 9-10
Operations	
Simplify and evaluate expressions and formulas.	SE: 7 ex 6, 8 ex 7, 9 #13-#14, 11 #41-#47, 19 #37, 58 #11-#17, 124 ex 1, 125 #9, 431-436, 441 ex 6, 443 #34-#42, 452 ex 4 TWE: EC 11, 436 <i>Study Guide and Practice</i> 121-122

BENCHMARKS	PAGE REFERENCES
Solve equations and inequalities.	SE: 67-72, 73-77, 86 #55, 96 #36, 104 #55, 107-111, 118 #28, 120 #11-#16, 122 #45-#48, 125 #6 TWE: EC 72, 76 <i>Study Guide and Practice</i> 21-22, 23-24, 31-32
<b>2. The student uses mathematics to define and solve problems.</b>	
<b>2.1 Investigate situations.</b>	
Search systematically for patterns in complex situations.	SE: 759-765, 766-773, 774-783, 793 #37-#38, 800 #53, 830 #11-#13, 845 #54, 867 #59 TWE: AIN 761, 779 EC 764, 773 <i>Enrichment</i> 133 <i>Study Guide and Practice</i> 215-216, 217-218
Use multiple strategies.	SE: 389 ex 1b, 459 #4, 467 #4
Identify what information is missing or extraneous and compensate for it.	SE: 65 #2
Analyze an unproductive approach and attempt to modify it or try a new approach.	SE: 48 #4, 82 #4, 109 #2, 156 #5, 226 #4, 240 #4, 308 #4, 316 #4, 383 #5, 410 #5, 427 #5, 453 #5, 496 #3, 502 #3, 565 #4
<b>2.2 Formulate questions and define the problem.</b>	
Identify questions to be answered in complex situations.	SE: 288 #9, 292 ex 2, 297 #45, 301 ex 4, 303 #25-#26, 307 ex 4, 311 #48-#49, 317 #34, 323 ex 3, 331 #27, 332 #32, 346 ex 4, 354 #6, 372 ex 6, 455 #44
Define problems in complex situations.	SE: 288 #9, 292 ex 2, 297 #45, 301 ex 4, 303 #25-#26, 307 ex 4, 311 #48-#49, 317 #34, 323 ex 3, 331 #27, 332 #32, 346 ex 4, 354 #6, 372 ex 6, 455 #44
Identify the information that is known and unknown in complex situations.	SE: 65 #2
<b>2.3 Construct solutions.</b>	
Organize and synthesize information from multiple sources.	SE: 319 #2, 367 #2, 534 #2, 812 #38, 820 #34, 917 #27 <i>interNET Project</i> 123, 271, 339, 611, 691
Select and use appropriate mathematical tools.	SE: 308 #4, 703 #86 <i>Graphing Calculator Exploration</i> 333-334, 404, 526, 592, 685-686 <i>interNET Project</i> 937, 981
Apply viable strategies and appropriate concepts and procedures to construct a solution.	SE: 288 #9, 292 ex 2, 297 #45, 301 ex 4, 303 #25-#26, 307 ex 4, 311 #48-#49, 317 #34, 323 ex 3, 331 #27, 332 #32, 346 ex 4, 354 #6, 372 ex 6, 455 #44
<b>3. The student uses mathematical reasoning.</b>	
<b>3.1 Analyze information.</b>	
Compare, contrast, interpret, and integrate information from multiple sources.	SE: 319 #2, 367 #2, 534 #2, 812 #38, 820 #34, 917 #27 <i>interNET Project</i> 123, 271, 339, 611, 691

BENCHMARKS	PAGE REFERENCES
Validate thinking and mathematical ideas using models, known facts, patterns, relationships, counterexamples, and proportional reasoning.	SE: 185 #4, 239 #1, 308 #3, 363 #1, 410 #11-#12, 411 #32-#37, 421-422, 427 #1, 438 #1a, 467 #3, 589 #3, 627 #4, 848 #3, 923 #4
<b>3.2 Predict results.</b>	
Make and explain conjectures based on analysis of problem situations.	SE: 13 #5, 26 #2, 87 #4, 133 #4, 284 #4, 369 #3, 378 #3, 458 #4, 641 #1-#5, 695 #3-#4
<b>3.3 Draw conclusions and verify results.</b>	
Test conjectures by formulating a proof or by constructing a counterexample.	SE: 185 #4, 239 #1, 308 #3, 363 #1, 410 #11-#12, 411 #32-#37, 421-422, 427 #1, 438 #1a, 467 #3, 589 #3, 627 #4, 848 #3, 923 #4
Support arguments and justify results using inductive and deductive reasoning.	SE: 94 #25, 498 #43, 510 #40, 621 #28-#32, 724 #61, 822-828, 832 #51-#53 <i>Enrichment</i> 141 <i>Study Guide and Practice</i> 231-232
Check for reasonableness of results.	SE: 48 #4, 82 #4, 109 #2, 156 #5, 226 #4, 240 #4, 308 #4, 316 #4, 383 #5, 410 #5, 427 #5, 453 #5, 496 #3, 502 #3, 565 #4
Reflect on and evaluate procedures and results and make necessary revisions.	SE: 48 #4, 82 #4, 109 #2, 156 #5, 226 #4, 240 #4, 308 #4, 316 #4, 383 #5, 410 #5, 427 #5, 453 #5, 496 #3, 502 #3, 565 #4
<b>4. The student communicates knowledge and understanding in both everyday and mathematical language.</b>	
<b>4.1 Gather information.</b>	
Develop or select and follow an efficient system for collecting information.	SE: 319 #2, 367 #2, 534 #2, 812 #38, 820 #34, 917 #27 <i>interNET Project</i> 123, 271, 339, 611, 691
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: 319 #2, 367 #2, 534 #2, 812 #38, 820 #34, 917 #27 <i>interNET Project</i> 123, 271, 339, 611, 691
Integrate the use of a variety of available technologies to browse, select, and retrieve mathematical information from multiple sources.	SE: 812 #36 <i>interNET Project</i> 123, 271, 339, 611, 691
<b>4.2 Organize and interpret information.</b>	
Organize, clarify, and refine mathematical information in multiple ways – reflecting, verbalizing, discussing, or writing.	SE: 820 #34 TWE: OEA 12, 44, 72, 86, 106, 136, 168, 170, 212, 283, 304, 358, 403, 412
<b>4.3 Represent and share information.</b>	
Express complex ideas and situations using mathematical language and notation in appropriate and efficient forms.	SE: 17 #3, 18 #29, 23 #4, 37 #32, 41 #2, 48 #3, 50 #27, 110 #24, 118 #22, 133 #4, 149 #3, 157 #45, 168 #39, 218 #1, 350 #61
Explain or represent complex mathematical ideas and information in ways appropriate for audience and purpose.	SE: 820 #34 TWE: MTL 45 OEA 12, 44, 72, 86, 106, 136, 168, 170, 212, 283, 304, 358, 403

BENCHMARKS	PAGE REFERENCES
<b>5. The student understands how mathematical ideas connect within mathematics, to other subject areas, and to real-life situations.</b>	
<b>5.1 Relate concepts and procedures within mathematics.</b>	
Relate and use conceptual and procedural understandings among multiple mathematical content strands.	SE: 35 ex 5, 36 #11, 71 #33, 104 #50, 110 #23, 123 #53, 135 #40, 144 #41, 145 #46, 179 #44, 187 #44, 192 ex 5, 210 #14, 226 #13, 233 #9
Relate and use multiple equivalent mathematical models and representations.	TWE: MTL 52, 88, 107, 152, 181, 243, 251, 320, 527, 535, 631, 766, 786
<b>5.2 Relate mathematical concepts and procedures to other disciplines.</b>	
Extend mathematical patterns and ideas to other disciplines.	SE: 24 #35, 103 #48, 150 #40, 187 #41, 468 #33, 504 #48, 611 #65, 639 #49, 790 ex 6, 893 #6 <i>Real-World Application</i> 180, 786
Apply mathematical thinking and modeling in other disciplines.	SE: 24 #35, 103 #48, 150 #40, 187 #41, 468 #33, 504 #48, 611 #65, 651 #43, 701 #70, 720 ex 4 <i>Real-World Application</i> 180, 786
Describe examples of contributions to the development of mathematics <i>such as the contributions of women, men, and different cultures.</i>	SE: 716 #14, 807, 827 #23 <i>History of Mathematics</i> 97, 319, 367, 462, 534, 969
<b>5.3 Relate mathematical concepts and procedures to real-life situations.</b>	
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: 311 #49, 350 #57, 715 #10 <i>interNET Project</i> 61, 123, 201, 981
Investigate the mathematical knowledge and training requirements for occupational/career areas of interest.	SE: <i>Career Choices</i> 12, 105, 136, 221, 312, 358, 420, 499, 598, 622, 703, 800, 851, 896, 976

### Codes Used for TWE Pages

AIN	Addressing Individual Needs
EC	Extra Credit
F	Focus
FC	From the Classroom of...
MTL	Motivating the Lesson
OEA	Open-ended Assessment
TT	Teaching Tip