



ARIZONA
Mathematics Standard Articulated by Grade Level
Grade 8
Mathematics: Applications and Concepts Course 3 © 2006

CONTENT STANDARDS	PAGE REFERENCES
Strand 1: Number Sense and Operations	
Concept 1: Number Sense Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.	
PO 1. Locate rational numbers on a number line.	SE: 17-19, 23-24, 68, 70 #34, 112 #2, 220 TWE: B 17, 28 DI 24
PO 2. Identify irrational numbers.	SE: 125, 127-129, 130 #2, 147 #25-#30, 149 #9-#11 <i>Hands-On Lab</i> 141 TWE: A 129 DI 126 ICE 126
PO 3. Classify real numbers as rational or irrational.	SE: 125-129, 130 #18-#24, 147 #25-#30, 149 #9-#11 TWE: DI 126 ICE 126
Concept 2: Numerical Operations Understand and apply numerical operations and their relationship to one another.	
PO 1. Select the grade level appropriate operation to solve word problems.	SE: 6-11 <i>Problem Solving Strategies</i> 44, 97, 276, 277, 488, 489 TWE: B 23, 92 DI 7, 35, 72, 489
PO 2. Solve word problems using grade level appropriate operations and numbers.	SE: 9-10 #4-#20, 133 #20 <i>Problem Solving Strategies</i> 44, 97, 276, 277, 488, 489 TWE: B 23, 92 DI 24, 221 TNT 7, 24
PO 3. Determine the square of an integer.	SE: 116, 119 #40, #41, 122 #39 TWE: DI 117
PO 4. Determine the square root of an integer.	SE: 116, 118 #14-#25, 130 #4-#9, 146, 149 #3-#5, 151 #10 TWE: DI 117 ICE 117 TNT 117
PO 5. Identify squaring and finding square roots as inverse operations.	SE: 116, 118 #3, 151 #10 TWE: DI 120

CONTENT STANDARDS	PAGE REFERENCES
PO 6. Apply grade level appropriate properties to assist in computation.	SE: 13, 14 #10-#11, 15 #49-#50, 58 #3, 75 #32-#34, 76, 98 e.g., #1 TWE: A 15 DI 35 ICE 13
PO 7. Apply the symbols “ $\sqrt{\quad}$ ” to represent square root, “ \pm ” to represent roots, “ $\{\}$ ” as grouping symbols.	SE: 75 (Extending the Lesson), 98 e.g., #1, 116-117, 118 #1, 119 #47, 147 #24, 151 #10, #11 <i>Extending the Lesson 75</i> TWE: DI 12, 118
PO 8. Use grade level appropriate mathematical terminology.	SE: 63, 73, 98, 125, 241 <i>Spreadsheet Investigation 245</i> <i>Study Skill 16, 295</i> TWE: B 11, 28, 50, 98, 262 DI 18 PC 114F, 372F, 558 F
PO 9. Calculate the missing value in a percentage problem.	SE: 216-219, 224 #11-#13, 232-235, 236-240, 247 #35-#38, 248 #51-#54 TWE: ICE 217, 233
PO 10. Convert standard notation to scientific notation and vice versa.	SE: 104-107, 110 #58-#65, 111 #23-#24, 119 #51 TWE: ICE 105
PO 11. Simplify numerical expressions using the order of operations with grade appropriate operations on number sets.	SE: 11-15, 21 #64-#66, 27 #47, 36, 58 #2, 113 #20 TWE: DI 35, PS 57, 111
Concept 3: Estimation Use estimation strategies reasonably and fluently.	
PO 1. Solve grade level appropriate problems using estimation.	SE: 8, 9 #10-#12, 120-122, 228-231, 251 #15, <i>Problem Solving Strategies 226-227, 488-489</i> <i>Study Tip 540</i> TWE: DI 315 ICE 121, 229
PO 2. Use estimation to verify the reasonableness of a calculation. (e.g., Is 32 the square root of 64?)	SE: 120-122, 149 #6-#8, 228-231, 251 #15, 325 #11 <i>The Game Zone 131</i> <i>Problem Solving Strategies 226-227, 488-489</i> TWE: DI 120
PO 3. Express answers to the appropriate place or degree of precision. (e.g., time and money)	SE: 230 #1, 231 #44, 240 #34, #37, 362 #44 TWE: B 358 DI 93
PO 4. Verify the reasonableness of estimates made from calculator results within a contextual situation.	SE: 64 e.g., #3, 121 e.g., #2, 127 e.g., #7, 193 #7-#9

CONTENT STANDARDS	PAGE REFERENCES
Strand 2: Data Analysis, Probability, and Discrete Mathematics	
Concept 1: Data Analysis (Statistics) Understand and apply data collection, organization and representation to analyze and sort data.	
PO 1. Formulate questions to collect data in contextual situations.	SE: <i>Spreadsheet Investigation</i> 165 <i>Hands-On Lab</i> 434 <i>Web Quest</i> 3, 371, 465
PO 2. Construct box-and-whisker plots.	SE: 446-449, 460, 461 #1 TWE: DI 447
PO 3. Determine the appropriate type of graphical display for a given data set.	SE: 430-433, 440 #1, 451 #3, 459 #13, #14, 462 #7, 463 #17, 542 #24, 557 #17 TWE: B 430, 450 DI 421, 430 ICE 431
PO 4. Interpret box-and-whisker plots, circle graphs and scatter plots.	SE: 426-429, 430-431, 446-449, 539-542, 554 #35-#38 <i>Graphing Calculator Investigation</i> 543 TWE: B 426 DI 447 ICE 427, 431, 447
PO 5. Answer questions based on box-and-whisker plots, circle graphs and scatter plots.	SE: 429 #14, 430, 447, 448 #3, 459 #12, 508 #5, 539-542 TWE: B 426 DI 427, 447 ICE 428
PO 6. Solve problems in contextual situations using the mean, median, mode, and range of a given data set.	SE: 36 e.g., #8, 38 #57-#60, 69 #32, 435-438, 442-445, 451, 453, 463 #14 <i>Spreadsheet Investigation</i> 439 <i>The Game Zone</i> 441 TWE: DI 436, 451 ICE 451
PO 7. Formulate reasonable predictions based on a given set of data.	SE: 173 #45, 403 #24, 407 e.g., #3, 4 <i>Hands-On Lab</i> 22, 521 <i>WebQuest</i> 371
PO 8. Compare trends in data related to the same investigation.	SE: 406-409, 412 #46-#49, 421 e.g., #3, 423 #19-#21, 461 #13 TWE: DI 451 PA 541
PO 9. Solve contextual problems using scatter plots, box-and-whisker plots, and double line graphs of continuous data.	SE: 446-449, 538 #9, 539-542, 545 e.g., #3
PO 10. Evaluate the effects of missing or incorrect data on the results of an investigation. (e.g., Susie's teacher recorded a 39 instead of a 93 for her last quiz, what will happen to Susie's average?)	SE: 406-409, 412, 414 #7, 424 #26, 450-453, 460 #26-#30 TWE: A 409 DI 407
PO 11. Identify a line of best fit for a scatter plot.	SE: 540, 542 #17-#20 TWE: A 542 DI 540
PO 12. Distinguish between causation and correlation.	This objective can be met during teacher/class discussion.

CONTENT STANDARDS	PAGE REFERENCES
Concept 2: Probability	
Understand and apply the basic concepts of probability.	
PO 1. Determine the probability that a specific event will occur in a 2-stage probability experiment.	SE: 396-399, 412 #35-#41 <i>Hands-On Lab</i> 392-393 <i>Web Quest</i> 371
PO 2. Solve contextual situations using probability. (e.g., If the probability of Michelle making a free throw is 0.25, what is the probability that she will make three free throws in a row?)	SE: 374-377, 383 #27-#30, 402 #15, 403 TWE: ICE 375
PO 3. Predict the outcome of a grade level appropriate probability experiment.	SE: 400-403, 406-409, 412 #42-#45 <i>Web Quest</i> 371 TWE: DI 400 ICE 401
PO 4. Record the data from performing a grade level appropriate probability experiment.	SE: 380-383, 394 #9 <i>Problem Solving Strategies</i> 378-379 <i>Web Quest</i> 371 TWE: A 383, 403 DI 378 ICE 381
PO 5. Compare the outcome of an experiment to predictions made prior to performing the experiment.	SE: <i>Hands-On Lab</i> 392 #3 TWE: A 403
PO 6. Distinguish between independent and dependent events.	SE: 396-399, 403 #26, 27, 409 #25, 26, 412 #35-#41, 415 #15 TWE: DI 397 ICE 397
PO 7. Compare the results of two repetitions of the same grade level appropriate probability experiment.	SE: <i>Graphing Calculator Investigation</i> 404 (Act. 2) <i>Web Quest</i> 371 TWE: A 399 B 374
Concept 3: Discrete Mathematics – Systematic Listing and Counting	
Understand and demonstrate the systematic listing and counting of possible outcomes.	
PO 1. Determine all possible outcomes involving the combination of two or more sets of objects. (e.g., If you roll a 6 sided number cube 4 times how many possible outcomes are possible?)	SE: 388-391, 396-399, 403 #28, 411, 412 #35-#41, 415 #13 TWE: A 399 DI 389
PO 2. Determine all possible arrangements given a set. (e.g., “How many ways can you arrange a set of 7 books on a shelf?”)	SE: 380-383, 384-387, 388-391, 415 #12, #13 <i>Problem Solving Strategies</i> 378-379 TWE: A 387 B 380 ICE 381, 389
Concept 4: Vertex-Edge Graphs	
Understand and apply vertex-edge graphs.	
PO 1. Solve contextual problems represented by vertex edge graphs.	The following reference can be used to meet this objective. TWE: ICE 143 #2

CONTENT STANDARDS	PAGE REFERENCES
Strand 3: Patterns, Algebra, and Functions	
Concept 1: Patterns Identify patterns and apply pattern recognition to reason mathematically.	
PO 1. Communicate a grade level appropriate iterative or recursive pattern, using symbols or numbers.	SE: 9 #3, 8, 9, 90 #10, 512-515, 520 #29-#31, 530 #4-#6 <i>Problem Solving Strategies</i> 96-97, 227 #7 <i>Hands-On Lab</i> 304-305, 516 <i>WebQuest</i> 371 TWE: A 97 B 324, 512 DI 96, 99
PO 2. Extend a grade level appropriate iterative or recursive pattern.	SE: 9 #8, 9, 90 #10, 512-515, 520 #29-#31 <i>Problem Solving Strategies</i> 96-97, 227 #7 <i>Hands-On Lab</i> 304-305 TWE: A 97 B 324, 512 DI 96, 99
PO 3. Solve grade level appropriate iterative or recursive pattern problems.	SE: 10 #18, 512-515, 520, 530 <i>Problem Solving Strategies</i> 96-97, 227 #7 <i>Hands-On Lab</i> 304-305, 516 <i>WebQuest</i> 371 TWE: A 97 B 324 DI 63, 96, 99, 513
Concept 2: Functions and Relationships Describe and model functions and their relationships.	
PO 1. Describe the rule used in a simple grade level appropriate function. (e.g., T-chart, input/output model)	SE: 517-520 TWE: A 519 DI 518
PO 2. Distinguish between linear and nonlinear functions, given graphic examples.	SE: 522-525, 533, 534, 560, 561, 565-568 <i>The Game Zone</i> 531 <i>Graphing Calculator Investigation</i> 532 TWE: ICE 561
PO 3. Determine whether a graph or table are related to a given an equation of the form $y=ax^2$ where 'a' is a natural number.	SE: 561-563, 565-568 <i>Graphing Calculator Investigation</i> 564 TWE: ICE 545, 561, 566
PO 4. Identify independent and dependent variables for a contextual situation.	SE: <i>Study Tip</i> 518
Concept 3: Algebraic Representations Represent and analyze mathematical situations and structures using algebraic representations.	
PO 1. Evaluate algebraic expressions by substituting rational values for variables. [e.g., $2(ab+ac+bc)$, when $a = 2$, $b = 3/5$, and $c = 4$]	SE: 12-13, 14, 26 #39-#42, 36 e.g., #7, 38 #49-#56, 73 e.g., 4, 89 e.g., #4 TWE: ICE 73
PO 2. Use variables in contextual situations.	SE: 15 #41-#42, 73 e.g., #5, 93 e.g., #5, 94 #9-#10

CONTENT STANDARDS	PAGE REFERENCES
PO 3. Translate a written sentence or phrase into an algebraic equation or expression and vice versa. (e.g., Three less than twice a number is $2n-3$.)	SE: 26 #29-#32, 39-42, 47 #10-#11, 48 #32-#35, 52 #32-#39, 56 #42-#45, 58 #7, 80 #49, 473 #50-#53, 477 #47, 478-481, 506 #19-#21 TWE: DI 40 B 478 ICE 40, 479
PO 4. Translate a sentence written in context into an algebraic equation involving two operations.	SE: 478-481, 486 #28-#31, 487 #33-#36, 490 #17, 507 #12 TWE: A 487 ICE 479
PO 5. Translate a contextual situation into an algebraic inequality. (e.g., Joe earns more than \$5.00 an hour; therefore, $x > 5$)	SE: 492-495, 497 e.g., #4, 498 #30-#33, 506 #27, #28, 507 #13 TWE: A 495 ICE 493
PO 6. Identify an equation or inequality that represents a contextual situation.	SE: 48 #36-#41, 49 #42, 43, 53 #45, 479 e.g., #5, 480-481 #15-#21, 485, 487, 495, 497, 509 #15-#19 TWE: A 495 ICE 493
PO 7. Solve one-step equations with rational numbers as coefficients or as solutions.	SE: 45-49, 50-53, 56, 57 #23-#28, 70 #41-#43, 91 #48-#51, 92-95 TWE: B 50 ICE 51
PO 8. Solve one-step equations that model contextual situations.	SE: 48, 49, 52-53, 56, 95 #32-#33 <i>Mini Lab 45</i> TWE: A 49, 95 DI 51
PO 9. Solve two-step equations with rational coefficients and integer solutions. (e.g., $3x + 5 = 11$, $4x - 20 = 8$)	SE: 474-477, 479, 481 #26-#29, 490 #10-#15 <i>The Game Zone 491</i> TWE: A 53, 477 DI 475
PO 10. Graph an inequality on a number line.	SE: 493, 494 #24-#33, 495 #45, 498 #34-#45, 501, 502, 503 #12-#29, 506 #27, #28 TWE: A 495 ICE 493, 497, 501
PO 11. Solve a simple algebraic proportion.	SE: 170-172, 184-187, 188-191 TWE: ICE 171 TNT 171
PO 12. Solve applied problems using the Pythagorean theorem.	SE: 132-136, 137-140 TWE: A 136 DI 138 ICE 133, 134
Concept 4: Analysis of Change Analyze change in a variable over time and in various contexts.	
PO 1. Identify the slope of a line as the rate of change. (the ratio of rise over run)	SE: 166-169, 173 #47 TWE: DI 167

CONTENT STANDARDS	PAGE REFERENCES
Strand 4: Geometry and Measurement	
Concept 1: Geometric Properties Analyze the attributes and properties of two- and three-dimensional shapes and develop mathematical arguments about their relationships.	
PO 1. Draw a model that demonstrates basic geometric relationships such as parallelism, perpendicularity, similarity/ proportionality, and congruence.	SE: 181 #2, 259 #2, 281 #1, 290 e.g., #1 <i>Hands-On Lab</i> 261, 271, 283, 304-305 <i>Problem-Solving Strategy</i> 176-177 TWE: A 269 B 178 DI 280
PO 2. Draw three-dimensional figures by applying properties of each. (e.g., parallelism, perpendicularity and congruency)	SE: 333 #11, #12, 334 #16-#18 <i>Hands-On Lab</i> 330 TWE: A 334 DI 331
PO 3. Recognize the three-dimensional figure represented by a net.	SE: 347, 348, 352, 353 <i>Mini Lab</i> 342 <i>Hands-On Lab</i> 346 TWE: TNT 347
PO 4. Represent the surface area of rectangular prisms and cylinders as the area of their net.	SE: 347, 348 TWE: A 350 B 347 DI 348 TNT 347
PO 5. Draw regular polygons with appropriate labels.	SE: 279-282 <i>Hands-On Lab</i> 278 TWE: A 278
PO 6. Identify the properties of angles created by a transversal intersecting two parallel lines. (e.g., corresponding angles are congruent)	SE: 258-260, 270 #24-#27, 306 TWE: DI 257
PO 7. Recognize the relationship between inscribed angles and intercepted arcs.	After defining the terms for students, teachers can use the following to meet this objective. SE: 323 (Extend the Lesson)
PO 8. Identify tangents and secants of a circle.	A tangent for a triangle is referenced on: SE: 192-193.
PO 9. Determine whether three given lengths can form a triangle.	SE: 268-270 TWE: A 269 B 262, 267 DI 263, 268
PO 10. Identify corresponding angles of similar polygons as congruent and sides as proportional.	SE: 178-181, 279-282, 284 #8, 303 #25, 307 #21-#24, 311 #15 <i>Hands-On Lab</i> 283 TWE: DI 179, 280 ICE 180, 280

CONTENT STANDARDS	PAGE REFERENCES
Concept 2: Transformation of Shapes	
Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.	
PO 1. Identify the planar geometric figure that is the result of a given rigid transformation.	SE: 286-289, 290-294, 296-299, 300-303, 311 #17 <i>Hands-On Lab</i> 304-305 TWE: B 300 DI 287, 291 ICE 291, 297, 301
PO 2. Model a simple transformation on a coordinate grid. (e.g., translate right four units and down two units)	SE: 194-196, 290-291, 296-299, 301-302, 311 #17 TWE: ICE 195, 297, 301
Concept 3: Coordinate Geometry	
Specify and describe spatial relationships using coordinate geometry and other representational systems.	
PO 1. Use a table of values to graph a linear equation.	SE: 522, 523, 530 #14, 536 #45, 560-561 TWE: DI 560 ICE 561
PO 2. Determine the midpoint given two points on a number line.	SE: <i>Hands-On Lab</i> 271
PO 3. Determine the distance between two points on a number line.	SE: 143 e.g., #2 TWE: ICE 143 e.g., #2
Concept 4: Measurement - Units of Measure - Geometric Objects	
Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.	
PO 1. Solve problems for the area of a trapezoid.	SE: 315-318, 323 #36 TWE: A 318
PO 2. Solve problems involving the volume of rectangular prisms and cylinders.	SE: 335-338, 345 #32, 355 #28 TWE: B 335 ICE 336, 337
PO 3. Calculate the surface area of rectangular prisms or cylinders.	SE: 347-351, 355 #27, 365 TWE: ICE 348, 349
PO 4. Identify rectangular prisms and cylinders having the same volume.	SE: 337 #1, 339 #30 TWE: B 335
PO 5. Find the measure of a missing interior angle in a triangle or quadrilateral.	SE: 262, 264 #3-#5, 272, 274 #4-#6 TWE: ICE 263, 273
PO 6. Solve problems using ratios and proportions, given the scale factor.	SE: 184-187, 189 #3, #4, 190, 195 e.g., #3, 200, 202 #6 TWE: ICE 185
PO 7. Calculate the length of a side given two similar triangles.	SE: 189 #3, 190, 191, 197 #28, 200 #28-#29, 201 #11, 203 #15 TWE: B 188
Strand 5: Structure and Logic	
Concept 1: Algorithms and Algorithmic Thinking	
Use reasoning to solve mathematical problems in contextual situations.	
PO 1. Describe how to use a proportion to solve a problem in context.	SE: 170-173, 184-187, 188-191, 199 #16-#19, 200 #28-#29, 203 #12, #15 TWE: A 173 DI 179

CONTENT STANDARDS	PAGE REFERENCES
PO 2. Analyze algorithms.	TWE: A 42, 122 DI 167, 470 MIC 465 TNT 348
Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.	
PO 1. Solve a logic problem given the necessary information.	SE: 240 #34, 245 #3, 409 #17-#20, 532 #7 <i>Hands-On Lab</i> 103 #4, 141 #3 <i>Problem Solving Strategies</i> 226, 276 TWE: A 119, 344 DI 35, 133, 167, 276, 348, 565
PO 2. Identify simple valid arguments using <i>if...then</i> statements. (e.g., All squares are rectangles. If quadrilateral ABCD is a rectangle, is it a square?)	SE: 31 #46, 134, 156, 289 #21, 291 e.g., #3, 301, 357 #11, 349 #1 TWE: A 303, 344 DI 348
PO 3. Model a contextual situation using a flow chart.	SE: <i>Web Quest</i> 3 TWE: MIC 3 Note: These projects could use a flow chart in their application or presentation.
PO 4. Verify the Pythagorean theorem using an area dissection argument.	SE: <i>Mini Lab</i> 132

Codes Used for TWE Pages

A	Assess
B	Bellringer
DI	Daily Intervention
ICE	In-Class Example
MIC	More Interdisciplinary Connections
PA	Practice/Apply
PC	Project CRISS
TNT	Tips for New Teachers