

Arizona Mathematics Standard Articulated by Grade Level

GRADE 8

Every student should understand and use all concepts and skills from the previous grade levels. The standard is designed so that new learning builds on preceding skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of all mathematical strands.

Strand 1: Number and Operations

Number sense is the understanding of numbers and how they relate to each other and how they are used in specific context or real-world application. It includes an awareness of the different ways in which numbers are used, such as counting, measuring, labeling, and locating. It includes an awareness of the different types of numbers such as, whole numbers, integers, fractions, and decimals and the relationships between them and when each is most useful. Number sense includes an understanding of the size of numbers, so that students should be able to recognize that the volume of their room is closer to 1,000 than 10,000 cubic feet. Students develop a sense of what numbers are, i.e., to use numbers and number relationships to acquire basic facts, to solve a wide variety of real-world problems, and to estimate to determine the reasonableness of results.

Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, and the relationships among numbers and different number systems.

In Grade 8, students extend their knowledge and skills with the classification, comparison, ordering, and modeling real numbers and the real number system.

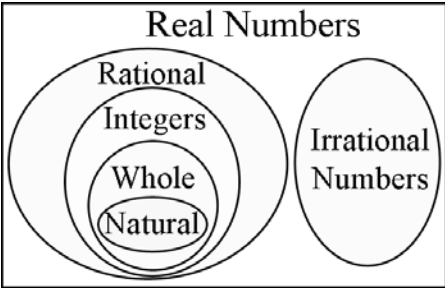
<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Compare and order real numbers including very large and small integers, and decimals and fractions close to zero. Connections: M08-S1C3-02	M08-S5C2-01. Analyze a problem situation to determine the question(s) to be answered. M08-S5C2-06. Communicate the answer(s) to the question(s) in a problem using appropriate representations, including symbols and informal and formal mathematical language.	Students order real numbers in a variety of forms (fractions, decimals, simple radicals, etc.) on a number line. Students compare real numbers within and among different subsets of the real number system.

The bulleted items within a performance objective indicate the specific content to be taught.

Explanations and Examples Updated 1.19.09

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 2. Classify real numbers as rational or irrational. Connections: M08-S1C1-03, M08-S1C3-02	M08-S5C2-01. Analyze a problem situation to determine the question(s) to be answered.	Students differentiate the definitions of rational and irrational numbers. They use the definitions to classify a list of real numbers.
PO 3. Model the relationship between the subsets of the real number system. Connections: M08-S1C1-02	M08-S5C2-04. Represent a problem situation using multiple representations, describe the process used to solve the problem, and verify the reasonableness of the solution.	Students can use graphic organizers to show the relationship between the subsets of the real number system. 
PO 4. Model and solve problems involving absolute value. Connections: M08-S1C2-05	M08-S5C2-04. Represent a problem situation using multiple representations, describe the process used to solve the problem, and verify the reasonableness of the solution.	Students solve problems that include absolute values and graph their answers on a number line.

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Explanations and Examples Updated 1.19.09

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Strand 1: Number and Operations

Concept 2: Numerical Operations

Understand and apply numerical operations and their relationship to one another.

In Grade 8, students use exponents and scientific notation to describe very large and very small numbers. Students extend their facility with percents to include percentage increases, decreases, and interest rates. Students will simplify more complex numerical expressions that include grouping symbols, roots, and positive exponents.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>						
<i>Students are expected to:</i>								
PO 1. Solve problems with factors, multiples, divisibility or remainders, prime numbers, and composite numbers.	M08-S5C2-01. Analyze a problem situation to determine the question(s) to be answered.	Examples: - Use the rules of divisibility to classify numbers. Explain why some numbers may be listed in more than one group. - Compare the price of each of the jars of spaghetti sauce to determine the best deal. <table> <tr> <td>\$2.12</td> <td>\$1.34</td> <td>\$0.88</td> </tr> <tr> <td>36 oz</td> <td>24 oz</td> <td>12 oz</td> </tr> </table> - You are planning a barbeque for 40 people. You will serve hot dogs. Each of the packages of hot dogs contains 8 hot dogs and each of the packages of hot dog buns contains 6 buns. You want to buy the minimum number of packages so that each hot dog is matched with a bun and there are no leftovers. How many packages of each must you buy? - A florist has 56 roses, 42 carnations, and 21 daisies that she can use to create bouquets. What is the greatest number of bouquets she can make containing at least one of each flower, without having any flowers left over?	\$2.12	\$1.34	\$0.88	36 oz	24 oz	12 oz
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36 oz	24 oz	12 oz						

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 2. Describe the effect of multiplying and dividing a rational number by - a number less than zero, - a number between zero and one, - one, and - a number greater than one.	M08-S5C2-06. Communicate the answer(s) to the question(s) in a problem using appropriate representations, including symbols and informal and formal mathematical language.	Example: Explain what happens to the number 2 when it is multiplied and divided by each of the real numbers listed below: $0 \quad -2$ $0 \quad -\frac{1}{2}$ $0 \quad \frac{1}{2}$ $0 \quad 2$
PO 3. Solve problems involving percent increase, percent decrease, and simple interest rates. Connections: M08-S1C3-01, M08-S3C2-05, M08-S3C4-02	M08-S5C2-01. Analyze a problem situation to determine the question(s) to be answered. M08-S5C2-08. Describe when to use proportional reasoning to solve a problem.	Examples: - Gas prices are projected to increase 124% by April. A gallon of gas costs \$4.17. How much will a gallon of gas cost in April? - A sweater is marked down 33%. Its original price was \$37.50. What is the price of the sweater before sales tax?
PO 4. Convert standard notation to scientific notation and vice versa (include positive and negative exponents).		Examples: - Write the distance between the Earth and the Sun using scientific notation. The average distance between the Earth and the Sun is 150 million kilometers. - What is the average size of a red blood cell in meters written in standard notation? The average size of a red blood cell is 7.0×10^{-6} meters.

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 5. Simplify numerical expressions using the order of operations that include grouping symbols, square roots, cube roots, absolute values, and positive exponents. Connections: M08-S1C1-04		Students are expected to simplify expressions containing exponents, including zero. Examples: $(5 + 7)^0 + -13$ $\frac{1}{3}(2 + 7^2) + \sqrt{84 - 35}$

Strand 1: Number and Operations

Concept 3: Estimation

Use estimation strategies reasonably and fluently while integrating content from each of the other strands.

In Grade 8, students continue to use estimation strategies to check solutions for reasonableness. They extend their knowledge of estimation to approximate the location of real numbers on a number line.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Make estimates appropriate to a given situation. Connections: M08-S1C2-03, M08-S1C3-02, M08-S2C1-02, M08-S2C3-02, M08-S3C3-02, M08-S3C4-02, M08-S4C1-02, M08-S4C3-01, M08-S4C4-01, M08-S5C1-01	M08-S5C2-01. Analyze a problem situation to determine the question(s) to be answered.	Students estimate using all four operations with whole numbers, fractions, and decimals. Estimation skills include identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, and verifying solutions or determining the reasonableness of situations using various estimation strategies. Continued on next page

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
		Estimation strategies for calculations with fractions and decimals extend from students' work with whole number operations. Estimation strategies include, but are not limited to: • front-end estimation with adjusting (using the highest place value and estimating from the front end making adjustments to the estimate by taking into account the remaining amounts), • clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate), • rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values), • using friendly or compatible numbers such as factors (students seek to fit numbers together - i.e., rounding to factors and grouping numbers together that have round sums like 100 or 1000), and • using benchmark numbers that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate). Specific strategies also exist for estimating measures. Students should develop fluency in estimating using standard referents (meters, yard, etc) or created referents (the window would fit about 12 times across the wall).

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 2. Estimate the location of rational and common irrational numbers on a number line. Connections: M08-S1C1-01, M08-S1C1-02, M08-S1C3-01		π , $\sqrt{2}$, and $\sqrt{3}$ are some examples of common irrational numbers that students should be able to estimate.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

This strand requires students to use data collection, data analysis, statistics, probability, systematic listing and counting, and the study of graphs. This prepares students for the study of discrete functions as well as to make valid inferences, decisions, and arguments. Discrete mathematics is a branch of mathematics that is widely used in business and industry. Combinatorics is the mathematics of systematic counting. Vertex-edge graphs are used to model and solve problems involving paths, networks, and relationships among a finite number of objects.

Concept 1: Data Analysis (Statistics)

Understand and apply data collection, organization, and representation to analyze and sort data.

In Grade 8, students build on their experiences of organizing and interpreting data and begin to apply principles to analyze statistical studies by identifying sources of bias. They create displays, including box and whisker plots, with two sets of data in order to compare and draw conclusions. Students use their knowledge of summary statistics to describe the data and the shape of their distribution.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Solve problems by selecting, constructing, interpreting, and calculating with displays of data, including box and whisker plots and scatterplots. Continued on next page	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning.	Students calculate extreme values, mean, median, mode, range, quartiles, and interquartile ranges. They should approximate lines of best fit for scatterplots and analyze the correlation between the variables (positive, negative, and no correlation).

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
Connections: M08-S2C1-04, SC08-S1C3-01, SC08-S1C3-03, SC08-S1C4-02, SS08-S1C1-01, SS08-S1C1-02, SS08-S1C1-03, SS08-S2C1-01, SS08-S2C1-02, SS08-S4C1-01, SS08-S4C1-03		
PO 2. Make inferences by comparing the same summary statistic for two or more data sets. Connections: M08-S1C3-01, M08-S2C1-03	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning. M08-S5C2-09. Make and test conjectures based on information collected from explorations and experiments.	Summary statistics include: extreme values, mean, median, mode, range, quartiles, and interquartile ranges. Students will include scatterplots, box and whisker plots, and all other applicable representations taught in previous grade levels. They will compare two different populations or two subsets of the same population.
PO 3. Describe how summary statistics relate to the shape of the distribution. Connections: M08-S2C1-02	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning.	Summary statistics include: extreme values, mean, median, mode, range, quartiles, and interquartile ranges.
PO 4. Determine whether information is represented effectively and appropriately given a graph or a set of data by identifying sources of bias and compare and contrast the effectiveness of different representations of data. Connections: M08-S2C1-01, SC08-S1C3-04, SC08-S1C3-05, SC08-S2C2-04, SS08-S1C1-02, SS08-S1C1-06, SS08-S2C1-02, SS08-S2C1-06, SS08-S4C1-03	M08-S5C2-06. Communicate the answer(s) to the question(s) in a problem using appropriate representations, including symbols and informal and formal mathematical language.	Graphical displays include representations taught from kindergarten through grade 8 (i.e., tally charts, pictographs, frequency tables, bar graphs (including multi bar graphs), line plots, circle graphs, line graph (including multi-line graphs), histograms, stem and leaf plots, box and whisker plots, and scatterplots).

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 5. Evaluate the design of an experiment. Connections: SC08-S1C2-02	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning.	Students evaluate an experiment to determine if the design meets the intended purpose, is free of bias, and utilizes an appropriate sample. Example: Students design an experiment to determine if there is a correlation between shoe size and height. All designs are evaluated to test for the characteristics above (i.e., intended purpose, free of bias, and appropriate sample size).

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Strand 2: Data Analysis, Probability, and Discrete Mathematics

Concept 2: Probability

Understand and apply the basic concepts of probability.

In Grade 8, students expand their work with theoretical and experimental probability to include conditional probabilities in compound experiments.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Determine theoretical and experimental conditional probabilities in compound probability experiments.		Conditional probability is limited to situations with and without replacement.
PO 2. Interpret probabilities within a given context and compare the outcome of an experiment to predictions made prior to performing the experiment.	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning.	Students predict the outcomes of an experiment with and without replacement by calculating the theoretical probability. They compare the results of the experiment to their predictions. Example: Tyrone takes two coins at random from his pocket, choosing one and setting it aside before choosing the other. Tyrone has 2 quarters, 6 dimes, and 3 nickels in his pocket. Make a prediction based upon the theoretical probability that he chooses a quarter followed by a dime. Try Tyrone's experiment by performing 50 trials. What is the experimental probability of drawing a quarter followed by a dime? How does the experimental probability compare to your prediction (theoretical probability)?

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 3. Use all possible outcomes (sample space) to determine the probability of dependent and independent events. Connections: M08-S2C3-01		Independent events are two events in which the outcome of the second event is not affected by the outcome of the first event (e.g., rolling two number cubes, tossing two coins, rolling a number cube and spinning a spinner). Dependent events are two events such that the likelihood of the outcome of the second event is affected by the outcome of the first event (e.g., bag pull without replacement, drawing a card from a stack without replacement, two cars parking in a parking lot).

Strand 2: Data Analysis, Probability, and Discrete Mathematics

Concept 3: Systematic Listing and Counting

Understand and demonstrate the systematic listing and counting of possible outcomes.

In Grade 8, students use more abstract reasoning and algebraic representation to solve counting problems. Understanding the concepts of probability is enhanced by the foundation of counting strategies. Factorial notation is introduced.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Represent, analyze, and solve counting problems with or without ordering and repetitions. Connections: M08-S2C2-03	M08-S5C2-04. Represent a problem situation using multiple representations, describe the process used to solve the problem, and verify the reasonableness of the solution.	By the end of Grade 8, students are able to solve a variety of counting problems using both visual and numerical representations. They should have had varied counting experiences that, over time, have helped to build these understandings. Initially, they begin by randomly generating all possibilities and then they begin to organize their thinking through visual representations such as charts, systematic listing, and tree diagrams. Finally, they are able to make connections from these visual representations to build numeric solutions. Continued on next page

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
		Through this process of connecting numeric representations with visual representations, even if they cannot be completely drawn but rather are mentally visualized, students are now able to solve a variety of counting problems numerically. Example: • Passwords are often a sequence of letters and numbers. A 6-character password is composed of 4 digits and 2 letters. - o If no repetition of letters is allowed, how many passwords are there? - o If no repeating letters or digits are allowed, how many passwords are there? - o If repeating both letters and digits are allowed, how many passwords are allowed? Solution: Students should be able to represent the general counting problem as: ---- digit digit digit digit letter letter and mentally visualize a tree diagram which, from some starting vertex, that spans either ten edges (if the initial position is a digit) or twenty-six edges (if the initial position contains a letter) and where each branch of the tree diagram has six levels that represent the next possible options for that position. Their visualization of this problem should convince students that the solution will involve many possibilities, that actually drawing the tree diagram will be hard work, and thus motivate them to find a numerical way to count all possibilities. Continued on next page

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
		- o If no repetition of letters is allowed, students should count the number of possible passwords as $10 \times 10 \times 10 \times 10 \times 26 \times 25$ (or some equivalent arrangement of this multiplication problem, for example, $26 \times 25 \times 10 \times 10 \times 10 \times 10$). - o If no repeating letters or digits are allowed, students should count the number of possible passwords as $10 \times 9 \times 8 \times 7 \times 26 \times 25$. - o If repeating letters and digits are allowed, students should count the number of possible passwords as $10 \times 10 \times 10 \times 10 \times 26 \times 26$.
PO 2. Solve counting problems and represent counting principles algebraically including factorial notation. Connections: M08-S1C3-01	M08-S5C2-04. Represent a problem situation using multiple representations, describe the process used to solve the problem, and verify the reasonableness of the solution	Example: • Five athletes are entered in a race, and five places are awarded ribbons. In how many different possible ways might they finish? Solution: $W = 5!$ or $5 \times 4 \times 3 \times 2 \times 1$

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Strand 2: Data Analysis, Probability, and Discrete Mathematics Concept 4: Vertex-Edge Graphs

Understand and apply vertex-edge graphs.

In Grade 8, students explore using directed graphs as a means of problem solving. This will lay a foundation for network and adjacency matrix investigations in high school.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Use directed graphs to solve problems.	M08-S5C2-01. Analyze a problem situation to determine the question(s) to be answered. M08-S5C2-04. Represent a problem situation using multiple representations, describe the process used to solve the problem, and verify the reasonableness of the solution.	Example: - Four players (Dom, Nathan, Ryan, & Zachary) are playing in a round-robin tennis tournament, where every player plays every other player. - Dom beats Nathan and Ryan, - Nathan beats Zachary, - Ryan beats Nathan and Zachary, and - Zachary beats Dom. - Represent this round-robin tournament using a directed graph. - How many matches are played in a round-robin tournament with four players? Systematically list all the matches. Explain your answer. - Find all Hamilton paths in this graph. "A winner" can be defined as the first player in a Hamilton path. How many possible tournament "winners" are in this example? What conclusions can you draw from this example? Continued on next page

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
Students are expected to:		Solution: <pre> graph TD Dom((Dom)) --> Nathan((Nathan)) Dom --> Zachary((Zachary)) Dom --> Ryan((Ryan)) Nathan --> Zachary Nathan --> Ryan Zachary --> Ryan </pre> o There are six matches played in a round-robin tournament with four players. These “matches” are represented by each edge in the graph above. One possible systematic list is below: MATCH #1 – Dom plays Nathan MATCH #2 – Dom plays Ryan MATCH #3 – Dom plays Zachary MATCH #4 – Nathan plays Ryan MATCH #5 – Nathan plays Zachary MATCH #6 – Ryan plays Zachary Continued on next page

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
		- o Following the edges in the direction of the arrows, one can find a Hamilton path that starts with Nathan to Zachary to Dom to Ryan. Thus we can say that “Nathan” is a winner! Another Hamilton path can start with Ryan to Nathan to Zachary to Dom (or Ryan to Zachary to Dom to Nathan). In both such cases, we can call “Ryan” a winner! A third type of Hamilton path can start with Dom to Ryan to Nathan to Zachary, so we can call “Dom” a winner! And finally, the last type of Hamilton path can start with Zachary to Dom to Ryan to Nathan; we can call “Zachary” a winner! Therefore, in this tournament, we can have four different tournament winners! - o How do we decide who is the tournament winner? On the basis of the Hamilton paths, there is no clear winner in this tournament. In one Hamilton path, Nathan wins, in another Hamilton path, Ryan wins; another Dom wins and yet another Zachary wins! Who is the overall winner? Unfortunately, there is no clear winner -- the ranking of these players is ambiguous. Students should enjoy deciding who should be ranked first and why that player should be ranked first! For tournament situations that can be modeled where one Hamilton path exists in the graph, the ranking is unambiguous.

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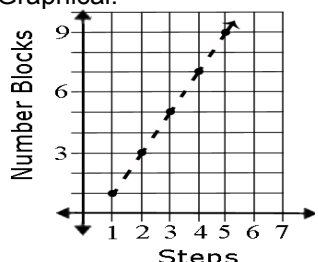
Strand 3: Patterns, Algebra, and Functions

Patterns occur everywhere in nature. Algebraic methods are used to explore, model and describe patterns, relationships, and functions involving numbers, shapes, iteration, recursion, and graphs within a variety of real-world problem solving situations. Iteration and recursion are used to model sequential, step-by-step change. Algebra emphasizes relationships among quantities, including functions, ways of representing mathematical relationships, and the analysis of change.

Concept 1: Patterns

Identify patterns and apply pattern recognition to reason mathematically while integrating content from each of the other strands.

In Grade 8, students increase their fluency with numerical and geometric sequences by expressing their thinking using a variety of representations. Students describe and analyze patterns and have the opportunity to create both types of sequences.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i> PO 1. Recognize, describe, create, and analyze numerical and geometric sequences using tables, graphs, words, or symbols; make conjectures about these sequences. Connections: M08-S3C2-02, M08-S3C2-03, M08-S3C2-05	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning.	Given an equation, students should create a table, graph the points on a coordinate grid, and describe the sequence. Example: - Given a sequence such as 1, 4, 9, 16, ... students need to create a table, graph the points on a coordinate grid, and describe algebraically the rule. Note the different representations of a sequence of blocks below: - Graphical:  Continued on next page

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<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>																
<i>Students are expected to:</i>																		
		o Table: <table><tr><th>Step</th><th>Number Blocks</th></tr><tr><td>1</td><td>1</td></tr><tr><td>2</td><td>3</td></tr><tr><td>3</td><td>5</td></tr><tr><td>▪</td><td>▪</td></tr><tr><td>▪</td><td>▪</td></tr><tr><td>▪</td><td>▪</td></tr><tr><td><i>n</i></td><td><i>2n-1</i></td></tr></table> o Written description: Begin with a square, add 2 squares on each step. o Physical Models: ■ ■ ■ ■ ■ ■ ■ ... o Equation: $y = 2n - 1$	Step	Number Blocks	1	1	2	3	3	5	▪	▪	▪	▪	▪	▪	<i>n</i>	<i>2n-1</i>
Step	Number Blocks																	
1	1																	
2	3																	
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<i>n</i>	<i>2n-1</i>																	

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Strand 3: Patterns, Algebra, and Functions

Concept 2: Functions and Relationships

Describe and model functions and their relationships.

In Grade 8, students extend their understanding of functions by exploring proportional algebraic relationships and analyzing functions.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>												
<i>Students are expected to:</i>														
PO 1. Sketch and interpret a graph that models a given context; describe a context that is modeled by a given graph. Connections: M08-S3C2-04, M08-S3C2-05, M08-S3C3-01, M08-S3C3-04	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning. M08-S5C2-05. Apply a previously used problem-solving strategy in a new context.	Use graphs of experiences common to students. Students are expected to both sketch and interpret graphs. Example: Sketch a graph of someone riding a bike to school that starts at home, travels two blocks at a constant speed, travels one block up a hill at a decreasing speed, then travels one block at a constant speed to reach school.												
PO 2. Determine if a relationship represented by a graph or table is a function. Connections: M08-S3C1-01, M08-S3C2 - 05	M08-S5C2-02. Analyze and compare mathematical strategies for efficient problem solving; select and use one or more strategies to solve a problem. M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning.	Students justify their reasoning about why a graph or table is a function, or why a graph or table is not a function. Students use strategies such as graphing the ordered pairs from a table, applying the vertical line test, or analyzing the patterns in a table to determine if each value of the independent variable has a unique value for the dependent variable.												
PO 3. Write the rule for a simple function using algebraic notation. Connections: M08-S3C1-01, M08-S3C2 - 05		Example: Write a rule for the function illustrated by the table of values below. <table><tr><td><i>x</i></td><td>2</td><td>3</td><td>5</td><td>8</td><td>12</td></tr><tr><td><i>y</i></td><td>5</td><td>8</td><td>14</td><td>23</td><td>35</td></tr></table>	<i>x</i>	2	3	5	8	12	<i>y</i>	5	8	14	23	35
<i>x</i>	2	3	5	8	12									
<i>y</i>	5	8	14	23	35									

The bulleted items within a performance objective indicate the specific content to be taught.

Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 4. Identify functions as linear or nonlinear and contrast distinguishing properties of functions using equations, graphs, or tables. Connections: M08-S3C2-01	M08-S5C2-03. Identify relevant, missing, and extraneous information related to the solution to a problem. M08-S5C2-12. Make, validate, and justify conclusions and generalizations about linear relationships.	Properties of functions include increasing, decreasing, and constant growth and minimum and maximum values. Students use strategies to determine linearity such as creating a table and graph from an equation or looking for patterns in equations and tables.
PO 5. Demonstrate that proportional relationships are linear using equations, graphs, or tables. Connections: M08-S1C2-03, M08-S3C1-01, M08-S3C2-01, M08-S3C2-02, M08-S3C2-03, M08-S3C3-03, M08-S3C3-04, M08-S3C4-01, M08-S3C4-02, M08-S5C1-01	M08-S5C2-08. Describe when to use proportional reasoning to solve a problem. M08-S5C2-12. Make, validate, and justify conclusions and generalizations about linear relationships.	Students model direct and indirect variation. Example: • Graph and/or make a table of these equations: - o $y = 2x$ - o $y = \frac{1}{2}x$ - o $y = \frac{3}{x}$

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

Strand 3: Patterns, Algebra, and Functions

Concept 3: Algebraic Representations

Represent and analyze mathematical situations and structures using algebraic representations.

In Grade 8, students extend their understanding of algebraic expressions, equations, and inequalities through the analysis of contextual situations. Students evaluate expressions and solve equations and inequalities of increasing complexity.

[illegible]

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>												
<i>Students are expected to:</i>														
		Example: Steven saved \$25 dollars. He spent \$10.81, including tax, to buy a new DVD. He needs to set aside \$10.00 to pay for his lunch next week. If peanuts cost \$0.38 per package including tax, what is the maximum number of packages that Steven can buy? Write an equation or inequality to model the situation. Explain how you determined whether to write an equation or inequality and the properties of the real number system that you use to find a solution.												
PO 4. Translate between different representations of linear equations using symbols, graphs, tables, or written descriptions. Connections: M08-S3C2-01, M08-S3C2-05	M08-S5C2-04. Represent a problem situation using multiple representations, describe the process used to solve the problem, and verify the reasonableness of the solution.	Example: - Given one representation, students create any of the other representations that show the same relationship. Representations of linear equations include tables, graphs, equations, or written descriptions. - Equation: $y = 4x + 1$ - Written description: Susan started with \$1 in her savings. She plans to add \$4 per week to her savings. - Table:<table><tr><th>x</th><th>y</th></tr><tr><td>-2</td><td>-7</td></tr><tr><td>-1</td><td>-3</td></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>5</td></tr><tr><td>2</td><td>9</td></tr></table>	x	y	-2	-7	-1	-3	0	1	1	5	2	9
x	y													
-2	-7													
-1	-3													
0	1													
1	5													
2	9													

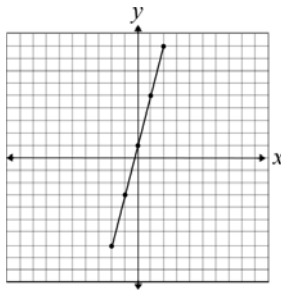
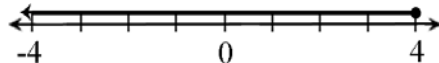
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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
		o Graph 
PO 5. Graph an inequality on a number line.		Example: Graph $x \leq 4$. 

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

Strand 3: Patterns, Algebra, and Functions

Concept 4: Analysis of Change

Analyze how changing the values of one quantity corresponds to change in the values of another quantity.

In Grade 8, students are introduced to the slope-intercept form of an equation. Students analyze linear equations and graphs to identify key characteristics. They solve problems involving interest, distance, and percent change in the context of rate.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Interpret the relationship between a linear equation and its graph, identifying and computing slope and intercepts. Connections: M08-S3C2-05	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning. M08-S5C2-12. Make, validate, and justify conclusions and generalizations about linear relationships.	Students determine the slope, x- and y- intercepts given an equation in slope intercept form. Students graph an equation given in slope intercept form.
PO 2. Solve problems involving simple rates. Connections: M08-S1C2-03, M08-S1C3-01, M08-S3C2-05	M08-S5C2-08. Describe when to use proportional reasoning to solve a problem.	Simple rates include interest, distance, and percent change. Examples: • Mark deposits \$120 into a savings account that earns 4% interest annually. The interest does not compound. How much interest will Mark earn after 2 years? • Linda traveled 110 miles in 2 hours. If her speed remains constant, how many miles can she expect to travel in 4.5 hours? • At the end of the first quarter, Robin's overall grade percentage was 74%. At the end of the second quarter her grade percentage was 88%. Calculate the percent change in her grade from first and second quarter.

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

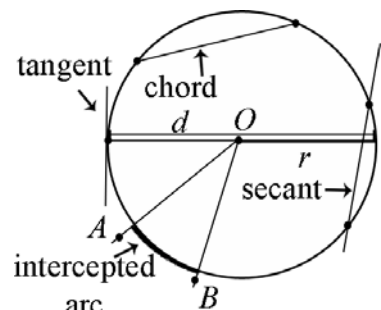
Strand 4: Geometry and Measurement

Geometry is a natural place for the development of students' reasoning, higher thinking, and justification skills culminating in work with proofs. Geometric modeling and spatial reasoning offer ways to interpret and describe physical environments and can be important tools in problem solving. Students use geometric methods, properties and relationships, transformations, and coordinate geometry as a means to recognize, draw, describe, connect, analyze, and measure shapes and representations in the physical world. Measurement is the assignment of a numerical value to an attribute of an object, such as the length of a pencil. At more sophisticated levels, measurement involves assigning a number to a characteristic of a situation, as is done by the consumer price index. A major emphasis in this strand is becoming familiar with the units and processes that are used in measuring attributes.

Concept 1: Geometric Properties

Analyze the attributes and properties of 2- and 3- dimensional figures and develop mathematical arguments about their relationships.

In Grade 8, students investigate the “art” of geometric design by changing the shapes of figures and solids. Students increase their knowledge of circles as additional vocabulary is added. They accurately and thoroughly describe figures and their attributes as they work with geometric proof. Students investigate proportionality using triangles and use their knowledge of the Pythagorean Theorem to solve problems.

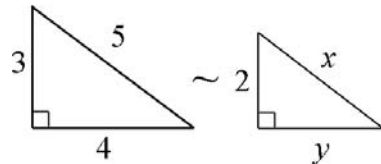
<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Identify the attributes of circles: radius, diameter, chords, tangents, secants, inscribed angles, central angles, intercepted arcs, circumference, and area.	M08-S5C2-11. Identify simple valid arguments using <i>if... then</i> statements.	Example: Students will draw a circle and identify and label attributes or identify attributes from a diagram. 

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 2. Predict results of combining, subdividing, and changing shapes of plane figures and solids. Connections: M08-S1C3-01, M08-S4C2-02	M08-S5C2-09. Make and test conjectures based on information collected from explorations and experiments.	Students need multiple opportunities to engage in activities such as paper folding, tiling, rearranging cut up pieces, modeling cross sections of solids, and constructing Frieze patterns and tessellations to accurately predict and describe the results of combining and subdividing two- and three-dimensional figures.
PO 3. Use proportional reasoning to determine congruence and similarity of triangles. Connections: M08-S4C4-02	M08-S5C2-08. Describe when to use proportional reasoning to solve a problem. M08-S5C2-13. Verify the Pythagorean Theorem using a valid argument.	Proportional reasoning includes consideration of conservation of angle and proportionality of side length. Example: The triangles shown in the figure are similar. Find the length of the sides labeled x and y.  Solution: $\frac{3}{4} = \frac{2}{y}$ $3y = 8$ $y = \frac{8}{3} = 2\frac{2}{3}$ $\frac{3}{5} = \frac{2}{x}$ $3x = 10$ $x = \frac{10}{3} = 3\frac{1}{3}$

The bulleted items within a performance objective indicate the specific content to be taught.

Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 4. Use the Pythagorean Theorem to solve problems. Connections: M08-S4C3-02, M08-S5C2-13	M08-S5C2-02. Analyze and compare mathematical strategies for efficient problem solving; select and use one or more strategies to solve a problem. M08-S5C2-06. Communicate the answer(s) to the question(s) in a problem using appropriate representations, including symbols and informal and formal mathematical language.	Students should be familiar with the common Pythagorean triples. Examples: • Is a triangle with side lengths 5 cm, 12 cm, and 13 cm a right triangle? Why or why not? • Determine the length of the diagonal of a rectangle that is 7 ft by 10 ft.

The bulleted items within a performance objective indicate the specific content to be taught.

Explanations and Examples Updated 1.19.09

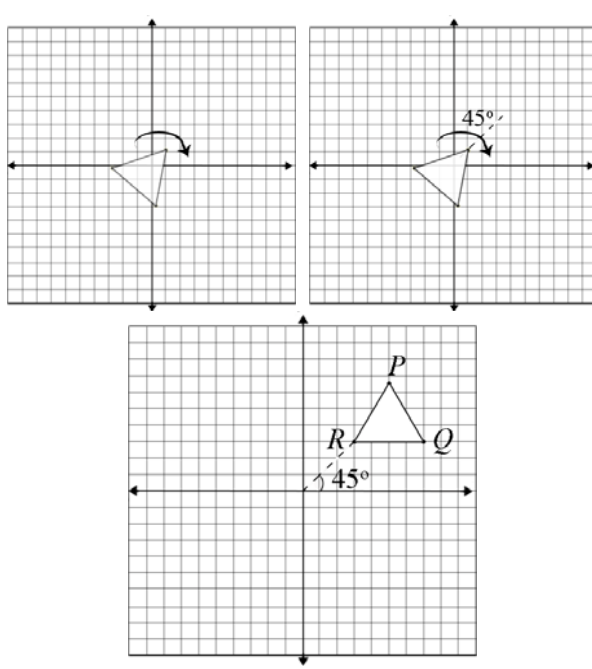
Grade 8

Arizona Mathematics Standard Articulated by Grade Level

Strand 4: Geometry and Measurement Concept 2: Transformation of Shapes

Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

In Grade 8, students investigate transformations of shapes on a coordinate grid. Students expand their knowledge of symmetry by finding lines of symmetry and classifying 2-dimensional figures by their symmetry.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i> PO 1. Model the result of rotations in multiples of 45 degrees of a 2-dimensional figure about the origin.	M08-S5C2-02. Analyze and compare mathematical strategies for efficient problem solving; select and use one or more strategies to solve a problem. M08-S5C2-05. Apply a previously used problem-solving strategy in a new context.	Figures may be rotated with the origin at the center or another point on the figure or using the origin as the point of rotation where the figure does not contain the origin. 

The bulleted items within a performance objective indicate the specific content to be taught.

Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 2. Describe the transformations that create a given tessellation. Connections: M08-S4C1-P02		Students will look at a tessellation or Frieze pattern. They will identify the original figure and the transformation(s) used to create the tessellation or Frieze pattern. Example: Look at the pattern below. What figure was used to create the pattern? What transformation(s) did the figure undergo? 
PO 3. Identify lines of symmetry in plane figures or classify types of symmetries of 2-dimensional figures.		Students are expected to classify figures by symmetry including rotational symmetry and reflection symmetry and differentiate between them. Rotational symmetry is considered for angles less than 360 degrees.

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Explanations and Examples Updated 1.19.09

Grade 8

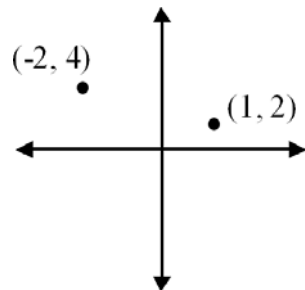
Arizona Mathematics Standard Articulated by Grade Level

Strand 4: Geometry and Measurement

Concept 3: Coordinate Geometry

Specify and describe spatial relationships using rectangular and other coordinate systems while integrating content from each of the other strands.

In Grade 8, students develop algorithms and investigate midpoint and distance calculations using the coordinate plane.

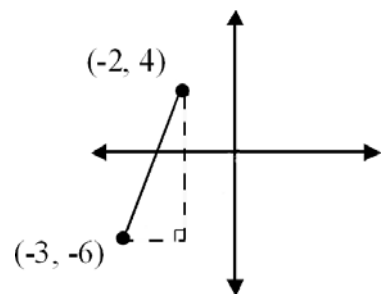
<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Make and test a conjecture about how to find the midpoint between any two points in the coordinate plane. Connections: M08-S1C3-01	M08-S5C2-09. Make and test conjectures based on information collected from explorations and experiments.	Students are expected to find the midpoint between any two points including points that are not horizontal or vertical from each other as shown in the model below. Students should not be given the formula, but rather create a formula or process with which to find the midpoint. Students test their conjecture and the conjecture of others to determine their validity. Students can then compare their conjectures to the formula or to the graphical algorithm for finding the midpoint of a line segment. 

The bulleted items within a performance objective indicate the specific content to be taught.

Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 2. Use the Pythagorean Theorem to find the distance between two points in the coordinate plane. Connections: M08-S4C1-04	M08-S5C2-06. Communicate the answer(s) to the question(s) in a problem using appropriate representations, including symbols and informal and formal mathematical language. M08-S5C2-13. Verify the Pythagorean Theorem using a valid argument.	Students will create a right triangle from the two points given (as shown in the diagram below) and then use the Pythagorean Theorem to find the distance between the two given points. 

The bulleted items within a performance objective indicate the specific content to be taught.

Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

Strand 4: Geometry and Measurement

Concept 4: Measurement

Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.

In Grade 8, students utilize and extend their proportional thinking to solve problems involving measurement conversions, geometric measurements, and calculations of surface area and volume.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>		
PO 1. Solve problems involving conversions within the same measurement system. Connections: M08-S1C3-01, M08-S5C1-01	M08-S5C2-08. Describe when to use proportional reasoning to solve a problem.	Examples: - U.S. Customary: A new carpet installer measured and found the tear in the carpet to be 75 square inches. When he went to order carpet for a patch, the carpet distributor wanted the measurement in square feet. What measurement should the installer give to the distributor? - Metric: The liquid in a beaker measures 250 milliliters. How many liters is this?
PO 2. Solve geometric problems using ratios and proportions. Connections: M08-S4C1-03, M08-S5C2-13	M08-S5C2-08. Describe when to use proportional reasoning to solve a problem.	Example: Two rectangles are similar. The dimensions of the first rectangle are a length of 3 cm and width of 7 cm. The width of the second rectangle is 6 cm. What is its length?
PO 3. Calculate the surface area and volume of rectangular prisms, right triangular prisms, and cylinders.		Students understanding of volume can be supported by focusing on the area of base times the height to calculate volume. Students understanding of surface area can be supported by focusing on the sum of the area of the faces. Nets can be used to evaluate surface area calculations. Example: Calculate the volume and surface area of a cylinder that has a diameter of 50 mm and a height of 35 mm.

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

Strand 5: Structure and Logic

This strand emphasizes the core processes of problem solving. Students draw from the content of the other four strands to devise algorithms and analyze algorithmic thinking. Strand One and Strand Three provide the conceptual and computational basis for these algorithms. Logical reasoning and proof draws its substance from the study of geometry, patterns, and analysis to connect remaining strands. Students use algorithms, algorithmic thinking, and logical reasoning (both inductive and deductive) as they make conjectures and test the validity of arguments and proofs. Concept two develops the core processes as students evaluate situations, select problem solving strategies, draw logical conclusions, develop and describe solutions, and recognize their applications.

Concept 1: Algorithms and Algorithmic Thinking

Use reasoning to solve mathematical problems.

In Grade 8, students continue to further their understanding of proportion to create algorithms to solve a variety of problems.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i> PO 1. Create an algorithm to solve problems involving indirect measurements, using proportional reasoning, dimensional analysis, and the concepts of density and rate. Connections: M08-S1C3-01, M08-S3C2-05, M08-S4C4-01	M08-S5C2-05. Apply a previously used problem-solving strategy in a new context. M08-S5C2-08. Describe when to use proportional reasoning to solve a problem.	Dimensional analysis uses ratios to simplify the conversion among or between units of measure. There is a strong connection between this performance objective and converting within measurement systems (M08-S4C4-01). Example: Below, a student determined how many square inches are in a square yard. Write an algorithm for this process. Test the algorithm with a different conversion. $1 \text{ yd}^2 = 3 \text{ ft} \bullet 3 \text{ ft} = 9 \text{ ft}^2$ $1 \text{ ft}^2 = 12 \text{ in} \bullet 12 \text{ in} = 144 \text{ in}^2$ $1 \text{ yd}^2 \times \frac{9 \text{ ft}^2}{1 \text{ yd}^2} \times \frac{144 \text{ in}^2}{1 \text{ ft}^2}$ $= 9 \bullet 144 \text{ in}^2$ $= 1296 \text{ in}^2$

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

Strand 5: Structure and Logic

Concept 2: Logic, Reasoning, Problem Solving, and Proof

Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions, and recognize their applications.

In Grade 8, students continue to build their understanding and application of problem solving strategies and processes. Students' solution paths include the analysis of the situation; identification of possible strategies; efficient method in solving the problem; and justification of why the solution is reasonable. Students use multiple representations in their problem solving process.

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	Some of the Strand 5 Concept 2 performance objectives are listed throughout the grade level document in the Process Integration Column (2nd column). Since these performance objectives are connected to the other content strands, the process integration column is not used in this section next to those performance objectives.	
PO 1. Analyze a problem situation to determine the question(s) to be answered.		Students need multiple opportunities to think about and dissect mathematical problems before undertaking the steps to find the problem's solution. Descriptions of solution processes, explanations, and justifications can include numbers, words (including mathematical language), pictures, physical objects, or equations. Students use all of these representations as needed.
PO 2. Analyze and compare mathematical strategies for efficient problem solving; select and use one or more strategies to solve a problem.		Example: The dimensions of a room are 12 feet by 15 feet by 10 feet. What is the furthest distance between any two points in the room? Explain your solution.

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	Some of the Strand 5 Concept 2 performance objectives are listed throughout the grade level document in the Process Integration Column (2nd column). Since these performance objectives are connected to the other content strands, the process integration column is not used in this section next to those performance objectives.	
PO 3. Identify relevant, missing, and extraneous information related to the solution to a problem.		
PO 4. Represent a problem situation using multiple representations, describe the process used to solve the problem, and verify the reasonableness of the solution.		Students should be able to explain or show their work using multiple representations and verify that their answer is reasonable.
PO 5. Apply a previously used problem-solving strategy in a new context.		Example: Miranda's cellular phone service contract ends this month. She is looking for ways to save money and is considering changing cellular phone companies. Her current cell phone carrier, X-Cell, calculates the monthly bill using the equation $C = \\$15.00 + \\$0.07m$, where C represents the total monthly cost and m represents the number of minutes of talk time during a monthly billing cycle. Another company, Prism Cell, offers 300 free minutes of talk time each month for a base fee of \$30.00 with an additional \$0.15 for every minute over 300 minutes. Miranda's last five phone bills were \$34.95, \$35.70, \$37.82, \$62.18, and \$36.28. Using the data from the last five months, help Miranda decide whether she should switch companies. Justify your answer. Continued on next page

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	Some of the Strand 5 Concept 2 performance objectives are listed throughout the grade level document in the Process Integration Column (2nd column). Since these performance objectives are connected to the other content strands, the process integration column is not used in this section next to those performance objectives.	
		How can this problem help you determine which car to buy given different payment plans? How can this problem help you determine whether to buy an apartment with paid utilities or without paid utilities? Are there other situations where you would use the same problem solving strategies?
PO 6. Communicate the answer(s) to the question(s) in a problem using appropriate representations, including symbols and informal and formal mathematical language.		Students use mathematical vocabulary and data in explanations of their mathematical thinking and in their justifications of the conclusions drawn.
PO 7. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning.		Students need multiple opportunities to think about and dissect mathematical problems before undertaking the steps to find the problem's solution. Descriptions of solution processes, explanations, and justifications can include numbers, words (including mathematical language), pictures, physical objects, or equations. Students use all of these representations as needed.
PO 8. Describe when to use proportional reasoning to solve a problem.		Students differentiate when it is appropriate to use multiplicative versus additive comparisons, and they understand that proportional reasoning makes use of multiplicative comparisons.

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	Some of the Strand 5 Concept 2 performance objectives are listed throughout the grade level document in the Process Integration Column (2nd column). Since these performance objectives are connected to the other content strands, the process integration column is not used in this section next to those performance objectives.	
PO 9. Make and test conjectures based on information collected from explorations and experiments.		Students draw conclusions based on actual collected data (qualitative and/or quantitative) and not solely on previously understood beliefs or expected data.
PO 10. Solve logic problems involving multiple variables, conditional statements, conjectures, and negation using words, charts, and pictures.	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning. M08-S5C2-09. Make and test conjectures based on information collected from explorations and experiments.	Example: A small high school has 57 tenth-graders. Of these students, 28 are taking geometry, 34 are taking biology, and 10 are taking neither geometry nor biology. If a tenth grader is taking neither geometry nor biology, then they are taking either Algebra II or Algebra I. There are 4 students enrolled in Algebra I that are in the 10th grade. How many students are taking both geometry and biology? How many students are taking geometry but not biology? How many students are taking biology but not geometry? How many students are taking Algebra II? Represent your solution with a chart, picture, or a written paragraph.
PO 11. Identify simple valid arguments using <i>if... then</i> statements.	M08-S5C2-03. Identify relevant, missing, and extraneous information related to the solution to a problem.	Example: All chords are line segments with both endpoints on the circumference of the circle. If a diameter is a line segment that passes through the center of a circle and connects two points of the circumference, is a diameter a chord?

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Explanations and Examples Updated 1.19.09

Grade 8

Arizona Mathematics Standard Articulated by Grade Level

<u>Performance Objectives</u>	<u>Process Integration</u>	<u>Explanations and Examples</u>
<i>Students are expected to:</i>	Some of the Strand 5 Concept 2 performance objectives are listed throughout the grade level document in the Process Integration Column (2nd column). Since these performance objectives are connected to the other content strands, the process integration column is not used in this section next to those performance objectives.	
PO 12. Make, validate, and justify conclusions and generalizations about linear relationships.	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning.	Example: Bailey's cross-country coach records her time at half-mile intervals throughout a 3.25-mile race. Would the coach's recorded times and distances represent a linear relationship? Explain your reasoning.
PO 13. Verify the Pythagorean Theorem using a valid argument. Connections: M08-S4C1-04, M08-S4C3-02	M08-S5C2-07. Isolate and organize mathematical information taken from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning. M08-S5C2-09. Make and test conjectures based on information collected from explorations and experiments.	Example: Verify, using a model, that the sum of the squares of the legs is equal to the square of the hypotenuse in a right triangle.

The bulleted items within a performance objective indicate the specific content to be taught.

Explanations and Examples Updated 1.19.09

Grade 8