

Arizona Academic Standards Crosswalk

Coding for Articulated Standards

R00-S0C0

R	00	-	S0	C0
Subject	Grade		Strand	Concept
(Reading)	level			

Examples of standards' codes:

Reading: R09-S2C2 (Grade 9, Strand 2, Concept 2)

Mathematics: MHS-S5C1 (High School, Strand 5, Concept 1)

Science: SCHS-S1C1 (High School, Strand 1, Concept 1)

Writing: W9-S1C3 (Grade 9, Strand 1, Concept 3)

Grade level codes:

Mathematics: High School (one level) HS

Science: High School (one level) HS

Reading and Writing: Grade 9 09

Grade 10 10

Grade 11 11

Grade 12 12

(use lowest grade in code when multiple grades are identified)

Performance Objective: PO

This may be included in the code by adding the Performance Objective number.

Example: R09-S1C1-01. Performance Objectives (PO) may be identified for one or more grade levels. They will have the same number but represent different grade levels. CTE addresses all grade level Performance Objectives 9-12. See the ADE web site for grade level identification.

Additional Standards:

Listening and Speaking: High School (proficiency level)

Viewing and Presenting: High School (proficiency level)

For additional information:
Arizona Department of Education
Arizona Academic Standards
<http://www.ade.az.gov/standards/contentstandards.asp>

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Reading Standard

INTRODUCTION

Reading is a complex skill that involves learning language and using it effectively in the active process of constructing meaning embedded in text. It requires students to fluently decode the words on a page, understand the vocabulary of the writer, and use strategies to build comprehension of the text. It is a vital form of communication in the 21st century and a critical skill for students of this “information age” as they learn to synthesize a vast array of texts.

The Reading Standard Articulated by Grade Level will provide a clear delineation of what students need to know and be able to do at each grade level. This allows teachers to better plan instructional goals for students at any grade.

RATIONALE

Requirements in the *No Child Left Behind Act of 2001* (NCLB) and the standard practice of conducting periodic review of the state academic standards prompted the decision by the Arizona Department of Education to refine and articulate the academic standards for mathematics and reading by grade level. This refinement and articulation project was started in July 2002, and was completed in March 2003.

For complete information on the Reading Standard:

<http://www.ade.az.gov/standards/language-arts/articulated.asp>

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Reading Standard Definitions of Strands/Concepts

Strand One: Reading Process

Recent research has established the major components of effective reading instruction. They are identified in the six concepts of this strand, each supported with specific performance objectives. While different skills will be emphasized at different stages of a student's reading development, all components are needed and used by fluent readers as they interact with text.

Concept 4: Vocabulary

Readers who develop a rich and varied repertoire of word meanings have a greater capacity for understanding the text they read. Reading vocabulary refers specifically to words readers recognize or use in print. Students learn vocabulary by direct instruction, and also indirectly through experiences in listening to read alouds and in reading on their own.

Concept 5: Fluency

Fluency is the ability to read a text with automaticity, accuracy, and expression to support comprehension. Fluency is a critical bridge between decoding and comprehension. Once a reader is able to access the printed words with confidence, he or she can better concentrate on reading for understanding.

Concept 6: Comprehension

Understanding the meaning embedded in text is the fundamental reason for reading. Good readers establish a purpose for reading and actively monitor their comprehension to accomplish their goal. They adjust the speed of their reading to accommodate challenging text, resolve comprehension problems while they're reading, and check for understanding when they are finished. Good readers consciously use comprehension strategies to make sense of what they have read.

Arizona Academic Standards Crosswalk

Reading Standard Definitions of Strands/Concepts

Strand 2: Comprehending Literary Text

This strand focuses on comprehension of fiction, including literature, poetry, and drama, and their historical and cultural contexts.

Concept 1: Elements of Literature

Comprehension elements in this concept address higher level thinking skills. This concept addresses the structure and elements of text such as plot, characters and theme, but also analyze, interpret, conclude and draw inferences. In this strand, students are expected to identify, analyze and interpret a variety of genres, relating them to their own experience and knowledge.

Concept 2: Historical and Cultural Aspects of Literature

This concept recognizes that comprehension of literary text is enhanced by an informed awareness of global issues and cultures. Literature that crosses cultural and national boundaries offers an excellent experience for students to broaden their horizons and understanding. Learning about the historical impact of an issue or incident allows today's students to make connections to the past and understand the present.

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Reading Standard Definitions of Strands/Concepts

Stand 3: Comprehending Informational Text

The comprehension skills particular to informational text can be taught across all content areas. Students need the opportunity to learn and practice these skills with the reading material they are required to read in various subject areas. It is important that students have the opportunity to read and understand real-world text in order to apply these skills to their personal or workplace tasks.

Concept 1: Expository Text

Expository text, such as encyclopedias, articles, textbooks and reference sources, provides organized information and explanations. Students need to be able to use, interpret, and analyze expository text to locate information for school or personal use.

Concept 2: Functional Text.

Functional text, such as maps, schedules, forms and workplace manuals conveys information. Students need to be able to use, interpret, and analyze functional text in order to perform everyday practical tasks.

Concept 3: Persuasive Text

Persuasive text, such as in editorial essays, reviews or critiques is written to sway or impress the reader. Students need to carefully read and analyze persuasive text in order to determine that the information in the text is accurate and unbiased.

Glossary

The purpose of this glossary is to help the user better understand and implement the Reading Standard. It is not intended to be a study guide for the AIMS and is not a comprehensive list of all literacy terms.

adage

a saying that conveys a common experience or general truth and has gained credit through extended use (e.g., a stitch in time saves nine)

affix

a non-word letter or group of letters attached to a root or stem to change its meaning or function, as the prefix ad- and the suffix -ing in adjoining

allegory

a literary work with two or more levels of meaning: one literal level and one or more symbolic or figurative levels; events, settings, objects, or characters that stand for ideas or qualities beyond themselves

alliteration

the repetition of consonant sounds, usually at the beginning of words

allusion

a reference to a well-known work of literature, famous person, or historical event with which the reader is assumed to be familiar

analogy

a partial similarity between two things that are otherwise dissimilar; a pairing of words designed to elicit associations between concepts and background knowledge

anecdotal evidence

evidence based on a brief story told to make a point or to entertain

antonym

a word opposite in meaning to another (e.g., wet and dry)

argument

a type of writing that develops a topic in a logical and persuasive manner

aside

a statement delivered by an actor to an audience in such a way that other characters on stage are presumed not to hear what is said; the character reveals his or her private thoughts, reactions, or motivations

assonance

the repetition of vowel sounds in stressed syllables or words without repeating consonant sounds

automaticity

the ability to read silently or orally without stopping to use decoding strategies on unknown words

ballad

a narrative poem, often of folk origin and intended to be sung; consists of simple stanzas, usually with a refrain

bandwagon

a persuasive technique that attempts to get people to follow the crowd using the logical fallacy that, since “everyone else likes it”, it must be good

base word

a word to which affixes may be added to change its meaning, tense, or part of speech

bias

the writer’s outlook or prejudice; the writer’s leaning or belief about a topic

cause and effect

a strategy for analyzing a subject by examining the reasons for specific actions or events (cause) and the consequences or results of certain causes (effect)

central argument

the main point or purpose of a piece of writing, often stated in a thesis statement or topic sentence

character foil

a character that provides a contrast to another character, thus intensifying the impact of that other character

characterization

the manner in which an author presents a character by using the character’s actions, dialogue, description, or how other characters react to that character

cinquain

a five line stanza with successive lines of two, four, six, eight, and two syllables

circular reasoning

supporting a position by merely restating it

compare

to use examples to show how things are similar and different, with the greater emphasis on similarities

compare (contrast)

a strategy for thinking or writing that involves explaining, defining, or evaluating subjects by showing how they resemble and differ from each other or from some standard for evaluation

conceit

an elaborate and extended metaphor, especially in poetic images

conflict

the problem(s) or struggle(s) between or among opposing forces that trigger(s) the action in literature (e.g., person vs. person, person vs. self, person vs. nature, person vs. society)

connotation/connotative

an association that a word calls to mind in addition to its dictionary or literal meaning

consonance

the repetition of consonant sounds within and at the end of words (e.g., stroke of luck)

consumer publications

publications for the use of the general public (e.g., periodicals, pamphlets, advertisements)

contrast

to use examples to show how things are different in one or more important ways

credibility

quality or power of inspiring belief; capacity for believability

denotation/denotative

the literal or standard dictionary meaning of a word

digraph

two letters representing a single speech sound (e.g., ph in phone)

diphthong

a speech sound beginning with one vowel sound and moving to another vowel sound within the same syllable (e.g., oi in oil)

e.g.

(abbreviation for for example) precedes a non-exhaustive list of examples provided as options; other examples may be appropriate but not included[compare to i.e.]

elegy

a song or poem written as a lament for the dead

epic

a narrative poem, usually about the adventures and heroic deeds of a folk hero (e.g., Homer's Iliad)

equivocation

language that is open to interpretation; often deliberately misleading

etymology

the history of words; the study of the history of words

euphemism

A mild or indirect term that is used in place of one considered harsh or blunt (e.g., passed away instead of died)

evidence

statements or information that help in making a conclusion or judgment:

- logical evidence - based on earlier known or well-known information presented in a clear organized pattern
- empirical evidence- information or facts gained by observation or experiment based on scientific analysis
- anecdotal evidence - information gained from casual observation, usually presented in a narrative style

expository text

writing that explains or informs through the use of facts, reasons, or examples

fable

a short narrative that teaches a moral or lesson; main characters are usually animals that speak and act like humans

fact

a statement that can be verified as true

fairy tale

a fanciful tale about real life problems, usually with imaginary characters such as fairies, trolls, or leprechauns

fallacious reasoning

reasoning that is deceptive or liable to mislead

false causality

the error of concluding that an event is caused by another event simply because it follows it

fantasy

a highly imaginative story characterized by fanciful or supernatural elements

figurative language

the use of words to create vivid pictures and ideas in the mind of the reader; not meant to be literally true (e.g., similes, metaphors, idioms, personification)

flashback

an account of a conversation, episode, or event that happened before the beginning of a story, told for the purpose of clarifying something in the present; often interrupts the chronological flow of the story

fluency

read with ease, expression, and automaticity to support comprehension

folktale

a narrative piece (e.g., epic, legend, myth, fable) that is part of the oral or written tradition of a culture passed from generation to generation

footnotes

the numbered notes or comments at the bottom or side of a page that comments on a designated part of the text

foreshadowing

writer's use of hints or clues to indicate events that will occur later in a text

free verse

a style of poetry that has an irregular rhyme or line pattern; verse that is developed according to author's own style

functional text

printed material that is specifically intended to convey information (e.g., instructions, technical manuals, labels, signs, recipes)

genre

a category or type of literature based on its style, form, and content (e.g., mystery, adventure, romance, science fiction)

grapheme

written representation of a phoneme (e.g., b for /b/, ck for /k/)

graphic features

features within or accompanying text, that help to clarify or explain the text (e.g., labels, illustrations, captions, headings, diagrams, charts, tables, titles)

graphic organizer

a visual representation of information in an organized manner that is intended to enhance understanding (e.g., Venn diagram, T-graph, word web, KWL chart)

haiku

a style of Japanese poetry consisting of three unrhymed lines of five, seven, and five syllables, traditionally about nature or the seasons

historical fiction

a long narrative that recreates an historical period or event based on fact, but embellished with imagined conversation and details

homographs

words with the same spelling but with different pronunciations and meanings (e.g., wind, read, bow)

homonyms/homophones

words with the same pronunciation but with different meanings, different parts of speech, and usually different spelling

hyperbole

figure of speech in which the truth is exaggerated for emphasis or humor

i.e.

(abbreviation for that is) precedes a specific list of items in which all of the items should be used [compare to e.g.]

idiom

phrase or expression that means something different from what the words actually say; usually understandable to a particular culture, language, or group of people (e.g., let the cat out of the bag)

imagery

descriptive language used in literature to recreate sensory experiences, enrich writing, and to make the writing more vivid; sensory details

incongruities

text or portions of text having inconsistent or inharmonious parts or elements

inflectional endings

see suffix

inference

a conclusion derived from facts or premises

intonation

the distinctive patterns of rising and falling pitch that enhances the meaning of spoken words

irony

using a word or phrase to mean the exact opposite of its literal meaning:· dramatic irony - where the reader or the audience sees a character's mistakes, but the character does not· verbal irony - where the writer says one thing and means another· irony of situation - where there is a great difference between the purpose of an action and the result

learning log

a student's record of his/her own learning activities, intended to help evaluate his/her own learning and to plan future learning

legend

a traditional, historical story of a culture passed from generation to generation

limerick

a light, humorous, five-line verse with an aabba rhyme pattern

linguistic roots

the origin of a word based on the nature, structure, and history of the word

literal language

language that is true to fact, avoiding exaggeration or metaphor

literal meaning

the actual or dictionary meaning of a word or phrase; language that means exactly what it appears to mean

loaded words

words that are slanted for or against a topic; words with strong positive or negative connotations

logic/logical evidence

the science of correct reasoning; correctly using facts, examples, and reasons to support one's view

lyric

a short poem that expresses personal feelings or emotions, often in a songlike style or form

main idea

the concept, thought, notion, or impression that is of greatest importance or influence:

- literal – adhering to fact or to the primary meaning or intent
- implied – a suggested meaning or intent (as opposed to explicit)
- explicit – fully revealed or expressed without vagueness, implication, or ambiguity; leaving no question as to the meaning or intent

main character

a character that plays a prominent role in a literary work

metacognitive strategy

the technique or strategy of examining one's own thinking process; awareness of one's own thinking process in order to monitor and direct the process to a desired end

metaphor

a figure of speech that compares two unlike things in which no word of comparison is used

meter

the arrangement of words in a rhythmical pattern, with stressed and unstressed syllables

minor character

a character that plays a role of lesser importance to the plot than the main character(s)

mood

the feeling(s) the text arouses in the reader (e.g., happiness, sadness, sorrow, peacefulness)

moral

the particular value or lesson the author attempts to convey to the reader

myth

a traditional or legendary story that deals with supernatural beings, ancestors, or heroes; intended to explain the mysteries of the natural world, or the customs or ideals of a society

narrative/narration

a type of fiction or nonfiction that tells a story or series of events

onomatopoeia

the use of a word whose pronunciation suggests its meaning (e.g., meow, buzz)

onsets

consonant(s) before the vowel(s) in a syllable, including consonant blends and digraphs (e.g., /s/ in sit, /spl/ in split)

opinion

a belief or conclusion not supported by evidence or facts

organization of text

format or structure; often varies with type of text, but common patterns exist:

- chronological order - details are arranged in the order in which they happen
- order of importance - details are arranged in order of importance: least important to most important or most important to least important
- cause-effect - details are arranged to show connections between a result and the events that preceded it
- comparison-contrast - details are arranged to show similarities and differences between two or more subjects
 - listing: details are arranged in a simple list
 - classification : details are placed into categories
- problem-solution - details are arranged to show a problem and then a way to solve the problem
- spatial - details are arranged geographically from left to right, right to left, top to bottom, and so on
- mixed - some details are arranged one way, and other details are arranged in another way

overgeneralization

an assumption that all members of a group, nationality, race, or gender have the characteristics observed in some members

oversimplification

the use of language which makes something far simpler than it is, to the point of distorting the meaning (e.g., “It’s not so bad...”)

overstatement

a statement that represents something as more than it actually is (e.g., “I have a million things to do today.”)

pacing

the reading speed or rate at which text is read

paradox

a statement that seems to be contradictory but that actually presents a truth

parody

a form of literature that intentionally uses a comic effect to mock a literary work or style

peer pressure

a persuasive technique in which the reader is pressured to think or act a particular way so as to be accepted by one's peers

personification

a figure of speech in which something non-human is given human characteristics or powers

persuasive techniques

devices of persuasion used for the purpose of changing one's mind, making one take action, or both; usually accomplished by a combination of emotional appeals and logical reasoning (see bandwagon, peer pressure, circular reasoning, oversimplification, transfer, loaded words, testimonial, false causality, overgeneralization, oversimplification)

phoneme

the smallest unit of sound within a word that distinguishes one word from another (e.g., cat = /c/ /a/ /t/)

phonemic awareness

the awareness of and the ability to manipulate sounds in the spoken word

phonogram

a spelling pattern, word family, or rime (e.g., -ame, -ack, -ay, -in)

plot

the action or sequence of related events that make up a story, consisting of five basic elements:

- exposition – the opening of a short story up to the point that the conflict is introduced to the reader
- rising action – the chain of events in which the conflicts intensify
- climax – the point of highest interest; point at which the reader makes his greatest emotional response; the point in the story in which rising action is about to turn into falling action
- falling action – takes place after the climax when the action begins to wind down or conflicts begin to lessen
- resolution – tells how the story conflict is resolved and ties up loose ends from the story

poetry

the expression of traditionally rhythmic compositions (sometimes rhymed, expressing ideas, experiences, or emotions) in a style more concentrated, imaginative, and powerful than that of ordinary speech or prose; generally categorized into specific forms based on purpose (e.g., elegies, ballads, parodies) and/or meter or rhyme scheme (e.g., sonnets, limericks, cinquains, free verse, haikus)

point of view

the perspective from which the story is told:

- first person – the narrator is a character who tells the story as he or she experienced, saw, heard, and understood it; identified by the first person pronouns I or we

- third person omniscient – the narrator is all-knowing, with the ability to see into the minds of more than one character
- third person limited - the narrator has the ability to see into the mind of only one character

prefix

a linguistic unit added to the beginning of a word which changes its meaning (i.e., re-, mis-, un-)

primary source

an original source that informs directly, not through another person’s explanation or interpretation (e.g., firsthand reports, diaries, letters, journals, original documents)

print concepts

the prerequisite skills students need about print as they learn how to read:

- book handling (e.g., front of book, print contains meaning, left page before right)
- directional behavior (e.g., where to start, left to right, return sweep)
- visual scanning and analysis
- language concepts (e.g., meaning of punctuation marks, capital letters)
- hierarchal concepts (e.g., word by word matching, difference between letter and word)

prior knowledge

knowledge gained from previous experience(s)

prose

written or spoken language that is not poetry (verse)

prosody

the rhythmic and inflectional aspect of language; expression

r-controlled vowels

a vowel whose sound is influenced by an r that directly follows it (e.g., farm, her, first, torn, nurse)

redundancy

repetition that is needless or distracting

repetition

repeating a word, phrase, sentence, or the like for impact and effect

rhetorical device

literary device that is intended to emphasize a point, not to obtain a response

rhyme

identical or very similar recurring final sounds in words within, or more frequently, at the ends of lines of verse

rhythm

a pattern of repeated cadence or accent in speech or text

rimes

the vowel(s) and any following consonant(s) in a syllable (e.g., /it/ in sit, /oat in float)

root

in a complex word, the meaningful base form after all affixes are removed

root word

meaningful base form after all affixes are removed

satire

a literary technique that combines a critical attitude with humor, often with the intent of correcting or changing the subject of the satire

search engine

computer software used to search data for specified information

secondary source

a source that contains information others have gathered and interpreted; indirect or secondhand information (e.g., newspaper and magazine accounts, encyclopedia articles, research studies, web sites, documentaries)

sequencing

the arrangement or ordering of subject matter to aid understanding:

- developmental
- chronological
- easy to difficult (difficult to easy)
- part to whole (whole to part)

setting

the time of day or year; historical period, place, situation

simile

figure of speech comparing two things that are unlike; uses the words like and as (e.g., as strong as an ox, flies like an eagle)

soliloquy

lines in a drama in which a character reveals his or her thoughts to the audience, but not to the other characters, by speaking as if to himself or herself

sonnet

a poem consisting of 14 lines with a formal rhyme scheme, which expresses a thought or feeling in a unified way

stylistic elements

components of a distinctive manner of expression; elements that comprise a literary style

suffix

a linguistic unit added to the end of a base word which changes the word's meaning or grammatical function (e.g., -ed, -ly, -ness)

symbol

person, place, or thing that represents something beyond itself (e.g., sword can stand for war, a

desert might represent loneliness or solitude, a dove as a symbol of peace)

symbolism

a literary technique in which an author uses symbols to represent concrete ideas, events, or relationships

synonym

one of two or more words that have a highly similar meaning (e.g., grip and grasp)

syntax

the study of sentence structure with emphasis on the grammatical relationships of the words and other elements

testimonial

a persuasive technique in which a personal success story is used to influence others

text features

components that support and clarify text (e.g., illustrations, titles, topic sentences, key words)

theme

the underlying idea or statement that the author is trying to convey

tone

the overall feeling or effect created by a writer's use of words (e.g., playful, serious, bitter, angry, sarcastic)

transfer

a persuasive technique that attempts to transfer positive feelings associated with images not necessarily related to the issue (e.g., a fabric softener advertisement set in beautiful, clear mountain scenery, implying freshness)

understatement

a statement that represents something as less than it actually is (e.g., The hurricane was a little windy.)

workplace documents

text, forms, or documents specifically used in the workplace or for business purposes (e.g., memos, business letters, applications, resumes, e-mails)

Arizona Academic Standards Crosswalk

Mathematics Standard

INTRODUCTION

Mathematics is a highly interconnected discipline. The need to understand and use a variety of mathematical strategies in multiple contextual situations has never been greater. Utilization of mathematics continues to increase in all aspects of everyday life, as a part of cultural heritage, the workplace, and in the scientific and technical communities. Today's changing world will offer enhanced opportunities and options for those who thoroughly understand mathematics.

The Mathematics Standard Articulated By Grade Level describes a connected body of mathematical understandings and competencies that provide a foundation for all students. They define the understanding, conceptual knowledge, and skills that students are to acquire.

Communication, problem solving, reasoning and proof, connections and representation are the process standards as described in the *Principles and Standards for School Mathematics* from the National Council of Teachers of Mathematics (NCTM). These process standards are interwoven within all the content strands of the Arizona Mathematics Standard. The process standards emphasize ways to acquire and use the content knowledge.

Mathematics education should enable students to fulfill personal ambitions and career goals in an informational age. In the NCTM *Principles and Standards* document it asks us to “*Imagine a classroom, a school, or a school district where all students have access to high-quality, engaging mathematics instruction. There are ambitious expectations for all, with accommodations for those who need it*”.¹ The Arizona Mathematics Standard Articulated by Grade Level is intended to facilitate this vision.

RATIONALE

Requirements in the *No Child Left Behind Act of 2001* (NCLB) and the need to do a periodic review of the state academic standards prompted the decision by the Arizona Department of Education to refine and articulate the academic standards for mathematics and reading by grade level. This refinement and articulation project was started in July 2002, and was completed in March 2003.

Due to the nature of the content, some performance objectives are repeated in subsequent grade levels. However, the intent is that the complexity, depth, and difficulty of the performance objective content must increase from one grade level to the next.

For more information on the Mathematic Standard:
<http://www.ade.az.gov/standards/math/articulated.asp>

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Mathematics Standard

Strand One: Number Sense 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: 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, the relationships among numbers and different number systems.

Concept 2: Numerical Operations

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

Concept 3: Estimation

Use estimation strategies reasonably and fluently.

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Mathematics Standard

Strand 2: Data Analysis, Probability, and Discrete Math

This strand requires students to use data collection, data analysis, statistics, probability, systematic listing and counting, and the study of graphs. This prepares the student for the study of discrete functions, fractals and chaos, and 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. This is considered to be the analysis and interpretation of numerical data in terms of samples and populations.

Concept 2: Probability

Understand and apply the basic concepts of probability. This is the field of mathematics that deals with the likelihood that an event will occur expressed as the ratio of the number of favorable outcomes in the set of outcomes divided by the total number of possible outcomes.

Concept 3: Discrete Mathematics (Systematic Listing & Counting)

Understand and demonstrate the systematic listing and counting of possible outcomes. This field of mathematics is generally referred to as Combinatorics.

Concept 4: Discrete Mathematics (Vertex-Edge Graphs)

Understand and apply the concepts vertex-edge graphs and networks. This field ties in graph theory with practical problems.

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Mathematics Standard

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. Students begin with simple repetitive patterns of many iterations. This is the beginning of recursive thinking. Later, students can study sequences that can best be defined and computed using recursion

Concept 2: Functions & Relationships

Describe and model functions and their relationships. For example, distribution and communication networks, laws of physics, population models, and statistical results can all be represented in the symbolic language of algebra.

Concept 3: Algebraic Representations

Represent and analyze mathematical situations and structures using algebraic representations. Algebraic representation is about abstract structures and about using the principles of those structures in solving problems expressed with symbols.

Concept 4: Analysis of Change

Analyze change in a variable over time and in various contexts such as, qualitative change, quantitative change, and the idea that slope represents the constant rate of change in linear functions, and functions that have non-constant rates of change.

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Mathematics Standard

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. Understanding what a measurable attribute is and becoming familiar with the units and processes that are used in measuring attributes, is a major emphasis in this strand.

Concept 1: Geometric Properties

Analyze the attributes and properties of two- and three-dimensional shapes and develop mathematical arguments about their relationships (in conjunction with strand 5, concept 2).

Concept 2: Transformation of Shapes

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

Concept 3: Coordinate Geometry

Specify and describe spatial relationships using coordinate geometry and other representational systems.

Concept 4: Measurement - Units of Measure - Geometric Objects

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

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Mathematics Standard

Strand 5: Structure and Logic

This strand is unique to the Arizona Mathematics Standard and might be considered an extension 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. They 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 contextual situations. Determine step-by-step series of instructions to explain mathematical processes.

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof

Evaluate situations, select problem solving strategies, draw logical conclusions, develop and describe solutions, and recognize and describe their applications. Develop mathematical arguments based on induction and deduction, and distinguish between valid and invalid arguments.

Arizona Academic Standards Crosswalk

Mathematics Standard

Glossary

absolute value

a number's distance from zero on a number line; the absolute value of -4 is 4; the absolute value of 4 is 4 symbolically, $|-4| = 4$ and $|4| = 4$

actual measure

the exact measurement of an object

acute angle

an angle whose measure is between 0 and 90°

addends

numbers used in the mathematical operation of addition

addition

a mathematical operation based on "putting things together"

additive inverses

two numbers whose sum is zero (opposites)

adjacent angles

two coplanar angles that share a common side and a common vertex but do not share common interior points

algebraic expression

a group of numbers, symbols, and variables that express a single or series of operations; mathematical phrase with one or more terms, one or more variables

algebraic sentence

an equation or inequality that represents a relationship between two expressions

algorithm

a set of step-by-step instructions for completing a task

alternate exteriorangles

angles formed by a transversal intersecting two lines; angles on opposite sides of the transversal, having two different vertices, and outside the lines

alternate interiorangles

angles formed by a transversal intersecting two lines; angles on opposite sides of the transversal, having two different vertices, and between the lines

analog clock

a device, with an hour, minute and second hand which shows a continuous sweep of time passing rather than in "jumps"(digital)

angle

a geometric figure consisting of two rays with a common endpoint (vertex)

angle bisector

a line or ray that divides an angle into two congruent angles

appropriate math terminology

vocabulary that accurately defines mathematical, concepts, operations and content at a given grade level

appropriate measure of accuracy

the degree of accuracy required for a given mathematical task (i.e., approximating the number of cubic inches needed in determining the volume of space for packing would have a need for less accuracy than say, the measurement of a piece of molding to fit precisely on a door frame)

approximation

a value that is sufficiently exact for a specified purpose

arc

a part of a circle that consists of two points, called endpoints, and all points of the circle between them

area

The two dimensional space enclosed by the perimeter is called the area.

arithmetic fact

any of the basic addition and multiplication numerical statements and the corresponding subtraction and division relationships

arithmetic sequence

a set of ordered terms in which the difference between consecutive terms is constant

array

a rectangular arrangement of objects in rows and columns (no gaps and no overlaps)

ascending order

a listing in which numbers or terms are organized in increasing value.

associative property

the property that states for real numbers a , b , and c , $(a + b) + c = a + (b + c)$ and $(ab)c = a(bc)$. Essentially this property is a grouping of three terms where the sum and product of the first two with the third is the same as the sum or product of the last two and the first

attribute

a common feature of a set of objects or numbers

average

See mean

axiom

a self-evident truth; a truth without proof and from which further statements, or theorems, can be derived

axis

either of two perpendicular number lines used to form a coordinate plane

bar graph

a graph in which horizontal or vertical bars represent data

base

a term used as a factor for repeated multiplication (i.e., in 4^7 , 4 is the base)

base of a polygon

the side(s) that is perpendicular to the height

base of a polyhedron

either of the two congruent parallel faces of a prism; the face of a pyramid that does not have to be a triangle

biased sample

a sample that is not representative of a population

bi-conditional

a logical statement containing the phrase “if and only if” (iff) ; both the statement and its converse are true

binomial

an expression consisting of two terms connected by a plus or minus sign (i.e., $4a+6$)

bisect

to divide into two congruent parts

box and whisker plot

a graph that uses a rectangle to represent the middle 50% of a set of data and line segments (or whiskers) where each represents 25% of the data; A line segment representing the median value divides the rectangle so that each section represents 25% of the data

calculation

action, process, or result of a mathematical computation

capacity

a measure of how much (volume) a container can hold

causation

an action that produces an effect

Celsius

metric measurement of temperature (i.e., 32 degrees Celsius, 32°c)

census

data collected from every member of the identified population

centimeter

a metric unit of length equivalent to 1/100 of a meter

chord of a circle

a segment joining any two points on the circle

circle

a set of points in a plane equidistant from a given point called the center

circle graph

a graph in which a circle is divided into sectors in order to compare different parts of a data set to the entire set (i.e., pie graph)

circumference

the perimeter of a circle

closure property

a set is closed under an operation if the application of the operation on any members in the set always results in a member of that set

co-efficient

the numerical factor in an algebraic term (i.e., in $7x$, 7 is the co-efficient)

combinations

a group of unordered items or events taken from a larger group (i.e., the number of three-person committees that can be chosen from a group of 21)

common denominator

any nonzero number that is a multiple of the denominators of two or more fractions

common factor

any number that is a factor of two or more numbers (i.e., 4 is a common factor of 8 and 12)

common multiple

a term that contains two or more terms as factors

commutative property

the property in addition and multiplication that states the order in which two terms are added or multiplied does not change the results. For real numbers a and b , $a + b = b + a$ and $ab = ba$

complementary angles

two angles, the sum of whose measures is 90°

complex fraction

a fraction that contains one or more fractions in the numerator or denominator

complex number

a number that can be written in the form $a + bi$, where a and b are real numbers and i is the imaginary number

composite number

a number that has more than two numerical factors

concave polygon

a polygon with one or more diagonals that have points outside the polygon

conclusion

the *then* clause of a conditional statement

conditional statement

a statement in “if-then” form where the “if” clause is called the hypothesis and the “then” clause is called the conclusion

cone a three-dimensional figure generated by rotating a right triangle about one of its legs

concrete objects

physical objects used to represent mathematical situations

conjecture

an unproven statement based on observations

consecutive

in order, with nothing missing

consecutive exterior angles

angles formed by a transversal intersecting two lines; angles on the same side of the transversal, having two different vertices, and outside the two lines; if the two lines are parallel, the same side exterior angles are supplementary

consecutive interior angles

angles formed by a transversal intersecting two lines: angles on the same side of the transversal, having two different vertices, and inside the two lines; if the two lines are parallel, the same side interior angles are supplementary

constant

a quantity that always stays the same

construct

a conclusion or result built or put together systematically

contextual situation

relating a mathematical problem to a real modeled or illustrated circumstance

continuous data

data in which there are no gaps, jumps or holes; data that can be measured and broken down into smaller parts and still have meaning; temperature and time are continuous

contra-positive of a statement

a new statement obtained by exchanging the negation of the conclusion with the negation of the hypothesis of a conditional statement

converse of a statement

a new statement obtained by exchanging the hypothesis and the conclusion of a conditional statement

convex polygon

a polygon with each interior angle measuring less than 180° ; all diagonals of a convex polygon lie inside the polygon

coordinate system (Cartesian)

a two dimensional system in which the coordinates of a point are its distances from the origin, the intersection of the x and y axes

coordinates of a point

an ordered pair of real numbers that locates a point in a plane

co-planar

in the same plane

correlation

an association between two variables

corresponding angles

angles formed by a transversal intersecting two lines; angles on the same side of the transversal, having two different vertices, and in the same relative position; if the two lines are parallel, the corresponding angles are congruent

cosine

in a right triangle, the ratio of the length of the leg adjacent to an acute angle to the length of the hypotenuse

counter-example

an example that shows that a conjecture is not always true

counting numbers

the set of numbers consisting of 1, 2, 3, 4, 5, 6, ... (natural numbers)

cube

the third power of a number; a regular three-dimensional figure having six congruent square faces

customary system of measurement

the measuring system used most often in the united states (i.e., inches, pounds, gallon)

cylinder

a three dimensional figure composed of two congruent and parallel circular regions joined by a curved surface

data

information gathered by observation, questioning or measurement, usually expressed with numbers

data sets

a defined group of information, especially numerical

decimal number system

a place value number system based on groupings by powers of ten

decimal point

the point used to write values less than one in the base ten number system

deductive reasoning

a series of logical steps in which a conclusion is drawn directly from a set of statements (premises) that are assumed to be true

degree

a unit of measure for angles based on dividing a circle into 360 equal parts; or a unit of measure for temperature

denominator

the number of equal parts into which a whole is divided (i.e., in the fraction $\frac{3}{4}$, 4 is the denominator)

density property

between any pair of rational numbers there is another number

dependent events

two events in which the outcome of the second event is affected by the outcome of the first event

dependent variable

in a function, the variable that is determined by the value of the related independent variable

descending

an order in which numbers or terms are organized in decreasing value

diagonal

a line segment joining two non-adjacent vertices of a polygon

diameter

a chord that contains the center of the circle

difference

the result of a subtraction

digit

in the base ten numeration system, one of the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

digital clock

a device for telling time, makes jumps from number to number (digital clocks usually use numbers with a colon separating the hour from the minutes, 6:30)

dilation

a transformation that either enlarges or reduces a geometric figure proportionately

dimension

a measure in one direction (i.e., length or width)

discrete data

involves a count of data items that can't be broken down into smaller units, such as number of defects, people, or items

discrete mathematics

the study of mathematics dealing with objects that can assume only certain “discrete” values; discrete objects can be characterized by integers whereas continuous objects require real numbers

dissection

to separate into parts, usually equal

distance

the length of the shortest line segment joining two points

distance formula

a formula used to find the distance between two points identified by their ordered pairs:

distortions of sets of data

the use of incorrect proportion, design variation in comparing to sets of data, lack of context or insignificant data used in direct comparison with meaningful data

distributive property

the distributive property of multiplication over addition or subtraction is a multiplication of a group of terms such that the multiplier is multiplied by each and every term in the group a , b , and c , $a(b + c) = ab + ac$ and $a(b - c) = ab - ac$

dividend

in a division problem, the quantity to be divided

divisibility

one whole number is divisible by another whole number if the result of the division is a whole number without a remainder

division

a mathematical operation based on separating into equal parts

divisor

in a division problem, the quantity by which another quantity is divided

domain

the set of values for the independent variable of a function (i.e., usually, the x values of a function)

edge of a polyhedron

a line segment where two faces of a polyhedron meet

edge (vertex-edge graph)

the path that joins two vertices

elapsed time

time between two events

ellipsis

the mark “...” to indicate the continuance of a pattern

empty set

a set that contains no elements

endpoint

the point at either end of a line segment; also, the initial point of a ray

equation

a mathematical sentence in which equivalent values are separated by an equal sign

equivalent

equal in value, but in a different form

equilateral triangle

a triangle with three congruent sides

estimate

a close rather than exact answer

evaluate

to find the numerical value of a mathematical expression

even number

an integer that is divisible by two without a remainder

event

one of the many occurrences that can take place during a probability activity

expanded notation

a way to write numbers that shows the place value of each digit. (i.e., $343 = 300+40+3$)

experimental (empirical) probability

relating to the outcomes of an actual performance of a probability activity

exponent

a number placed to the right of and above a non-zero base that indicates how many times the base is used as a factor; a base with a zero exponent is equal to 1 (i.e., $5^0 = 1$, $5^3 = 5 \cdot 5 \cdot 5$ and

$$5^{-3} = \frac{1}{5^3} = \frac{1}{5 \cdot 5 \cdot 5})$$

exponential function

a function commonly used to study growth and decay; it has a form $y = a^x$

expression

a mathematical phrase containing one or more terms linked by operation symbols

face of a polyhedron

a flat surface on a three-dimensional object

fact family

a collection of related addition and subtraction facts, or multiplication and division facts, made from the same numbers

factor (noun)

a number or expression that evenly divides another quantity (i.e., 4 is a factor of 12; and $(x + 1)$ is a factor of $x^2 + 3x + 2$)

factor (verb)

to represent a number as a product of factors

Fahrenheit

the customary scale system for temperature measurement (32°F)

finite set

a set that contains a countable number of elements

formula

a general mathematical rule using variables

fractal

an algebraically generated complex geometric shape having the property of being endlessly self-similar under magnification

fraction

a number in the form $\frac{a}{b}$, where b is not zero

fractional part

part of a whole or part of a group that is less than a whole

frequency table

a collection of data that specifies the number of occurrences in each of several categories

function

(input – output) a dependent relationship between two sets of numbers in which a value in the first set determines one and only one element in the second set

geometric model

a model of mathematical concepts using geometric representations

geometric sequence

a set of ordered terms in which the ratio between consecutive terms is constant

geometric solid

a three dimensional shape bounded by surfaces (i.e., rectangular prism, pyramid, cylinder, cone, and sphere)

graph

a pictorial device that shows a relationship between variables or sets of data

greatest common factor

largest factor that two or more numbers have in common (GFC) (i.e., the GFC of 8 and 12 is 4)

grouping symbols

symbols of inclusion; parentheses, brackets, braces or bars (i.e., () , [] , { } , "\$ %)

height

the perpendicular distance to a base from a vertex or between bases

hexagon

a polygon with six sides

histogram

a vertical bar graph with each bar representing a certain interval of data

horizontal

parallel to or in the plane of the horizon; in a coordinate grid, the x-axis is a horizontal line

hypotenuse

the side opposite the right angle in a right triangle

hypothesis

the *if* clause of a conditional statement

identity element

a number when used in an operation with a given number leaves the given number unchanged; the identity element for addition is zero; the identity element for multiplication is 1

image

a figure created as the result of a transformation

imaginary numbers

the square root of a negative number expressed using i ($\sqrt{-1} = i$)

improper fraction

a fraction in which the numerator is greater than the denominator

independent events

two events in which the outcome of the second event does not related to the outcome of the first event

indirect proof

a deductive proof using contradiction or elimination to rule out all possible conclusions except the desired one

inductive reasoning

making a generalization based on observation of specific cases or patterns (i.e., formulating a rule after considering several parts of a pattern)

inequality

a statement indicating that two quantities are not equal

inference

a conclusion drawn from data

infinite set

the set in which the number of elements cannot be counted or determined (never ending)

inscribed angles

an angle with its vertex on the circle and with sides that are chords of the circle

integers

the set of numbers consisting of the whole numbers and their opposites $\frac{1}{4}$ -2, -1, 0, 1, $2\frac{1}{4}$

interval

the set of numbers between two numbers a and b; the interval may include a or b

inverse operation

a related but opposite process (i.e., multiplication is the inverse of division)

inverse of a statement

a new statement obtained by negating both the hypothesis and the conclusion of a conditional statement

irrational numbers

a set of numbers that cannot be expressed as a ratio of two integers (i.e., $\pi, \sqrt{2}$)

isosceles triangle

a triangle that has at least two congruent sides

iterative pattern

a pattern generated by using an initial value and repeatedly applying an operation (i.e., 4,7,10,13, is adding 3 each time)

kite

a quadrilateral with two distinct pairs of adjacent, congruent sides

lateral surface

in a prism or a pyramid, it is the face that is not a base

least common multiple

the smallest number for which two or more numbers are factors (i.e., the LCM of 3, 4, and 6 is 12)

line

an undefined geometric term; a straight path that extends infinitely in opposite directions; a line that has no thickness

line graph

a graph in which points are connected by line segments to represent data

line of best fit

a line drawn on a scatter plot to estimate the relationship between two sets variables in a set of data

line of symmetry

a line that divides a figure into two congruent parts that are mirror images of each other

line plots

a sketch of data in which check marks, x's, or other marks above a number line shows the frequency of each value

line segment

a part of a line that consists of two points, called endpoints, and all the points between them

linear equation

a polynomial equation containing one or more terms in which the variable is raised to the power of one but no higher

linear function

a function that has a constant rate of change and can be modeled by a straight line

liter

a metric unit of capacity, equal to the volume of a cube that measures ten centimeters on a side

logic

a system of reasoning used to validate arguments

lowest common denominator

the least common multiple of the denominators of every fraction in a given collection of fractions

magnitude

size or quantity

manipulatives

a wide variety of physical materials, objects, and supplies that students use to foster the learning of abstract ideas in mathematics

matrix

a number into which the given number may be divided with no remainder

multiplication

the operation of repeated addition (i.e., 4×3 is the same as $4+4+4$)

natural numbers

the set of counting numbers consisting of 1, 2, 3, 4, 5, 6...

negative number

a number less than zero

net of a polyhedron

a two-dimensional representation of the surface of a three-dimensional figure that has been unfolded

normal curve

in statistics, the distribution of data along a bell-shaped curve that reaches its maximum height at the mean

normal distribution

a “bell-shaped” probability distribution; there are as many values that are less than the mean as there are values that are greater than the mean

number line

a diagram that represents numbers as points on a line with a uniform scale

number sentence

an equation or inequality with numbers

numerator

the number or expression written above the line in a fraction; it tells how many equal parts of a total number of parts are described by a fraction

obtuse angle

an angle whose measure is greater than 90° and less than 180°

octagon

a polygon with eight sides

odd number

an integer that is not divisible by two

open sentence

a statement that contains at least one unknown (i.e., $6 + x = 14$)

operation

an action performed on some set of quantities (i.e., addition, raising to a power)

order of operations

the sequence in which operations are performed when evaluating an expression

ordered pair

a pair of numbers used to locate points in the coordinate plane

ordinal number

a whole number that names the position of an object in a sequence

origin

the intersection of the x - and y -axes in a coordinate plane; the origin is described by the ordered pair $(0,0)$

outcome

one of the possible events in a probability situation

outcome set

set of all outcomes of a given situation

outliers/extreme values

numerical data piece that are significantly larger or smaller than the rest of the data in a set

parallel lines

lines in the same plane that never intersect and are always the same distance apart

parallelogram

a quadrilateral with opposite sides parallel and congruent

pattern

a set or sequence of shapes or numbers that are repeated in a predictable manner

pentagon

a polygon with five sides

percent

a ratio that compares a number to 100 (%)

perfect square

a whole number whose square root is a whole number

perimeter

the distance around a shape or figure

permutation

an ordered arrangement of a set of events or items (if you put the items or events into a different order, you have a different permutation)

perpendicular lines

two lines that intersect to form right angles

pi

the ratio of the circumference of a circle to its diameter. Pi is an irrational number and approximately equal to 3.14 or $\frac{22}{7}$

pictograph

a graph that uses pictures or symbols to represent data

place value

the value of the position of a digit in a numeral

plane

an undefined geometric term; a flat surface that extends infinitely in all directions

point

an undefined geometric term; denotes an exact location in space; a point has no size

polygon

a closed two-dimensional figure made up of segments, called sides, which intersect only at their endpoints, called vertices

polyhedron

a closed three-dimensional figure in which all the surfaces are polygons

polynomial

an expression consisting of two or more terms

population

in statistics, an entire set of objects, observations, or scores that have something in common

postulate

a mathematical statement that is accepted as true without proof

power

a number with a base and an exponent

predictions

use of base information to produce an approximation of change or result

pre-image

a picture or object before it undergoes a transformation

premise

a statement that is given to be true

prime number

a positive integer that has exactly two different positive factors, itself and one; one is not a prime number

prime factorization

a composite number expressed as the product of factors that are prime numbers

prism

three-dimensional figures that have two congruent and parallel face that are polygons; the remaining faces are parallelograms

probability

the measure of the likelihood of an event occurring

product

the result of multiplication

proof

a logical argument that shows why a statement must be true

proper fraction

a fraction whose numerator is an integer smaller than its integral denominator

properties of operations

mathematical principals that are always true (i.e., commutative, associative, distributive and inverses)

proportion

the statement of equality between two ratios

proportionality

the concept of having equivalent ratios

pyramid

a three-dimensional figure whose base is a polygon and who's other faces are triangles that share a common vertex

Pythagorean theorem

in a right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse ($a^2+b^2= c^2$)

quadrant

one of the four sections into which the coordinate plane is divided by the x - and y -axes

quadratic equation

a polynomial equation containing one or more terms in which the variable is raised to the second power but no higher

quadratic formula

the formula used to find the roots of quadratic equations

quadratic function

a function that has an equation of the form: $y = ax^2 + bx + c$, $a \neq 0$; a function of degree two

quadrilateral

a polygon with four sides

quartiles

the quartiles divide an ordered set of data into four groups of the same size

quotient

the result of division of one quantity by another (dividend \div divisor = quotient)

radius of a circle

a segment whose endpoints are the center of the circle and a point on the circle (radii)

random sample

each item or element of the population has an equal chance of being chosen as part of a sample of the population

range

the set of output values for a function

range (of data set)

the difference between the greatest and least number in a set of numbers

rate

a ratio comparing two different units (i.e., miles per hour or cents per pound)

ratio

a comparison of two values by division; a ratio can be expressed as *a to b* or *a:b*

rational number

a number that can be expressed as a ratio of two integers

ray

a geometric figure that extends infinitely along a straight path from a point, called its endpoint

real numbers

the set of numbers combining rational and irrational numbers

reasonable estimations

approximations based on mathematical reasoning that are within the desired degree of accuracy (i.e., $35+43=$ reasonable estimation would be 75 or 80 not 100 or 700)

reciprocals

two numbers whose product is equal to one (multiplicative inverses)

rectangle

a quadrilateral with two pairs of congruent, parallel sides and four right angles (square, parallelogram, quadrilateral, polygon)

recursive pattern

a pattern that uses the solution from previous steps to generate the solution to the next step. (i.e., 2,2,4,6,10,16...)

reflection

a transformation creating a mirror image of a figure on the opposite side of a line

reflex angle

an angle that is greater than 180° and less than 360°

reflexive property

the property that states a quantity is equal to itself; the property that states an object is congruent to itself

regular polygon

a convex polygon in which the angles are equiangular and sides are equilateral

repeating decimal

a decimal in which one or more digit(s) repeats without termination

rhombus

a parallelogram with four congruent sides. (plural: rhombi)

right angle

an angle whose measure is 90°

right triangle

a triangle that contains a right angle

root

the inverse of a power

rotation

a transformation in which a figure is turned a given angle and direction around a point

rounding

approximating a number by analyzing a specific place value

sample

a part of the total population; used in statistics to make predictions about the characteristics of the entire group

sample space

a list of all possible outcomes of an activity

scale

(1) an instrument used for weighing; (2) a system of marks at fixed intervals used in measurement or graphing

scale factor

the ratio between the lengths of corresponding sides of two similar figures

scalene triangle

a triangle with no sides the same length and no congruent angles

scatter plot

a graph of the points representing a collection of data

scientific notation

a form of writing a number expressed as a power of 10 and a decimal number greater than or equal to one and less than ten

secant

a line that intersects a circle at exactly two points; a line that contains a chord of a circle

sector

a region defined by a central angle and an arc

signed number

a positive or negative number

similar figures

figures that are the same shape but not necessarily the same size

sine

in a right triangle, the ratio of the length of the leg opposite the given angle to the hypotenuse

skip counting

counting by equal intervals (i.e., 2,4,6... or 4,8,12...)

slope of a line

the measure of steepness of a line; the ratio of rise over run; or change in y over change in x

solid

a three-dimensional figure

solution

a value for a variable that makes an equation or inequality true

solution set

a set consisting of all values that make an equation or inequality true

space

the set of all possible points

sphere

a three-dimensional figure made up of all points in space equidistant from a given point called the center

square

a parallelogram with four congruent sides and four right angles

square root

one of the two equal factors of a number

standard notation

a number written with one digit for each place value in base ten; the most familiar way of representing whole numbers, integers, and decimals is standard notation (i.e., three hundred fifty six is 356)

statistics

the collection, organization, description and analysis of data; statistics are quantitative data

stem-and-leaf plot

a display of data in which digits with larger place values (10's) are "stems" and digits with smaller place values (1's) are "leaves"

straight angle

an angle whose measure is 180° ; it is formed by two opposite rays

subscript

a number written to the right of and slightly below a term; usually used for indexing

substitution property

the property that allows equal values to replace each other

subtraction

a mathematical operation that gives the difference between two numbers; subtraction also is used to compare two numbers or sets

subtrahend

in subtraction, the subtrahend is the number being subtracted

750 minuend
- 84 subtrahend
666 difference

sum

the result of an addition

supplementary angles

two angles the sum of whose measures is 180°

surface area

the total area of the faces (including the bases) and curved surfaces of a three-dimensional figure

symbol

a sign or token used to represent something, such as an operation, quantity, or relation

symmetric property

the property that states for real numbers a and b , if $a = b$, then $b = a$

symmetry

a correspondence in size, form, and arrangement of parts, related to a plane, line, or point; for example, a figure that has line symmetry has two halves that coincide if folded along a line of symmetry

system of equations

a set of two or more equations with the same number of unknowns

tangent

in a right triangle, the ratio of the length of the leg opposite an acute angle to the leg adjacent to the acute angle

tangent to a circle

a line in the plane of a circle that touches a circle in exactly one point (tangent line)

t-chart

a mathematical organizer to display and record data, patterns, or functions/rules in an organized way

term

a product or quotient of numerals or variables or both; terms are separated by plus or minus signs in an expression

terminating decimal

a decimal that contains a finite number of digits

tessellation

a covering of a plane without overlaps or gaps using combinations of congruent figures

theorem

a mathematical statement or proposition derived from previously accepted results

theoretical probability

the probability of an event without doing an experiment or analyzing data

transformation

an operation that creates an image from an original figure or pre-image

transitive property

the property that states for real numbers a , b , and c , if $a = b$ and $b = c$, then $a = c$ or if $a > b$ and $b > c$ then, $a > c$ or if $a < b$ and $b < c$, then $a < c$

translation

a transformation that moves every point on a figure a given distance in a given direction

transversal

a line that intersects two or more lines in a plane at different points

trapezoid

a quadrilateral that has exactly one pair of parallel sides

tree-diagram

a tree diagram used to find all the possible permutations for a set of items or the prime factorization of a number of a number

trend

the general drift, tendency, or direction of a data

trend line

a line that represents a general pattern for a set of data

triangle

a polygon with three sides

trigonometric ratios

the ratios of the lengths of pairs of sides in a right triangle (i.e., sine, cosine and tangent)

unit fraction

a fraction with a numerator of one

unit price

the price of something for one unit of measure

valid argument

an argument that is correctly inferred or deduced from a premise

variability

numbers that describe how spread out a set of data is (i.e., range and quartile)

variable

a symbol that represents a quantity

venn diagram

a representation that uses circles to show relationships between sets

vertex-edge graph

a structure consisting of vertices and edges, where the edges indicate a mapping among the vertices (i.e., the vertices may represent players in a tournament, and the edges indicate who plays whom)

vertex

the point at which the rays of an angle, two sides of a polygon, or the edges of a polyhedron meet (vertices)

vertical

at right angles to the horizon

vertical angles

the opposite angles formed when two lines intersect

volume

the measure of the capacity of a three-dimensional figure, measured in cubic units

whole

the entire object, collection of objects, or quantity being considered

whole numbers

the set of numbers consisting of the counting numbers and zero (i.e., 0, 1, 2, 3 . . .)

x-intercept

the coordinate at which the graph of a line intersects the x-axis

y-intercept

the coordinate at which the graph of a line intersects the y-axis

Arizona Academic Standards Crosswalk

Writing Standard

INTRODUCTION

The purpose of the Writing Standard Articulated by Grade Level is to equip students with the skills and knowledge needed to participate in society as literate citizens. The ability to communicate effectively in writing will be essential to their success in their communities and careers. Students may realize personal fulfillment and enjoyment as they learn to become proficient writers and continue as writers throughout their lives.

Writing is a complex skill that involves learning language and using it effectively to convey meaning through text. This standard recognizes that students' abilities in writing develop from their earliest stages with phonetic spelling; to limited understanding of a certain genre; to the ability to produce conventional, coherent, unified documents. Their ideas are expressed in various forms, such as notes, lists, letters, journal writing, stories, web postings, instant messaging, essays, and reports. Effective writing may be evaluated by examining the use of ideas, organization, voice, word choice, sentence fluency, and conventions.

RATIONALE

Requirements in the No Child Left Behind Act of 2001 (NCLB) and the standard practice of conducting periodic review of the state academic standards prompted the decision by the Arizona Department of Education to refine and articulate the academic standards for mathematics, reading, writing, and science by grade level. This refinement and articulation project was started in December 2003, and was completed in June 2004.

For more information on the Writing Standard:

<http://www.ade.az.gov/standards/language-arts/writing/articulated.asp>

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Writing Standard

Strand One: Writing Process

Research has established the major steps of the writing process. These steps are identified in the five concepts of this strand, each supported with specific performance objectives. While all steps are needed and used by effective writers as they compose text, different skills may be emphasized in individual assignments. These steps may be used recursively as a piece moves toward completion. Throughout the process, students should reflect on their own writing skills, set goals, and evaluate their own progress.

Concept 1: Prewriting

Prewriting includes using strategies to generate, plan, and organize ideas for specific purposes.

Concept 2: Drafting

Drafting incorporates prewriting activities to create a first draft containing necessary elements for a specific purpose.

Concept 3: Revising

Revising includes evaluating and refining the rough draft for clarity and effectiveness. (Ask: Does this draft say what you want it to say?)

Concept 4: Editing

Editing includes proofreading and correcting the draft for conventions.

Concept 5: Publishing

Publishing includes formatting and presenting a final product for the intended audience.

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Writing Standard

Strand 2: Writing Elements

This strand focuses on the elements of effective writing. Good writing instruction incorporates multiple performance objectives into an integrated experience of learning for the student. Throughout the process, students should reflect on their own writing skills, set goals, and evaluate their own progress. The order of the concepts and performance objectives is not intended to indicate a progression or hierarchy for writing instruction. Instructional activities may focus on just one concept or many.

Concept 1: Ideas and Content

Writing is clear and focused, holding the reader's attention throughout. Main ideas stand out and are developed by strong support and rich details. Purpose is accomplished.

Concept 2: Organization

Organization addresses the structure of the writing and integrates the central meaning and patterns that hold the piece together.

Concept 3: Voice

Voice will vary according to the type of writing, but should be appropriately formal or casual, distant or personal, depending on the audience and purpose.

Concept 4: Word Choice

Word choice reflects the writer's use of specific words and phrases to convey the intended message and employs a variety of words that are functional and appropriate to the audience and purpose.

Concept 5: Sentence Fluency

Fluency addresses the rhythm and flow of language. Sentences are strong and varied in structure and length.

Concept 6: Conventions

Conventions addresses the mechanics of writing, including capitalization, punctuation, spelling, grammar and usage, and paragraph breaks.

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Writing Standard

Strand 3: Writing Applications

Writing skills particular to the applications listed here may be taught across the curriculum, although some applications may lend themselves more readily to specific content areas. It is imperative that students write in all content areas in order to increase their communication skills, and ultimately to improve their understanding of content area concepts. When appropriate, other content standards are referenced to show interdisciplinary connections.

Concept 1: Expressive

Expressive writing includes **personal narratives**, stories, poetry, songs, and dramatic pieces. Writing may be based on real or imagined events.

Concept 2: Expository

Expository writing includes nonfiction writing that describes, explains, informs, or summarizes ideas and content. The writing supports a **thesis** based on research, observation, and/or experience.

Concept 3: Functional

Functional writing provides specific directions or information related to real-world tasks. This includes letters, memos, schedules, directories, signs, manuals, forms, recipes, and technical pieces for specific content areas.

Concept 4: Persuasive

Persuasive writing is used for the purpose of influencing the reader. The author presents an issue and expresses an opinion in order to convince an audience to agree with the opinion or to take a particular action.

Concept 5: Literary Response

Literary response is the writer's reaction to a literary selection. The response includes the writer's interpretation, analysis, opinion, and/or feelings about the piece of literature and selected elements within it.

Concept 6: Research

Research writing is a process in which the writer identifies a topic or question to be answered. The writer locates and evaluates information about the topic or question, and then organizes, summarizes, and synthesizes the information into a finished product

Glossary

academic discourse

primarily expository writing with the intent to demonstrate knowledge within an academic setting [Grade 7]

affix

a non-word letter or group of letters attached to a root or stem to change its meaning or function, as the prefix *ad-* and the suffix *-ing* in *adjoining* [Grade 3]

allegory

a literary work with two or more levels of meaning: one literal level and one or more symbolic or figurative levels; events, settings, objects, or characters that stand for ideas or qualities beyond themselves [Grade 12]

alliteration

the repetition of initial sounds, usually at the beginning of words [Grade 11]

allusion

a reference to a well-known work of literature, famous person, or historical event with which the reader is assumed to be familiar [Grade 9]

ambiguity

words that are unclear in meaning [Grade 11]

appositive

a phrase which renames or describes a noun, set off by commas (e.g., My friend, Melissa, is here., Mr. Martinez, our neighbor, is at the door.) [Grade 7]

aside

a statement delivered by an actor to an audience in such a way that other characters on stage are presumed not to hear what is said; the character reveals his or her private thoughts, reactions, or motivations [Grade 12]

assonance

the repetition of vowel sounds in stressed syllables or words without repeating consonant sounds [Grade 11]

author study

the study of different stories written by one author [Grade 3]

CCVC words

words following a consonant-consonant-vowel-consonant pattern [Grade 3]

character foil

a character that provides a contrast to another character, thus intensifying the impact of that other character [Grade 12]

characterization

the manner in which an author presents a character by using the character's actions, dialogue, description, or how other characters react to that character [Grade 3]

cliché

an overused word or phrase that lacks originality and weakens the thought [Grade 9]

compare

to use examples to show how things are similar and different, with the greater emphasis on similarities [Kindergarten]

complex sentence

a sentence that contains an independent clause and one or more subordinate clause(s)[Grade 7]

compound sentence

a sentence with two or more independent clauses joined by a coordinating conjunction (for, and, nor, but, or, yet, so) or a semicolon [Grade 3]

compound-complex sentence

a sentence made up of a compound sentence (two or more independent clauses) and one or more subordinate clauses [Grade 9]

conceit

an elaborate and extended metaphor, especially in poetic images [Grade 11]

conflict

the problem(s) or struggle(s) between or among opposing forces that trigger(s) the action in literature (e.g., person vs. person, person vs. self, person vs. nature, person vs. society)[Grade 4]

consonance

the repetition of the final consonant sound within words with different vowel sounds(e.g., stroke of luck) [Grade 11]

consonant digraph

two or more consonant letters representing a single sound (e.g., gn /n/) [Grade 3]

contradictions

words or ideas that oppose one another [Grade 11]

contrast

to use examples to show how things are different in one or more important ways [Grade 12]

controlling idea

the main point or purpose of a piece of writing, often stated in a thesis statement or topic sentence [Grade 6]

dialogue

the portion of text in which the character(s) speak aloud, usually indicated by quotation marks [Grade 4]

diphthong

a speech sound beginning with one vowel sound and gliding to another vowel sound within the same syllable (e.g., oi in oil) [Grade 3]

direct address

the use of commas to offset one person speaking directly to another (e.g., Jesse, I like your story., I think, Sue, that you are right.) [Grade 5]

e.g.

(abbreviation for *for example*) precedes a non-exhaustive list of examples provided as options; other examples may be appropriate but not included (compare to i.e.)

environmental print

print and symbols that are found in one's physical environment (e.g., street and building signs) [Kindergarten]

evidence

statements or information that help in making a conclusion or judgment:

- logical evidence - based on earlier known or well-known information presented in a clear organized pattern
- empirical evidence- information or facts gained by observation or experiment based on scientific analysis
- anecdotal evidence - information gained from casual observation, usually presented in a narrative style [Grade 9]

explanatory essay

an essay that describes the reasons and/or factors for a particular situation [Grade 8]

extended metaphor

a metaphor that continues throughout a series of sentences with the purpose of expanding or clarifying an idea [Grade 11]

figurative language

the use of words to create vivid pictures and ideas in the mind of the reader; not meant to be literally true (e.g., similes, metaphors, idioms, personification) [Grade 3]

flashback

an account of a conversation, episode, or event that happened before the beginning of a story, told for the purpose of clarifying something in the present; often interrupts the chronological flow of the story [Grade 11]

foreshadowing

writer's use of hints or clues to indicate events that will occur later in a text [Grade 11]

formal letter

a letter that follows a standard business format (e.g., block, semi-block) [Grade 3]

friendly letter

an informal letter written to a friend or relative [Kindergarten]

graphic organizer

a visual representation of information in an organized manner that is intended to enhance understanding (e.g., Venn diagram, T-graph, word web, KWL chart) [Grade 3]

high-frequency words

words often used in spoken and written language [Grade 1]

homonyms

words with the same pronunciation but with different meanings, different parts of speech, and usually different spelling [Grade 3]

hyperbole

figure of speech in which the truth is exaggerated for emphasis or humor [Grade 9]

hypothesis

proposed relationship among observable phenomena or an inferred explanation for those phenomena [Grade 9] (from Science Standard Articulated by Grade Level Glossary)

i.e.

(abbreviation for *that is*) precedes a specific list of items in which all of the items should be used (compare to e.g.)

imagery

descriptive language used in literature to recreate sensory experiences, enrich writing, and to make the writing more vivid; sensory details [Grade 9]

imitative text

writing that mimics another piece [Kindergarten]

genre

a category or type of literature based on its style, form, and content (e.g., mystery, adventure, romance, science fiction) [Grade 9]

incongruity

lack of agreement, harmony, or conformity [Grade 11]

inference

a conclusion derived from facts or premises [Grade 6]

interior monologue

writing that indicates the writer's or a character's unspoken thoughts [Grade 9]

internal citations

information documentation within text [Grade 10]

interrupter

parenthetical or nonessential information set off by commas (e.g., We will, however, have to talk later) [Grade 6]

irony

using a word or phrase to mean the exact opposite of its literal meaning:

dramatic irony - where the reader or the audience sees a character's mistakes, but the character does not

verbal irony - where the writer says one thing and means another

irony of situation - where there is a great difference between the purpose of an action and the result [Grade 11]

irregular plural

a plural formed in a manner other than adding -s or -es (e.g., child-children, party-parties, goose-geese) [Grade 4]

KWL chart

a chart that shows what the writer knows, wants to learn and has learned [Grade 3]

literal language

language that is true to fact, avoiding exaggeration or metaphor [Grade 3]

literary elements

elements of literature including plot, setting, theme and characterization [Grade 9]

literature circle

a student discussion of a book or story they have read [Grade 3]

main idea

the concept, thought, notion, or impression that is of greatest importance or influence:

literal – adhering to fact or to the primary meaning or intent

implied – a suggested meaning or intent (as opposed to explicit)

explicit – fully revealed or expressed without vagueness, implication, or ambiguity;

leaving no question as to the meaning or intent [Grade 1]

metaphor

a figure of speech that compares two unlike things in which no word of comparison is used [Grade 9]

meter

the arrangement of words in a rhythmical pattern, with stressed and unstressed syllables [Grade 11]

mood

the feeling(s) the text arouses in the reader (e.g., happiness, sadness, sorrow, peacefulness)

narrative

a type of fiction or nonfiction that tells a story or series of events [Kindergarten]

onset

consonant(s) before the vowel(s) in a syllable, including consonant blends and digraphs (e.g., /s/ in sit, /spl/ in split) [Grade 1]

paradox

a statement that seems to be contradictory but that actually presents a truth [Grade 11]

parody

a form of literature that intentionally uses a comic effect to mock a literary work or style [Grade 12]

peer review

an opportunity for one student to read, review, and comment on another student’s writing [Grade 3]

personal narrative

an expressive piece of writing that relates an event in the writer’s life; it may contain personal comments and observations as well as a description of the event [Grade 9]

personification

a figure of speech in which something non-human is given human characteristics or powers [Grade 9]

persuasive techniques

devices of persuasion used for the purpose of changing one’s mind, making one take action, or both; usually accomplished by a combination of emotional appeals and logical reasoning (e.g., bandwagon, peer pressure, circular reasoning, transfer, loaded words, testimonial, false causality, oversimplification, overgeneralization) [Grade 6]

phonetic spelling

incorrect spelling of a word as though it were phonetically regular (e.g., *fone* instead of *phone*) [Grade 2]

plot

the action or sequence of related events that make up a story, consisting of five basic elements:
exposition – the opening of a short story up to the point that the conflict is introduced to the reader
rising action – the chain of events in which the conflicts intensify
climax – the point of highest interest; point at which the reader makes his greatest emotional response; the point in the story in which rising action is about to turn into falling action
falling action – takes place after the climax when the action begins to wind down or conflicts begin to lessen
resolution – tells how the story conflict is resolved and ties up loose ends from the story [Grade 3]

plot pyramid

a graphic organizer establishing a story’s sequence: introduction, body and conclusion [Grade 6]

point of view

the perspective from which the text is written:

first person – the narrator is a character who tells the story as he or she experienced, saw, heard, and understood it; identified by the first person pronouns *I* or *we*.

third person omniscient – the narrator is all-knowing, with the ability to see into the minds of more than one character.

third person limited - the narrator has the ability to see into the mind of only one character [Grade 9]

prefix

a linguistic unit added to the beginning of a word which changes its meaning (i.e., re-, mis-, un-) [Grade 2]

prewriting plan

brainstorming ideas to create a writing plan [Grade 3]

primary source

an original source that informs directly, not through another person's explanation or interpretation (e.g., firsthand reports, diaries, letters, journals, original documents) [Grade 9]

prior knowledge

knowledge gained from previous experience(s) [Grade 6]

process essay

an essay that describes the method by which an event, task, or goal is completed [Grade 6]

proofreading marks

marks used when editing a writer's work [Grade 3]

proper adjective

a word, derived from a proper noun, that describes a noun or pronoun and is always capitalized (e.g., Canadian bacon, Irish setter) [Grade 6]

proper noun

a noun that names a specific person, place or thing [Grade 2]

r-controlled

a vowel whose sound is influenced by an r that directly follows it (e.g., farm, her, first, torn, nurse); the vowel sound is neither long nor short [Grade 3]

reflective personal narrative

an expressive piece of writing that relates the writer's search for meaning through an event in his/her life; it contains personal comments and observations as well as a description of the event [Grade 10]

regular plural

a noun that forms its plural by adding -s or -es (e.g., dog-dogs, box-boxes) [Grade 2]

repetition

repeating a word, phrase, sentence, or the like for impact and effect [Grade 11]

resolution

the part of a literary piece in which the conflict is resolved [Grade 4]

rhetorical device

literary device that is intended to emphasize a point, not to obtain a response [Grade 10]

rhyme

identical or very similar recurring final sounds in words within, or more frequently, at the ends of lines of verse [Kindergarten]

rhyme scheme

the pattern of rhyme occurring at the end of the lines of poetry within a stanza/poem [Grade 11]

rhythm

a pattern of repeated cadence or accent in speech or text [Grade 3]

rime

the vowel(s) and any following consonant(s) in a syllable (e.g., /it/ in sit, /oat in float) [Grade 1]

rubric

a written descriptor of performance containing criteria, guidelines, or standards used to measure or assess a product [Grade 3]

satire

a literary technique that combines a critical attitude with humor, often with the intent of correcting or changing the subject of the satire [Grade 12]

secondary source

a source that contains information others have gathered and interpreted; indirect or secondhand information (e.g., newspaper and magazine accounts, encyclopedia articles, research studies, web sites, documentaries) [Grade 9]

setting

the time of day or year; historical period, place, situation [Grade 3]

silent e

the letter e in a word that is not heard when the word is spoken and often signals a long vowel sound in the preceding vowel [Grade 4]

simile

figure of speech comparing two things that are unlike; uses the words *like* and *as* (e.g., *as strong as an ox*, *flies like an eagle*) [Grade 9]

simple sentence

a sentence containing a subject and verb that may also include prepositional phrases
[Kindergarten]

soliloquy

discourse in which a character speaks his/her thoughts aloud without addressing an audience
(Grade 12)

stand-alone text

text whose meaning is derived without the benefit of additional support of pictures or graphics
[Grade 1]

story map

a graphic organizer that establishes a story's order: beginning, middle and end [Grade 3]

style manual

a recognized resource for expository and research writing such as MLA, APA, or Chicago [Grade 9]

suffix

a linguistic unit added to the end of a base word which changes the word's meaning or grammatical function (e.g., -ed, -ly, -ness) [Grade 2]

syllabication

the division of words into syllables [Grade 2]

symbol

person, place, or thing that represents something beyond itself (e.g., sword can stand for war, a desert might represent loneliness or solitude, a dove as a symbol of peace)

symbolism

a literary technique in which an author uses symbols to represent concrete ideas, events, or relationships [Grade 9]

theme

the underlying idea or statement that the author is trying to convey [Grade 9]

thesis (or thesis statement)

a focus statement that identifies the purpose, intent, or main idea of a piece of expository or research writing [Grade 6]

time-management strategies

methods to determine the effort a writer devotes to specific components of the writing process; strategies to effectively use time in order to meet a deadline [Grade 3]

tone

the overall feeling or effect created by a writer's use of words (e.g., playful, serious, bitter, angry, sarcastic) [Grade 6]

transitional words

words and phrases that bridge sentences and paragraphs by showing location, time, comparisons, emphases, summaries/conclusions, additions, or clarifications [Grade 2]

Venn diagram

a graphic organizer used to help a writer organize ideas to compare and contrast, composed of two or more overlapping circles [Grade 6]

vowel digraph

a spelling pattern using two or more letters to represent a single vowel sound [Grade 4]

web (webbing)

a type of graphic organizer used to record ideas [Grade 1]

word family (-ies)

words that may have the same root or base sound [Grade 1]

word wall

classroom display of high frequency and/or grade level specific words available for student reference [Kindergarten]

Arizona Academic Standards Crosswalk

Science Standard

INTRODUCTION

Students are naturally curious about the world and their place in it. Sustaining this curiosity and giving it a scientific foundation must be a high priority in Arizona schools. Application of scientific thinking enables Arizona students to strengthen skills that people use every day: solving problems creatively, thinking critically, working cooperatively in teams, using technology effectively, and valuing lifelong learning.

Science education is much more than merely learning content. It is the active process of investigation and the critical review of evidence related to the world around us, both visible and invisible. Science is a dynamic process of gathering and evaluating information, looking for patterns, and then devising and testing possible explanations. Active engagement in scientific investigation leads students to think critically and to develop reasoning skills that allow them to become independent, lifelong learners. Science methods and thought processes have application well beyond the bounds of science and support learning goals in all subject areas.

The Arizona Science Standard Articulated by Grade Level has been written for ALL students. The science standard is set with the expectation that science instruction occurs at all grade levels – beginning in early grades with simple exploration, progressing to increasingly organized and sophisticated science investigations in higher grades.

Underlying all of the science standard strands are the five unifying concepts as identified in the National Science Education Standards (1995):

- Systems, Order, and Organization
- Evidence, Models, and Explanation
- Constancy, Change, and Measurement
- Evolution and Equilibrium
- Form and Function

This conceptual framework provides students with productive and insightful ways of considering and integrating a range of basic ideas that explain the natural world. Because the understanding and abilities associated with major conceptual and procedural schemes need to be developed over an entire education, the unifying concepts and processes transcend disciplinary boundaries.

These unifying concepts can be introduced in early grades and developed appropriately through the elementary grades and high school. Students should be explicitly shown how each of these unifying concepts apply to and connect life, physical, and earth and space sciences. These science content areas can be taught in conjunction with each other, as well as with other subject areas in an interdisciplinary approach. The unifying concepts in science education help focus instruction and provide a link to other disciplines.

Arizona Academic Standards Crosswalk

Science Standard

RATIONALE

Requirements in the *No Child Left Behind Act of 2001* (NCLB) and the need for periodic review of the state academic standards prompted the decision by the Arizona Department of Education (ADE) to refine and articulate the academic standard for science by grade level. This refinement and articulation project was started in April 2003, and was completed in May 2004.

For more information:

<http://www.ade.az.gov/standards/science/articulated.asp>

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Science Standard

Strand 1: Inquiry Process

“Science as inquiry is basic to science education and a controlling principle in the continuing organization and selection of students’ activities. Students at all grade levels and in every domain of science should have the opportunity to use scientific inquiry and develop the ability to think and act in ways associated with inquiry...” (National Science Education Standards, 1995).

Inquiry Process establishes the basis for students’ learning in science. Students use scientific processes: questioning, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, and communicating results.

- Concept 1: HS Observations, Questions, and Hypotheses**
Formulate predictions, questions, or hypotheses based on observations. Evaluate appropriate resources.
- Concept 2: HS Scientific Testing (Investigating and Modeling)**
Design and conduct controlled investigations.
- Concept 3: HS Analysis, Conclusions, and Refinements**
Evaluate experimental design, analyze data to explain results and to propose further investigations. Design models.
- Concept 4: HS Communication**
Communicate results of investigations.

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Science Standard

Strand 2: History and Nature of Science

“Knowledge of the nature of science is central to the understanding of the scientific enterprise.”
(National Assessment of Educational Progress, 2000)

Scientific investigation grows from the contributions of many people. History and Nature of Science emphasizes the importance of the inclusion of historical perspectives and the advances that each new development brings to technology and human knowledge. This strand focuses on the human aspects of science and the role that scientists play in the development of various cultures.

- Concept 1: HS History of Science as a Human Endeavor**
Identify individual, cultural, and technological contributions to scientific knowledge.
- Concept 2: HS Nature of Scientific Knowledge**
Understand how scientists evaluate and extend scientific knowledge.

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Science Standard

Strand 3: Science in Personal and Social Perspectives

Science in Personal and Social Perspectives emphasizes developing the ability to design a solution to a problem, to understand the relationship between science and technology, and the ways people are involved in both. Students understand the impact of science and technology on human activity and the environment. This strand affords students the opportunity to understand their place in the world – as living creatures, consumers, decision makers, problem solvers, managers, and planners.

Concept 1: HS

Changes in Environments

Describe the interactions between human populations, natural hazards, and the environment.

Concept 2: HS

Science and Technology in Society

Develop viable solutions to a need or problem.

Concept 3: HS

Human Population Characteristics

Analyze factors that affect human populations.

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Science Standard

Strand 4: Life Science

“The fundamental goal of life sciences is to attempt to understand and explain the nature of life.” (NAEP 2000)

Life Science expands students’ biological understanding of life by focusing on the characteristics of living things, the diversity of life, and how organisms and populations change over time in terms of biological adaptation and genetics. This understanding includes the relationship of structures to their functions and life cycles, interrelationships of matter and energy in living organisms, and the interactions of living organisms with their environment.

- Concept 1: HS The Cell**
Understand the role of the cell and cellular processes.
- Concept 2: HS Molecular Basis of Heredity**
Understand the molecular basis of heredity and resulting genetic diversity.
- Concept 3: HS Interdependence of Organisms**
Analyze the relationships among various organisms and their environment.
- Concept 4: HS Biological Evolution**
Understand the scientific principles and processes involved in biological evolution.
- Concept 5: HS Matter, Energy, and Organization in Living Systems (Including Human Systems)**
Understand the organization of living systems, and the role of energy within those systems.

Arizona Academic Standards Crosswalk

Definitions of Strands/Concepts Science Standard

Strand 5: Physical Science

“The physical science component ... should probe the following major topics: matter and its transformations, energy and its transformations, and the motion of things.” (NAEP 2000)

Physical Science affords students the opportunity to increase their understanding of the characteristics of objects and materials they encounter daily. Students gain an understanding of the nature of matter and energy including their forms, the changes they undergo, and their interactions. By studying objects and the forces that act upon them, students develop an understanding of the fundamental laws of motion, knowledge of the various ways energy is stored in a system, and the processes by which energy is transferred between systems and surroundings.

- Concept 1: HS Structure and Properties of Matter**
Understand physical, chemical, and atomic properties of matter.
- Concept 2: HS Motions and Forces**
Analyze relationships between forces and motion.
- Concept 3: HS Conservation of Energy and Increase in Disorder**
Understand ways that energy is conserved, stored, and transferred.
- Concept 4: HS Chemical Reactions**
Investigate relationships between reactants and products in chemical reactions.
- Concept 5: HS Interactions of Energy and Matter**
Understand the interactions of energy and matter.

Strand 6: Earth and Space Science (not Identified within the CTE crosswalk)

Glossary

abiotic

nonliving

absorb

to take up (e.g., plant roots absorb water)

adaptation

hereditary features of organisms that allow them to live in a particular environment

affect

to have an influence on

affluence

plentiful supply of material goods; wealth

applied science

research aimed at answering questions that have practical applications, e.g., determining the causes of diseases so that cures might be found

asteroid

small rocky body orbiting the Sun

atmosphere

gaseous envelope surrounding the Earth

atom

smallest particle of an element that retains the chemical nature of the element

barometric pressure

atmospheric pressure as indicated by a barometer, used especially in weather forecasting

basic science

research designed to describe or explain nature to satisfy one's curiosity

bias

statistical sampling or testing error caused by systematically favoring some outcomes over others
biodiversity

1.number and variety of organisms found within a specified geographic region

2.variability among organisms, including the variability within and between species and within and between ecosystems

biome

broad area of the Earth's surface characterized by distinctive vegetation and associated animal life; e.g., broad-leaf forest biome, grassland biome, desert biome

biotic

relating to life or living organisms

calorimetric

relating to the measurement of heat energy by means of temperature measurements

camouflage

concealment by disguise or protective coloring

carrying capacity

maximum number of individuals that a given environment can support for a sustained period of time

catalyst

substance, usually used in small amounts relative to the reactants, that modifies and increases the rate of a reaction without being consumed in the process

cellular respiration

metabolic processes which break down nutrients into usable energy

Chemistry

having to do with carbon compounds

circuit

1. closed path followed or capable of being followed by an electric current
2. configuration of electrically or electromagnetically connected components or devices

cirrus

high-altitude cloud composed of narrow bands or patches of thin, generally white, fleecy parts

characteristic

distinguishing trait, feature, quality, or property

cladistics

system of classification that constructs evolutionary trees, showing how shared derived characters can be used to reveal degrees of evolutionary relationships between existing and extinct species

classification system

method of organization of objects or organisms using distinct characteristics or features

climate

average course or condition of the weather at a place usually over a period of years as exhibited by temperature, wind velocity and precipitation

comet

body of dust, ice, and gas, which orbits the Sun; the orbit is usually highly elliptical or even parabolic

community

group of plants and animals living and interacting with one another in a specific region under relatively similar environmental conditions

compound

substance formed from two or more elements chemically united in fixed proportions

conduction

process by which heat or electrical energy is transmitted through a material or body without gross motion of the medium itself

conifer

any of various mostly needle-leaved or scale-leaved, chiefly evergreen, cone-bearing gymnosperm trees or shrubs such as pines, spruces, and firs

conservation

Life science: the protection, preservation, management, or restoration of wildlife and of natural resources such as forests, soil, and water, to prevent exploitation, destruction or neglect

Physical science: a unifying principle of constancy of a quantity under specified conditions

constellation

formation of stars perceived as a figure or design, especially one of 88 recognized groups named after characters from classical mythology and various common animals and objects

consumer

organisms requiring complex organic compounds for food, which is obtained by preying on other organisms or by eating particles of organic matter

contrail

artificial cloud created by an aircraft, caused either by condensation due to the reduction in air pressure above the wing surface, or by water vapor in the engine exhaust

controlled investigation

investigation in which all but one variable remain constant

convection

transfer of heat energy in a gas or liquid by the circulation of currents of matter from one region to another

cumulus

dense, white, fluffy, flat-based cloud with a multiple rounded top and a well-defined outline, usually formed by the ascent of thermally unstable air masses

data

factual information, from observations, organized for analysis

decomposer

organisms such as bacteria and fungi that feed and break down dead organisms, returning constituents of organic substances to the environment

deformation

alteration of shape, as by pressure or stress

deposition

- 1.act of depositing, especially the laying down of matter by a natural process
- 2.something deposited; a deposit

distinguish

to perceive or indicate differences; discriminate

dominant

of, relating to, or being an allele that produces the same phenotypic effect whether inherited with a homozygous or heterozygous allele

DNA

(Deoxyribonucleic acid) double strand of nucleotides that is a self-replicating molecule present in living organisms as the main constituent of chromosomes; contains the genetic code and transmits the heredity pattern

ecology

study of the interactions and relationships between and among organisms and their environment

ecosystem

all the organisms in a given area and the abiotic factors with which they interact

eclipse

partial or complete obscuring, relative to a designated observer, of one celestial body by another

electron

negatively charged fundamental particle in an atom

element

any of more than 100 fundamental substances that consist of atoms of only one atomic number and that singly or in combination constitute all matter

environment

sum of all external conditions affecting the life, development and survival of an organism,

including the biotic (living) and abiotic (non-living) elements

erosion

group of natural processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is worn away from the Earth's surface

eukaryotic

referring to a cell with a nucleus and other internal structure

experimentation

act of conducting a controlled test or investigation

extinct

no longer in existence

fertilization

1. act or process of initiating biological reproduction by insemination or pollination
2. union of male and female gametes to form a zygote

food chain

arrangement of the organisms of an ecological community according to the order of predation in which each uses the next as a food source

food web

totality of interacting food chains in an ecological community

force (K-6)

push or pull that changes the motion or shape of an object

force (7-HS)

vector quantity that tends to produce an acceleration of a body in the direction of its application

formulate

to devise or invent

frequency

ratio of the number of times an event occurs in a series of trials of a chance experiment to the number of trials of the experiment performed; the number of cycles an oscillating system executes in one second

friction

force that resists relative motion between two bodies in contact

front (weather)

interface between air masses of different temperatures or densities

gas

state of matter that does not have a definite shape or volume and is much less dense than a liquid because its molecules are far apart compared to their diameters

genotype

particular combination of genes in an organism

gravitation

universal force by which every body in the universe attracts every other body

gravity

attraction of the mass of the Earth, the Moon or a planet for bodies at or near its surface

greenhouse gas

atmospheric gas such as carbon dioxide, water vapor, and methane that allows incoming sunlight to pass through but absorbs infrared radiation radiated back from the Earth's surface, leading to the phenomenon whereby the Earth's atmosphere traps solar radiation

guided investigation

teacher-directed investigation

habitat

place or environment where a plant or animal naturally or normally lives and grows

hazardous waste

substance, such as nuclear waste or an industrial byproduct, that is potentially damaging to the environment and harmful to humans and other organisms

heredity

genetic transmission of characteristics from parent to offspring

heterogeneous

consisting of dissimilar elements or parts

homogeneous

uniform in structure or composition throughout

hydrosphere

aqueous envelope of the Earth, including the oceans, all lakes, streams, and underground waters, ice, and the aqueous vapor in the atmosphere

hypothesis (K-5)

statement of an anticipated result of an investigation

hypothesis (6-HS)

proposed relationship among observable phenomena or an inferred explanation for those phenomena

igneous

relating to, resulting from, or suggestive of the intrusion or extrusion of magma or volcanic activity; rock formed from molten magma

inorganic

involving neither organic life nor the products of organic life
Chemistry: of or relating to compounds not containing carbon

interdependence

state of organisms depending on each other and the environment for survival

interpretation

explanation

interrelationships

interactions between two or more objects or organisms

invertebrate

animal, such as an insect or mollusk, that lacks a backbone or spinal column

investigation

inquiry, research, or systematic examination

involuntary

not under the influence or control of the will; not voluntary; as, the involuntary movements of the body (involuntary muscle fibers)

isotope

any of two or more species of atoms of a chemical element with the same atomic number and nearly identical chemical behavior, but with differing atomic mass and mass number and different physical properties

law

statement that summarizes, identifies, or describes a relationship among observable phenomena

lever

simple machine consisting of a rigid bar pivoted on a fixed point and used to transmit force, as in raising or moving a weight at one end by pushing down on the other
limiting factor conditions or resources that control the size of a population

liquid

state of matter that does not hold a definite shape but occupies a definite volume because its molecules are in close contact

lithosphere

outer part of the Earth, consisting of the crust and upper mantle, approximately 100 km (62 mi.) thick

living

state of being alive

lunar

of, involving, caused by, or affecting the Moon

macroscopic

large enough to be perceived or examined by the unaided eye; large compared to a microscopic object

mass

property of a body that is a measure of its inertia and causes it to have weight in a gravitational field, that is commonly taken as a measure of the amount of material it contains

matter

anything that possesses mass and occupies volume

mean

average value of a set of numbers

meiosis

type of cell division that occurs during the reproduction of diploid organisms to produce the gametes. The double set of genes and chromosomes of the normal diploid cells is reduced during meiosis to a single haploid set in the gametes. Crossing-over and, therefore, recombination occur during a phase of meiosis

metamorphic

change in the constitution of rock; specifically, a pronounced change affected by pressure, heat and water that results in a more compact and more highly crystalline condition; a rock produced by these processes

meteor

bright trail or streak that appears in the sky when a meteoroid is heated to incandescence by friction with the Earth's atmosphere; also called falling star, meteor burst, shooting star

microscopic

too small to be seen by the unaided eye but large enough to be studied under a microscope; small compared to a macroscopic object

mimicry

resemblance of one organism to another or to an object in its surroundings for concealment and protection from predators

mitosis

cell division; cell division in multicellular organisms occurs by mitosis except for the special division called meiosis that generates the gametes

mixture

portion of matter consisting of two or more components in varying proportions that retain their own properties

model

schematic description or representation of a system, theory, or phenomenon that accounts for at least some of its known or inferred properties and may be used for further study of its characteristics

molecule

smallest particle of a chemical substance that retains all the properties of the substance and is composed of one or more atoms

mutation

change of the DNA sequence within a gene or chromosome of an organism

mutualism

close, prolonged association between organisms of two different species in which each member benefits; type of symbiotic relationship

natural selection

process by which, in a given environment, individuals having characteristics that aid survival will produce more offspring, so the proportion of individuals having such characteristics will increase with each succeeding generation. Two mechanisms of natural selection include:
gradualism - slow genetic modification (evolution) of a population over **long periods of time**
punctuated equilibrium - relatively rapid evolution at a speciation event

neutron

uncharged elementary particle that has a mass a little greater than that of the proton and is present in most atomic nuclei

nonliving

objects that don't reproduce, grow, react, or use food
nonstandard units of measure units of measurement based on everyday items (e.g., hands, feet, pace, candy, potato, paper clip) used as a precursor to learning and using standard units of measurement

mutualism

close, prolonged association between organisms of two different species in which each member benefits

nucleus

Physical science: central region of an atom, which contains more than 99% of the atom's mass
Life science: cellular organelle in eukaryotes that contains most of the genetic material

observation

event that is experienced personally or enhanced through measurement or instruments

openness

mind set that allows a person to consider explanations of a phenomena

organic

of, relating to, or derived from living organisms

organism

living individual, such as a plant, animal, bacterium, protist, or fungus; a body made up of organs, organelles, or other parts that work together to carry on the various processes of life

population density

number of organisms per unit area

periodic table

arrangement of the chemical elements by atomic number, starting with hydrogen in the upper left-hand corner and continuing in ascending order from left to right, arranged in columns according to similar chemical properties

PH

numerical measure of the acidity or alkalinity of a chemical solution; the negative of the logarithm of the hydrogen ion concentration

phenotype

physical or visible characteristics of an organism that are determined by its genotype

photosynthesis

chemical process by which chlorophyll-containing plants use light to convert carbon dioxide and water into carbohydrates, releasing oxygen as a byproduct

pitch

aurally perceived property of a sound, especially a musical tone, that is determined by the frequency of the waves producing it; highness or lowness of sound

plane

flat or level surface

plate tectonics

theory that explains the global distribution of geological phenomena such as seismicity, volcanism, continental drift, and mountain building in terms of the formation, destruction, movement, and interaction of the Earth's lithospheric plates; the theory that the earth's crust is broken into fragments (plates) which move in relation to one another, shifting continents, forming new crust, and causing volcanic eruptions

population

group of organisms of the same species living and reproducing in a particular habitat or geographic region

precipitation

any form of water, such as rain, snow, sleet, or hail, which falls to the Earth's surface

predict

to forecast a future occurrence based on past observations or the extension of an idea

prediction

statement of an expected (future) outcome of a planned test assuming that the hypothesis being tested is correct; to be compared with observed result to test the hypothesis
preservation to keep in perfect or unaltered condition; maintain unchanged

probability

measure of the likelihood of an event occurring

procedures

series of steps taken to accomplish an end

producer

organisms (e.g., green plants) that produce their own organic compounds from simple precursors (such as carbon dioxide and inorganic nitrogen), many of which are food sources for other organisms

prokaryotic

referring to a cell with no nucleus (e.g., a bacterium)

property

characteristic attribute possessed by all members of a class

propose

to put forward for consideration, discussion, or adoption

proton

stable subatomic particle occurring in all atomic nuclei, with a positive electric charge equal in magnitude to that of an electron

pulley

simple machine consisting of a wheel with a grooved rim in which a pulled rope or chain can run to change the direction of the pull and thereby lift a load

pure science

science for the pursuit of scientific knowledge

qualitative

involving quality or kind

quantitative

involving the measurement of quantity or amount

radiation

Physical science: transfer of energy by electromagnetic radiation; process of emitting energy in the form of waves or particles (e.g., visible light, X-rays, alpha and beta radiation). **Life science:** the geographic spreading of a species

recessive

of, relating to, or designating an allele that does not produce a characteristic effect when present with a dominant allele

reflect

to throw or bend back (light, for example) from a surface

refract

to deflect from a straight path undergone by light or other wave in passing obliquely from one medium (e.g., air) into another (e.g., glass) in which its speed is different

reliability

to yield the same or compatible results in different clinical experiments or statistical trials

respiration

physical and chemical processes by which an organism supplies its cells and tissues with the oxygen needed for metabolism and relieves them of the carbon dioxide formed in energy-producing reactions

revolution

orbital motion about a point, especially as distinguished from axial rotation

RNA

(Ribonucleic acid) nucleic acids that contains ribose and uracil as structural components and is associated with the control of cellular chemical activities

rotation

act or process of turning around a center or an axis; the turning of a body part about its long axis as if on a pivot

sedimentary

of or relating to rocks formed by the deposition of sediment

sexual

relating to, produced by, or involving reproduction characterized by the union of male and female gametes

simple investigation

investigation involving a single variable

solid

body of definite shape and volume; not liquid or gaseous

species

class of individuals or objects grouped by virtue of their common attributes and their ability to mate and produce fertile offspring, and assigned a common name; a division subordinate to a genus

spectrophotometer

instrument used to determine the intensity of various wavelengths in a spectrum of light

stimulus

object or event that causes a response

stratus

low-altitude cloud formation consisting of a horizontal layer of clouds

structures

way in which parts are arranged or put together to form a whole; makeup
Life science: arrangement or formation of the tissues, organs, or other parts of an organism; an organ or other part of an organism

subsystem

component of a system (e.g., a solar system is a subsystem of a galaxy)

symbiotic relationship

lose, prolonged association between organisms of two different species that may, but does not necessarily, benefit each member; includes mutualism, commensalisms, and parasitism

system

1.group of body organs that together perform one or more vital functions
2.organized group of devices, parts or factors that together perform a function or drive a process (e.g., weather system, mechanical system)

technology

application of science, especially to industrial or commercial objectives; tools and techniques

temperature

degree of hotness or coldness of a body or environment

theory

collection of statements (conditions, components, claims, postulates, propositions) that when taken together attempt to explain a broad class of related phenomena; inferred explanations for observable phenomena

transient

not regular or permanent

U.S. customary units

measuring system used most often in the United States (e.g., inches, pounds, gallons)

valid

correctly inferred or deduced from a premise

variable

characteristic with values (e.g., numbers, colors, sizes) that differ from one object, event, or situation in a group to the others; e.g., in a group of students, their heights differ, thus “height” is a variable.

independent: manipulated variable in an experiment or study whose presence or quantity determines the change in the dependent variable.

dependent: observed variable in an experiment or study whose changes are determined by the presence or quantity of one or more independent variables

vector

representation of a quantity having both magnitude and direction, such as velocity or force

velocity

rate of change of position and direction with respect to time

Venn Diagram

representation that uses circles to show relationships between sets

vertebrate

having a backbone or spinal column

viable

capable of living, developing, or germinating under favorable conditions

volume

measure of the capacity of a three-dimensional figure or object, measured in cubic units

voluntary

normally controlled by or subject to individual volition, such as *voluntary muscle contractions*

weathering

effect of exposure to the action of the elements

wedge

piece of material, such as metal or wood, thick at one edge and tapered to a thin edge at the other for insertion in a narrow crevice, used for splitting, tightening, securing, or levering

wheel and axle

simple machine made up of two coaxial cylindrical objects of different size in which the axle (a small wheel) is attached to the center of a larger wheel; the wheel and axle must move together to be a simple machine; a wheel and axle lifts or moves loads

Processes

analyze:	to examine methodically by separating into parts and studying their interrelations
classify:	to arrange or organize according to category
compare:	to examine in order to note the similarities or differences of
communicate:	to convey information about; make known; express oneself in such a way that one is readily and clearly understood
conclusion:	statement, or statements, that summarize the extent to which hypotheses have been supported or not supported
evaluate:	to examine and judge carefully; appraise
infer:	to conclude from evidence or premises
interpret:	to explain the meaning of
justify:	to demonstrate or prove to be just, right, or valid
measure:	to ascertain the dimensions, quantity, or capacity of
observe:	to be or become aware of, through one's senses, and may include qualitative or quantitative data
predict:	to forecast a future occurrence based on past observation or the extension of an idea
question:	to ask
result:	quantity or expression obtained by calculation