

Colorado Mathematics Standards and Expanded Benchmarks

Standard 1: Develop Number Sense

1.1 Demonstrate meanings for whole numbers, commonly used fractions & decimals, and representing equivalent forms of the same number through the use of physical models, drawings, calculators and computers.

Represent Whole Numbers

- Interact with objects related to mathematical activities
- Demonstrate the concept of one (e.g. hit the switch one time, give me one, etc.)
- Demonstrate an understanding that a quantity can be represented by a set of objects
- Represent a quantity using a set of objects
- Apply a numeral to a quantity
- Apply appropriate numeral to a quantity
- Demonstrate an ability to ascertain quantity without counting (1-6)
- Demonstrate an understanding of numeral and the quantity (quantity/label)
- Demonstrate an understanding of numeral
- Demonstrate the concept of “none” or “some”
- Demonstrate understanding of number conservation (when objects rearranged number/weight/mass still same)

Demonstrate an Understanding of Equalities and Inequalities

- Demonstrate an understanding that a set can contain nothing, or one or more items (some, none)
- Demonstrate an understanding that objects go together defined by shared an (comparing number of elements in two sets) attribute from a set to which a number can be applied
- Demonstrate an understanding of same/different by color, size, shape
- Indicate what does not belong in sets of objects
- Match quantity to quantity sets (compare)
- Indicate if the numbers of identical objects in two groups are the same or different and which group has more (when arranged in the same structured presentation).
- Indicate if the numbers of identical objects in two groups are the same or different and which group has more (when arranged in a random presentation).
- Given 2 unequal sets of identical objects, indicate which group has more and how many more.
- Given 2 unequal sets of different objects, indicate which group has more and how many more.
- Demonstrate one to one correspondence between sets of objects
- Identify pairs by attribute
- Demonstrate understanding of symbols $<$, $>$, $=$
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Demonstrate Fractions

- Group objects into sets by attributes
- Demonstrate an understanding of a whole unit
- Divide a whole unit (such as a pizza) into $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$
- Demonstrate that n equal parts of $\frac{1}{n}$ each of an object make a whole unit (e.g., 4 $\frac{1}{4}$ th pieces = 1 whole, 6 $\frac{1}{6}$ th pieces = 1 whole)
- Recognize that fractional parts are relative to the whole unit ($\frac{1}{4}$ of a 16 in pizza is different from a $\frac{1}{4}$ of a 10 inch pizza)
- Divide discrete objects (such as pieces of candy) into equal portions, such as $\frac{1}{2}$, $\frac{1}{4}$, etc.

- Divide a continuous object (such as a piece of paper or a board) into $\frac{1}{2}$
- Divide a whole unit into a required number of parts
- Divide a whole units into equal portions ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{10}$)

Demonstrate an Understanding and Use of Money

- Recognize the difference between a coin and a bill
- Differentiate between coins by attributes (metal color, size, weight, texture)
- Recognize that coins and bills can be exchanged for merchandise/goods/services
- Match coins to like coins and bills to like bill
- Recognize coins and bills when given label
- Label coins/bills
- Identify coins and bill by values in cents and dollars
- Recognize when sets of coins can be exchanged for bills
- Count money
- Use different bill amounts to show equivalent (e.g. 5 \$1's -\$5)
- Use different coins to show equivalent amounts of money
- Count out exact amount of money
- Round amount to the next dollar (next dollar strategy)
- Pay the exact amount for items using coins or bills
- Determine how much more money is needed when funds are insufficient
- Determine change when funds are more than cost

1.2 Reading and writing whole numbers and knowing place-value concepts and numeration through their relationships to counting, ordering, and grouping.

Read and Write Numbers

- Discriminate numerals from other printed symbols
- Match numeral to numeral
- Recognize number symbols 1-10
- Match numeral to quantity
- Label numerals 1-10
- Recognize the numeral for a two digit number
- Read and label two digit numerals
- Identify number words one through ten
- Match numeral to number words
- Match number word to quantity
- Create marks or graphics that represent numbers
- Read and label three digit numbers
- Produce a numeral to 10, 100 or 1000
- Label 3-digit numbers

Understand and Order By Place Value

- Group quantities in sets of tens
- Represent quantities in different ways, using tens and ones
- Group objects in sets of tens up to 100
- Understand that a 2 digit number is made up of groups of tens and ones
- Represent two digit numbers up to 100 in an expanded form

1.3 Using numbers to count, to measure, to label, and to indicate location

Count

- Demonstrate attention to other's counting
- Demonstrate an understanding that "counting" is saying numbers
- Count using a random order of numbers (e.g. 1,3,2, 7)
- Count using a sequential order of numbers (e.g. 1, 2, 3, 4)
- Demonstrate one to one correspondence between objects and numbers when counting without recounting
- Understanding that the final number you say, when counting, is the quantity of the set
- Demonstrate one-to-one correspondence between sets of objects
- Count by ones from a given number forward
- Demonstrate an understanding of the concept of one more
- Skip count by 2s, 5s, & 10s to 100
- Count from 1-100

Use Ordinal Position

- Demonstrate first and last
- Identify first and last
- Indicate ordinal position of various elements (such as person, activities, etc.) in a sequence

Sequence Numbers

- Indicate smallest, largest, least, most, fewer, more
- Arrange sets of objects from least to most
- Arrange numbers from least to most or vice versa up to 100
- Locate and label numbers on a number line

1.4 Developing, testing and explaining conjectures about properties of whole numbers, and commonly used fractions and decimals (for example, $\frac{1}{3}$, $\frac{3}{4}$, 0.5, 0.75)

Demonstrate a Concept of Zero

- Associate numeral 0 with empty sets in different settings
- Recognize that adding 0 to any number, equals the number
- Appropriately labels an empty set (none, zero, nothing)

1.5 Using number sense to estimate and justify the reasonableness of solutions to problems involving whole numbers, and commonly used fractions and decimals (for example, $\frac{1}{3}$, $\frac{3}{4}$, 0.5, 0.75)

Estimate

- Use comparisons to estimate value, size, amounts, etc. (e.g., as big as a house)
- Identify more or less
- Use a quantitative label when making a guess (a bunch, a gazillion, seventeen)
- Identify a reasonable quantity when guessing the amount in a given set
- Round numbers to the next highest group of 10, 100, 1000 (i.e. 27 = 30)
- Round numbers to the next highest group of 100 (i.e. 574 = 600)
- Estimate sums by rounding
- Determine if solution to computational problem is reasonable.

1.6 Creating models to represent mathematical relationships

Demonstrate the ability to create models to represent mathematical relationships

- Model/recognize sets that contain nothing, or one or more items (some, none)
- Demonstrate that objects defined by a shared attribute form a set to which a number can be applied
- Model/Recognize same/different amount
- Indicate what does not belong in sets of objects
- Model comparison of two sets
- Demonstrate when groups of like objects are the same, more, or less quantity when ordered the same way (by the same attribute)
- Demonstrate when groups of like objects are the same, more, or less quantity when ordered the same way (by the varied attribute)
- Demonstrate when groups of like objects are the same, more, or less quantity when ordered in different ways (comparing number of elements in two sets)
- Demonstrate when groups of unlike objects are the same, more, or less quantity when ordered the same way (by the same attribute)
- Demonstrate when groups of unlike objects are the same, more, or less quantity when ordered the same way (by the varied attribute)
- Demonstrate when groups of unlike objects are the same, more, or less quantity when ordered in different ways (comparing number of elements in two sets)
- Identify pairs as two related objects
- Indicate little/big; smallest/largest; least/most; less/more
- Arrange sets of objects from most to least

Standard 2: Students use algebraic methods to explore, model and describe patterns and functions involving numbers, shapes, data and graphs in problem-solving situations and communicate the reasoning used in solving these properties.

2.1 Reproducing, extending, creating and describing patterns and sequences using a variety of materials

Recognize, Create and Extend Patterns

- Recognize and anticipate an event that occurs routinely (e.g. repeated ringing of bell)
- Recognize and indicate when a change has interrupted a regular event (Change in the daily routine such as an assembly or fire drill)
- Reproduce a repeated event (e.g. clapping sequence)
- Recognize and reproduce a change in a regular event
- Match a line of a single object, shape, design or number (3, 3, 3, 3.)
- Recognize and demonstrate understanding of regularity in a pattern by adding on the next object, shape, design or number to a continuing pattern of single object, shape, design or number (circle, circle, circle, etc.)
- Match an alternating pattern of two or more objects, shapes, designs or numbers (2, 3, 2)
- Extend a repeating pattern of 2 or more objects, shapes, designs or numbers (cup, spoon, spoon)
- Find and supply a missing element in a repeating pattern (1,1,2,2,1,1,_)2))
- Create a repeating pattern using objects, shapes, designs or sets and numbers
- Predict, extend, or create a repeating pattern (numbers or objects)
- Match growing patterns by attribute and number
- Extend a growing pattern by supplying the next element (e.g. 5, 10, 15, 20, ----, ----)
- Find and supply a missing element in a growing pattern (fork, knife, spoon; fork, --- knife, spoon)
- Create growing patterns by attribute and number
- Predict, extend or create a pattern a growing pattern (numbers or objects)
- Label type of pattern (repeating, growing)

- Locate a pattern in order to solve a problem (recall a phone number by remembering there is a pattern, e.g., 555-1212)

2.2 Describing patterns and other relationships using tables, graphs and open sentences

Sort, Classify, Describe or Order Collections

- Sort collections of items (e.g. big buttons from little buttons)
- Sort by a single attribute (group by color, size, shape, etc.)
- Label collections of items (e.g. shapes, numbers, etc.)
- Determine a pattern within an alternate (abstract) representation (e.g. calendar or number line)
- Continue an established pattern within an alternate (continue patterns of numbers on a calendar, days of week, classroom schedule, etc.)
- Identify linear vs. 2 dimensional pattern (calendar, 100 chart, graphs with 2 axis)
- Classifying objects based on attributes (e.g. forks, knives, spoons as 'silverware')

2.3 Identify and communicate rules that define patterns (concrete to abstract) for the purpose of solving problems

Use Rule or Pattern to Solve a Problem

- Locate a pattern in order to solve a problem
- Describe pattern in order to solve a problem (each number in the pattern is increasing by 2)

2.4 Observing and explaining how a change in one quantity can produce an change in another

Understand the Effects of Change

- Recognize cause/effect relationship between two elements (e.g. hit switch, number appears on screen)
- Demonstrate/communicate what the relationship is between the two elements (if a person earns \$5.00 per hour and works a 40 hour week, a change in hours will change the amount of money earned in that week)
- Predict how change in one element may change the other element (e.g. hit switch two times, two numbers appear on screen)

2.5 Using algebraic symbols to represent and analyze situations

Demonstrate the ability to use algebraic symbols to represent and analyze situations

- Demonstrate the understanding of symbols $<$, $>$, $=$
- Recognize that a box is used as a place holder
- Find simple missing addends represented by a box in number sentences
- Supply the missing number for open sentences
- Find values that satisfy an inequality (e.g., $\square > 5$)
- Supply appropriate relation symbol when given two quantities/labels

Standard 3: Students use data collection and analysis, statistics, and probability in problem-solving situations and communicate the reasoning and processed used in solving these problems.

3.1 Constructing, reading, and interpreting displays of data including tables, charts, pictographs, and bar graphs.

Collect and Display Data

- Indicate an awareness of collections within the environment (e.g. books, shoes, boys/girls, etc.)
- Add to collections
- Given a class of objects, sort into categories and subcategories (e.g. laundry into shirts, pants, socks-socks into colors, or food items into different food group, etc.)
- When given a problem or situation, determine the data (objects or information) that needs to be collected
- Identify where to get data about a category
- Identify how to get data about a category
- Use a symbol to represent data (e.g. marks on a page, tokens, etc.)
- Gather data
- Ask questions to gain information
- Sort data into general and subcategories to solve the problem or situation (e.g. how many students have hats, how many boys have hats, etc.)
- Determine quantity (frequency) of data gathered, or needed, in each category (frequency table)
- Explain data
- Demonstrate an understanding that data can be displayed in a variety of ways
- Display data using concrete representations
- Represent numbers in different ways/forms
- Display data using abstract representations
- Display 2 or more categories on a bar graph

3.2 Interpreting data using the concepts of largest, smallest, most often, and middle.

Interpret Data

- Indicate an understanding of comparison words within the natural environment such as: more/fewer/same/none/larger/smaller/less/most/middle
- Use comparison words to describe the elements of a collection or groups within the natural environment (e.g. larger, fewer, more, less, etc.)
- Describe the characteristics of categories and subcategories of data using comparison words (e.g. many boys wear hats to school, some girls wear hats to school, etc.)
- Arrange categories of data in an ordered manner (e.g. largest to fewest)
- Compare categories of data using comparison words (e.g. more boys than girls wear hats to school)
- Demonstrate an awareness that symbols may be used to represent objects and events
- Use tables, charts or graphs to represent meaningful information
- Create a bar graph using real objects and/or symbols
- Determine which category has the most
- Determine which data point is in the middle
- Communicate the relationships among categories

3.3 Generating, analyzing, and making predictions based on data obtained from surveys and chance devices

Make Predictions

- Predict outcome based on available information (if-then)
- Understand prediction language such as 'likely' and 'not likely'
- Predict outcome of chance event (e.g. guess whether coin will land heads or tails)
- Collect and record information about chance events

- Describe frequency of occurrences within a chance event
- Use outcome information to predict future occurrences (which hits first when dropped? A feather or a rock?)

3.4 Solving problems using various strategies for making combinations (for example, determining the number of different outfits that can be made using two blouses and three skirts)

- Given 2 different sets, understands different combinations can be made when using an element from each set. (e.g. 2 shirts, 2 pants = 4 different outfits)
- When given one set of one object and another set of two objects, describe all possible combinations
- When given two sets of limited numbers of items, form all distinct combinations (make sure all objects are used)
- Explain difference between combinations
- Rearrange in a variety of ways by different attributes
- Understand that change in one category affects the outcome of combining that category with another (e.g. number and types of combinations-adding a shirt to a set of shirts will affect the number of combinations that can be made of shirts with the existing number of pants)

Standard 4: Students use geometric concepts, properties and relationships in problem-solving situations and communicate the reasoning used in solving these problems.

4.1 Recognizing shapes and their relationships using a variety of materials

Recognize Shapes

- Interact with geometric materials
- Recognize that shapes are the similar or different
- Match shapes (line, circle, square, triangle, rectangle, oval) to like shape in same position
- Match shape to like shape in a different position
- Sort objects by shapes
- Match shape to picture
- Label shapes
- Finds various shapes in environment
- Determine if two figures/objects are the same shape (visually matching)
- Determine if two shapes are congruent

4.2 Identifying, describing, drawing, comparing, classifying and building physical models of geometric figures.

Construct Geometric Models

- Match three dimensional shapes in similar positions
- Match three dimensional shapes in different positions
- Sort three dimensional shapes by the fundamental definition(vs. extraneous such as size, color) of that shape (cube-4 sides, cylinder-round, triangle-3 sides, etc.)
- Describe attributes of shapes (e.g. points, sides, round, etc)
- Identify shape of an object in a typical and nontypical display by attributes
- Recognize the properties of points, lines, and planes

- Recognize attributes of pairs of lines (parallel vs. intersecting lines)
- Identify the two dimensional shape in a three dimensional object, such as cubes (square), shoe box (rectangle), cylinder (circle)
- Construct 2-3 dimensional shapes
- Differentiate right angles from other angles

4.3 Relating geometric ideas to measurement and number sense.

Measure Attribute of Shape

- Discriminate between sizes of shapes
- Estimate number of objects needed to cover a specified distance
- Estimate number of objects/shapes needed to cover a specified area
- Estimate number of objects/shapes needed to fill a specified volume

4.4 Solving problems using coordinate geometry

Understand How to Combine Geometric Figures

- Demonstrate an understanding of object positions such as off, on, top, over, under, in front of, in back of, behind, beside, outside, inside
- Place shapes together to make another shape (e.g. 2 squares to form a rectangle, 2 identical right triangles to form a square)
- Subdivide geometric shapes to make other shapes (e.g. fold paper in half to form a rectangle)
- Form a line or lines of symmetry in a two-dimensional shape
- Produce reflection given a line of symmetry and half a shape
- Recognize and apply slides, flips, and turns.

Standard 5: Students use a variety of tools and techniques to measure, apply the results in problem-solving situations, and communicate the reasoning used in solving these problems.

5.1 Knowing, using, describing, and estimating measures of length, perimeter, capacity, weight, time and temperature; and

5.2 Comparing and ordering objects according to measurable attributes

5.3 Demonstrating the process of measuring and explaining the concepts related to units of measurement.

Tell Time

- Recognize changes in the environment (day/night, hot/cold, etc.)
- Show an awareness of time as a sequence of events that relates to daily life
- Show an awareness of time related symbols/objects (pointing to clock, calendar, picture of sun meaning daytime)
- Show an awareness of time related language (time to brush teeth, time to wake up)
- Demonstrate an understanding of symbolic representations of daily activities (calendar box; tangible/object system)
- Demonstrate use of clock, daily schedule, calendar
- Follow an established daily routine/schedule
- Understand that a routine has been changed and is able to follow the changes

- Demonstrate and describe time events using general terms such as day-night morning-afternoon-evening, today-tomorrow-yesterday, before-after, now
- Estimate the amount of time to complete task
- Compare time intervals (more time, less time)
- Use words to describe duration (long, short, 2 weeks)
- Plan activities
- Describe and represent past events
- Sequence events by order
- Describe different rates of movement (fast/slow)
- Understands that there are 60 seconds in a minute
- Understands that there are 60 minutes in an hour
- Understands that there are 24 hours in a day
- Tell time by the hour using both analog and digital
- Tell time by the half hour using both analog and digital
- Tell time by the quarter hour using both analog and digital
- Tell time by the 5 minute increment using both analog and digital
- Tell time by the minute increment using both analog and digital
- Round to the nearest hour
- Round to the nearest half hour
- Understand stop/start
- Identify the days of the week
- Use the name of the current day of the week
- Distinguish between weekday and weekend
- Identify yesterday, today, and tomorrow
- Name the current month
- Name own date of birth
- Locate birthday on calendar
- Label seasonal changes (winter, spring, summer, fall)
- Use calendar to recognize days, weeks, months and seasons
- Name holidays and special events using calendar
- Sequence events using a timeline
- Identify tools associated with measuring time

Measure Length/Perimeter

- Interact with tools associated with measurement
- Identify tools associated with measurement, such as ruler, tape measure, etc.
- Attend to others using measurement language (inch, foot, mile, longer, shorter)
- Use words such as long, short
- Compare lengths using longer than, shorter than, the same length
- Compare distances using farther than, nearer than
- Demonstrate an understanding of directionality
- Estimate and measure with nonstandard tools, such as cubes (paperclips, feet and hands) to measure length
- Demonstrate understanding of number conservation (when objects rearranged, number/weight/mass still the same)
- Estimate and measure with nonstandard tools to measure perimeter (the length of the boundary)
- Use vocabulary of inch, foot, yard, mile, centimeter, meter, kilometer
- Use appropriate standard unit of measurement when estimating length, distance, etc.

Measure Capacity

- Identify tools associated with measuring capacity (teaspoon, tablespoon, measuring cup)
- Identify full/empty
- Use words such as a lot, a little
- Compare volumes of more, less, same
- Identify measuring units of teaspoon, tablespoon, cup, pint, quart, gallon, liter
- Use nonstandard unit as a measurement of capacity (e.g. 12 paper cups to fill the bowl)
- Use appropriate standard unit of measurement when estimating capacity
- Demonstrate understanding of conservation (when liquid is poured from one container to another, still same volume)
- Recognize that shape of container is not determining property of capacity

Measure Weight

- Identify tools associated with measuring weight (scale, balance scale)
- Demonstrates an understanding of heavy, light
- Identifies weight units of pound, ounce; mass: grams and kilograms
- Uses words such as a heavy, light
- Compare weights of heavier than, lighter than, the same weight
- Uses appropriate standard units of measurement when describing weight
- Demonstrate understanding of conservation (mass remains constant when shape of an object is changed e.g. rolling a ball of clay into a cylinder.)

Measure Temperature

- Identify tools associated with measuring temperature
- Indicate changes in temperature
- Indicate difference between hot and cold
- Identify units of temperature (e.g. degrees Celsius, degrees Fahrenheit)
- Read temperature on thermometer
- Use appropriate standard unit of measurement when estimating temperature
- Associate temperature reading with hot/cold

Standard 6: Students link concepts and procedures as they develop and use computational techniques, including estimation, mental arithmetic, paper and pencil, calculators and computers in problem-solving situations and communicate the reasoning used in solving these problems.

6.1 *Demonstrating conceptual meanings for the four basic arithmetic operations of addition, subtraction, multiplication and division.*

Apply Basic Addition/Subtraction Concepts

- Demonstrate an understanding of some/more/take away/all gone/no more
- Choose the correct operation to the situation
- Connect symbols to operation
- Demonstrate an understanding of addition as combining collections/counting on
- Form sets of objects of up to ten items
- Translate written number to a set of objects, combine sets of objects, count objects
- Demonstrate an understanding of subtraction as taking away from a collection
- Demonstrate an understanding of subtraction as comparing collections of different sizes
- Determine if the number of identical objects in two groups are the same or different and which groups has more (when arranged in a random presentation)

- Given two unequal sets of identical objects, determine which group has more and how many more
- Demonstrate an understanding of multiplication by (1) combining equal sets of objects (repeated addition), (2) an m by n array, (3) number of possible pairings of objects in two sets
- Demonstrate an understanding of division as 1) sharing equally, 2) repeated subtraction

6.2 *Adding and subtracting commonly used fractions and decimals using physical models*

Add and subtract halves, thirds, and fourths

- Add and subtract halves
- Add and subtract thirds
- Add and subtract fourths

6.3 *Demonstrating understanding and proficiency with basic addition, subtraction, multiplication and division facts without the use of a calculator*

Use a Strategy to Find Basic Addition/Subtraction Facts

- Employ strategies to find simple addition facts (single digit-sums up to 10)
- Employ strategies to find simple subtraction facts (single digit-differences from 10)

6.4 *Constructing, using and explaining procedures to compute and estimate with whole number*

Use Procedures to Compute

- Use concrete materials to compute addition problem
- Use alternate computational strategies for addition and subtraction
- Use standard algorithms for addition and subtraction
- Demonstrate a strategy for rounding numbers up or down

6.5 *Selecting and using appropriate methods for computing with whole numbers in problem-solving situations from among mental arithmetic, estimation, paper and pencil, calculator and computer methods*

Use Appropriate Method to Compute Problem

- Choose correct operation to solve problem
- Identify tool to solve problem
- Enter numbers correctly on calculator/write numbers correctly
- Carry out strategy to solve problem
- Determine if results make sense

Compute with whole numbers

- Employ strategies to recall simple addition facts (single-digit sums up to 10, e.g. $1 + 9 = 10$)
- Employ strategies to recall simple subtraction facts (single-digit differences from 10, e.g., $8 - 2 = 6$)
- Employ strategies to recall simple multiplication facts
- Employ strategies to recall simple division facts
- Use concrete procedures to compute addition problems (e.g., use manipulatives)
- Use concrete procedures to compute subtraction problems (e.g., use manipulatives)
- Use concrete procedures to compute multiplication problems (e.g., use manipulatives)
- Use concrete procedures to compute division problems (e.g., use manipulatives)



- Demonstrate a strategy for rounding numbers up or down
- Use a calculator for whole number calculations

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