IOWA | Department of Education

IOWA ACADEMIC STANDARDS
ESSENTIAL ELEMENTS FOR

Mathematics

for Students with Significant Cognitive Disabilities

September 2024

Contents

Introduction

The Iowa Academic Standards Essential Elements (EEs) for Mathematics are specific statements of knowledge and skills linked to the grade-level expectations identified in the Iowa Academic Standards for Mathematics. The purpose of the EEs is to build a bridge from the content in the Iowa Academic Standards to academic expectations for students with the most significant cognitive disabilities.

These EEs are not intended as a redefinition of the standards. Rather, they are intended to describe challenging expectations for students with significant cognitive disabilities in relation to the Iowa Academic Standards. The EEs clarify the bridge between grade-level achievement expectations for students with significant cognitive disabilities participating in alternate assessments and the Iowa Academic Standards.

Neither are the EEs intended to prescribe the beginning or end of instruction on the content and skills they represent; rather, they indicate the grade level at which initial mastery would be the target to be assessed. Students should begin instruction in content and skills at the earliest point possible and continue instruction until mastery is attained.

This document provides a high-level view of the relationship between the Iowa Academic Standards and the links to performance for students with significant cognitive disabilities. It is intended to provide a beginning structure for the design of an instructionally embedded alternate assessment. The document is not intended as a stand-alone guide to instruction, nor is it intended to contain all the steps in a complete learning progression or detailed curriculum. The DLM and associated professional development will provide greater detail than described in this document.

System Alignment

The EEs are intended to contribute to a fully aligned system of standards, curriculum, teaching, learning, technology, and assessment that optimize equity of opportunity for all students in each classroom, school, and local education agency to access and learn the standards. To the degree possible, the grade-level EEs are vertically aligned and linked to the grade-level Iowa Academic Standards.

The linkages provided by the EEs to the Iowa Academic Standards are intended to increase access to the general curriculum for all students with disabilities. Just as the EEs are designed to define achievement in academic content areas linked to the Iowa Academic Standards, the EEs reframe the expectations for foundational skills in pre-academic and academic areas. Precursor/prerequisite and the unique enabling skills related to mathematics content are specified in the context of their roles as a foundation for students with significant cognitive disabilities to achieve skills related to academic content. The EEs are designed to allow students with significant cognitive disabilities to progress toward the achievement of state standards linked to grade-level expectations. The relationship of standards and assessment to teaching and learning are depicted for use by teachers, assessment designers, and users of alternate assessment results.

Access to Instruction and Assessment

The EEs are intended to create the maximum possible access to the Iowa Academic Standards for students with significant cognitive disabilities. How information is presented for instruction and assessment and the way students demonstrate achievement is not intended to be limited by statements of EEs. To that end, modes of communication, both for presentation and response, are not stated in the EEs unless a specific mode is an expectation. Where no limitation has been stated, no limitation should be inferred. Students' opportunities to learn and to demonstrate learning should be maximized by providing whatever communication, assistive technologies, augmentative and alternative communication (AAC) devices, or other access tools that are necessary and routinely used by the student during instruction.

Students with significant cognitive disabilities include a broad range of students with diverse needs. For some students with significant cognitive disabilities, graphic organizers like those used by students without

disabilities provide useful access to content and are adequate to maximize opportunities to learn and demonstrate achievement. Other students require a range of assistive technologies to access content and demonstrate achievement. For some students, AAC devices and accommodations for hearing and visual impairments will be needed. As with other physical disabilities, students with visual impairments may perform some expectations using modified items, presentations, or response formats. A few items may not lend themselves to such modifications. Decisions about the appropriate modifications for visual impairments are accounted for in the design of the assessments.

The access challenge for some is compounded by the presence of multiple disabilities. All these needs, as well as the impact of levels of alertness due to medication and other physical disabilities that may affect opportunities to respond appropriately, need to be considered.

Technology

Technology is also of importance to students with significant cognitive disabilities to access the Iowa Academic Standards and achieve the EEs. Assistive technology tools; low, medium, and high tech, can be vital to a student in acquiring and demonstrating learning unimpeded by the barriers that the disability presents. Most presentation and response access conditions do not constitute accommodations as they are understood for students who take the general assessment. Methods of presentation that do not violate the intended construct by aiding or directing the student's response allow the student to perceive what knowledge or skill is expected. Aids to responding that do not constitute a violation of the intended construct allow the student to demonstrate the expected knowledge and skills.

- Examples of access technologies include the following:
- Communication devices that compensate for a student's physical inability to produce independent speech.
- Devices that compensate for a student's physical inability to manipulate objects or materials, point to responses, turn pages in a book, or use a pencil or keyboard to answer questions or produce writing.

Tools that maximize a student's ability to acquire knowledge and skills and to demonstrate the products of their learning.

Model symbol use throughout instruction

Many students with significant cognitive disabilities have difficulty with or cannot use speech to communicate and/or are supported using communication symbols (e.g., communication boards, speech generating devices, voice output communication devices) and supports to augment their speech and other means of communication. Students who require symbols and other AAC supports require frequent modeling in the use of those symbols to interact and respond during instruction. Students who use symbols and other communication supports need as much modeling as children who use speech to communicate. Modeling in this way is not viewed as a means of prompting, guidance, or support, just as having a teacher talk serves those purposes for a student who communicates using speech.

When modeling the use of symbols and other communication supports, teachers use the symbols and supports themselves, hand them to students without communication impairments to use, and involve the students who need to use them every day. Each of these steps can play an important role in validating the use of symbols and communication supports and demonstrating multiple levels of expertise in their use.

Use partner assisted scanning across the day

Partner-assisted scanning is used to support students who have motor, communication, and/or visual impairments. The communication partner (teacher, paraprofessional) scans the array of choices by showing/pointing and/or speaking the names of items i.e. scanning the items using visual means, auditory means, or a combination of the two. The communication partner pauses long enough between the choices for the student with the physical, communication, and or vision impairment to respond to their desired choice. Depending upon the needs of the student, they may use one action to accept the choice or a two-step action to accept and reject the choices as they are scanned by the communication partner. It is suggested that teachers use partner-assisted scanning to support these modes of responding and communicating whenever it appears that the act of directly pointing to a response is too difficult for a student.

Guidance and Support

The authors of the Common Core State Standards use the words, “prompting and support” at the earliest grade levels to indicate when students were not expected to achieve standards completely independently. Generally, prompting refers to “the action of saying something to persuade, encourage, or remind someone to do or say something” (McKean, 2005). However, in special education, prompting is often used to mean a system of structured cues to elicit desired behaviors that otherwise would not occur. To communicate clearly that teacher assistance is permitted during instruction of the EEs, and is not limited to structured prompting procedures, the decision was made by the stakeholder group to use the more general term *guidance* throughout the EEs.

Guidance and support during instruction should be interpreted as teacher encouragement, general assistance, and informative feedback to support the student in learning. Some examples of the kinds of teacher behaviors that would be considered guidance and support include:

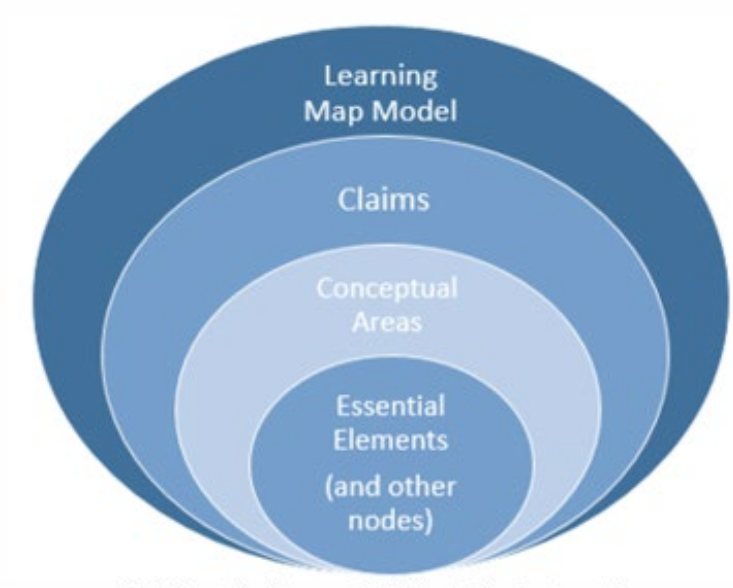
- Getting the student started (e.g., “Tell me what to do first.”).
- Providing a hint in the right direction without revealing the answer (e.g., Student is stuck on an addition problem and does not know where to start. The teacher might say, “See if you can count out the number of blocks in the problem.”).
- Narrowing the field of choices as a student provides an inaccurate response.
- Using structured technologies such as task-specific word banks.
- Providing structured cues such as those found in prompting procedures (e.g., least-to-most prompts, simultaneous prompting, and graduated guidance).

Guidance and support as described above apply to instruction. Alternate assessments measure the degree to which students with significant cognitive disabilities have mastered the EEs. During any assessment, accommodation(s) allowed on the assessment must have been used and practiced during instruction; however, some accommodations that are permissible during instruction would compromise the integrity of the assessments, thereby yielding invalid and unreliable results and cannot be used for assessment purposes.

Alignment of the Iowa Academic Essential Elements to the Dynamic Learning Maps

Claims and conceptional areas

The Dynamic Learning Maps (DLM) system uses a variant of evidence-centered design (ECD) as the framework for developing the DLM Alternate Assessment System. While ECD is multifaceted, it starts with a set of claims regarding important knowledge in the domains of interest as well as an understanding of how that knowledge is acquired. Two sets of claims have been developed for DLM that identify the major domains of interest for students with significant cognitive disabilities. These claims are broad statements about expected student learning that serve to focus the scope of instruction and assessment. Because the learning map identifies paths to the acquisition of academic skills, the claims also help to organize the structures in the learning map for this population of students. Specifically, conceptual areas within the map further define the knowledge and skills required to meet the broad claims identified by DLM. The claims are also significant because they provide another means through which to evaluate alignment between the EEs and the learning map nodes and serve as the foundation for evaluating the validity of inferences made from test scores. EEs related to a claim and conceptual area must clearly link to one another, and the learning map must reflect how that knowledge is acquired. Developing the claims and conceptual areas for DLM provided a critical framework for organizing nodes on the learning maps and, accordingly, the EEs that align with each node. Clearly articulated claims and conceptual areas for DLM served as an important evidence-centered framework within which this version of the EEs was developed. With the claims and conceptual areas in place, the relationship between EEs within a claim and conceptual area or across grade levels is easier to track and strengthen.



Unpacking the Essential Elements

Where applicable, an unpacked section identifies the concepts, skills, big ideas, and essential questions for each grade-level cluster. This will help teachers understand what the student needs to know and be able to do. It is important to note that the standards do not support isolated skill development but conceptual understanding and skill development within context.

The unpacked Iowa Core ELA EEs provides teachers with the concepts, skills, big ideas, and essential questions:

- To set the expectation for the learning goals in an instructional unit
- As instructional filters for selecting lessons and activities

Unpacking means to identify the concepts and skills found in the cluster of grade-level EEs.

- What does the student need to know (concepts and content)?
- What does the student need to be able to do (skills)?
- Is there a context in which the information is nested (counting, equal shares, addition all nested in multiplication)?
- To what depth of understanding should the information be learned (identifying, remembering, analyzing, creating, etc.)?

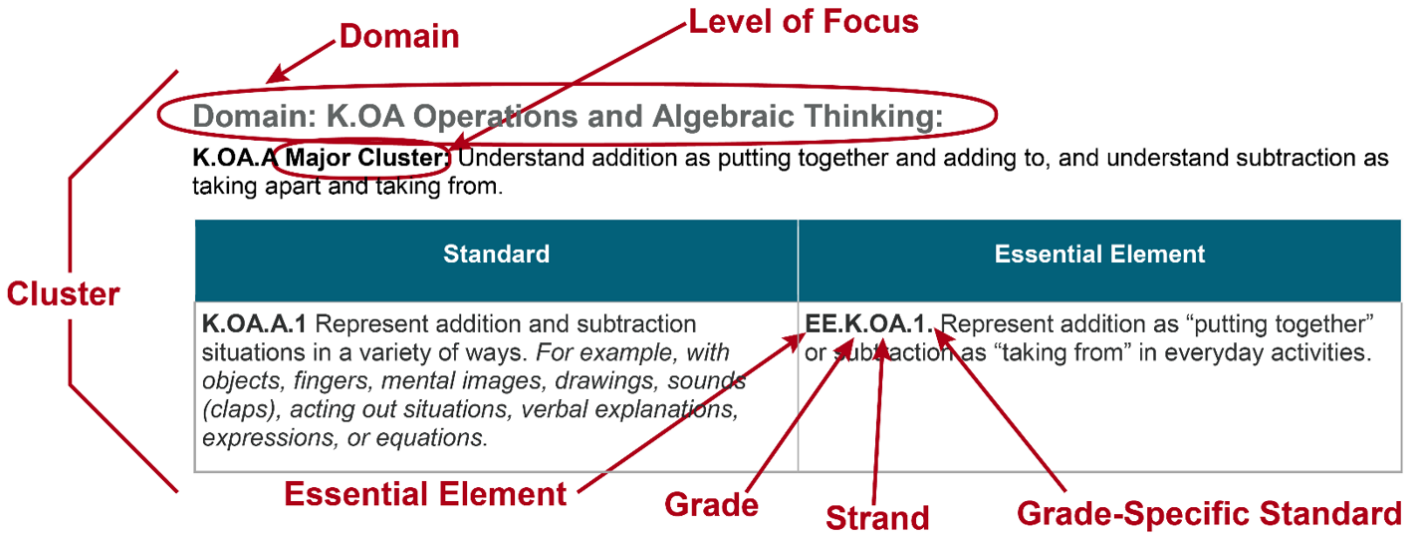
For every cluster the unpacked EEs document provides four components:

- Concept
  - Because the EEs were unpacked by cluster and not each Essential Element the concept is inferred from all of the EEs in the cluster.
- Skills
  - What might that look like for students with significant cognitive disabilities?
    - Point
    - Eye gaze
    - Vocalize
    - Use of AAC system (with or without switches, high tech or low tech)
    - Partner assisted scanning
- Big idea
  - What we want students to comprehend independently and remember indefinitely
    - Will the big idea apply to more than one content area of learning?
    - Will the big idea apply to more than one grade?
    - Will the big idea be important in the future?
    - Will the big idea be one a student can remember after instruction ends?

- Essential questions
  - Are more narrowly focused and point to the big ideas and concepts
  - Provoke thought, discussion, inquiry, new understandings, and more questions
  - Ask students to consider alternates, weigh evidence, support ideas, and justify answers
  - Spark meaningful connections with prior learning, personal experience, and prior lessons
  - Help students transfer knowledge to other situations and subjects

For more detailed information on the Iowa Academic Standards for Mathematics, please refer to the standards document.

Interpreting the Essential Elements and Mathematics Strands



Claims and Conceptual Areas Tested in DLM Mathematics Testlets

Claim 1

Number Sense: Students demonstrate increasingly complex understanding of number sense.

Conceptual Areas:

- MC 1.1 Understand number structure (counting, place value, fraction)
  - Aligned EEs: K.CC.1, 4 ,5; 1.NBT.1a-b; 2.NBT.2a-b,3; 3.NBT.1,2,3; 3.NF.1-3; 4.NF.1-2,3; 5.NF.1,2; 6.RP.1; 7.RP.1-3; 7.NS.2.c-d; 8.NS.2.a
- MC 1.2 Compare, compose, and decompose number sets
  - Aligned EEs: K.CC.6; 1.NBT.2, 3, 4, 6; 2.NBT.1, 4, 5b; 4.NBT.2, 3; 5.NBT.1, 2, 3, 4; 6.NS.1, 5-8; 7.NS.3; 8.NS.2.b; 8.EE.3-4;
- MC 1.3 Calculate accurately and efficiently using simple arithmetic operations
  - Aligned EEs: 2.NBT.5.a, 6-7; 3.OA.4; 4.NBT.4, 5.NBT.5, 6-7; 6.NS.2, 3; 7.NS.1, 2. a, 2.b; 8.NS.1; 8.EE.1; N-CN.2.a, 2.b, 2.c; N-RN.1; S-CP.1-5; S-IC.1-2

Claim 2

Geometry: Students demonstrate increasingly complex spatial reasoning and understanding of geometric principles.

Conceptual Areas

- MC 2.1 Understand and use geometric properties of two- and three-dimensional shapes
  - K.MD.1-3; K.G.2-3; 1.G.1, 2; 2.G.1; 3.G.1; 4.G.1, 2; 4.MD.5, 6; 5.G.1-4; 5.MD.3; 7.G.1, 2, 3, 5; 8.G.1, 2, 4, 5; G-CO.1, 4-5, 6-8; G-GMD.1-3, 4
- MC 2.2 Solve problems involving area, perimeter, and volume
  - 1.G.3; 3.G.2; 4.G.3; 4.MD.3; 5.MD.4-5; 6.G.1, 2; 7.G.4, 6; 8.G.9; G-GMD.1-3; G-GPE.7

Claim 3

Measurement Data and Analysis: Students demonstrate increasingly complex understanding of measurement, data, and analytic procedures.

Conceptual Areas

- MC 3.1 Understand and use measurement principles and units of measure
  - 1.MD.1-2, 3.a, 3.b, 3.c, 3.d; 2.MD.1, 3-4, 5, 6, 7, 8; 3.MD.1, 2, 4; 4.MD.1, 2.a, 2.b, 2.c, 2.d; 5.MD.1.a, 1.b, 1.c; N-Q.1-3
- MC 3.2 Represent and interpret data displays
  - 1.MD.4; 2.MD.9-10; 3.MD.3; 4.MD.4.a, 4.b; 5.MD.2; 6.SP.1-2, 5; 7.SP.1-2, 3, 5-7; 8.SP.4; S-ID. 1-2, 3, 4

Claim 4

Algebraic and functional reasoning: Students solve increasingly complex mathematical problems, making productive use of algebra and functions.

Conceptual Areas

- MC 4.1. Use operations and models to solve problems
  - K.OA.1, 1.a, 1.b, 2, 5.a, 5.b; 2.OA.3, 4; 3.OA.1-2, 8; 4.OA.1-2, 3, 4; 6.EE.1-2, 3, 5-7; 7.EE.1, 4; 8.EE.7; A-CED.1, 2-4; A-SSE.1, 3
- MC 4.2 Understand patterns and functional thinking
  - 3.OA.9; 4.OA.5; 5.OA.3; 7.EE.2; 8.EE.5-6; 8.F.1-3, 4, 5; A-REI.10-12; A-SSE.4; F-BF.1, 2; F-IF.1-3, 4-6; F-LE.1

Code Key (for above):

A-CED = creating equations	G-GMD = geometric measurement & dimension	NS = number systems;
A-SSE = seeing structure in equations	G-GPE = general properties & equations	N-Q = number & quantity
BF = building functions	MD = measurement & data;	OA = operations & algebraic thinking
CC = counting & cardinality	NBT = numbers & operations in base ten;	RP = ratios & proportional relationships
EE = expressions & equations	N-CN = complex number system;	SP = statistics & probability
F-BF = basic fractions	NF = numbers & operations - fractions	S-IC- statistics & probability - making inferences/justifying conclusions
F-IF = interpreting functions	N-RN = real number system	S-ID = statistics & probability - interpreting categorical & quantitative data
G = geometry		

Kindergarten

Domain: K.CC Counting and Cardinality

K.CC.A Major Cluster: Know number names and the count sequence forward.

Standard	Essential Element
K.CC.A.1 Count to 100 by ones and by tens.	**EE.K.CC.1** Starting with one, count to 10 by ones.
K.CC.A.2 Count forward beginning from any given number within the range of 0–100.	See **EE.2.NBT.2.b**
K.CC.A.3 Write numbers from 0 to 20. Given a set of 0–20 objects, write a numeral to represent the quantity.	See **EE.2.NBT.3**

Unpacked

Concept: Numbers have meaning.

Skills: Indicate the desire for more quantity of something; use number words when naming a quantity even if it is not the right number word; count 1-10 in sequence.

Big idea: Use words or numerals to represent quantity.

Essential questions: How do I communicate the number I want? What number names are used to count to 10? Which words describe how many?

K.CC.IA.A Supporting Cluster: Know number names and the count sequence backward.

Standard	Essential Element
K.CC.IA.A.1 Count backwards by ones from 20 to 0.	Not applicable.
K.CC.IA.A.2 Count backwards beginning from any given number within the range of 0–20.	Not applicable.

K.CC.B Major Cluster: Count to tell the number of objects.

Standard	Essential Element
K.CC.B.4 Demonstrate awareness of the principles of counting. a. Number names must be said in the standard order (sequencing). b. Each object must be paired with one and only one number name and each number name with one and only one object (one-to-one correspondence). c. The last number name said tells the number of objects counted, objects may be counted in any order (cardinality). d. The number of objects is the same regardless of their arrangement or the order in which they were counted (conservation of number). e. Each successive number name refers to a quantity that is one larger.	**EE.K.CC.4** Demonstrate one-to-one correspondence, pairing each object with one and only one number and each number with one and only one object.
K.CC.B.5 Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration given. Given a number from 1–20, count out that many objects.	**EE.K.CC.5** Count out up to three objects from a larger set, pairing each object with one and only one number name to tell how many.
K.CC.IA.B.1 Quickly recognize and name the quantity of up to 5 objects briefly shown in structured or unstructured arrangements without counting (perceptual subitizing).	Not applicable.

Unpacked

Concept: Numbers have a sequence and represent quantity.

Skills: Count objects using a one-to-one correspondence, pairing each object with one and only one number and each number with one and only one object; identify total quantity in a set using a single number name; count items (concrete, pictorial) to tell how many; count out up to three objects from a larger set.

Big idea: Use numbers to identify how many in a set.

Essential questions: What is the sequence I use to count? What number name goes with each object in the group? How do I know when to stop counting? How many objects are there? How can I organize the objects so I remember what I have counted?

K.CC.C Major Cluster: Compare numbers.

Standard	Essential Element
K.CC.C.6 Determine whether the number of objects in one group of 1–10 objects is greater than, less than, or equal to the number of objects in another group of 1–10 objects. *For example, using matching and counting strategies.*	**EE.K.CC.6** Identify whether the number of objects in one group is more or less than (when the quantities are clearly different) or equal to the number of objects in another group.
K.CC.C.7 Compare two numbers between 1 and 10 presented as written numerals.	See **EE.2.NBT.4**

Unpacked

Concept: Discriminates between groups **.**

Skills: Identify a group of objects to be counted; identify two or more groups as more or less; identify two or more groups of equal value; identify two or more groups as more, less, or equal.

Big idea: Sets can be compared by their relative quantities.

Essential questions: What is a group? Which group has more, less or equal quantities?

Domain: K.OA Operations and Algebraic Thinking:

K.OA.A Major Cluster: Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Standard	Essential Element
K.OA.A.1 Represent addition and subtraction situations in a variety of ways. *For example, with objects, fingers, mental images, drawings, sounds (claps), acting out situations, verbal explanations, expressions, or equations.*	**EE.K.OA.1** Represent addition as “putting together” or subtraction as “taking from” in everyday activities.
K.OA.A.2 Add and subtract within 10 and solve word problems involving the different problem types listed below. *For example, by using objects or drawings to represent the problem.* • Add-to with result unknown. • Take-from with result unknown. • Put-together/take-apart with total unknown. • Put-together with both addends unknown.	See **EE.2.NBT.6–7**
K.OA.A.3 Decompose numbers less than or equal to 10 in more than one way. *For example, by using objects or drawings, and record each decomposition by a drawing or equation, as in* $5 = 2 + 3$, $5 = 4 + 1$, and $5 = 2 + 2 + 1$.	See **EE.1.NBT.6**

Standard	Essential Element
K.OA.A.4 For any number from 1 to 9, find the number that makes 10 when added to the given numbers by using objects or drawings and record the answer with a drawing or equation.	See **EE.1.NBT.2**
K.OA.A.5 Fluently add and subtract within 5 using efficient mental strategies. • Counting on. • Counting back. • Using the relationship between addition and subtraction. • Creating equivalent, but easier or known sums. By the end of kindergarten, flexibly, efficiently and accurately find all sums within 5. Note: Fluency of this standard is critical by the end of grade level.	See **EE.3.OA.4**

Unpacked

Concept: Addition and subtraction are used to represent and solve many different kinds of problems.

Skills: Identify a group as being more when two or more groups are put together; identify a group as being less when objects are taken away; use one-to-one correspondence to find the quantity of a group before and after putting together or taking from the group.

Big idea: The quantity of a group can change when items are put with or taken from a group.

Essential questions: What happens when I combine groups? What happens when I take groups apart?

Domain: K.NBT Number and Operations in Base Ten

K.NBT.A Major Cluster: Work with numbers 11–19 to gain foundations for place value.

Standard	Essential Element
K.NBT.A.1 Compose and decompose numbers from 11 to 19 into ten ones and some further ones, by using objects or drawings, and record each composition or decomposition by a drawing or equation. For example, $18 = 10 + 8$; understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones	See **EE.1.NBT.4** and **EE.1.NBT.6**

Domain: K.MD Measurement and Data

K.MD.A Additional Cluster: Describe and compare measurable attributes.

Standard	Essential Element
K.MD.A.1 Describe several measurable attributes (*for example, length, width, weight*) of objects by using words such as short, long, small, big, heavy, light.	**EE.K.MD.1-3** Classify objects according to attributes (big/small, heavy/light).
K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*	**EE.K.MD.1-3** Classify objects according to attributes (big/small, heavy/light).

Unpacked

Concept: We find out about objects by looking at, touching, and directly comparing them.

Skills: Identify objects as heavy or light; identify objects as small or big; identify objects as same or different; compare objects big/small, heavy/light; group objects by attributes.

Big idea: Objects with similar characteristics can be grouped together.

Essential questions: Are these objects the same or different? Are these objects big or small? Are these objects heavy or light?

K.MD.B Supporting Cluster: Classify objects and count the number of objects in each category.

Standard	Essential Element
K.MD.B.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count. Limit category counts to be less than or equal to 10.	**EE.K.MD.1-3** Classify objects according to attributes (big/small, heavy/light).

K.MD.IA.B Additional Cluster: Identify attributes and values of money.

Standard	Essential Element
K.MD.IA.B.1 Identify the penny and know the value is one cent. Count pennies up to 20.	**EE.K.MD.IA.1** Identify the penny and know the value is one cent. Count pennies up to 10.

Domain: K.G Geometry

K.G.A Additional Cluster: Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

Standard	Essential Element
K.G.A.1 Describe objects in the environment using names of shapes and describe the relative positions of these objects using terms such as above, below, besides, in front of, behind, and next to.	See **EE.1.G.a**
K.G.A.2 Correctly name shapes regardless of their orientations or overall size.	**EE.K.G.2–3** Match shapes of same size and orientation (circle, square, rectangle, triangle).
K.G.A.3 Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").	**EE.K.G.2–3** Match shapes of same size and orientation (circle, square, rectangle, triangle).

Unpacked

Concept: Shapes have specific attributes.

Skills: Recognize the name of a shape; identify shapes of the same size; identify shapes of the same orientation; group shapes based on attribute; match same shapes.

Big idea: Shapes can be categorized by similar characteristics.

Essential questions: Are these shapes the same or different? Do these shapes match?

K.G.B Supporting Cluster: Analyze, compare, create, and compose shapes.

Standard	Essential Element
K.G.B.4 Analyze and compare two- and three-dimensional shapes, in varied sizes and orientations, using informal language to describe their similarities, differences, parts and other attributes. *For example, number of sides and vertices/corners and having sides of equal length*.	See **EE.7.G.1**
K.G.B.5 Model shapes in the world by building shapes from components and drawing shapes. For *example, sticks and clay balls*.	Not applicable.
K.G.B.6 Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?"*	See **EE.1.G.3**

First Grade

Domain: 1.OA Operations and Algebraic Thinking

1.OA.A Major Cluster: Represent and solve problems involving addition and subtraction.

Standard	Essential Element
1.OA.A.1 Use addition and subtraction within 20 to solve word problems involving the problem types listed below, with unknowns in all positions, by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. • Adding to. • Taking from. • Putting together. • Taking apart. • Comparing.	**EE.1.OA.1.a** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), or acting out situations. **EE.1.OA.1.b** Recognize two groups that have the same or equal quantity.
1.OA.A.2 Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20. *For example, by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.*	**EE.1.OA.2** Use "putting together" to solve problems with two sets.

Unpacked

Concept: The quantity of a set can change when items are added or subtracted.

Skills: Represent addition and subtraction; count objects in sets to determine if they are equal in quantity; communicate same quantity; use put together to solve problems.

Big idea: There are flexible methods of representing addition and subtraction to solve problems. One-to-one correspondence can be used to compare sets.

Essential questions: How can I represent the problem? How many items will there be if items are added or subtracted? How do I know if two sets have the same quantity? What does putting together do to the set?

1.OA.B Major Cluster: Understand and apply properties of operations and the relationship between addition and subtraction.

Standard	Essential Element
1.OA.B.3 Apply properties of operations, (commutative and associative), as strategies to add and subtract. *For example, Commutative property of addition, if* $8 + 3 = 11$ *is known then,* $3 + 8 = 11$ *is also known. Associative property of addition, to add,* $2 + 6 + 4$*, the second two numbers can be added to make a ten, so* $2 + 6 + 4 = 2 + 10 = 12$*.*	See **EE.6.EE.3** and **EE.N-CN.2**
1.OA.B.4 Understand subtraction as an unknown-addend problem. *For example, subtract* $10 - 8$ *by finding the number that makes 10 when added to 8.*	See **EE.1.NBT.4** and **EE.1.NBT.6**

1.OA.C Major Cluster: Add and subtract within 20.

Standard	Essential Element
1.OA.IA.C.1 Use counting and subitizing strategies to explain addition and subtraction. *a.* Relate counting to addition and subtraction *(for example, by counting on 2 to add 2).* b. Use conceptual subitizing in unstructured arrangements with totals up to 10 and structured arrangements anchored to 5 or 10 (*for example, 10 frames, double ten frames, math rack*) with totals up to 20 to relate the compositions and decompositions to addition and subtraction.	Not applicable.
1.OA.C.5 Relate counting forward and backward to addition and subtraction, add or subtract 1 or 2.	**EE.1.OA.5.a** Use manipulatives or visual representations to indicate the number that results when adding one more. **EE.1.OA.5.b** Apply knowledge of "one less" to subtract one from a number.
1.OA.C.6 Add and subtract within 20, using strategies such as: • Counting on. • Making ten *(for example,* $8 + 6 = 8 + 2 + 4 = 10 + 4 = 14$*).* • Decomposing a number leading to a ten *(for example,* $13 - 4 = 13 - 3 - 1 = 10 - 1 = 9$*).* • Using the relationship between addition and subtraction *(for example, knowing that* $8 + 4 = 12$*, one knows* $12 - 8 = 4$*).* • Creating equivalent but easier or known sums *(for example, adding* $6 + 7$ *by creating the known equivalent* $6 + 6 + 1 = 12 + 1 = 13$*).* • Counting up to subtract.	See **EE.3.OA.4**

Standard	Essential Element
1.OA.IA.C.2 Fluently add and subtract within 10 using efficient mental strategies. • Counting on. • Making ten. • Decomposing a number leading to a ten. • Using the relationship between addition and subtraction. • Creating equivalent, but easier or known sums. • Counting up to subtract. By the end of Grade 1, flexibly, efficiently, and accurately find all sums within 10. Note: Fluency of this standard is critical by the end of grade level.	Not applicable.

Unpacked

Concept: The quantity of a set can change when items are added or subtracted.

Skills: Use manipulatives and pictorial representations to add or subtract one; indicate the quantity when adding and subtracting one; use 1:1 correspondence.

Big idea: Adding to a set makes the quantity more and subtracting from a set makes the quantity less.

Essential questions: How do I represent a collection of objects when adding or subtracting one? What number represents the set when I add or subtract one? What happens to set when I add or subtract one?

1.OA.D Major Cluster: Work with addition and subtraction equations.

Standard	Essential Element
1.OA.D.7 Understand the meaning of the equal sign and determine if equations involving addition and subtraction are true or false. *For example, which of the following equations is true and which is false?* $6 = 6, 7 = 8 - 1, 5 + 2 = 2 + 5, 4 + 3 = 5 + 2.$	See **EE.1.OA.1.b** and **EE.2.NBT.5.a**
1.OA.D.8 Determine the unknown whole number in an addition or subtraction equation relating to three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations* $8 + \square = 11, 5 = \square - 3, 6 + 6 = \square.$	See **EE.3.OA.4**

Domain: 1.NBT Number and Operations in Base Ten

1.NBT.A Major Cluster: Extend the counting sequence.

Standard	Essential Element
1.NBT.A.1 Count forward and backward starting with any given number within the range of 0–120, In this range, read and write numerals and represent a number of objects with a written numeral.	**EE.1.NBT.1.a** Count by ones to 30. **EE.1.NBT.1.b** Count as many as 10 objects and represent the quantity with the corresponding numeral.

Unpacked

Concept: Numbers have a sequence and represent quantity.

Skills: Count objects using a one-to-one correspondence using correct sequence of number words; identify or represent total quantity using a single number word; identify or represent total quantity using a single numeral; count items (concrete, pictorial) to tell how many; recognize a counted set moved to another position doesn't change the value. (Conservation of number.)

Big idea: A numeral represents a quantity. Counting tells how many objects in a quantity. When counting, the last number counted is the total number of items; it is a cumulative count.

Essential questions: What number comes next? How many objects are there in the group? What was the last number I counted? How many do I have now (when a set is moved to a different position)?

1.NBT.B Major Cluster: Understand place value.

Standard	Essential Element
1.NBT.B.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases. a. 10 can be thought of as a bundle of ten ones — called a "ten." b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).	**EE.1.NBT.2** Create sets of 10.
1.NBT.B.3 Compare two two-digit numbers based on meanings of the tens and ones digits, using phrases as greater than, less than or equal to, connecting to the use of >, =, and < symbols.	**EE.1.NBT.3** Compare two groups of 10 or fewer items when the number of items in each group is similar.

Unpacked

Concept: Sets of ten must be perceived as a single entity when interpreting numbers using place value (e.g., 1 ten is one group, it is 10 ones).

Skills: Count objects to 10; separate objects into groups of 10; identify 10 as a composition of ten ones; compare groups of objects.

Big idea: Objects that are grouped make a set; objects can be grouped by a given number. Benchmark numbers such as 5 and 10 can be used to compare sets.

Essential questions: How many items do I want to put in each group? How do I keep track of the number of items I put in a group? Are the groups more, less or the same? How do I know when I have 10? What do I do with my extras? How many (more or less) do I need to make a set of 5 or 10?

1.NBT.C Major Cluster: Use place value understanding and properties of operations to add and subtract.

Standard	Essential Element
1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.	**EE.1.NBT.4** Compose numbers less than or equal to five in more than one way.
1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.	See **EE.1.OA.5.a** and **EE.1.OA.5.b**
1.NBT.C.6 Subtract multiples of 10 in the range 10 to 90 from multiples of 10 in the range 10 to 90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; explain the reasoning used.	**EE.1.NBT.6** Decompose numbers less than or equal to five in more than one way.

Unpacked

Concept: Any number can be represented in a number of ways that have the same value.

Skills: Identify the smaller numbers that make up a larger number (part-part-whole); use smaller quantities to compose larger quantities; break apart a larger quantity into at least two groups of smaller quantities; put the two groups back together to produce the original quantity; describe quantities in comparison to the benchmark of 5.

Big idea: Numbers can be composed and decomposed. The same quantity can be created in many ways.

Essential questions: How can I represent the same quantity in different ways? What is the number name for that quantity? How does this quantity compare to the quantity of 5? What words can I use to describe the quantity?

Domain: 1.MD Measurement and Data

1.MD.A Major Cluster: Measure lengths indirectly and by iterating length units.

Standard	Essential Element
1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.	**EE.1.MD.1–2** Compare lengths to identify which is longer/shorter, taller/shorter.
1.MD.A.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*	**EE.1.MD.1–2** Compare lengths to identify which is longer/shorter, taller/shorter.

Unpacked

Concept: Length is an attribute that can be compared.

Skills: Use direct comparison to determine the lengths of objects that are longer/shorter, taller/shorter; compare objects to determine which has more or less length.

Big idea: Objects can be different lengths. Words can be used to describe and compare the length of objects.

Essential questions: Which object has more or less length? What words describe an object with less length or more length?

1.MD.B Additional Cluster: Work with time and money.

Standard	Essential Element
1.MD.B.3 Tell and write time in hours and half-hours using analog and digital clocks.	**EE.1.MD.3.a** Demonstrate an understanding of the terms *tomorrow*, *yesterday*, and *today*. **EE.1.MD.3.b** Demonstrate an understanding of the terms *morning*, *afternoon, day*, and *night*. **EE.1.MD.3.c** Identify activities that come before, next, and after. **EE.1.MD.3.d** Demonstrate an understanding that telling time is the same every day.
1.MD.IA.B.1 Identify pennies and dimes and their values. Count a mixed collection of dimes and pennies to determine the cent value (total not to exceed 100 cents).	This standard is applicable to all students, including students with significant cognitive disabilities.

Unpacked

Concept: Events occur at different times.

Skills: Identify events that occur today, tomorrow, or yesterday; identify events that occur in the morning and the afternoon, day and night; identify activities that come before, next, and after; anticipate a familiar activity based on the daily schedule; recognize that some events happen every day; represent time with words.

Big idea: Use words to describe when an event takes place.

Essential questions: What words can I use to describe when an event happens or is going to happen? How do I know what is going to happen at different times of the day? What are things that happen at similar times every day? What happens after lunch? What do I do in the morning? Based on my schedule or routine, what do I think will happen next?

1.MD.C Supporting Cluster: Represent and interpret data.

Standard	Essential Element
1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	**EE.1.MD.4** Organize data into categories by sorting.

Unpacked

Concept: Use data to answer questions.

Skills: Identify the question the data refers to; identify the data; categorize or group information by similarity; organize data by categories from most to least or least to most.

Big idea: Data can be arranged in categories.

Essential questions: What is the question? What do the numbers (data) represent? How can items or visual representations of items be organized? How does data help me answer questions?

Domain: 1.G Geometry

1.G.A Additional Cluster: Reason with shapes and their attributes.

Standard	Essential Element
1.G.A.1 Distinguish between defining attributes *(for example, triangles are closed and three-sided)* versus non-defining attributes *(for example, color, orientation, overall size)*; build and draw shapes to possess defining attributes.	**EE.1.G.1** Identify the relative position of objects that are on, off, in, and out.
1.G.A.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, rectangular prisms, cones and cylinders) to create a composite shape, and compose new shapes from the composite shape. Students do not need to learn formal names for these shapes.	**EE.1.G.2** Sort shapes of same size and orientation (circle, square, rectangle, triangle).
1.G.A.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.	**EE.1.G.3** Put together two pieces to make a shape that relates to the whole (i.e., two semicircles to make a circle, two squares to make a rectangle).

Unpacked

Concept: Shapes and objects can be oriented in many ways, and their location can be described.

Skills: Use the words on, off, in, and out to describe the position of an object; find an object when given its relative position to another familiar object; name the shapes; sort shapes of the same size and orientation; put parts together to make a whole.

Big idea: Words can describe where an object is located. Shapes have specific names and attributes. Shapes can be sorted by attributes. Shapes can be broken into parts and put back together to create the whole.

Essential questions: What word describes where an object is located? How do I know these shapes are the same? What parts make a whole? What shape is this?

Second Grade

Domain: 2.OA Operations and Algebraic Thinking

2.OA.A Major Cluster: Represent and solve problems involving addition and subtraction.

Standard	Essential Element
2.OA.A.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving the problem types listed below, with unknowns in all positions, by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. • Adding to. • Taking from. • Putting together. • Taking apart. • Comparing.	See **EE.3.OA.4**

2.OA.B Major Cluster: Add and Subtract within 20.

Standard	Essential Element
2.OA.B.2 Fluently add and subtract within 20 using efficient mental strategies listed below. • Counting on. • Counting back. • Making ten. • Decomposing a number leading to a ten. • Using the relationship between addition and subtraction. • Creating equivalent, but easier or known sums. • Adding up to subtract. By the end of Grade 2, flexibly, efficiently and accurately find all sums of two one-digit numbers. Note: Fluency of this standard is critical by the end of grade.	See **EE.2.NBT.6–7** and **EE.3.OA.4**

2.OA.C Supporting Cluster: Work with equal groups of objects to gain foundations for multiplication.

Standard	Essential Element
2.OA.C.3 Determine whether a group of objects (up to 20) has an odd or even number of members; write an equation to express an even number as a sum of two equal addends. *For example, by pairing objects or counting them by 2s.*	**EE.2.OA.3** Equally distribute even numbers of objects between two groups.
2.OA.C.4 Use repeated addition to find the total number of objects arranged in equal groups and rectangular arrays; write an equation to express the total as a sum of equal addends.	**EE.2.OA.4** Use addition to find the total number of objects arranged within equal groups up to a total of 10.

Unpacked

Concept: Some quantities can be organized and represented in equal groups.

Skills: Distribute objects equally between two sets; identify the quantities up to 10 that can be shared fairly or equally; identify these quantities as even numbers; identify quantities as not even (odd) numbers if there are left overs; add groups to find the total number of objects.

Big idea: Groups that can be shared fairly or equally have an even number of objects.

Essential questions: What is the task asking me to do? What information do I have? How can I use the objects to help me? Can I pair up all the objects in this group? How are even and odd numbers different? How many will there be when these groups are joined together?

Domain: 2.NBT Number and Operations in Base Ten

2.NBT.A Major Cluster: Understand place value.

Standard	Essential Element
2.NBT.A.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones. Understand the following as special cases. a. 100 can be thought of as a bundle of ten tens — called a "hundred." b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and zero tens and zero ones). *706 equals 7 hundreds, 0 tens, and 6 ones.*	**EE.2.NBT.1** Represent numbers up to 30 with sets of tens and ones using objects in columns or arrays.
2.NBT.A.2 Count forward and backward within 1,000; skip-count forward and backward by 5s, 10s, and 100s.	**EE.2.NBT.2.a** Count from 1 to 30 (count with meaning; cardinality). **EE.2.NBT.2.b** Name the next number in a sequence between 1 and 10.
2.NBT.A.3 Read and write numbers to 1,000 using base-ten numerals, number names, and expanded form.	**EE.2.NBT.3** Identify numerals 1 to 30.
2.NBT.A.4 Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using terms “greater than”, “less than”, and “equal to”, connecting to the use of >, =, and < symbols.	**EE.2.NBT.4** Compare sets of objects and numbers using appropriate vocabulary (more, less, equal).

Unpacked

Concept: The value of a digit depends on its place, or position, in the number.

Skills: Use place value tools (i.e., ten- frame, hundreds chart, base ten blocks, etc.) to combine groups of 10 and 1's to represent quantities; count from 1-30 using concrete, pictorial, and symbolic/numeral representations; name the number word applied to the last object representing the total amount; count forward beginning from a given number; name the next number in a sequence (e.g., 3, 4, __, 6, 7. or 2, 4, __, 8. or 7, 6, 5,__.); identify numerals 1 to 30; compare sets using the words more, less, and equal.

Big idea: Numbers beyond nine are comprised of groups of tens and ones. Sequence is a series of numbers that follows a logical rule or pattern.

Essential questions: How can I represent this number using groups of tens and ones? How many groups of ten and how many ones are in this quantity? What numeral represents the quantity? What number is next? How can I keep track of what I have or have not counted? What number comes next in this sequence? Which group has more or less objects? Which groups have the same number of objects?

2.NBT.B Major Cluster: Use place value understanding and properties of operations to add and subtract.

Standard	Essential Element
2.NBT.B.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. Note: Fluency of this standard is critical by the end of grade level.	**EE.2.NBT.5.a** Identify the meaning of the "+" sign (i.e., combine, plus, add), "–" sign (i.e., separate, subtract, take), and the "=" sign (equal). **EE.2.NBT.5.b** Using concrete examples, compose and decompose numbers up to 10 in more than one way.
2.NBT.B.6 Add up to four two-digit numbers using strategies based on place value and properties of operations.	**EE.2.NBT.6-7** Use objects, representations, and numbers (0–20) to add and subtract.
2.NBT.B.7 Add and subtract within 1,000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.	**EE.2.NBT.6-7.** Use objects, representations, and numbers (0–20) to add and subtract.
2.NBT.B.8 Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.	Not applicable.
2.NBT.B.9 Explain why addition and subtraction strategies work, using place value and the properties of operations. Explanations may be supported by drawings or objects.	Not applicable.

Unpacked

Concept: Relationships between numbers or values can be represented with symbols.

Skills: Use concrete, pictorial, and numeral representations to show what +, - , = mean; combine sets; break number up into smaller subsets; describe '+' action as "add", "plus", "combine," or "and"; describe '-' action as "separate," "subtract," or "take"; describe '=' as "equal" or "the same amount"; combine smaller groups to determine total number from 0-20; show part-part-whole; take away from total number to determine parts of number; compose and decompose numbers (e.g., 7 = 3 + 4, 7 = 5 + 2, 7 - 5 = 2 with concrete manipulatives); use concrete, pictorial, and numeral representations to add and subtract.

Big idea: Numbers can be taken apart to create smaller groups or put together to create larger groups.

Essential questions: What do I do with these sets when there is a '+'? How many will I have when I combine these sets? What do I do with these sets when there is a '-'? How many will be in each set when I separate the whole into parts? How else can I separate the whole into parts? How many will I have when I put the parts back together? What symbol can I use to show two sets have the same amount? How can I make these two sets equal? What words can I use to describe what I did? Is there another way I can represent the problem? How?

Domain: 2.MD Measurement and Data

2.MD.A Major Cluster: Measure and estimate lengths in standard units.

Standard	Essential Element
2.MD.A.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.	**EE.2.MD.1** Measure the length of objects using non-standard units.
2.MD.A.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.	Not applicable.
2.MD.A.3 Estimate lengths using units of inches, feet, centimeters, and meters.	**EE.2.MD.3–4** Order by length using non-standard units.
2.MD.A.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard-length unit.	**EE.2.MD.3–4** Order by length using non-standard units.

Unpacked

Concept: Objects can be measured and ordered in many ways.

Skills: Recognize attribute of length; use non-standard tools to measure objects, (e.g. paper clips, color tiles); use equal sized units to measure two or more objects; lay non- standard units end-to-end to measure; count the total units to determine length; use the non-standard unit measure to order objects by length; compare the size of unit to how many are needed to measure the same object.

Big idea: Lengths can be compared using ideas such as longer, shorter, and equal. The longer the unit of measure, the fewer units it takes to measure the object.

Essential questions: How many units (i.e., paper clips, popsicle sticks, erasers) is this object? Which object is longer? Which object is shorter? What other tool can I use to measure the object? Which object should I use to measure this? What will happen to the amount of objects if I use a smaller or larger object of measure?

2.MD.B Major Cluster: Relate additional and subtraction to length.

Standard	Essential Element
2.MD.B.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units. *For example, by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.*	**EE.2.MD.5** Increase or decrease length by adding or subtracting unit(s).
2.MD.B.6 Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.	**EE.2.MD.6** Use a number line to add one more unit of length.

Unpacked

Concept: Lengths can get bigger or smaller when units are added or subtracted.

Skills: Use addition of a unit to make something longer; use subtraction of a unit to make something shorter; use number line as a tool for measuring length; add one more unit on the number line to make something longer.

Big idea: A number line has evenly spaced points corresponding to the numbers and can be used as a measurement tool.

Essential questions: How long is this? What will happen if I add one more? What will happen if I take one unit away? How can I make the length longer? How can I make a length shorter? When measuring with a number line, what direction should I move to if I am adding one more unit?

2.MD.C Supporting Cluster: Work with time and money.

Standard	Essential Element
2.MD.C.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.	**EE.2.MD.7** Identify on a digital clock the hour that matches a routine activity.
2.MD.IA.C.1 Describe the relationship among standard units of time: minutes, hours, days, weeks, months and years (such as 7 days in a week, 60 minutes in an hour, etc.).	**EE.2.MD.IA.C.1** Recognize there is a relationship between standard units of time (such as 7 days in a week, 60 minutes in an hour, etc.).
2.MD.IA.C.2 Identify nickels, quarters and dollars and know their values.	This standard is applicable to all students, including students with significant cognitive disabilities.
2.MD.C.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *For example, if you have 3 quarters, 2 dimes and 4 pennies, how many cents do you have?* For this standard, it may be appropriate to record amounts using decimals but does not include adding and subtracting with decimals.	**EE.2.MD.8** Recognize that money has value.

Unpacked

Concept: Time and money are types of measurement.

Skills: Identify the tools that help measure how time passes; identify the hour on a digital clock; use a digital clock to identify familiar events that occur at a defined time each day; identify or name objects as money or not money; exchange money for an item.

Big idea: Events occur at different times and can be identified on a clock. Money is used to buy things.

Essential questions: How do I know when an activity will occur? What time do I have this activity? When I buy something, what do I give them?

2.MD.D Supporting Cluster: Represent and interpret data.

Standard	Essential Element
2.MD.D.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.	**EE.2.MD.9-10** Create picture graphs from collected measurement data.
2.MD.IA.D.1 Use interviews, surveys, and observations to collect data that answer questions about students' interests and/or their environment.	This standard is applicable to all students, including students with significant cognitive disabilities.
2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple problems: put-together, take-apart, and compare, using information presented in a bar graph.	**EE.2.MD.9-10** Create picture graphs from collected measurement data.

Unpacked

Concept: Data can be represented visually using tables, charts, and graphs.

Skills: Identify parts of picture graph; organize data to answer a question; represent data using pictures or symbols.

Big idea: Picture graphs are useful for comparing data in different categories and answering questions.

Essential questions: What are the parts of a picture graph? What question does my graph help me answer? What categories can I use to organize the data? What picture or symbol will I use to represent the data? What is a good title for my graph? How can I label the graph so others will understand it?

Domain: 2.G Geometry

2.G.A Additional Cluster: Reason with shapes and their attributes.

Standard	Essential Element
2.G.A.1 Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify two-dimensional shapes: triangles, quadrilaterals, rectangles, squares, trapezoids, pentagons, hexagons, circles, half-circles and quarter-circles, and three-dimensional figures: cubes, right rectangular prisms, right circular cones, and right circular cylinders. (Sizes are compared directly or visually, not compared by measuring.)	**EE.2.G.1** Identify common two-dimensional shapes: square, circle, triangle, and rectangle.
2.G.A.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of squares.	Not applicable.
2.G.A.3 Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.	See **EE.4.G.3** and **EE.4.NF.1–2**

Unpacked

Concept: Shapes can be described, classified, and analyzed by their attributes.

Skills: Identify a square, circle, triangle, and rectangle; name a square, circle, triangle, and rectangle; identify shapes in the environment.

Big idea: Shapes have specific names and characteristics.

Essential questions: How do I know what shape this is? What is the name of this shape? Where else can I find this shape?

Third Grade

Domain: 3.OA Operations and Algebraic Thinking

3.OA.A Major Cluster: Represent and solve problems involving multiplication and division.

Standard	Essential Element
3.OA.A.1 Interpret products of whole numbers. *For example, interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each; describe a context in which a total number of objects can be expressed as 5 × 7.*	**EE.3.OA.1-2** Use repeated addition to find the total number of objects and determine the sum.
3.OA.A.2 Interpret whole-number quotients of whole numbers as the number of groups or the number in each group in situations of equal groups. *For example, describe a context involving equal groups of objects in which the number of groups or the number in each group can be expressed as 56 ÷ 8.*	**EE.3.OA.1-2** Use repeated addition to find the total number of objects and determine the sum.
3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, with unknowns in all positions. *For example, by using drawings and equations with a symbol for the unknown number to represent the problem.*	See **EE.3.OA.1** and **EE.5.NBT.5**
3.OA.A.4 Be able to represent a word problem by writing an equation with a symbol for the unknown whole number and determine the unknown whole number in a multiplication or division equation relating to three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations* $8 \times \square = 48, 5 = \square \div 3, 6 \times 6 = \square$.	**EE.3.OA.4** Solve addition and subtraction problems when result is unknown, limited to operands and results within 20.

Unpacked

Concept: Multiplication can be represented in different ways (e.g., repeated addition of equal groups, skip counting, objects in an array, area of a rectangle).

Skills: Counts equal groups by using repeated addition (e.g., 2+2+2+2 = 8); add and subtract numbers when the result is unknown (e.g., 3 + 2 =).

Big idea: Addition and subtraction are used to represent and solve many different kinds of problems.

Essential questions: How do I use addition and subtraction to solve problems? How can I keep track of the groups I have or have not counted? How do addition and subtraction problems relate to each other? How do I know which mathematical operation (+, -) to use?

3.OA.B Major Cluster: Use properties of operations and the relationship between multiplication and division.

Standard	Essential Element
3.OA.B.5 Use properties of operations as strategies to multiply and divide. *For example, if* $6 \times 4 = 24$ *is known, then* $4 \times 6 = 24$ *is also known. (Commutative property of multiplication.)* $3 \times 5 \times 2$ *can be found by* $3 \times 5 = 15$*, then* $15 \times 2 = 30$*, or by* $5 \times 2 = 10$*, then* $3 \times 10 = 30$*. (Associative property of multiplication.) Knowing that* $8 \times 5 = 40$ *and* $8 \times 2 = 16$*, one can find* 8×7 *as* $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$*. (Distributive property.)*	See **EE.N-CN.2**
3.OA.B.6 Understand division as an unknown-factor problem. *For example, find* $32 \div 8$ *by finding (or remembering) the number that makes 32 when multiplied by* 8 ($\square \times 8 = 32$).	See **EE.5.NBT.6–7**

3.OA.C Major Cluster: Multiply and divide within 100.

Standard	Essential Element
3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division, or properties of operations. *For example, knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8*. By the end of Grade 3, flexibly, efficiently, and accurately find all products of two one-digit numbers. Note: Fluency of this standard is critical by the end of grade level.	See **EE.7.NS.2.a** and **EE.7.NS.2.b**

3.OA.D Major Cluster: Solve problems involving the four operations and identify and explain patterns in arithmetic.

Standard	Essential Element
3.OA.D.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. Note: this standard is limited to problems posed with whole numbers and have whole number answers; students should know how to perform operations in conventional order when there are no parentheses to specify a particular order (Order of Operations).	**EE.3.OA.8** Solve one-step real-world problems using addition or subtraction within 20.

Unpacked

Concept: Addition and subtraction are used to represent and solve many different kinds of problems.

Skills: Identify what the question is asking; identify which operation will help solve the problem; develop an equation to solve the problem; solve for the unknown in addition and subtraction equations.

Big idea: The context of a problem determines the operation that is used to solve the problem.

Essential questions: How do I know which mathematical operation (+, -) to use? How do I know where to begin when solving a problem? How do I use addition or subtraction to find the missing value? What do I do when I get stuck?

Standard	Essential Element
3.OA.D.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends*.	**EE.3.OA.9** Identify arithmetic patterns.

Unpacked

Concept: Patterns are important learning tools to help us see relationships and make connections between concepts.

Skills: Recognize the core unit in repeating, symbolic, and growing patterns; skip count by 2's, 5's and 10's; identify common change; identify the rule used in the pattern; recognize if the change in the pattern is increasing, decreasing, or constant; extend the pattern; identify the next number in a pattern.

Big idea: Patterns can be recognized, analyzed, and extended.

Essential questions: What is the core pattern of this sequence? How do I know? What rule was used to make the pattern? What is the next number in this pattern? How can I extend the pattern? Is the change in the pattern increasing, decreasing, or staying the same?

Domain: 3.NBT Number and Operations in Base Ten

3.NBT.A Additional Cluster: Use place value understanding and properties of operations to perform multi-digit arithmetic.

Standard	Essential Element
3.NBT.A.1 Round whole numbers to the nearest 10 or 100 within the range of 0–1,000. *For example, rounding 643 to the nearest 10 would be 640; to the nearest 100 would be 600.*	**EE.3.NBT.1** Use decade numbers (10, 20, 30) as benchmarks to demonstrate understanding of place value for numbers 0–30.
3.NBT.A.2 Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. *For example, 412 - 13 =412 -12 -1 = 400 -1 =399; 505+70 = 575.* Note: Fluency of this standard is critical by the end of grade level.	**EE.3.NBT.2** Demonstrate understanding of place value to tens.
3.NBT.A.3 Use place value and properties of operations to multiply one-digit whole numbers by multiples of 10 in the range 10–90. *For example,* 9×80, 5×60.	**EE.3.NBT.3** Count by tens using models such as objects, base ten blocks, or money.

Unpacked

Concept: The base ten numeration system provides a structure for recording numbers using digits 0-9, groups of ten, and place value.

Skills: Compare numbers using the decade benchmark to estimate if a number is greater than (>), less than (<), and equal to (=) another number; use models to demonstrate how many tens and ones are in a given number; use manipulatives to skip count by 10's.

Big idea: The value of a digit depends on its place, or position, in the number.

Essential questions: How does using 10 as a benchmark help me compare numbers? How can making equal groups of ten objects help me count larger numbers? How can I easily locate 10 more or 10 less on a hundred chart? How do I model a number larger than 9? How does using 10 as a benchmark help me compose numbers?

Domain: 3.NF Number and Operations - Fractions

Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8.

3.NF.A Major Cluster: Understand fractions as numbers.

Standard	Essential Element
3.NF.A.1 Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction $\frac{a}{b}$ as the quantity formed by *a* part of size $\frac{1}{b}$.	**EE.3.NF.1–3** Differentiate a fractional part from a whole.
3.NF.A.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Represent a fraction $\frac{1}{b}$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size $\frac{1}{b}$ and that the endpoint of the part based at 0 locates the number $\frac{1}{b}$ on the number line. b. Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off a lengths $\frac{1}{b}$ from 0. Recognize that the resulting interval has size $\frac{a}{b}$ and that its endpoint locates the number $\frac{a}{b}$ on the number line.	**EE.3.NF.1–3** Differentiate a fractional part from a whole.
3.NF.A.3 Explain equivalence of fractions in special cases and compare fractions by reasoning about their size. a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line. b. Recognize and generate simple equivalent fractions. *For example,* $\frac{1}{2} = \frac{2}{4}$, $\frac{4}{6} = \frac{2}{3}$. Explain why the fractions are equivalent. *For example, by using a visual fraction model.* *c.* Express whole numbers as fractions and recognize fractions that are equivalent to whole numbers. *For example, express 3 in the form 3 =* $\frac{3}{1}$*; recognize that* $\frac{6}{1} = 6$*; locate* $\frac{4}{4}$ *and 1 at the same point of a number line diagram.* *d.* Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusion. *For example, by using a visual fraction model.*	**EE.3.NF.1–3** Differentiate a fractional part from a whole.

Unpacked

Concept: Fractions are numbers that can be represented in different ways.

Skills: Recognize a whole; create equal- sized parts; use multiple representations; identify a unit fraction (one part when a whole is partitioned into *n* equal parts); model part/whole relationships.

Big idea: A fraction represents equal parts of a whole.

Essential questions: Which shape/object is a whole? Which shape/object is a part of the whole? What is a fraction? How do I divide this shape so it has equal sized parts? How many equal parts made up the whole? How can I represent one part (unit fraction) of a shape? What other shapes can I divide equally?

Domain: 3.MD Measurement and Data

3.MD.A Major Cluster: Solve problems with time and measured quantities.

Standard	Essential Element
3.MD.A.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes. *For example, by representing the problem on a number line.*	**EE.3.MD.1** Tell time to the hour on a digital clock.
3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l) (Excludes compound units such as cubic centimeters and finding the geometric volume of a container.) Add, subtract, multiply, or divide to solve one-step word problems involving measured quantities (masses and liquid volumes). Excludes multiplicative comparison problems involving notions of "times as much"; problems do not require unit conversion.	**EE.3.MD.2** Identify the appropriate measurement tool to solve one-step word problems involving mass and volume.

Unpacked

Concept: Measurement involves an understanding of appropriate measurement units in various situations, how many units there are, the measurement processes, and the use of measurement tools.

Skills: Identify the hour on a digital clock; use a digital clock to identify events that occur at a defined time each day; identify volume as the space inside an object; identify mass as the weight of an object; choose measurement tools to solve problems; solve one-step word problem, identify operation, organize numbers, solve for unknown; identify unit for answer.

Big idea: Familiarity with known benchmark measurements and measurement tools can help when calculating other measurements.

Essential questions: How can I use a digital clock to tell time to the hour? What does mass measure? What does volume measure? What are the tools I can use to measure mass or volume? What is the problem asking us to solve? Which tool will I use to solve it? What unit do I use to label my answer?

3.MD.B Supporting Cluster: Represent and Interpret Data.

Standard	Essential Element
3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.	**EE.3.MD.3** Use picture or bar graph data to answer questions about data.
3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.	**EE.3.MD.4** Measure length of objects using standard tools, such as rulers, yardsticks, and meter sticks.

Unpacked

Concept: Information can be collected and displayed as objects in pictures, graphs and tables. Objects can be measured and ordered in different ways.

Skills: Interprets data presented by a picture/bar graph (i.e., more, less, same, how many); use standard measuring tools; line objects up to the end of measuring tool; identify and read numbers on a standard measuring tool; state or record the length of objects.

Big idea: Data can be represented to answer questions. Standard units of measurement provide consistency in measurement.

Essential questions: What do I know from the data? What questions can I answer from my data? How do labels help others understand the data? How can I measure an object? What tools can I use to measure the length of this object? How long is this object? Should I use inches, feet, or meters?

3.MD.C Major Cluster: Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

Standard	Essential Element
3.MD.C.5 Recognize area as an attribute of plane figures and understand concepts of area measurement. a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area. b. A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.	See **EE.4.MD.2**
3.MD.C.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).	See **EE.4.MD.2**
3.MD.C.7 Relate area to the operations of multiplication and addition. a. Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths. b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems. c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning. d. Recognize area as additive. Find areas of figures that can be decomposed into non-overlapping rectangles and add the areas of the non-overlapping parts, applying this technique to solve real world problems.	See **EE.4.MD.2**

3.MD.D Additional Cluster: Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Standard	Essential Element
3.MD.D.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.	See **EE.7.G.4** and **EE.8.G.9**

Domain: 3.G Geometry

3.G.A Supporting Cluster: Reason with shapes and their attributes.

Standard	Essential Element
3.G.A.1 Understand that shapes in different categories *(for example, rhombuses, rectangles, and others)* may share attributes *(for example, having four sides)*, and that the shared attributes can define a larger category *(for example, quadrilaterals)*. Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.	**EE.3.G.1** Describe attributes of two-dimensional shapes.
3.G.A.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as* $\frac{1}{4}$ *of the area of the shape.*	**EE.3.G.2** Recognize that shapes can be partitioned into equal areas.

Unpacked

Concept: Shapes can be described and classified according to their attributes.

Skills: Identify a line and line segment; identify an angle; identify the number of sides (vertices); identify the number of angles; identify equal parts of a shape; divide shapes into equal pieces.

Big idea: Shapes can be defined by their attributes. Shapes can be partitioned into equal parts.

Essential questions: What makes shapes different from each other? What is the name of that shape? How do I divide (cut) this shape into equal parts? How many equal parts could I divide (cut) this shape into? How could I describe this shape using its attributes?

Fourth Grade

Domain: 4.OA Operations and Algebraic Thinking

4.OA.A Major Cluster: Use the four operations with whole numbers to solve problems.

Standard	Essential Element
4.OA.A.1 Interpret a multiplication equation as a comparison and represent verbal statements of multiplicative comparisons as multiplication equations. *For example, write 35 = 7 x 5 to represent the statement that a 35-foot-long whale shark is 7 times as long as a 5-foot-long reef shark.*	**EE.4.OA.1-2** Demonstrate the connection between repeated addition and multiplication.
4.OA.A.2 Multiply or divide to solve word problems involving multiplicative comparison, distinguishing multiplicative comparison from additive comparison. Be able to use drawings and equations with a variable for the unknown number to represent the problem. *For example, Tom's pencil is 4 times as long as Julie's pencil. Tom's pencil is 8 inches long. How long is Julie's pencil? (multiplicative comparison) For example, Julie's pencil is 2 inches long. Tom's pencil is 8 inches long. How much longer is Tom's pencil than Julie's pencil? (additive comparison)*	**EE.4.OA.1-2** Demonstrate the connection between repeated addition and multiplication.
4.OA.A.3 Solve multistep word problems posed with whole numbers and whole-number answers using the four operations, including problems in which remainders must be interpreted. Be able to represent word problems with mathematical diagrams and with equations in which a letter stands for an unknown quantity and be able to assess the reasonableness of answers using mental computation and estimation strategies including rounding.	**EE.4.OA.3** Solve one-step real-world problems using addition or subtraction within 100.

Unpacked

Concept: Real life situations or problems can be solved using different mathematical operations.

Skills: Create equal sets; combine sets; use repeated addition with equal sets; use knowledge of repeated addition to solve multiplication problems; identify what the question is asking; identify which operation will help solve the problem; organize numbers to create an equation; solve for the unknown.

Big idea: Repeated addition can be used to explain multiplication. Solving problems that involve the same numbers help make the connection between addition and subtraction (e.g., 3 + 4 =7, 7 - 4 =3).

Essential questions: How can I use repeated addition to solve this multiplication problem? How do I set up a repeated addition problem? What is the problem asking? What operation can I use to solve the problem? How do I recognize what strategy to use for a specific problem?

4.OA.B Supporting Cluster: Gain familiarity with factors and multiples.

Standard	Essential Element
4.OA.B.4 Be able to find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.	**EE.4.OA.4** Show one way to arrive at a product.

Unpacked

Concept: There are a variety of operations and strategies that can be applied to solve problems.

Skills: Use array model to solve problems; use skip counting to solve problems; use repeated addition to solve problems.

Big idea: Multiplication can be represented in different ways.

Essential questions: How can I use the array model to find the solution? How can I relate what I know about skip counting to help me solve this problem? How can I relate what I know about repeated addition to help me solve this problem?

4.OA.C Additional Cluster: Analyze a number sequence that follows a given rule.

Standard	Essential Element
4.OA.C.5 Given the rule for a sequence of numbers, identify apparent features of the sequence that were not explicit in the rule itself; explain informally why the numbers will continue to alternate in this way. *For example, given the rule "Add 3" and the number sequence 1, 4, 7, 10, 13 observe that the terms appear to alternate between odd and even numbers;*	**EE.4.OA.5** Use repeating patterns to make predictions.

Unpacked

Concept: Patterns help us see relationships, make connections between concepts, and make predictions.

Skills: Recognize the unit in a repeating pattern with pictures or symbols; extend the pattern; describe how the pattern changes; make a prediction about the repeated core unit; describe a general rule for determining any stage of the pattern.

Big idea: Patterns can be identified, predicted and repeated.

Essential questions: What is the core unit in the repeating pattern? How does the pattern grow? What changes as the pattern grows? What stays the same as the pattern grows? Based on the pattern rule, what do I think the next shape will be? What about the next shape after that?

Domain: 4.NBT Numbers and Operations in Base Ten

4.NBT.A Major Cluster: Generalize place value understanding for multi-digit whole numbers up to 1,000,000.

Standard	Essential Element
4.NBT.A.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what that same digit represents in the place to its right. *For example, recognize that* $700 \div 70 = 10$ *by applying concepts of place value and division.*	See **EE.5.NBT.1**
4.NBT.A.2 Read and write whole multi-digit numbers using base-ten numerals (standard form), number names (word form), and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**EE.4.NBT.2** Compare whole numbers to 10 using symbols (<, >, =).
4.NBT.A.3 Use place value understanding to round multi-digit whole numbers to any place. *For example, 435,450 rounded to the nearest ten-thousands place is 440,000 because it is more than halfway between 430,000 and 440,000.*	**EE.4.NBT.3** Round any whole number 0-30 to the nearest ten.

Unpacked

Concept: The value of a digit depends on its place, or position in the number.

Skills: Identify the place value of numbers; compare numbers using < > =, identify the benchmarks on a number line; identify the midpoint on a number line (e.g., the midpoint between the benchmarks of 20 and 30 is 25); identify that numbers less than the midpoint on the number line round down, numbers the same as or greater than the midpoint round-up; use the ones place to determine the nearest benchmark number in the tens place.

Big idea: Numbers can be compared. Rounding is a useful strategy when you don't have to have an exact number.

Essential questions: Is more than, less than, or equal to__? What symbol do I use to show that a number is greater than, less than, or equal to another number? When I solve this problem, do I need an exact answer or an estimate? What are the benchmarks on either side of the number I want to round? What is the midpoint? Should I round up or down?

4.NBT.B Major Cluster: Calculate with multi-digit numbers.

Standard	Essential Element
4.NBT.B.4 Fluently add and subtract multi-digit whole numbers up to 1,000,000 using an algorithm. Algorithms may include the standard algorithm, partial sums, partial differences, counting or adding up in increments. Note: Fluency of this standard is critical by the end of grade level.	**EE.4.NBT.4** Add and subtract two-digit whole numbers.
4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Be able to illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	See **EE.4.OA.1**
4.NBT.B.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	Not applicable.

Unpacked

Concept: Mathematical problems can be solved using different mathematical operations.

Skills: Use concrete, pictorial, and symbol/numeral representations to add and subtract 2-digit numbers; identify the place value of numbers; group ten's together and the ones together to add or subtract 2-digit numbers; create an equation to add or subtract 2-digit numbers, find the sum for addition problems and the difference for subtraction problems; use the identity, associative, and commutative properties to help solve equations.

Big idea: Numbers can be broken apart and grouped in different ways to make calculations simpler. Place value is important when solving problems with multi-digit numbers.

Essential questions: Numbers can be broken apart and grouped in different ways to make calculations simpler. Place value is important when solving problems with multi-digit numbers.

Domain: 4.NF Numbers and Operations–Fractions

Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.

4.NF.A Major Cluster: Extend understanding of fraction equivalence and ordering.

Standard	Essential Element
4.NF.A.1 Illustrate and explain numerical statements of fraction equivalence by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and write equivalent fractions.	**EE.4.NF.1–2** Identify models of one half (1/2) and one fourth (1/4).
4.NF.A.2 Compare two fractions with different numerators and different denominators, by creating common denominators or numerators, comparing to a benchmark fraction such as $\frac{1}{2}$ and/or by using a visual fraction model. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions.	**EE.4.NF.1–2** Identify models of one half (1/2) and one fourth (1/4).

Unpacked

Concept: A fraction describes the division of a whole into equal parts.

Skills: Identify the meaning of the numerator and denominator (i.e., the bottom number in a fraction tells how many equal parts the whole or unit is divided into, and the top number tells how many equal parts are indicated); identify the model of one-half and one-fourth; indicate that the more parts a whole is divided into the smaller the pieces of the whole; identify numeric symbols for ½ and ¼.

Big idea: Fractions are special numbers that represent the relationship between parts and whole.

Essential questions: How can this shape or set be divided into smaller equal parts? What does the bottom number in a fraction tell me? What does the top number in a fraction tell me? How do I know how many fractional parts make a whole? How do I partition this shape so the fraction ½ or ¼ is represented?

4.NF.B Major Cluster: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

Standard	Essential Element
4.NF.B.3 Understand a fraction $\frac{a}{b}$ with $a > 1$ as a sum of fractions $\frac{1}{b}$. *For example,* $\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Be able to justify decompositions. *For example, by using a visual fraction model.* *For example:* $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{1}{8} + \frac{2}{8}$; $2\frac{1}{8} = 1 + 1 + \frac{1}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8}$. c. Add and subtract mixed numbers with like denominators and show sums and differences of mixed numbers on a number line diagram. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, by using visual fraction models and or equations to represent the problem.	**EE.4.NF.3** Differentiate between whole and half.

Unpacked

Concept: Fractions are parts of wholes.

Skills: Indicate shapes that have not been divided into equal parts; indicate shapes that have been divided into 2 equal parts.

Big idea: A fraction represents equal parts of a whole.

Essential questions: How can this whole be broken in half? How many parts of the object make up the whole of the object?

Standard	Essential Element
4.NF.B.4 Apply and extend earlier understandings of multiplication to multiply a fraction by a whole number. a. Using a visual fraction model, understand a fraction with a numerator greater than 1 is a multiple of a unit fraction. *For example, using a number line to show* $\frac{5}{4}$ *as the product of* $5 \times \frac{1}{4}$. b. Multiply a fraction by a whole number using the principle that the product is the whole number times the numerator of the fraction with the same denominator. c. Solve word problems involving multiplication of a fraction by a whole number. Use visual fraction models and/or equations to represent the problem.	See **EE.4.OA.1–2** and **EE.5.NBT.5**

4.NF.C Major Cluster: Understand decimal notation for fractions for tenths and hundredths.

Standard	Essential Element
4.NF.C.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100 and use this technique to add two fractions with respective denominators 10 and 100. *For example, express* $\frac{3}{10}$ *as* $\frac{30}{100}$, *and add* $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$. Note: Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators is not a requirement at this grade.	See **EE.7.NS.2.c-d**
4.NF.C.6 Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as* $\frac{62}{100}$ *and locate 0.62 on a number line.*	See **EE.7.NS.2.c-d**
4.NF.C.7 Compare two decimals to hundredths by reasoning about their size, recording the results of comparisons with the symbols >, =, or <. Recognize that comparisons are valid only when the two decimals refer to the same whole. Show decimals on a number line diagram and be able to justify numerical statements of decimal comparison by using a visual fraction model.	See **EE.7.NS.2.c-d**

Domain: 4.MD Measurement and Data

4.MD.A Supporting Cluster: Solve problems involving conversion of measurements from a larger unit to a smaller unit.

Standard	Essential Element
4.MD.A.1 Know relative sizes of measurement units within one system of measurement, including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit by using multiplication. *For example, record measurement equivalents in a two-column table, know that 1 ft is 12 times as long as 1 in or express the length of a 4 ft snake as 48 in.*	**EE.4.MD.1** Identify the smaller measurement unit that comprises a larger unit within a measurement system (inches/foot, centimeter/meter, minutes/hour).
4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time (including elapsed time), liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit.	**EE.4.MD.2.a** Tell time using a digital clock. Tell time to the nearest hour using an analog clock. **EE.4.MD.2.b** Measure mass or volume using standard tools. **EE.4.MD.2.c** Use standard measurement to compare lengths of objects. **EE.4.MD.2.d** Identify coins (penny, nickel, dime, quarter) and their values.
4.MD.A.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*	**EE.4.MD.3** Determine the area of a square or rectangle by counting units of measure (unit squares).

Unpacked

Concept: Measurement involves a selected attribute (e.g., time, length, mass, volume, money, area) and a comparison of the attribute being measured against a unit of the same attribute.

Skills: Identify the smaller unit that relates to the larger unit (e.g., inches to feet); use the same unit of measure when comparing measurements; round up to nearest hour; identify time on digital clock; identify hour hand and minute hand on analog clock; identify mass as measurement of matter/weight; use a scale to measure mass; identify volume as a measurement of liquid; use cups or ounces to measure volume; compare lengths of objects; identify coins and their value; use unit square to measure square and rectangle.

Big idea: The larger the unit of measure, the fewer units it takes to measure the attribute.

Essential questions: What tools and units are used to measure the attributes of an object? How do I choose the appropriate tool and unit when measuring? How are the units of measure within a standard system related? How do I measure accurately? How do I find area, mass, and volume of geometric figures? What tools and units are used to measure the attributes of time? Why is telling time important? How do I use a clock to tell time to the nearest hour? How can I tell time using both digital and analog clocks? Why is it important to understand the value of coins?

4.MD.B Supporting Cluster: Represent and interpret data using a line plot.

Standard	Essential Element
4.MD.B.4 Make a line plot to display a data set of measurements using the fractions of a unit. ($\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$). • $\frac{1}{8}, \frac{2}{8}, \frac{3}{8}, \frac{4}{8}, \frac{5}{8}, \frac{6}{8}, \frac{7}{8}, \frac{8}{8}$ • $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}$ • $\frac{1}{2}, \frac{2}{2}$ Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest pencils in a collection.*	**EE.4.MD.4.a** Represent data on a picture or bar graph given a model and a graph to complete. **EE.4.MD.4.b** Interpret data from a picture or bar graph.

Unpacked

Concept: Data can be represented and organized in order to answer questions and solve problems.

Skills: Sort objects or pictures into categories based on one common attribute; record sorted categories using marks, stamps, pictures, etc. with each symbol used representing one data object; label graph; use data to create picture graph; use data to create bar graph; answer questions about the sorted sets (e.g., Which has more? Which has less? How many are their all together?); answer the question(s) using the information represented in the sorted sets.

Big idea: The way data is displayed or organized influences interpretation.

Essential questions: Why are graphs helpful? What kinds of questions can be answered using a picture or bar graph? Can I sort or organize this data in different ways? Why is data collected and analyzed? How can information be gathered, recorded, and organized? How does collecting data help me solve problems or make decisions? How do labels help others understand the data?

4.MD.C Additional Cluster: Geometric measurement: understand the concept of angle and measure angles.

Standard	Essential Element
4.MD.C.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the angle's rays. An angle that turns through $\frac{1}{360}$ of a circle is called a "one-degree angle," and can be used to measure angles. b. An angle that turns through *n* one-degree angles is said to have an angle measure of n°. *For example, an angle that turns through 45 one-degree angles has an angle measure of 45 degrees.*	**EE.4.MD.5** Recognize angles in geometric shapes.
4.MD.C.6 Draw and measure angles in whole-number degrees (1–180°) using a protractor. Sketch angles of specified measure.	**EE.4.MD.6** Identify angles as larger and smaller.
4.MD.C.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems. *For example, by using an equation with a symbol for the unknown angle measure.*	See **EE.4.G.2.a**

Unpacked

Concept: Shapes can be described and classified according to their attributes.

Skills: Recognize a line; recognize a ray; recognize a line segment; recognize a point on a geometric shape; identify an angle as a figure formed by two rays sharing one endpoint; compare two or more angles as larger or smaller.

Big idea: Angles are geometric shapes that have a common end point and can be measured.

Essential questions: Where are the lines, rays, line segments, points, and angles on these shapes? Which angle is larger? Which angle is smaller?

Domain: 4.G Geometry

4.G.A Additional Cluster: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Standard	Essential Element
4.G.A.1 Draw points, lines, line segments, rays, angles (acute, right, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	**EE.4.G.1** Recognize parallel lines and intersecting lines.
4.G.A.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category and identify right triangles.	**EE.4.G.2** Describe the defining attributes of two-dimensional shapes.
4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	**EE.4.G.3** Recognize that lines of symmetry partition shapes into equal areas.

Unpacked

Concept: Shapes can be described and classified by their attributes.

Skills: Recognize a line; recognize a line segment; recognize the difference between intersecting and parallel lines; describe attributes of two-dimensional shapes; identify lines of symmetry that partition a shape into equal areas.

Big idea: Shapes can be defined by different types of lines.

Essential questions: What are parallel lines? Where do I see parallel lines in my environment? What are intersecting lines? Where do I see intersecting lines in my environment? How many lines does this shape have? How many angles does this shape have? Is this a line of symmetry? Is this shape divided into equal parts?

Fifth Grade

Domain: 5.OA Operations and Algebraic Thinking

5.OA.A Additional Cluster: Write and interpret numerical expressions.

Standard	Essential Element
5.OA.A.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols, including expressions in which whole numbers and fractions appear.	Not applicable.
5.OA.A.2 Write simple expressions that record calculations with numbers and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by* $\frac{1}{2}$ *as* $\frac{1}{2} \times (8 + 7)$*. Recognize that* $3 \times (\frac{18}{19} + \frac{2}{3})$ *is three times as large as* $\frac{18}{19} + \frac{2}{3}$*, without having to calculate the indicated sum or product.*	Not applicable.

5.OA.B Additional Cluster: Analyze a pair of number sequences.

Standard	Essential Element
5.OA.B.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns and graph the ordered pairs on a coordinate plane; explain informally why this is so. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence.*	**EE.5.OA.3** Identify and extend numerical patterns.

Unpacked

Concept: Patterns help us see relationships, make connections between concepts, and make predictions.

Skills: Identify pattern as shrinking or growing; identify rule of pattern; apply the rule to extend the pattern.

Big idea: Numerical patterns are predictable as they shrink and grow. Numbers are interconnected and have relationships with other numbers.

Essential questions: How can you extend the numerical pattern? What is the rule of the pattern?

Domain: 5.NBT Numbers and Operations in Base Ten

5.NBT.A Major Cluster: Understand the place value system.

Standard	Essential Element
5.NBT.A.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.	**EE.5.NBT.1** Compare numbers up to 99 using base ten models.
5.NBT.A.2 Explain and use patterns in the number of zeros of the product when multiplying a number by powers of 10 and use patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.	**EE.5.NBT.2** Use the number of zeros in numbers that are powers of 10 to determine which values are equal, greater than, or less than.
5.NBT.A.3 Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form. *For example,* $347.392 = 300 + 40 + 7 + 0.3 + 0.09 + 0.002$. b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	**EE.5.NBT.3** Compare whole numbers up to 100 using symbols (<, >, =).
5.NBT.A.4 Use place value understanding to round decimals to any place. *For example,* 5.43 *rounded to the tenths is* 5.4 *because the last digit must be in the place the decimal is rounded to.* Note: 5.40 would not be correct as it is rounded to the hundredths, not tenths.	**EE.5.NBT.4** Round two-digit whole numbers to the nearest 10 from 0—90.

Unpacked

Concept: The value of a digit depends on its place, or position in the number.

Skills: Compare numbers using base-ten models; group objects into tens once the count exceeds 9; group objects into sets of tens of tens (1 group of one hundred) when it exceeds 99; identify the patterns in the numbers themselves (e.g., 10, 20, 30, follows the same pattern as 1, 2, 3,.); identify place value of 2-digit numbers ending in zero; compare the place value of numbers ending in zero(s); compare whole numbers using symbols (<,>, =); round two-digit whole numbers to the nearest 10.

Big idea: Place value is important when comparing numbers.

Essential questions: What do I know about these numbers? Are the numbers <, >, or = to each other? How can I use place value to determine what number is <, >, or = to another number? How does the number of zeros in a number affect its value? When I solve this problem, do I need an exact answer or an estimate? What are the benchmarks on either side of the number I want to round? What is the midpoint? Should I round up or down?

5.NBT.B Major Cluster: Perform operations with multi-digit whole numbers and with decimals to hundredths.

Standard	Essential Element
5.NBT.B.5 Fluently multiply whole multi-digit numbers including using an algorithm. Algorithms may include the standard algorithm, partial products, area model. Note: Fluency of this standard is critical by the end of grade level.	**EE.5.NBT.5** Multiply whole numbers up to 5 × 5.
5.NBT.B.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division, including the standard algorithm. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	**EE.5.NBT.6–7** Illustrate the concept of division using fair and equal shares.
5.NBT.B.7 Add, subtract, multiply, and divide decimals to hundredths. Be able to illustrate and explain using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	**EE.5.NBT.6–7** Illustrate the concept of division using fair and equal shares.

Unpacked

Concept: Mathematical problems can be solved using different mathematical operations.

Skills: Make equal groups up to 5 (5 groups with 5 in each group); find the product of whole numbers up to 5; use repeated addition to find the product; use array module to find product; use skip counting (2's and 5's) to find product; use the properties of multiplication when solving equations (commutative and identity); partition whole sets into smaller equal-sized sets.

Big idea: Division facts can be found by thinking about the related multiplication fact.

Essential questions: What are the mathematical properties of multiplication? How would I use them? What strategies can I use when solving multiplication and division problems? How can I use what I know about skip counting to help me find the product? How can I use what I know about sharing fairly or equally to solve division problems? How can I use what I know about multiplication to help me solve division problems?

Domain: 5.NF Number and Operations–Fractions

5.NF.A Major Cluster: Use equivalent fractions as a strategy to add and subtract fractions.

Standard	Essential Element
5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example,* $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$. *(In general,* $\frac{a}{b} + \frac{c}{d} = \frac{(ad + bc)}{bd}$*).*	**EE.5.NF.1** Identify models of halves (1/2, 2/2) and fourths (1/4, 2/4, 3/4, 4/4).
5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators. *For example, by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, my friend and I each have some lemons. We need 1 cup of lemon juice to make lemonade. If I squeeze* $\frac{1}{2}$ *cup of lemon juice and my friend squeezes* $\frac{2}{5}$ *a cup of lemon juice how much lemon juice do we have? Is it enough?*	**EE.5.NF.2** Identify models of thirds (1/3. 2/3, 3/3) and tenths (1/10, 2/10, 3/10, 4/10, 5/10, 6/10, 7/10, 8/10, 9/10, 10/10).

Unpacked

Concept: Fractions can mean different things and be modeled in different ways: part of a set, part of a region, and as a measure.

Skills: Identify the meaning of the numerator and denominator; identify models (area or set) of halves, fourths, thirds, and tenths; indicate that the more parts a whole is divided into, the smaller the parts will be; identify numeric symbols for halves, fourths, thirds, and tenths.

Big idea: Fractions are special numbers that represent the relationship between parts and whole.

Essential questions: How can this shape or set be divided into smaller equal parts? What does the bottom number in a fraction tell me? What does the top number in a fraction tell me? How do I know how many fractional parts make a whole? How do I partition this shape so the fraction _____ is represented?

5.NF.B Major Cluster: Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Standard	Essential Element
5.NF.B.3 Interpret that a fraction is the division of the numerator by the denominator ($\frac{a}{b} = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, by using visual fraction models or equations to represent the problem. *For example, if 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*	See **EE.6.RP.1**
5.NF.B.4 Apply and extend earlier understandings of multiplication to multiply a fraction or whole number by a fraction. (This standard does not include mixed numbers) a. Interpret the product $(\frac{a}{b}) \times q$ as a part of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. Recognize that $\frac{1}{b} \times q = q \div b$ (dividing by a whole is the same as multiplying by the reciprocal. *For example, use a visual fraction model to show* $(\frac{2}{3}) \times 4 = \frac{8}{3}$*, and create a story context for this equation. Do the same with* $(\frac{2}{3}) \times (\frac{4}{5}) = \frac{8}{15}$*. (In general,* $(\frac{a}{b}) \times (\frac{c}{d}) = \frac{ac}{bd}$*.)* b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles and represent fraction products as rectangular areas.	Not applicable.
5.NF.B.5 Interpret multiplication as scaling (resizing) by: a. Comparing the size of a product to the size of one factor based on the size of the other factor, without performing the indicated multiplication. b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $\frac{a}{b} = \frac{n \times a}{n \times b}$ to the effect of multiplying $\frac{a}{b}$ by 1.	Not applicable.

Standard	Essential Element
5.NF.B.6 Solve real world problems involving multiplication of fractions and mixed numbers. *For example, by using visual fraction models or equations to represent the problem.*	See **EE.10.N-CN.2.b**
5.NF.B.7 Apply and extend earlier understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (This standard does not include dividing fractions by fractions). a. Interpret division of a unit fraction by a non-zero whole number and compute such quotients. *For example, create a story context for* $(\frac{1}{3}) \div 4$*, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that* $(\frac{1}{3}) \div 4 = \frac{1}{12}$ *because* $(\frac{1}{12}) \times 4 = \frac{1}{3}$. b. Interpret division of a whole number by a unit fraction and compute such quotients. *For example, create a story context for* $4 \div (\frac{1}{5})$*, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that* $4 \div (\frac{1}{5}) = 20$ *because* $20 \times (\frac{1}{5}) = 4$. c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions. *For example, by using visual fraction models and equations to represent the problem: how much chocolate will each person get if 3 people share* $\frac{1}{2}$ *lb of chocolate equally? How many* $\frac{1}{3}$ *cup servings are in 2 cups of raisins?*	See **EE.7.NS.2.b**

Domain: 5.MD Measurement and Data

5.MD.A Supporting Cluster: Convert like measurement units within a given measurement system.

Standard	Essential Element
5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system and use these conversions in solving multi-step, real world problems. *For example, (convert 5 cm to 0.05 m).*	**EE.5.MD.1.a** Tell time using an analog or digital clock to the half or quarter hour. **EE.5.MD.1.b** Use standard units to measure weight and length of objects. **EE.5.MD.1.c** Indicate relative value of collections of coins.

Unpacked

Concept: Measurement involves a selected attribute (e.g., time, length, mass, volume, money) and a comparison of the attribute being measured against a unit of the same attribute.

Skills: Tell time using an analog and digital clock to the half and quarter hour; use standard units to measure the weight and length of objects; count the value of a collection of coins; indicate coins needed to equal the value of another coin (e.g., 2 nickels make one dime, two dimes and one nickel make one quarter).

Big idea: The larger the unit of measure, the fewer units it takes to measure the attribute.

Essential questions: Why is telling time important? How do I use a clock to tell time to the nearest hour, half hour, or quarter hour? How can I tell time using both digital and analog clocks? What tools and units are used to measure the attributes of an object? How do I choose the appropriate tool and unit when measuring? How can I measure the length of this object accurately? Why is it important to understand the values of coins? How can I represent the same amount of money using different combinations of coins? How can I combine coins to make them easier to count? What coins can I use to give me the same value as a nickel? Dime? Quarter? Half dollar?

5.MD.B Supporting Cluster: Represent and interpret data.

Standard	Essential Element
5.MD.B.2 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions to solve problems involving information presented in line plots. • $\frac{1}{8}, \frac{2}{8}, \frac{3}{8}, \frac{4}{8}, \frac{5}{8}, \frac{6}{8}, \frac{7}{8}, \frac{8}{8}$ • $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}$ • $\frac{1}{2}, \frac{2}{2}$	**EE.5.MD.2** Represent and interpret data on a picture, line plot, or bar graph.

Unpacked

Concept: Data can be represented and organized to answer questions and solve problems.

Skills: Sort objects or pictures into two or three categories based on one common attribute; record sorted categories using marks, stamps, pictures, etc. with each symbol used representing one data object; label graph; use data to create picture graph; use data to create bar graph; use data to create a line plot; answer questions about the sorted sets (e.g., Which has more? Which has less? How many are their all together?); answer question(s) using the information represented in the sorted sets.

Big idea: The way data is displayed or organized influences interpretation.

Essential questions: Why are graphs helpful? What kinds of questions can be answered using picture, bar graph, or line plot? Can I sort or organize this data in different ways? Why is data collected and analyzed? How can information be gathered, recorded, and organized? How does collecting data help me solve problems or make decisions? How do labels help others understand the data?

5.MD.C Major Cluster: Geometric measurement: understand concepts of volume and relate volume to multiplication and addition.

Standard	Essential Element
5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of n cubic units.	**EE.5.MD.3** Identify common three-dimensional shapes.

Unpacked

Concept: Shapes can be described, classified, and analyzed by their attributes.

Skills: Identify a cube, cone, sphere, pyramid, prism, and cylinder; identify the name of a cube, cone, sphere, pyramid, prism, and cylinder; match shapes with the same size and different orientation, match shapes with different size and different orientation, match shapes with the same size and same orientation

Big idea: Many of the properties and attributes that apply to 2-D shapes also apply to 3-D shapes.

Essential questions: Where in the real world can I find this shape? How can I identify and describe solid figures by describing the faces, edges, and sides? What is the name of this shape? Are these shapes similar, if so how? Are these shapes different, if so how?

Standard	Essential Element
5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.	**E.5.MD.4–5** Determine the volume of a rectangular prism by counting units of measure (unit cubes).
5.MD.C.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes and show that the volume is the same as would be if found by multiplying the edge lengths or equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes to represent the associative property of multiplication. b. Apply the formulas $V = l \times w \times h$ and $V = B \times h$ (where B stands for the area of the base) for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts (composite figures), applying this technique to solve real world problems. *For example, find the volume of composite figures.*	**E.5.MD.4–5** Determine the volume of a rectangular prism by counting units of measure (unit cubes).

Unpacked

Concept: Shapes can be described, classified, and analyzed by their attributes.

Skills: Identify a unit cube; identify a rectangular prism; define volume as the amount of space inside a three-dimensional shape; fill and count a rectangular prism with unit cubes; describe the total as the volume of the rectangular prism.

Big idea: Volume is a unique attribute of solids that explains how much space an object takes up.

Essential questions: What unit of measure do I use to measure the volume of a rectangular prism? What strategy can I use to determine the volume of any rectangular prism? How can I describe the volume of a shape?

Domain: 5.G Geometry

5.G.A Additional Cluster: Graph points on the coordinate plane to solve real-world and mathematical problems.

Standard	Essential Element
5.G.A.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Plot points in the first quadrant of a coordinate plane. Understand that the first number indicates how far to travel from the origin in the direction of the *x*-axis, and the second number indicates how far to travel in the direction of the y-axis, with the convention that the names of the two axes and the coordinates correspond (x, y).	**EE.5.G.1-4** Sort two-dimensional figures and identify the attributes (angles, number of sides, corners, color) they have in common.
5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane and interpret coordinate values of points in the context of the situation.	**EE.5.G.1-4** Sort two-dimensional figures and identify the attributes (angles, number of sides, corners, color) they have in common.

Unpacked

Concept: Shapes can be described and classified according to their attributes.

Skills: Identify angles, number of sides, corners (right angles) and color of two- dimensional figures; analyze figures to identify common attributes; compare angles within figures as more than, less than, or equal; compare the number of sides of figures using more than, less than or equal; compare the number of right angles in figures using more than, less than or equal; sort two-dimensional figures based on attributes.

Big idea: Two-dimensional figures can be compared using ideas such as greater than, less than, and equal.

Essential questions: What attributes do the figures have in common? How can I sort these figures in different ways? What attribute am I going to use to classify this group of objects?

5.G.B Additional Cluster: Classify two-dimensional figures into categories based on their properties.

Standard	Essential Element
5.G.B.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*	**EE.5.G.1-4** Sort two-dimensional figures and identify the attributes (angles, number of sides, corners, color) they have in common.
5.G.B.4 Classify two-dimensional figures in a hierarchy based on properties.	**EE.5.G.1-4** Sort two-dimensional figures and identify the attributes (angles, number of sides, corners, color) they have in common.

Unpacked

Concept: Shapes can be described and classified according to their attributes.

Skills: Identify angles, number of sides, corners (right angles) and color of two- dimensional figures; analyze figures to identify common attributes; compare angles within figures as more than, less than, or equal; compare the number of sides of figures using more than, less than or equal; compare the number of right angles in figures using more than, less than or equal; sort two-dimensional figures based on attributes.

Big idea: Two-dimensional figures can be compared using ideas such as greater than, less than, and equal.

Essential questions: What attributes do the figures have in common? How can I sort these figures in different ways? What attribute am I going to use to classify this group of objects?

Sixth Grade

Domain: 6.RP Ratios and Proportional Relationships

6.RP.A Major Cluster: Apply ratio concepts and use ratio reasoning to solve problems.

Standard	Essential Element
6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was* $2:1$*, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*	**EE.6.RP.1** Demonstrate a simple ratio relationship.
6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio *a*:*b* with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is* $\frac{3}{4}$ *cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger." Expectations for unit rates in this grade are limited to non-complex fractions.*	See **EE.7.RP.1–3**
6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. b. Use unit rates and scaling to solve problems about proportional relationships, including problems involving unit pricing and constant speed. c. Find a percentage of a quantity as a rate per 100; solve problems involving finding the whole, given a part and the percentage. *For example,* 30% *of a quantity means* $\frac{30}{100}$ *times the quantity.* d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	See **EE.8.F.1–3**

Unpacked

Concept: Ratios compare values**.**

Skills: Recognize and represent many (part to part, part to whole) to 1 ratio.

Big idea: A ratio tells how much of one thing there is compared to how much of another thing. A ratio compares two quantities-part to part or part to whole.

Essential questions: What is a ratio? How can I write a ratio? What am I comparing? What does this ratio tell me? How many parts are there in the whole? What does the ratio represent?

Domain: 6.NS The Number System

6.NS.A Major Cluster: Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

Standard	Essential Element
6.NS.A.1 Use and interpret models to compute quotients of fractions. Solve word problems involving division of fractions by fractions. Be able to use visual fraction models and equations to represent the problem. *For example, create a story context for* $(\frac{2}{3}) \div (\frac{3}{4})$ *and use a visual fraction - model to show the quotient; use the relationship between multiplication and division to explain that* $(\frac{2}{3}) \div (\frac{3}{4}) = \frac{8}{9}$ *because* $\frac{3}{4}$ *of* $\frac{8}{9}$ *is* $\frac{2}{3}$*. (In general,* $(\frac{a}{b}) \div (\frac{c}{d}) = \frac{ad}{bc}$*). If* $\frac{2}{3}$ *of a shoelace is* $\frac{1}{2}$ *meter long, how many meters long is the shoelace? How many* $\frac{3}{4}$ *cup servings are in* $\frac{2}{3}$ *of a cup of yogurt? How wide is a rectangular strip of land with length* $\frac{3}{4}$ *mi and area* $\frac{1}{2}$ *square-mile?*	**EE.6.NS.1** Compare the relationships between two-unit fractions.

Unpacked

Concept: Fractions can mean different things and be modeled in different ways: part of a set, part of a region, and as a measure.

Skills: Identify that a unit fraction is one part of a whole; indicate that the more parts a whole is divided into, the smaller the parts will be; use partitioning and iterations to represent the unit fractions; compare two-unit fractions.

Big idea: A fractional part is equal to, less than, or greater than one whole.

Essential questions: How can I represent these fractions? What is the relationship between the two fractions? Are they equivalent? Which fraction is larger/smaller?

6.NS.B Additional Cluster: Compute with multi-digit numbers and find common factors and multiples.

Standard	Essential Element
6.NS.B.2 Divide multi-digit numbers using the standard algorithm. For at least 4 digits by 1-digit division by hand; more complicated cases using technology. *For example,* $\frac{6,389}{7}$.	**EE.6.NS.2** Apply the concept of fair share and equal shares to divide.
6.NS.B.3 Add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. For more complex cases, use technology.	**EE.6.NS.3** Solve two-factor multiplication problems with products up to 50 using concrete objects and/or a calculator.
6.NS.B.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express* $36 + 8$ *as* $4(9 + 2)$.	Not applicable.

Unpacked

Concept: Problems can be solved using various operations.

Skills: Use the values in a division equation to find the number of groups that can be made or the number of items in each group using the strategy of fair or equal shares; solve multiplication problems using 2 values whose product is less than or equal to 50; use concrete objects to prove the answer; use a calculator to prove the answer.

Big idea: Some problems involving joining equal groups, separating equal groups, comparison, or combinations can be solved using multiplication; others can be solved using division.

Essential questions: How can I make equal groups from this one large group? How do I know this is a fair share? What is the product? How can I solve this multiplication/division problem using objects? How can I solve this multiplication/division problem using a calculator?

6.NS.C Major Cluster: Apply and extend previous understandings of numbers to the system of rational numbers.

Standard	Essential Element
6.NS.C.5 Describe quantities having opposite directions or values using positive and negative numbers: temperature above/below zero, elevation above/below sea level, credits/debits, and positive/negative electric charge. Use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	**EE.6.NS.5–8** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero).
6.NS.C.6 Represent a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from earlier grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself. *For example,* $-(-3) = 3$*, and that 0 is its own opposite.* b. Describe locations in the coordinate plane using signed numbers in ordered pairs; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.	**EE.6.NS.5–8** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero).
6.NS.C.7 Compare, order and describe the absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret* $-3 > -7$ *as a statement that* -3 *is located to the right of* -7 *on a number line oriented from left to right.* b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write* $-3°C > -7°C$ *to express the fact that* $-3°C$ *is warmer than* $-7°C$*.* *c.* Describe the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of* -30 *dollars, write* $|-30| = 30$ *to describe the size of the debt in dollars.* *d.* Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than* -30 *dollars represents a debt greater than* 30 *dollars.*	**EE.6.NS.5–8** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero).

Standard	Essential Element
6.NS.C.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	**EE.6.NS.5–8** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero).

Unpacked

Concept: Both positive and negative numbers represent a distance from zero on the number line.

Skills: Identify positive and negative numbers on a number line; identify real- world examples for the use of positive and negative numbers (e.g., temperature, owing money, working with a budget, elevations below sea level, the basement floor of a building, diving under water); explain that zero is the value between positive and negative numbers; show the direction of movement on a number line when working with positive and negative numbers.

Big idea: Positive numbers are greater than zero. Negative numbers are less than zero and have a negative sign (−) in front of them. A negative number is the opposite of a positive number of the same size.

Essential questions: Where can I find this number on a number line? Does this number have a positive or negative value? What are some examples I can use to show negative and positive numbers? If I start with a positive number and then add a negative number, what direction on the number line will I move? How far is this number from zero?

Domain: 6.EE Expressions and Equations

6.EE.A Major Cluster: Apply and extend previous understandings of arithmetic to algebraic expressions.

Standard	Essential Element
6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents.	**EE.6.EE.1–2** Identify equivalent number sentences.
6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as* $5 - y$. b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression* $2(8 + 7)$ *as a product of two factors; view* $(8 + 7)$ *as both a single entity and a sum of two terms.* c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with sides of length* $s = \frac{1}{2}$.	**EE.6.EE.1–2** Identify equivalent number sentences.
6.EE.A.3 Apply the properties of operations to generate equivalent expressions. Know that expressions are called equivalent when they name the same number regardless of which value is substituted into them. *For example, apply the distributive property to the expression* $3(2 + x)$ *to produce the equivalent expression* $6 + 3x$*; apply the distributive property to the expression* $24x + 18y$ *to produce the equivalent expression* $6(4x + 3y)$*; apply properties of operations to* $y + y + y$ *to produce the equivalent expression* $3y$.	**EE.6.EE.3** Apply the properties of addition to identify equivalent numerical expressions.
6.EE.A.4 Describe the properties of operations used to show two expressions are equivalent. *For example, show that* $3c + 3cd$ *and* $3c(1 + d)$ *are equivalent.*	Not applicable.

Unpacked

Concept: Number sentences and equations show a relationship and can be written in different ways.

Skills: Recognize equivalent algebraic expressions; represent the unknown in an equation; use properties of operation to generate equivalent expressions involving addition, subtraction, multiplication or division; identify equivalent number sentences; use symbols for equal and not equal.

Big idea: A number sentence uses numbers and the equal sign to show that two quantities have equal value, whereas a number expression is a math problem that uses numbers and letters to represent variables and an equal sign to show that two quantities have equal value.

Essential questions: Do the two sides of this problem have equal value? Is this expression true (equal) or false (not equal)?

6.EE.B Major Cluster: Reason about and solve one-variable equations and inequalities.

Standard	Essential Element
6.EE.B.5 Use substitution to determine whether a given number in a specified set makes an equation or inequality true. Solving an equation or inequality is a process of answering a question: Which values from a specified set, if any, make the equation or inequality true?	**EE.6.EE.5–7** Match an equation to a real-world problem in which variables are used to represent numbers.
6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number or depending on the purpose at hand, any number in a specified set.	**EE.6.EE.5–7** Match an equation to a real-world problem in which variables are used to represent numbers.
6.EE.B.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.	**EE.6.EE.5–7** Match an equation to a real-world problem in which variables are used to represent numbers.
6.EE.B.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that an inequality of the form $x > c$ or $x < c$ has infinitely many solutions; use a number line diagram to represent infinitely many solutions of such an inequality.	Not applicable.

Unpacked

Concept: Mathematical situations and structures can be translated and represented abstractly using variables, expressions, and equations.

Skills: Identify what operation is needed in the real-world problem; identify the known quantities and the unknown variable; identify the structure of the equation; match an equation to a real world-problem.

Big idea: Letters are used in mathematics to represent generalized properties, unknowns in equations, and relationships between quantities.

Essential questions: What operation is needed in this problem? What are the known quantities and the unknown variables in the problem? What does the variable represent? Which equations match this problem?

6.EE.C Major Cluster: Represent and analyze quantitative relationships between dependent and independent variables.

Standard	Essential Element
6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity in terms of the other quantity. Analyze the relationship between the dependent and independent variables using graphs and tables and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation* $d = 65t$ *to represent the relationship between distance and time.*	Not applicable.

Domain: 6.G Geometry

6.G.A Supporting Cluster: Solve real-world and mathematical problems involving area, surface area, and volume.

Standard	Essential Element
6.G.A.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	**EE.6.G.1** Solve real-world and mathematical problems about area using unit squares.
6.G.A.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = Bh$ (where B stands for the area of the base) to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	**EE.6.G.2** Solve real-world and mathematical problems about volume using unit cubes.
6.G.A.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	Not applicable.
6.G.A.4 Represent three-dimensional figures using nets made up of rectangles and triangles and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	Not applicable.

Unpacked

Concept: Measurement involves a selected attribute of an object (e.g., area, volume) and a comparison of the object being measured against a unit of the same attribute.

Skills: Identify contexts for using unit squares (area) and unit cubes (volume); use unit squares and unit cubes to count the total; apply knowledge of repeated addition to solve for volume; apply knowledge of multiplication to solve for volume; solve a real-world problem involving area; solve a real-world problem involving volume.

Big idea: The use of standard measurement units simplifies communication about the size of objects.

Essential questions: What is the difference between area and volume? How do I know when to use unit cubes or unit squares? How can I organize the information to solve for area and/or volume? What is the area? What is the volume?

Domain: 6.SP Statistics and Probability

6.SP.A Additional Cluster: Develop understanding of statistical variability.

Standard	Essential Element
6.SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*	**EE.6.SP.1–2** Display data on a graph or table that shows variability in the data.
6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	**EE.6.SP.1–2** Display data on a graph or table that shows variability in the data.
6.SP.A.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	See **EE.S-ID.4**

Unpacked

Concept: Information can be collected, displayed, summarized, and analyzed.

Skills: Identify the question the data needs to answer; determine an appropriate display for data (line plot, bar graph, picture graph, table); recognize and summarize data by overall shape (increasing, decreasing, staying the same); recognize outliers and peaks in data distribution.

Big idea: It is important not only to read information from graphs but to make inferences, draw conclusions, and make predictions.

Essential questions: What is the overall shape of the data? What data is an outlier? Why does this type of graph represent the data the best?

6.SP.B Additional Cluster: Summarize and describe distributions.

Standard	Essential Element
6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	See **EE.6.SP.1–2**
6.SP.B.5 Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations. b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	**EE.6.SP.5** Summarize data distributions shown in graphs or tables.

Unpacked

Concept: Information can be collected, displayed, summarized and analyzed.

Skills: Summarize data by overall shape; identify outliers; identify most common value; identify the middle value; identify highest and lowest value; identify peaks in data distribution; identify symmetric distribution (data is balanced on both sides of the mean).

Big idea: It is important not only to read information from graphs but to make inferences, draw conclusions, and make predictions.

Essential questions: What is the shape of the data? How is the data in this graph the same? How is the data in this graph different? Does this data have a pattern and if so, what is the pattern? How is this data distributed? How could I summarize my interpretation of the data?

Seventh Grade

Domain: 7.RP Ratios and Proportional Relationships

7.RP.A Major Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems.

Standard	Essential Element
7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks* $\frac{1}{2}$ *mile in each* $\frac{1}{4}$ *hour, compute the unit rate as the complex fraction* $\frac{\frac{1}{2}}{\frac{1}{4}}$ *miles per hour, equivalently 2 miles per hour. Give a reason it is a better value to buy a supply of an item at a cost of $22.50 for ten pounds than at a cost of $1.50 for* $\frac{1}{2}$ *pound.*	**EE.7.RP.1–3** Use a ratio to model or describe a relationship.
7.RP.A.2 Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship. *For example, by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.* b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items bought at a constant price p, the relationship between the total cost and the number of items can be expressed as* $t = pn$. d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0,0)$ and $(1, r)$ where r is the unit rate.	**EE.7.RP.1–3** Use a ratio to model or describe a relationship.
7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. *For example: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.*	**EE.7.RP.1–3** Use a ratio to model or describe a relationship.

Unpacked

Concept: What is the shape of the data? How is the data in this graph the same? How is the data in this graph different? Does this data have a pattern and if so, what is the pattern? How is this data distributed? How could I summarize my interpretation of the data?

Skills: Use ratio language "to" and "out of" to identify how much of one thing there is compared to another thing; write/indicate a ratio comparing part to part or part to whole.

Big idea: A ratio is used to describe a relationship to part-part or part-whole.

Essential questions: What does this ratio tell me? How can I model this relationship? How do you write a ratio that describes part to part or part to whole?

Domain: 7.NS The Number System

7.NS.A Major Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Standard	Essential Element
7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.* b. Use a model to describe $p + q$ as a number located a distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. c. Use a model to describe subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real-world contexts. d. Apply properties of operations as strategies to add and subtract rational numbers.	**EE.7.NS.1** Add fractions with like denominators (halves, thirds, fourths, and tenths) with sums less than or equal to one.
7.NS.A.2 Apply and extend earlier understandings of multiplication and division and of fractions to multiply and divide rational numbers. a. Use properties of operations, particularly the distributive property, leading to generalizations for products such as $(-1)(-1) = 1$ for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. b. Use properties of operations, particularly the distributive property, leading to generalizations for quotients of integers (provided that the divisor is not zero). If p and q are integers, then $-\left(\frac{p}{q}\right) = \frac{(-p)}{q} = \frac{p}{(-q)}$. Interpret quotients of rational numbers by describing real-world contexts. c. Multiply and divide rational numbers. d. Convert a rational number to a decimal; know that the decimal form of a rational number terminates in 0s or eventually repeats.	**EE.7.NS.2.a** Solve multiplication problems with products to 100. **EE.7.NS.2.b** Solve division problems with divisors up to five and also with a divisor of 10 without remainders. **EE.7.NS.2.c–d** Express a fraction with a denominator of 10 as a decimal.

Standard	Essential Element
7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions, a fraction within a fraction.	**EE.7.NS.3** Compare quantities represented as decimals in real- world examples to tenths.

Unpacked

Concept: Numbers can be represented, displayed, converted, and compared.

Skills: Add fractions with like denominators; solve multiplication problems; solve division problems; convert a fraction with a denominator of 10 to a decimal; compare decimals in real- world examples.

Big idea: The concepts and properties of addition, subtraction, multiplication, and division are the same whether using whole numbers, fractions, or decimals.

Essential questions: What is the sum of two fractions? Which part of the fractions do I add? Why do I not add the denominators? What is the product of this multiplication problem? What model can I use to help me solve this multiplication problem? What are the parts of a division problem? What model can I use to help me solve this division problem? How can I express a fraction as a decimal? Which tenth is larger/smaller (from a real-world example)?

Domain: 7.EE Expressions and Equations

7.EE.A Major Cluster: Use properties of operations to generate equivalent expressions.

Standard	Essential Element
7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	**EE.7.EE.1** Use the properties of operations as strategies to demonstrate that expressions are equivalent.
7.EE.A.2 Describe how rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example,* $a + 0.05a = 1.05a$ *means that "increase by* 5%*" is the same as "multiply by* 1.05*."*	**EE.7.EE.2** Identify an arithmetic sequence of whole numbers with a whole number common difference.

Unpacked

Concept: Operations create relationships between numbers.

Skills: Apply the properties of operations (e.g., commutative, associative); recognize equivalent expressions (e.g., A + (B x C)= (C x B) + A, and (A+B)– C x (D x E)= (A+B) – (C x D) x E); identify arithmetic sequence with common difference (e.g., 5, 7, 9, 11, 13,15 common difference of 2).

Big idea: The commutative and associative properties for addition and multiplication of whole numbers allow computations to be performed flexibly. Subtraction is not commutative or associative for whole numbers. The difference between successive terms in some sequences is constant.

Essential questions: What is the correct order for performing mathematical operations? How can the properties of operations be used to determine if two equations are equivalent? What is the difference between each of the numbers in this sequence? What is the rule for this sequence?

7.EE.B Major Cluster: Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Standard	Essential Element
7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example, If someone making $25 an hour gets a* 10% *raise, that is an additional* $\frac{1}{10}$ *of their salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar* $9\ \frac{3}{4}$ *inches long in the center of a door that is* $27\ \frac{1}{2}$ *inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*	Not applicable.
7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example, as a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make and describe the solutions.* $px + q > r$	**EE.7.EE.4** Use the concept of equality with models to solve one-step addition and subtraction equations.

Unpacked

Concept: Equality means that both values on the left and the right side of the equal sign '=' will have the same value.

Skills: Use models to solve one step addition and subtraction equations (e.g., p + 12 = 12 + p and p + 7 = 12 - 7).

Big idea: The expressions on each side of the equal sign are equal, so you can add the same value to each side and maintain the equality and you can subtract the same value from each side of an equation and maintain the equality.

Essential questions: What is meant by equality in mathematics? How can I use addition or subtraction to solve one-step equations? What information do we know from the equation? What information is missing? What operation could be used to find the solution? Which representation will I use to help me solve this problem (concrete manipulatives, pictures, words, or equations)?

Domain: 7.G Geometry

7.G.A Additional Cluster: Draw, construct, and describe geometrical figures and describe the relationships between them.

Standard	Essential Element
7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	**EE.7.G.1** Match two similar geometric shapes that are proportional in size and in the same orientation.
7.G.A.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	**EE.7.G.2** Recognize geometric shapes with given conditions.
7.G.A.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	**EE.7.G.3** Match a two-dimensional shape with a three-dimensional shape that shares an attribute.

Unpacked

Concept: Shapes can be described, classified and analyzed by their attributes.

Skills: Match familiar shapes such as squares, rectangles, and circles when presented with different sizes and the same orientation; match familiar solids such as spheres, rectangular prisms, cubes, and pyramids when presented with different sizes and the same orientation; classify shapes with like attributes; describe attributes of shapes; match a two-dimensional shape with a three- dimensional shape that shares an attribute (e.g., identify a square in a cube, identify the circle in a cylinder).

Big idea: Many two-dimensional shapes share attributes with three-dimensional shapes.

Essential questions: How can I decide if two shapes are similar? What attributes do the shapes have? What attributes do these shapes have in common?

7.G.B Additional Cluster: Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Standard	Essential Element
7.G.B.4 Choose the formula needed and use it to solve problems involving the area and circumference of a circle. *For example, a 15.1 in long wire is bent into the shape of a circle to make a wreath with 2.9 in left over. To the nearest 0.1 in, what is the diameter of the circle?*	**EE.7.G4** Determine the perimeter of a rectangle by adding the measures of the sides.
7.G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	**EE.7.G.5** Recognize angles that are acute, obtuse, and right.
7.G.B.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	**EE.7.G.6** Determine the area of a rectangle using the formula for length × width, and confirm the result using tiling or partitioning into unit squares.

Unpacked

Concept: Units of measure can be used to solve real-world problems.

Skills: Calculate the perimeter of a rectangle; classify angles by size (right, acute and obtuse); calculate the area of a rectangle; use tiles to confirm the area of a rectangle; use partitioning to confirm the area of a rectangle.

Big idea: Formulas are used to calculate perimeter and area. The name of an angle describes its attribute.

Essential questions: How do I calculate perimeter? How do I calculate area? How is perimeter measured? How is area measured? How can I use the right angle to help me compare and classify other angles? How do I classify an angle? How can I confirm my calculations for area?

Domain: 7.SP Statistics and Probability

7.SP.A Supporting Cluster: Use random sampling to draw inferences about a population.

Standard	Essential Element
7.SP.A.1 Describe how statistics can be used to gain information about a population by examining a sample of the population, recognizing that generalizations about a population from a sample are valid only if the sample is representative of that population. Explain that random sampling tends to produce representative samples and support valid inferences.	**EE.7.SP.1–2** Answer a question related to the collected data from an experiment, given a model of data, or from data collected by the student.
7.SP.A.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data and observe the variation in predictions across multiple surveys.*	**EE.7.SP.1–2** Answer a question related to the collected data from an experiment, given a model of data, or from data collected by the student.

Unpacked

Concept: Information can be collected, displayed, summarized and analyzed.

Skills: Use data to answer a question; interpret data from an experiment; interpret data from a model; interpret collected data.

Big idea: Data can be used to answer questions.

Essential questions: What data has been collected? What is the question I am trying to answer about the data? What does that data mean to me? What conclusions can I draw from the data? What do I want to say to answer the question?

7.SP.B Additional Cluster: Draw informal comparative inferences about two populations.

Standard	Essential Element
7.SP.B.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.*	**EE.7.SP.3** Compare two sets of data within a single data display such as a picture graph, line plot, or bar graph.
7.SP.B.4 Use measures of center (*for example, mode, median, mean*) and measures of variability (*for example, range, interquartile range, mean absolute deviation*) for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*	See **EE.S-ID.4**

Unpacked

Concept: Information can be collected, displayed, summarized and analyzed.

Skills: Read, interpret, and draw conclusions from data, presented in picture graphs, line plots, and bar graphs; use the visual overlap of two sets of data to compare their variability; compare differences in the shape of 2 sets of data; use comparative language such as more/less/equal.

Big idea: Data can be represented visually using tables, charts, and graphs. The type of data determines the best choice of visual representation.

Essential questions: What is this data telling me? What does this data represent? What comparisons or conclusions can you make from the data?

7.SP.C Supporting Cluster: Investigate and model chance processes.

Standard	Essential Element
7.SP.C.5 Describe the probability of a chance event as a number between 0 and 1 that expresses the likelihood of the event occurring. (*for example, larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around* $\frac{1}{2}$ *indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event*).	**EE.7.SP.5–7** Describe the probability of events occurring as possible or impossible.

Standard	Essential Element
7.SP.C.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency. Given the probability of a chance event, predict the approximate relative frequency that will be observed, and collect data to assess the agreement between the probability and the observed frequency. *For example, collect data to approximate the probability that a tossed paper cup will land open-end down. Your friend calculated that the probability of "rolling double sixes" with a pair of number cubes is* $\frac{1}{36}$ *(which is the wrong answer) collect data to see how well this probability agrees with the observation frequency.*	**EE.7.SP.5–7** Describe the probability of events occurring as possible or impossible.
7.SP.C.7 Calculate probabilities of simple events under an assumption of equal probability for all outcomes. *For example, suppose that one student in seventh grade will be chosen to speak at a school assembly. On the assumption that every student is equally likely to be chosen, calculate the probability that the youngest seventh grader will be chosen and the probability that a member of Homeroom 701 will be chosen. Calculate the probability of a spinner landing on a certain color, assuming that all of the colors are equally likely outcomes.*	**EE.7.SP.5–7** Describe the probability of events occurring as possible or impossible.
7.SP.C.8 Calculate probabilities of compound events using organized lists, tables, tree diagrams, and simulation. *For example, Calculate the probability of "rolling double sixes." Use a simulation to approximate the answer to the question. For example, if* 40% *of blood donors have type A blood, what is the probability that it will take at least 4 blood donors to find one with type A blood?*	Not applicable.

Unpacked

Concept: Probability can provide a basis for making predictions.

Skills: Describe the likelihood of events by indicating possible and impossible; identify outcome of an event; predict the probability that a familiar event will occur or not occur (e.g., recess, snow, pencil falling).

Big idea: You can describe an event based on its probability (from certain to impossible).

Essential questions: What is the likelihood that the event will occur? What are the possible outcomes of the event?

Eighth Grade

Domain: 8.NS The Number System

8.NS.A Supporting Cluster: Work with numbers that are not rational and approximate them by rational numbers.

Standard	Essential Element
8.NS.A.1 Classify and explain numbers as rational or irrational. For rational numbers show that the decimal expansion repeats eventually and convert a decimal expansion which repeats eventually into a rational number.	**EE.8.NS.1** Subtract fractions with like denominators (halves, thirds, fourths, and tenths) with minuends less than or equal to one.
8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions. *For example, estimate the value of* $\sqrt{2}$*. By truncating the decimal expansion of* $\sqrt{2}$*, show that* $\sqrt{2}$ *is between 1 and 2, then between 1.4 and 1.5, and explain how to continue - on to get better approximations.*	**EE.8.NS.2.a** Express a fraction with a denominator of 100 as a decimal. **EE.8.NS.2.b** Compare quantities represented as decimals in real-world examples to hundredths.

Unpacked

Concept: What is the likelihood that the event will occur? What are the possible outcomes of the event?

Skills: Identify when two fractions are divided into an equal number of parts (like denominators); subtract fractions with like denominators; convert a fraction with a denominator of 100 to a decimal; compare decimals in real-world examples.

Big idea: The concepts and properties of addition, subtraction, multiplication, and division are the same whether using whole numbers, fractions, or decimals.

Essential questions: What is the difference of two fractions? Which part of the fractions do I subtract? Why do I not subtract the denominators? How can I express a fraction as a decimal? Which hundredths is larger/smaller (from a real-world example)?

Domain: 8.EE Expressions and Equations

8.EE.A Major Cluster: Work with radicals and integer exponents.

Standard	Essential Element
8.EE.A.1 Apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \times 3^{-5} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$.	**EE.8.EE.1** Identify the meaning of an exponent (limited to exponents of 2 and 3).
8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Students evaluate square roots of small perfect squares and cube roots of small perfect cubes. Use bases 1 through 5 and 10 for cubes.	**EE.8.EE.2** Identify a geometric sequence of whole numbers with a whole number common ratio.
8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate exceptionally large or small quantities and to express how many times as much one is than another. *For example, estimate the population of the United States as 3 times* 10^8 *and the population of the world as 7 times* 10^9*, and determine that the world population is more than 20 times larger.*	**EE.8.EE.3–4** Compose and decompose whole numbers up to 999.
8.EE.A.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of convenient size for quantities. *For example, use millimeters per year for seafloor spreading. Interpret scientific notation that has been generated by technology.*	**EE.8.EE.3–4** Compose and decompose whole numbers up to 999.

Unpacked

Concept: Numbers have relationships and can be written in different ways.

Skills: Identify the base and exponent; use multiplication strategies to demonstrate the meaning of exponents; solve problems involving exponents of 2 or 3; multiply by the same number each time to get the next term in the geometric sequence (e.g., 3, 6, 12, the common ratio is 2); compose and decompose whole numbers up to three digits.

Big idea: Exponents are notations of repeated multiplication. Geometric sequence represents multiplication or division by a common ratio (number). Numbers can be taken apart to create smaller groups or put together to create larger groups.

Essential questions: Which number is the exponent? How do I represent multiplication using exponents? How do I find the pattern of a geometric sequence? What is the common ratio between this sequence of numbers? How can I represent the same quantity in different ways?

8.EE.B Major Cluster: Understand the connections between proportional relationships, lines, and linear equations.

Standard	Essential Element
8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.	**EE.8.EE.5–6** Graph a simple ratio by connecting the origin to a point representing the ratio in the form of *y*/*x*. *For example, when given a ratio in standard form (2:1), convert to 2/1, and plot the point (1,2).*
8.EE.B.6 Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane. a. Derive from this principle the equation $y = mx$ for a line through the origin. b. Derive from this principle the equation $y = mx + b$ for a line intercepting the vertical axis at b.	**EE.8.EE.5–6** Graph a simple ratio by connecting the origin to a point representing the ratio in the form of *y*/*x*. *For example, when given a ratio in standard form (2:1), convert to 2/1, and plot the point (1,2).*

Unpacked

Concept: Ratios show a comparison and can be used for mathematical reasoning.

Skills: Identify a coordinate plane and its parts; identify the origin on a coordinate plane; identify the x value and the y value on a coordinate plane; identify that the x values move left and right, and the y value moves up and down; graph the points on the plane; given a ratio, identify which number goes on the x axis, and which number goes on the y axis.

Big idea: A ratio can be displayed on a graph to show a relationship between the horizontal and vertical axis.

Essential questions: What are the parts of the coordinate plane? Where is the origin? Where is the x value and the y value on a coordinate plane? Which value moves left and right? Which value moves up and down? Where would this ratio be located on the coordinate plane? Given a ratio, which number represents the y value, and which number represents the x value?

8.EE.C Major Cluster: Analyze and solve linear equations and pairs of simultaneous linear equations.

Standard	Essential Element
8.EE.C.7 Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	**EE.8.EE.7** Solve simple algebraic equations with one variable using addition and subtraction.
8.EE.C.8 Analyze and solve pairs of simultaneous linear equations. a. Describe how the solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations. Solve simple (by inspection) cases. *For example,* $3x + 2y = 5$ *and* $3x + 2y = 6$ *have no solution because* $3x + 2y$ *cannot simultaneously be 5 and 6;* $x - y = 11$ *and* $2x + y = 19$. c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*	See **EE.8.EE.5–6**

Unpacked

Concept: Equations express a relationship that can be used to solve an unknown.

Skills: Equations express a relationship that can be used to solve an unknown.

Big idea: Variables represent the unknown in an equation.

Essential questions: What am I trying to figure out in this equation? What do I know about the properties of addition and subtraction that can help me solve this problem?

Domain: 8.F Functions

8.F.A Major Cluster: Define, evaluate, and compare functions.

Standard	Essential Element
8.F.A.1 Describe a function as a rule that assigns to each input exactly one output and the graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Function notation is not required in grade 8.	**EE.8.F.1–3** Given a function table containing at least 2 complete ordered pairs, identify a missing number that completes another ordered pair (limited to linear functions).
8.F.A.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*	**EE.8.F.1–3** Given a function table containing at least 2 complete ordered pairs, identify a missing number that completes another ordered pair (limited to linear functions).
8.F.A.3 Interpret the equation $y = mx + b$ as defining a function that assigns to each input value x the output value $mx + b$; this is a linear function whose graph is a straight line. Give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points $(1,1)$, $(2,4)$ and $(3,9)$, which are not on a straight line.*	**EE.8.F.1–3** Given a function table containing at least 2 complete ordered pairs, identify a missing number that completes another ordered pair (limited to linear functions).

Unpacked

Concept: A function is a mathematical rule that describes how two or more quantities vary in relationship to each other.

Skills: Identify the relationship between the input and output (the pattern); identify the change (function or rule); use mathematical strategies to find the missing number; identify the missing number.

Big idea: In mathematical relationships, the value of one quantity depends on the value of the other quantity. Known values in a function table (pattern) can be used to predict other values.

Essential questions: What is the constant change? What rule can express this change? How can I use a rule to find additional ordered pairs (values)? What is the next set of ordered pairs?

8.F.B Major Cluster: Use functions to model relationships between quantities.

Standard	Essential Element
8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.	**EE.8.F.4** Determine the values or rule of a function using a graph or a table.
8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph. *For example, identify where the function is increasing or decreasing, and if it is linear or nonlinear. Sketch a graph that shows the qualitative features of a function that has been described verbally.*	**EE.8.F.5** Describe how a graph represents a relationship between two quantities.

Unpacked

Concept: In mathematical relationships, the value of one quantity depends on the value of the other quantity.

Skills: Given the input values and a rule, compute the output; describe the function rule from the list of ordered pairs given in a table or graph; describe the relationship between two quantities on a graph.

Big idea: The graph of a relationship can be analyzed with regard to the change in one quantity relative to the change in the other quantity.

Essential questions: How can I use the ordered pairs to figure out the rule? How can I use the values represented on a graph to figure out the rule? How can I use the rule to figure out the next ordered pair or the next plot on the graph? How can I describe the relationship between two quantities on a graph?

Domain: 8.G Geometry

8.G.A Major Cluster: Demonstrate congruence and similarity using physical models, patty paper or geometry software.

Standard	Essential Element
8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.	**EE.8.G.1** Recognize translations, rotations, and reflections of shapes.
8.G.A.2 Explain that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Given two congruent figures, describe a sequence of rigid transformations that proves the congruence between them.	**EE.8.G.2** Identify shapes that are congruent.
8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	Not applicable.
8.G.A.4 Explain that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that demonstrates the similarity between them.	**EE.8.G.4** Identify similar shapes with and without rotation.
8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*	**EE.8.G.5** Compare any angle to a right angle, and describe the angle as greater than, less than, or congruent to a right angle.

Unpacked

Concept: Shapes can be described, classified and analyzed by their attributes.

Skills: Identify translation (slide), rotation (turning around a point), and reflection (flip) of shapes; describe properties of congruence; identify shapes that are congruent; describe properties of similar shapes; recognize similar shapes without rotation; compare angle to right angle-describe as greater than, less than or congruent to right angle.

Big idea: Shapes have attributes that do not change despite their orientation.

Essential questions: What do I know about shapes and their attributes? What happens to a shape if I slide it (translate)? What happens to a shape when I rotate it? What happens to a shape when I flip it? What makes two shapes similar? What makes two shapes congruent? How does this angle compare to a right angle?

8.G.B Major Cluster: Explain and apply the Pythagorean Theorem.

Standard	Essential Element
8.G.B.6 Explain a proof of the Pythagorean Theorem and a proof of its converse.	Not applicable.
8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two- and three-dimensions.	Not applicable.
8.G.B.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	Not applicable.

8.G.C Additional Cluster: Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Standard	Essential Element
8.G.C.9 Apply the formulas for the volume of cones, cylinders, and spheres to solve real-world and mathematical problems.	**EE.8.G.9** Use the formulas for perimeter, area, and volume to solve real-world and mathematical problems (limited to perimeter and area of rectangles and volume of rectangular prisms).

Unpacked

Concept: Measurement can be applied to solve real world problems.

Skills: Identify the formulas for area, perimeter, and volume; calculate the area of a shape; calculate perimeter of a shape; calculate volume of a shape; use formulas for area, perimeter, and volume to solve real-world problems.

Big idea: Measurement involves a selected attribute of an object (area, perimeter, volume) and calculating the attribute based on the measurements and formula.

Essential questions: What is this problem asking me to find? What formula do I use to solve this problem? What makes each formula different? Where do I use the formula for perimeter in real life? Where do I use the formula for area in real life? Where do I use the formula for volume in real life? Why is knowing the perimeter, area, and/or volume important?

Domain: 8.SP Statistics and Probability

8.SP.A Supporting Cluster: Investigate patterns of association in bivariate data.

Standard	Essential Element
8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	Not applicable.
8.SP.A.2 For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	See **EE.10.S-ID.1–2** and **EE.10.S-ID.3**
8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5* $\frac{cm}{hr}$ *has meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*	Not applicable.
8.SP.A.4 Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*	**EE.8.SP.4** Construct a graph or table from given categorical data, and compare data categorized in the graph or table.

Unpacked

Concept: Information can be collected, displayed, summarized and analyzed.

Skills: Decide what data will be represented; construct a graph or table from given categorical data; compare data categorized in the graph or table.

Big idea: Data can be displayed in a graph or table to be compared. Data can be used to answer questions.

Essential questions: How can this data be displayed in a graph? How can this data be displayed in a table? What comparisons can be made from the data? How would I describe the comparison of the data?

Algebra

Conceptual Category: A.N Number and Quantity

Domain: A1.N-RN The Real Number System

A2.N-RN.A Major Cluster: Extend the properties of exponents to rational exponents.

Standard	Essential Element
A2.N-RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define* $5^{\frac{1}{3}}$ *to be the cube root of 5 because we want* $(5^{\frac{1}{3}})^3 = 5^{(\frac{1}{3})^3}$ *to hold, so* $5^{(\frac{1}{3})^3}$ *must equal 5.*	**EE.N-RN.1** Determine the value of a quantity that is squared or cubed.
A2.N-RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.	Not applicable.

Unpacked

Concept: Number sentences show a relationship and can be written in different ways.

Skills: Identify the exponent; relate exponent of 2 as squared; relate exponent of 3 as cubed; identify a perfect square; identify a perfect cube; model with tiles a perfect square and a perfect cube; calculate the value of a quantity that is squared or cubed.

Big idea: A perfect square is a number that can be expressed as the product of two equal integers. A perfect cube is a number that can be expressed as the product of three equal integers.

Essential questions: How can I model this quantity with tiles? What do I do when a number is squared? What do I do when a number is cubed? How can I write this using expanded notation? How do I write this expression using exponents?

Domain:A2.N-CN The Complex Number System

A2.N-CN.A Additional Cluster: Perform arithmetic operations with complex numbers.

Standard	Essential Element
A2.N-CN.A.1 Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.	Not applicable.
A2.N-CN.A.2 Use the relation $i^2 = -1$and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	**EE.N-CN.2.a** Use the commutative, associative, and distributive properties to add, subtract, and multiply whole numbers. **EE.N-CN.2.b** Solve real-world problems involving addition and subtraction of decimals, using models when needed. **EE.N-CN.2.c** Solve real-world problems involving multiplication of decimals and whole numbers, using models when needed.

Unpacked

Concept: Mathematical problems can be solved using different mathematical operations.

Skills: Solve addition, subtraction, and multiplication problems using the commutative, associative, and distributive properties; solve problems with appropriate operations using whole numbers and decimals; use a model to solve problems.

Big idea: The concepts and properties of addition, subtraction, multiplication, and division are the same whether using whole numbers, fractions, or decimals.

Essential questions: What do I know about addition, subtraction, or multiplication that can help me solve this problem? What operation will I use to solve the problem? What do I know about the commutative, associative, and distributive properties that can help me solve this problem? How can I represent this problem with a model?

A1.N-RN.B Additional Cluster: Use properties of rational and irrational numbers.

Standard	Essential Element
A1.N-RN.B.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	Not applicable.

Domain: A1.N-Q Quantities

A1.N-Q.A Supporting Cluster: Reason quantitatively and use units to solve problems.

Standard	Essential Element
A1.N-Q.A.1 Use units to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (A1 and A2)	**EE.N-Q.1–3** Express quantities to the appropriate precision of measurement.
A1.N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.	**EE.N-Q.1–3** Express quantities to the appropriate precision of measurement.
A1.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	**EE.N-Q.1–3** Express quantities to the appropriate precision of measurement.

Unpacked

Concept: Numerical calculations can be approximated by replacing numbers with other numbers that are close and easy to compute mentally.

Skills: Use a calculator to multiply, add, and subtract quantities involving decimals; round the quantity to the nearest tenth or hundredth (e.g., answer 11.825 rounded to 11.82 or $2.97 and $3.51 is about $6.50)

Big idea: Precise calculations are not always needed to gain an understanding of the quantity.

Essential questions: What does it mean to estimate numerical quantities? How will this number change if I round it to the nearest tenth or nearest hundredth?

Conceptual Category: A1.A Algebra

Domain: A1.A-SSE Seeing Structure in Expressions and Equations

A-SSE.A Major Cluster: Interpret the structure of expressions.

Standard	Essential Element
A1.A-SSE.A.1.a Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.	**EE.A-SSE.1** Identify an algebraic expression involving one arithmetic operation to represent a real-world problem.
A1.A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* (x^2+y^2).	Not applicable.

Unpacked

Concept: Mathematical problems can be solved using different mathematical operations.

Skills: Identify an algebraic expression as having a number, an operation, and a variable; interpret a real-world problem to identify the operation and the variable; represent real-world problems as expressions (e.g. Susan is twice as tall as Tom; If T = Tom's height, then 2T = Susan's height.).

Big idea: Real-world problems can be represented as algebraic expressions.

Essential questions: What is the expression for this real-world problem? Which operation and variable can I use to represent this expression?

A-SSE.A Supporting Cluster: Write expressions and equations in equivalent forms to solve problems.

Standard	Essential Element
A1.A-SSE.B.3 Choose and produce an equivalent form of an expression or equation to reveal and explain properties of the quantity represented by the expression. (A1 and A2) a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic equation to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. *For example, the expression* 3^x *can be rewritten as* $(1+2)^x$ *to reveal the growth rate is* 200%.	**EE.A-SSE.3** Solve simple algebraic equations with one variable using multiplication and division.
A2.A-SSE.B.4 Apply the formula for the sum of a finite geometric series (when the common ratio is not 1) and use the formula to solve problems. For example, calculate mortgage payments.	**EE.A-SSE.4** Determine the successive term in a geometric sequence given the common ratio.

Unpacked

Concept: Mathematical problems can be solved using different mathematical operations.

Skills: Determine the unknown in an equation; use the property of inverse operation (multiplication/ division) to complete the inverse to each side of the equation; isolate the variable to solve; solve algebraic expressions using multiplication or division; apply ratio of geometric sequence to determine next term.

Big idea: Equations represent equality. Geometric sequences are constant and used to predict values.

Essential questions: When I read this equation what quantities are known and unknown? What do I know about multiplication and division that can help me solve this problem? What do I know about equality that can help me solve this problem? What is the next term in the geometric sequence?

Domain: A1.A-CED Creating Equations

A1.A-CED.A Major Cluster: Create equations that describe numbers or relationships.

Standard	Essential Element
A1.A-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	**EE.A-CED.1** Create an equation involving one operation with one variable and use it to solve a real-world problem.
A1.A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	**EE.A-CED.2–4** Solve one-step inequalities.
A1.A-CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	**EE.A-CED.2–4** Solve one-step inequalities.
A1.A-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R.	**EE.A-CED.2–4** Solve one-step inequalities.

Unpacked

Concept: Rules of arithmetic and algebra can be used together to transform equations and inequalities so real-world problems can be solved.

Skills: Interpret a problem; determine the unknown in the problem; identify an algebraic expression as having a number, an operation, and a variable; create an equation; use property of inverse operation (addition/subtraction, multiplication/ division) to complete the inverse to each side of the equation; isolate the variable to solve; solve algebraic expressions; compare two expressions using an inequality sign (≠, <, >) (e.g., x ≠ y, 7 ≠ 9, x > y, 13 > 3, x < y, 55< 365).

Big idea: Techniques for solving equations can be applied to solving inequalities. Inequalities solve for a range of values.

Essential questions: What problem do I need to solve? What operation is needed to solve this problem? What equation represents this problem? What numbers make this inequity true? What steps do I follow to solve this equation and/or inequality?

Domain: A1.A-REI Reasoning with Equations and Inequalities

A1.A-REI.A Major Cluster: Understand solving equations as a process of reasoning and explain the reasoning.

Standard	Essential Element
A1.A-REI.A.1 Explain each step-in solving equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	Not applicable.
A1.A-REI.A.2 Solve rational and radical equations in one variable and give examples showing how extraneous solutions may arise.	See **EE.A-CED.1**

A1.A-REI.B Major Cluster: Solve equations and inequalities in one variable.

Standard	Essential Element
A1.A-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	See **EE.A-CED.1**
A1.A-REI.B.4 Solve quadratic equations in one variable. (A1 and A2) a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. b. Solve quadratic equations with real solutions using any method.	Not applicable.

A-REI.C Additional Cluster: Solve systems of equations.

Standard	Essential Element
A1.A-REI.C.5 Explain how the strategy of elimination results in finding solution(s) to a system of equations.	Not applicable.
A1.A-REI.C.6 Solve systems of linear equations exactly and approximately. *For example, with graphs, focusing on pairs of linear equations in two variables.*	See **EE.A-REI.10–12**
A1.A-REI.C.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	See **EE.A-REI.10–12**

A1.A-REI.D Major Cluster: Represent and solve equations and inequalities graphically.

Standard	Essential Element
A1.A-REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).	**EE.A-REI.10–12** Interpret the meaning of a point on the graph of a line. *For example, on a graph of pizza purchases, trace the graph to a point and tell the number of pizzas purchased and the total cost of the pizzas.*
A1.A-REI.D.11 Explain why the solution(s) of a system of equations are the point(s) of intersection(s) on a coordinate plane. Find the solutions approximately, using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, quadratic, absolute value functions.	**EE.A-REI.10–12** Interpret the meaning of a point on the graph of a line. *For example, on a graph of pizza purchases, trace the graph to a point and tell the number of pizzas purchased and the total cost of the pizzas.*
A1.A-REI.D.12 Graph and interpret (with the use of technology) the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	**EE.A-REI.10–12** Interpret the meaning of a point on the graph of a line. *For example, on a graph of pizza purchases, trace the graph to a point and tell the number of pizzas purchased and the total cost of the pizzas.*

Unpacked

Concept: Information can be collected, displayed, summarized and analyzed.

Skills: Identify the value of x-axis; identify value of y-axis; identify where the point is on the coordinate plane; identify the meaning of the point on the graph.

Big idea: Points on graphs represent real- world data and can be used to answer questions.

Essential questions: What do I know about this graph? What is being compared on this graph? What does the point on this graph tell me?

Conceptual Category: A1.F Functions

Domain: A1.F-IF Interpreting Functions

A1.F-IF.A Major Cluster: Understand the concept of a function and use function notation.

Standard	Essential Element
A1.F-IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of x corresponding to the input f. The graph of f is the graph of the equation $y = f(x)$.	**EE.F-IF.1–3** Use the concept of function to solve problems.
F-IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**EE.F-IF.1–3** Use the concept of function to solve problems.
A1.F-IF.A.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1)$ *for* $n \geq 1$.	**EE.F-IF.1–3** Use the concept of function to solve problems.

Unpacked

Concept: A function is a mathematical rule that describes how two or more quantities vary in relationship to each other.

Skills: Identify the relationship between the input and output (the pattern); identify the change (function or rule) for a graph and a table; identify a linear function represented in a graph or table; extend information presented in the tables and graphs to answer questions (if 3 people eat 2 pies and 6 people eat 4 pies, how many pies will 9 people eat?)

Big idea: A function can be represented in a table or graph. All forms of a function can be used to extend, predict or infer values to solve problems.

Essential questions: How can I use what I know about the problem to help me figure out what I don't know? What question do I need to answer? How do I analyze a function using tables and graphs? What pattern does the graph or table show me? Can I extend the pattern to figure out the answer?

A1.F-IF.B Major Cluster: Interpret functions that arise in applications in terms of the context.

Standard	Essential Element
A1.F-IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features may include intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximum and minimum; and symmetries.	**EE.F-IF.4–6** Construct graphs that represent linear functions with different rates of change and interpret which is faster/slower, higher/lower, etc.
A1.F-IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*	**EE.F-IF.4–6** Construct graphs that represent linear functions with different rates of change and interpret which is faster/slower, higher/lower, etc.
A1.F-IF.B.6 Calculate and interpret the average rate of change of a nonlinear function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. (A1 and A2)	**EE.F-IF.4–6** Construct graphs that represent linear functions with different rates of change and interpret which is faster/slower, higher/lower, etc.

Unpacked

Concept: Information can be collected, displayed, summarized and analyzed.

Skills: Use linear function data to create graphs, x-coordinates = input, y-coordinates = output; create a table to record values x and f(x), compare the rate of change (ratio of y/x) between the two functions; explain that the higher value represents a faster or higher change, the lower value represents a slower or lower change; compare the graph to determine which is faster/higher and slower/lower change.

Big idea: The graph of a relationship can be analyzed with regard to the change in one quantity relative to the change in the other quantity.

Essential questions: How can I represent and describe functions? How do I analyze a function using graphs? How can I determine rates of change by viewing the graph of a function? For each point on the graph, what are the x and y-coordinates? When I compare graphs, how can I tell which one grows at a faster rate of change? When I compare graphs, how can I tell which one has a higher rate of change?

A1.F-IF.C Major Cluster: Analyze functions using different representations.

Standard	Essential Element
A1.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases, including intercepts, maxima, and minima if they exist. (A1 and A2)	See **EE.F-IF.1–3**
A1.F-IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. *For example, use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.* (A1 and A2)	Not applicable.

Domain: A1.F-BF Building Functions

A1.F-BF.A Supporting Cluster: Build a function that models a relationship between two quantities.

Standard	Essential Element
A1.F-BF.A.1a Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a context.	**EE.F-BF.1** Select the appropriate graphical representation (first quadrant) given a situation involving constant rate of change.
A1.F-BF.A.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. Interpret arithmetic sequences as linear functions and geometric sequences as exponential functions. (A1 and A2)	**EE.F-BF.2** Determine an arithmetic sequence with whole numbers when provided a recursive rule.

Unpacked

Concept: Relationships (functions) can be explored across representations, as each one provides a different view of the same relationship.

Skills: Identify the graph that demonstrates a given rate of change; identify the recursive rule (e.g., + 3 or -2) for arithmetic sequences; extend the arithmetic sequence by applying the recursive rule (constant rate of change); translate an arithmetic sequence into graphical form.

Big idea: Rate of change and a recursive rule can be used to find the next number in a sequence.

Essential questions: What is the rate of change? What graph best represents the constant rate of change? What strategies can be used to continue a sequence? How can a rule be used to determine unknowns?

A1.F-BF.B Additional Cluster: Build new functions from existing functions.

Standard	Essential Element
A1.F-BF.B.3 Identify the effect on linear and quadratic graphs of replacing $f(x)$ by $f(x)+k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	Not applicable.

Domain: A1.F-LE Linear, Quadratic, and Exponential Models

A1.F-LE.A Supporting Cluster: Construct and compare linear, quadratic, and exponential models and solve problems.

Standard	Essential Element
A1.F-LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	**EE.F-LE.1–3** Model a simple linear function such as *y* = *mx* to show that these functions increase by equal amounts over equal intervals.
A1.F-LE.A.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). (A1 and A2)	**EE.F-LE.1–3** Model a simple linear function such as *y* = *mx* to show that these functions increase by equal amounts over equal intervals.
A1.F-LE.A.3 Use graphs and tables to show that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	**EE.F-LE.1–3** Model a simple linear function such as *y* = *mx* to show that these functions increase by equal amounts over equal intervals.

Unpacked

Concept: A function is a mathematical rule that describes how two or more quantities vary in relationship to each other.

Skills: A function is represented in the form of f(x)=x, use the function to create a table of values for x and f(x); determine the constant rate of change between the f(x) values when x values increase is constant; graph the values to determine a constant rate of change.

Big idea: A function, a graph, and a table are three ways to represent information.

Essential questions: What model can I use to determine a constant increase of equal amounts over equal intervals?

Domain: F-LE Linear, Quadratic, and Exponential Models

A2.F-LE.A Supporting Cluster: Construct and compare linear, quadratic, and exponential models and solve problems.

Standard	Essential Element
A2.F-LE.A.4 For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, b, c, and d are numbers and the base a is 2, 10, or e, evaluate the logarithm using technology.	Not applicable.

A1.F-LE.B Supporting Cluster: Interpret expressions for functions in terms of the situation they model.

Standard	Essential Element
A1.F-LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context. (A1 and A2)	See **EE.F-IF.1–3**

Conceptual Category: A1.S Statistics and Probability

Domain: A1.S-ID Interpreting Categorical and Quantitative Data

A1.S-ID.A Additional Cluster: Summarize, represent, and interpret data on a single count or measurement variable.

Standard	Essential Element
A1.S-ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots) in a modeling context.	**EE.S-ID.1–2** Given data, construct a simple graph (line, pie, bar, or picture) or table, and interpret the data.
A1.S-ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	**EE.S-ID.1–2** Given data, construct a simple graph (line, pie, bar, or picture) or table, and interpret the data.
A1.S-ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	**EE.S-ID.3** Interpret general trends on a graph or chart.
A2.S-ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	**EE.S-ID.4** Calculate the mean of a given data set (limit the number of data points to fewer than five).

Unpacked

Concept: How can I describe this object? What common attributes does this object have with either a 2-D shape or a 3-D figure?

Skills: Represent data on a variety of graphs (line, pie, bar, or picture); represent data on a table; interpret the graph or table to answer a question; identify the trends on a graph or chart; interpret the meaning of the trend on a graph or chart; calculate the mean of a data set.

Big idea: The mean is a measure of the average and can be used to summarize the data set.

Essential questions: How can I calculate the mean of this given set? What does the mean tell me? How can this data be displayed in a graph? What trends are represented in the graph?

A1.S-ID.B Supporting Cluster: Summarize, represent, and interpret data on two categorical and quantitative variables.

Standard	Essential Element
A1.S-ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	See **EE.F-IF.1** and **EE.A-REI.6–7**
A1.S-ID.B.6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	Not applicable.

A1.S-ID.C Major Cluster: Interpret linear models.

Standard	Essential Element
A1.S-ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	See **EE.F-IF.4–6**
A1.S-ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.	Not applicable.
A1.S-ID.C.9 Distinguish between correlation and causation.	Not applicable.

Domain: A2.S-IC Making Inferences and Justifying Conclusions

A2.S-IC.A Supporting Cluster: Understand and evaluate random processes underlying statistical experiments.

Standard	Essential Element
A2.S-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	**EE.S-IC.1–2** Determine the likelihood of an event occurring when the outcomes are equally likely to occur.
A2.S-IC.A.2 Decide if a specified model is consistent with results from a given data-generating process. *For example, using simulation or a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*	**EE.S-IC.1–2** Determine the likelihood of an event occurring when the outcomes are equally likely to occur.

Unpacked

Concept: Probability is used to make informed decisions.

Skills: When given a situation of equal probabilities (e.g., pick 1 cube from a bag containing 1 red, 1 blue, and 1 green cube), identify the correct probability (e.g., the probability of drawing a green cube is 1/3).

Big idea: Events that have the same chance of occurring will have equal probability.

Essential questions: What does it mean for something to be more or less likely? What does it mean for something to be equally likely? What are the number of ways an event can occur and the total possible outcomes?

Geometry

Conceptual Category: G.G Geometry

Domain: G.G-CO Congruence

G.G-CO.A Supporting Cluster: Experiment with transformations in the plane.

Standard	Essential Element
G.G-CO.A.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	**EE.G-CO.1** Know the attributes of perpendicular lines, parallel lines, and line segments; angles; and circles.
G.G-CO.A.2 Represent transformations in the plane using geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not. *For example, translation versus horizontal stretch).*	Not applicable.
G.G-CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	Not applicable.
G.G-CO.A.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	**EE.G-CO.4–5** Given a geometric figure and a rotation, reflection, or translation of that figure, identify the components of the two figures that are congruent.
G.G-CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure. Specify a sequence of transformations that will carry a given figure onto another. *For example, using graph paper, tracing paper, or geometry software.*	**EE.G-CO.4–5** Given a geometric figure and a rotation, reflection, or translation of that figure, identify the components of the two figures that are congruent.

Unpacked

Concept: Shapes and lines can be described, classified and analyzed by their attributes.

Skills: Identify points; identify a ray; identify an angle; identify perpendicular lines; identify parallel lines; identify line segments; identify circle; identify a translation (slide), rotation (turning around a point), and reflection (flip) of shapes; describe properties of congruence; identify shapes that are congruent.

Big idea: Congruent figures remain congruent through translations, rotations, and reflections.

Essential questions: What do I know about shapes and their attributes? How do I know two lines are perpendicular? How do I know lines are parallel? What makes two shapes congruent?

G.G-CO.B Major Cluster: Understand congruence in terms of rigid motions.

Standard	Essential Element
G.G-CO.B.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.	**EE.G-CO.6–8** Identify corresponding congruent and similar parts of shapes.
G.G-CO.B.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	**EE.G-CO.6–8** Identify corresponding congruent and similar parts of shapes.
G.G-CO.B.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	**EE.G-CO.6–8** Identify corresponding congruent and similar parts of shapes.

Unpacked

Concept: Shapes can be described, classified and analyzed by their attributes.

Skills: Compare the lines and angles of shapes; determine if sides (lines) are congruent or proportional; determine if angles are congruent; determine if shapes are similar.

Big idea: Shapes can be transformed into similar shapes (larger or smaller) with proportional corresponding sides and congruent corresponding angles.

Essential questions: What attributes do I think about to decide if these shapes are congruent? How do I know the sides (lines) are proportional? Which shape is congruent to this shape? Which shape is similar to this shape? What parts of the shape are congruent to this other shape? How do I know the lines are congruent? How do I know the angles are congruent? How would I explain congruent to others?

Domain: G.G-SRT Similarity, Right Triangles, and Trigonometry

G.G-SRT.A Major Cluster: Understand similarity in terms of similarity transformations.

Standard	Essential Element
G.G-SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor: a. A dilation takes a line not passing through the center of the dilation to a parallel line and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	See **EE.G-CO.6–8**
G.G-SRT.A.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	See **EE.G-CO.6–8**
G.G-SRT.A.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	See **EE.G-CO.6–8**

G.G-SRT.B Major Cluster: Prove and apply theorems involving similarity.

Standard	Essential Element
G.G-SRT.B.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.	Not applicable.
G.G-SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	See **EE.G-CO.6–8**

Domain: G.G-GPE Expressing Geometric Properties with Equations

G.G-GPE.A Additional Cluster: Translate between the geometric description and the equation for a conic section.

Standard	Essential Element
G.G-GPE.A.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	Not applicable.

G-GPE.B Major Cluster: Use coordinates to prove simple geometric theorems algebraically.

Standard	Essential Element
G.G-GPE.B.4 Use coordinate geometry to prove simple geometric theorems. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle.*	Not applicable.
G.G-GPE.B.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems. *For example, find the equation of a line parallel or perpendicular to a given line that passes through a given point.*	See **EE.G.CO.1**
G.G-GPE.B.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	See **EE.G.CO.1**
G.G-GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles. *For example, use the distance formula to calculate the distance between the two points.*	**EE.G-GPE.7** Find perimeters and areas of squares and rectangles to solve real-world problems.

Unpacked

Concept: Measurement can be applied to solve real world problems.

Skills: Identify situations that involve calculating area; identify situations that involve calculating perimeter; apply a formula to solve a problem; solve word problems to find the area of rectangles by squares, tiling, or formula.

Big idea: Perimeter is a linear measurement to calculate the distance around an object. Area is a 2D measurement of how many square units cover the inside of a shape.

Essential questions: What is the problem asking me to find? Which formula do I use for perimeter? Which formula do I use for area? What lengths do you know on the square and rectangle? If you don't know the lengths, how can you find them? What is the area and perimeter of the square or rectangle? How does knowing the formula for area and perimeter help me solve problems?

Domain: G.G-GMD Geometric Measurement and Dimension

G.G-GMD.A Additional Cluster: Explain volume formulas and use them to solve problems.

Standard	Essential Element
G.G-GMD.A.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.	**EE.G-GMD.1–3** Make a prediction about the volume of a container, the area of a figure, and the perimeter of a figure, and then test the prediction using formulas or models.
G.G-GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	See **EE.8.G.9** and **EE.G-GPE.7**.

Unpacked

Concept: Measurement can be applied to solve real world problems.

Skills: Make predictions of volume, area and perimeter; test prediction using concrete objects or equations; identify values for what variables represent (l,w,h); solve problems involving area, perimeter and volume using a formula.

Big idea: Formulas or models are used to check predictions with area, perimeter, and volume.

Essential questions: What information helps me decide if I am finding volume, area, or perimeter? How is finding the area different from finding the perimeter? What do the variables (l,w,h) represent? What is my prediction about this size of this container/figure? How can I prove my prediction? How did my prediction relate to my calculated value?

G.G-GMD.B Additional Cluster: Visualize relationships between two-dimensional and three-dimensional objects.

Standard	Essential Element
G.G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	**EE.G-GMD.4** Identify the shapes of two- dimensional cross-sections of three-dimensional objects.

Unpacked

Concept: Shapes can be seen from various perspectives.

Skills: Identify attributes of two-dimensional shapes; identify attributes of three-dimensional objects; identify what attributes the shapes have in common; identify the shapes within the unfolded 3-D figure (net); cut 2-D cross-sections from 3-D figures.

Big idea: Perceiving shapes from different viewpoints helps in understanding the relationships between two- and three- dimensional figures.

Essential questions: What 2-D shapes can I make by slicing this 3-D figure in different directions; horizontal, vertical, and diagonal? When I unfold a 3-D figure, what 2-D shapes do I see?

Domain: G.G-MG Modeling with Geometry

G.G-MG.A Major Cluster: Apply geometric concepts with modeling situations.

Standard	Essential Element
G.G-MG.A.1 Use geometric shapes, their measures, and their properties to describe and explain objects. For example, modeling a tree trunk as a cylinder.	**EE.G-MG.1–3** Use properties of geometric shapes to describe real-life objects.
G.G-MG.A.2 Apply concepts of density based on area and volume in modeling situations. *For example, persons per square mile, BTUs per cubic foot.*	**EE.G-MG.1–3** Use properties of geometric shapes to describe real-life objects.
G.G-MG.A.3 Apply geometric methods to solve design problems. *For example, designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios.*	**EE.G-MG.1–3** Use properties of geometric shapes to describe real-life objects.

Unpacked

Concept: Shapes can be defined and classified by their attributes.

Skills: Identify common attributes between two-dimensional shapes and three-dimensional figures; recognize common two-dimensional shapes and three-dimensional figures; make comparisons between common 2-D shapes and 3-D figures to real-life objects; describe real life objects using attributes of 2-D shapes and 3-D figures; name everyday objects in terms of geometric shapes.

Big idea: Geometric properties help us determine and define shapes in the real world.

Essential questions: How can I describe this object? What common attributes does this object have with either a 2-D shape or a 3-D figure?

Conceptual Category: G.S-CP Statistics and Probability

Domain: G.S-CP Conditional Probability and the Rules of Probability

G.S-CP.A Additional Cluster: Use independence and conditional probability to interpret data.

Standard	Essential Element
G.S-CP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or” “and” “not”).	**EE.S-CP.1–5** Identify when events are independent or dependent.
G.S-CP.A.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities and use this characterization to determine if they are independent.	**EE.S-CP.1–5** Identify when events are independent or dependent.

Standard	Essential Element
G.S-CP.A.3 Understand the conditional probability of A given B as $\frac{P(A \text{ and } B)}{P(B)}$, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.	**EE.S-CP.1–5** Identify when events are independent or dependent.
G.S-CP.A.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among mathematics, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*	**EE.S-CP.1–5** Identify when events are independent or dependent.
G.S-CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*	**EE.S-CP.1–5** Identify when events are independent or dependent.

Unpacked

Concept: Probability is the extent to which an event is likely to occur.

Skills: Identify the number of ways an event can occur and the total possible outcomes (e.g., there are 3 red marbles in a bag and 2 green marbles, what is the probability of pulling out a red marble? 3/5); identify when two events are independent; identify when two events are dependent.

Big idea: Independent and dependent events change the probability outcome.

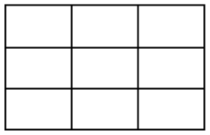
Essential questions: What is the event the question focuses on? What are the possible outcomes of this event? How can I determine if a situation involves dependent or independent events?

Glossary and Examples of Mathematical Terms

Acute triangle. A triangle with all acute angles (acute means measuring less than 90°).

Angles. A shape formed by two lines or rays that diverge from a common point or vertex.

Area. The size of a region enclosed by the figure. Area is measured in square units (e.g., the area of this rectangle is nine square units).



Associative property for addition. The sum of three or more numbers which are always the same when added together, no matter what order they are in. This is illustrated by $a + (b + c) = (a + b) + c$; $2 + (3 + 4) = (2 + 3) + 4$.

Associative property for multiplication. The product of three or more numbers which are always the same when multiplied together, regardless of their grouping. This is illustrated by $a(bc) = (ab)c$; $2(3\times4) = (2\times3)4$.

Attributes. For math purposes, attributes refer to characteristics of an object or geometric shape. These include qualities of shape, color, size, side, length, etc.

Base ten blocks. Blocks are used to learn place value, addition, subtraction, multiplication, and division. Base ten blocks consist of cubes(ones place), rods (tens place), flats (hundreds place), and blocks (thousands place).

Categorical data. Types of data, which may be divided into groups such as race, sex, age group, and educational level when categorized into a small number of groups.

Commutative property of addition. The sum of numbers is always the same when added together, no matter if the order of the addends is changed. This is illustrated by $a + b = b + a$ ($2 + 1 = 1 + 2$).

Commutative property of multiplication. The product of numbers is always the same when multiplied together, even if the order of factors is changed (i.e., if a and b are two real numbers, then $a \times b = b \times a$).

Compose numbers. To combine parts/components to form a number (adding parts to obtain a number).

Congruent figures. Figures that have the same size and shape.

Congruent/congruence. The same.

Decompose numbers. The process of separating numbers into their components (to divide a number into smaller parts). *Example:* 456 can be decomposed as $456 = 400 + 50 + 6$.

Denominator. The bottom number of a fraction; the number that represents the total number of parts into which one whole is divided (e.g., in 3/4, the 4 is the denominator and indicates that one whole is divided into 4 parts).

Dividend. The number that is being divided (e.g., In the problem, there are 550 pencils; each pack has 10 pencils; how many packs are there? $550 \div 10 = 55$, *550* is the dividend because it tells how many pencils there are in all to be divided.).
Divisor. A number by which another number is divided (e.g., In the problem, there are 550 pencils; each

pack has 10 pencils; how many packs are there? 550 ÷ 10 = 55, *10* is the divisor because it tells how many times 550 is to be divided.

Edge. The line segment where two faces of a solid figure meet (i.e., a cube has 12 edges).

ELA. English Language Arts

Equation. A mathematical sentence of equality between two expressions; equations have an equal sign (e.g., n + 50 = 75 or 75 = n + 50 means that n + 50 must have the same value as 75).

Equilateral triangle. A triangle with all three sides of equal length, corresponding to what could also be known as a regular triangle – an equilateral triangle is therefore a special case of an isosceles triangle having not just two but all three sides equal. An equilateral triangle also has three equal angles.

Expression. An operation between numbers that represents a single numeric quantity; expressions do not have an equal sign (e.g.,*4r, x+2, y-1*).

Face. A plane surface of a three-dimensional figure.

Fact families. Sets of related math facts. For example:

- Addition fact family: 3 + 5 = 8; 8 - 3 = 5; 5 + 3 = 8; and 8 - 5 = 3
- Multiplication fact family: 5 x 4 = 20; 20 ÷ 5 = 4; 4 x 5=20; and 20 ÷ 4 = 5

Fair share. In division meaning splitting into equal parts or groups with nothing left over.

Frequency table. A table that lists items and uses tally marks to record and show the number of times they occur.

Functions. A special kind of relation where each x-value has one and only one y-value.

Function table. A table that lists pairs of numbers that show a function.

Inequality. A mathematical sentence in which the value of the expressions on either side of the relationship symbol are unequal; relation symbols used in inequalities include > (greater than) and < (less than) symbols (e.g., *7 > 3, x < y*).

Input/output table. A table that lists pairs of numbers that show a function.

Integers. Positive and negative whole numbers.

Interlocking cubes. Manipulatives that help students learn number and math concepts - cubes represent units and link in one direction. Interlocking cubes are used for patterning, grouping, sorting, counting, numbers, addition, subtraction, multiplication, division, and measurement.

Intersecting lines. Lines that cross.

Inverse operations. Opposite/reverse operations (e.g., subtraction is the inverse operation of addition, which is why 4 + 5 = 9 and 9 – 5 = 4; division is the inverse operation of multiplication, which is why 4 x 5 = 20 and 20 ÷ 5 = 4).

Linear equation. An equation that is made up of two expressions set equal to each other (e.g., $y = 2x + 5$) - A linear equation has only one or two variables and graph as a straight line.
Line graph. A graphical representation using points connected by line segments to show how something

changes over time.

Lines of symmetry. Any imaginary line along which a figure could be folded so that both halves match exactly.

Manipulatives. Objects that are used to explore mathematical ideas and solve mathematical problems (e.g., tools, models, blocks, tiles cubes, geoboards, colored rods, M&M's).

Mathematical structures.

Addition – compare-total unknown
Ex. If Anita has 10 sheets of paper and you have 10 more sheets than Anita. How many sheets do you have?

Addition – start unknown
Ex. Sam gave away 10 apples and has five apples left. How many apples did he start have before he gave 10 apples?

Addition join-part/part – whole
Ex. Jessie had 20 cakes and bought five more. How many does he have now?

Subtraction – classic take away
Ex. If Judy had $50 and spent $10, how much does she have left?

Subtraction – difference unknown
Ex. Sandi has 10 cats and 20 dogs. Which does she have more of, cats or dogs? How many more?

Subtraction – deficit missing amount
Ex. Sandy wants to collect 35 cards and she already has 15. How many more cards does she need?

Multiplication – repeated addition
Ex. James got paid $5 each day for five days. How much money did he have at the end of the five days?

Multiplication – array
Ex. Carlos wanted to cover his rectangular paper with one-inch tiles. If his paper is five inches long and four inches wide, how many tiles will it take to cover the paper?

Multiplication – fundamental counting principle
Ex. Julie packed four shirts and four jeans for her trip. How many outfits can she make?

Division – repeated subtraction
Ex. James pays $5 each day to ride the bus. How many days can he ride for $20?

Division – factor/area – side length
Ex. Tim wants to know the width of a rectangular surface covered in 20 one-inch tiles. He knows the length is five inches, but what is the width?

Division – partitive/fair share
Ex. Julie has 20 different outfits. She has five shirts – how many pair of jeans does she have to make 20 different outfits?

Mean. The "average" – To find the mean, add up all the numbers and then divide by the number of numbers.
Median. The "middle" value in the list of numbers - To find the median, your numbers have to be listed in

numerical order, so you may have to rewrite your list.

Minuend. The number one is subtracting from (e.g., 9 in 9 – 2 = _____).

Mode. The value that occurs most often - If no number is repeated, then there is no mode for the list.

Models. Pictorial or tactile aids used explore mathematical ideas and solve mathematical problems – Manipulatives can be used to model situations.

Non-numeric patterns. Using symbols, shapes, designs, and pictures to make patterns (e.g., ΔΔ◊◊ ΔΔ◊◊).

Non-standard units of measure. Measurements that are neither metric nor English (e.g., number of footsteps used to measure distance or using a piece of yarn used to measure length).

Number line. A diagram that represents numbers as points on a line; a number line must have the arrows at the end.

Number sentence. An equation or inequality using numbers and symbols that is written horizontally (e.g., 5 < 7 or 5 +7+12).

Numerals. 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Numeric patterns. A pattern that uses skip counting, often starting with the number 1 or 2 Counting by tens and twos may also be presented to students beginning with different numbers such as 7 or 23; this is more difficult for students but indicates a deeper understanding of skip counting (e.g., 7, 17, 27, 37, 47, . . . or 7, 9, 11, 13, 15, 17).

Numerical expression. A mathematical phrase that involves only numbers and one or more operational symbols.

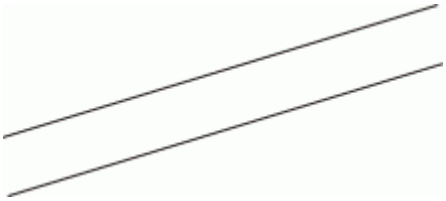
Obtuse triangle. A triangle that has one obtuse angle (obtuse means measuring more than 90°).

Operations. Addition, subtraction, multiplication, and division.

Ordered pair. In the ordered pair (1, 3), the first number is called the x-coordinate; the second number is called the y-coordinate this ordered pair represents the coordinates of point A

- The x-coordinate tells the distance right (positive) or left (negative).
- The y-coordinate tells the distance up (positive) or down (negative).

Parallel Lines. Lines that are the same distance apart and that never intersect – Lines that have the same slope are parallel.



Pattern. Patterns with a minimum of three terms

- using numbers by repeatedly adding or subtracting (i.e., 2, 4, 6, 8, 10, 12; 0, 3, 6, 9, 12, 15; or 50, 45, 40, 35, 30, 25).
- using objects, figures, colors, sound, etc. - a repeated pattern needs to be at least six terms.

Extend a pattern - When a student is asked to continue a pattern, the pattern is presented, and the student is asked, "What comes next?" before a student can extend or describe a pattern, the given pattern must be comprised of a minimum of three terms so that the student can see the regularities of the situation and extend or describe the pattern based on those regularities.

Percent. A way of expressing a fraction as "out of 100" (e.g., 50% means 50 out of 100 or 50/100).

Perpendicular lines. Lines that intersect, forming right angles.

Polygon. A closed plane figure made by line segments.

Prediction. A guess based on available information.

Quadrilateral. A four-sided polygon.

Rational numbers. Any number that can be expressed as a/b (b≠0) where a and b are integers; also, in decimal form, any terminating or ultimately repeating decimal.

Ratios. A comparison between two things. For instance, someone can look at a group of people and refer to the "ratio of boys to girls" in the class. Suppose there are 35 students, 15 of whom are boys; the ratio of boys to girls is 15 to 20.

Real-life situations. Ways in which mathematical concepts are used in real life.

Real numbers. All numbers on a number line, including negative and positive integers, fractions, and irrational numbers.

Real-world applications. Ways in which mathematical concepts are used in real-life situations.

Rectangle. A four-sided polygon (a flat shape with straight sides) where every angle is a right angle (90°); opposite sides are parallel and of equal length.

Right triangle. A triangle that has one right angle (a right-angle measures exactly 90°) – Only a single angle in a triangle can be a right angle or it would not be a triangle. A small square is used to mark which angle in the figure is the right angle.

Sets. A group or collection of things that go together (e.g., a group of four stars).

Side. In most general terms, a line segment that is part of the figure - it is connected at either end to another line segment, which, in turn, may or may not be connected to still other line segments.

Similar figures. Figures that have the same shape but different sizes.

Similar shapes. Objects of the same shape but different sizes in which the corresponding angles are the same.

Slope. The steepness/incline/grade of a line.

Positive slope – The condition in which a line inclines from left to right.

Negative slope – The condition in which a line declines from left to right.

Square. A four-sided polygon (a flat shape with straight sides) where all sides have equal length and every angle is a right angle (90°).

Square root. A value that can be multiplied by itself to give the original number (e.g., the square root of 25 is 5 because 5 x 5 = 25).

Square root notation. Numbers written using a radical √.

Subitize. To judge the number of objects in a group accurately without counting.

Three-dimensional geometric figures. The study of solid figures in three-dimensional space: cube, rectangular prism, sphere, cone, cylinder, and pyramid.

Two-dimensional figures. The study of two-dimensional figures in a plane; drawings of square, rectangle, circle, triangle, pentagon, hexagon, and octagon.

Unknown fixed quantities. A constant that is a quantity; a value that does not change.

Variable. A symbol for an unknown number to be solved; it is usually a letter like x or y (e.g., in x + 3 = 7, x is the variable).

Venn diagram. Made up of two or more overlapping circles. It is often used in mathematics to show relationships between sets. A Venn diagram enables students to organize similarities and differences visually.

Vertex (vertices, pl.). The point(s) where two or more edges meet (corners).

Volume. The amount of three-dimensional space an object occupies; capacity.