Mathematics
Grade 3

2015

Maryland College and Career Ready Curriculum Framework

MARYLAND STATE DEPARTMENT OF EDUCATION

PREPARING WORLD CLASS STUDENTS

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Introduction

The Maryland Common Core State Standards for Mathematics (MDCCSSM) at the third grade level specify the mathematics that all students should study as they prepare to be college and career ready by graduation. The third grade standards are listed in domains (Operations & Algebraic Thinking, Number and Operations in Base Ten, Number and Operations – Fractions, Measurement & Data, and Geometry). This is not necessarily the recommended order of instruction, but simply grouped by appropriate topic. For further clarification of the standards, reference the appropriate domain in the set of Common Core Progressions documents found on http://math.arizona.edu/~ime/progressions/.

How to Read the Maryland Common Core Curriculum Framework for Grade 3

This framework document provides an overview of the Standards that are grouped together to form the Domains for Grade Three. The Standards within each domain are grouped by topic and are in the same order as they appear in the Common Core State Standards for Mathematics. This document is not intended to convey the exact order in which the Standards will be taught, nor the length of time to devote to the study of the different Standards

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The framework contains the following**:**

- **Domains** are intended to convey coherent groupings of content.

- **Clusters** are groups of related standards**.** A description of each cluster appears in the same column as the corresponding standards

- **Standards** define what students should understand and be able to do.

  - Clusters and standards have been identified as Major, Supporting or Additional

- **Essential Skills and Knowledge** statements provide language to help teachers develop common understandings and valuable insights into what a student must understand and be able to do to demonstrate proficiency with each standard. Maryland mathematics educators thoroughly reviewed the standards and, as needed, provided statements to help teachers comprehend the full intent of each standard. The wording of some standards is so clear, however, that only partial support or no additional support seems necessary.

- **Standards for Mathematical Practice** are listed in the right column.

- **Framework Vocabulary**-words or phrases highlighted in **Blue Bold**- are defined and offer clarifications found in the vocabulary section of this document

Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1. Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4.Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5.Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7.Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well-remembered 7 × 5+ 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers *x* and *y*

8.Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x-1)(x^2+x+1)$ and $(x-1)(x^3+x^2+x+1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction. The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word “understand” are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices. In this respect, those content standards which set an expectation of understanding are potential “points of intersection” between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

Codes for Common Core State Standards (Math) Standards – K – 12

Grades K – 8		Applicable Grades
CC	Counting & Cardinality	K
EE	Expressions & Equations	6, 7, 8
F	Functions	8
G	Geometry	K, 1, 2, 3, 4, 5, 6, 7, 8
MD	Measurement & Data	K, 1, 2, 3, 4, 5
NBT	Number & Operations (Base Ten)	K, 1, 2, 3, 4, 5
NF	Number & Operations (Fractions)	3, 4, 5
NS	Number System	6, 7, 8
OA	Operations & Algebraic Thinking	K, 1, 2, 3, 4, 5
RP	Ratios & Proportional Relationship	6, 7
SP	Statistics & Probability	6, 7, 8
Modeling		
No Codes		Not determined
	High School	
Algebra (A)		
A-APR	Arithmetic with Polynomial & Rational Expressions	8 -12
A-CED	Creating Equations	8 -12
A-REI	Reasoning with Equations & Inequalities	8 -12
A-SSE	Seeing Structure in Expressions	8 -12
Functions (F)		
F-BF	Building Functions	8 -12
F-IF	Interpreting Functions	8 -12
F-LE	Linear, Quadratic & Exponential Models	8 -12
F-TF	Trigonometric Functions	Not determined
Geometry (G)		
G-C	Circles	Not determined
G-CO	Congruence	Not determined
G-GMD	Geometric Measurement & Dimension	Not determined
G-MG	Modeling with Geometry	Not determined
G-GPE	Expressing Geometric Properties with Equations	Not determined
G-SRT	Similarity, Right Triangles & Trigonometry	Not determined
Number & Quantity (N)		
N-CN	Complex Number System	Not determined
N-Q	Quantities	Not determined
N-RN	Real Number System	8 -12
N-VM	Vector & Matrix Quantities	Not determined
Statistics (S)		
S-ID	Interpreting Categorical & Quantitative Data	8 -12
S-IC	Making Inferences & Justifying Conclusions	Not determined
S-CP	Conditional Probability & Rules of Probability	Not determined
S-MD	Using Probability to Make Decisions	Not determined
Modeling		
No Codes		Not determined

<table>
<tr><th colspan="2">Domain: Operations and Algebraic Thinking</th></tr>
<tr><th>Cluster and Standards</th><th>Mathematical Practices</th></tr>
<tr><td>

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

Major Standard 3.OA.A.1
Interpret **products** of whole numbers, e.g., interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 x 7.*

Essential Skills and Knowledge

- Knowledge that multiplication is the process of repeated addition and equal groups.
- Interprets a multiplication expression as X number of groups of X number of objects.
- Ability to use concrete objects, pictures, and arrays to represent the product as the total number of objects
- Knowledge that the product represented by the array is equivalent to the total of equal addends (2.OA.B.4)
- Ability to apply knowledge of repeated addition up to 5 rows and 5 columns and partitioning, which leads to multiplication (2.OA.B.4)
- Knowledge that the example in Standard 3.0A.A.1 can also represent the total number of objects with 5 items in each of 7 groups (Commutative Property)

Major Standard 3.OA.A.2
Interpret whole-number **quotients** of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each **share** when 56 objects are **partitioned** equally into 8 shares, or as a number of shares when 56 objects are **partitioned** into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷8.*

Essential Skills and Knowledge

- Knowledge that division is the inverse of multiplication and the process of repeated subtraction
- Ability to use concrete objects to represent the total number and represent how these objects could be shared equally
- Knowledge that the quotient can either represent the amount in each group or the number of groups with which a total is shared
- Knowledge that just as multiplication is related to repeated addition, division is related to of repeated subtraction

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DOMAIN: Operations and Algebraic Thinking	
Cluster and Standards	**Mathematical Practices**
Major Cluster 3.OA.A-Represent and solve problems involving multiplication and division **Major Standard 3.OA.A.3** Use multiplication and division within 100 to solve word problems in situations involving equal groups, **arrays**, and **measurement quantities**, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. **Essential Skills and Knowledge** • Ability to determine when to use multiplication or division to solve a given word problem situation. • Ability to represent a problem using drawings and equations without or with a symbol for the unknown number. • Ability to solve different types of multiplication and division word problems (CCSS, Page 89, Table 2) **Major Standard 3.OA.A.4** Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations* *8 x ? = 48, 5 = □ ÷ 3, 6 x 6 = ?* **Essential Skills and Knowledge** • Ability to use concrete objects to compose and decompose sets of numbers • Ability to use the inverse operation as it applies to given equation • Knowledge of fact families • Ability to find the unknown in a given multiplication or division equation, where the unknown is represented by a question mark, a box, or a blank line • Ability to solve problems that employ different placements for the unknown and product/quotient (Examples: 5 x ___= 15, 15 = 3 x ___ , 15 ÷ 3 =___, 15 ÷ ___= 5, 15 = 5 x _____, _____ = 15 ÷ 3, 3 = ___ ÷ 5)	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

DOMAIN: Operations and Algebraic Thinking

Cluster and Standards	Mathematical Practices
Major Cluster-3.OA.B- Understand properties of multiplication and the relationship between multiplication and division. **Major Standard 3.OA.B.5** Apply **properties of operations** as strategies to multiply and divide • *If 6 x 4 = 24 is known, then 4 x 6 = 24 is also known(Commutative property of multiplication)* • *3 x 5 x 2 can be found by 3 x 5 = 15, then 15 x 2 = 30, or by 5 x 2 = 10, then 3 x 10 = 30. (Associative property of multiplication)* • *Knowing that 8 x 5 = 40 and 8 x 2 = 16, one can find 8 x 7 as 8 x (5 + 2) = (8 x5) + (8 x 2) which leads to 40 + 16 = 56. (Distributive property)* **Essential Skills and Knowledge** • Ability to break apart and manipulate the numbers (decomposing and composing numbers) • Knowledge of the properties of multiplication include Zero, Identity, Commutative, Associative and Distributive properties (CCSS, Page 90, Table 3) • Knowledge that the properties of division include the Distributive Property, but not Commutative or Associative. • Ability to understand and apply the Properties of Operations as opposed to simply naming them • Ability to apply of the Properties of Operations as strategies for increased efficiency **Major Standard 3.OA.B.6** Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.* **Essential Skills and Knowledge** • Knowledge that multiplication is the inverse operation of division • Ability to apply knowledge of multiplication to solve division problems	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

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<tr><td>

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

Major Standard 3.OA.C.7
Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

Essential Skills and Knowledge

Knowledge of multiplication and division strategies and properties to achieve efficient recall of facts
Ability to use multiple strategies to enhance understanding
Ability to model the various properties using concrete materials

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

Major Standard 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.

Essential Skills and Knowledge

- Knowledge of strategies **for word problems as established** for addition and subtraction (2.OA.A.1)
- Ability to solve word problems that use whole numbers and yield whole-number solutions
- Ability to determine what a reasonable solution would be prior to solving the word problem
- Knowledge that a variable refers to an unknown quantity in an equation that can be represented with any letter other than "o"
- Knowledge that the letter representing a variable takes the place of an empty box or question mark as used to indicate the unknown in earlier grades
- Ability to use various strategies applied in one-step word problems to solve multi-step word problems
- Knowledge of and the ability to use the vocabulary of equation vs. expression
- Knowledge of and ability to apply estimation strategies, including rounding and front-end estimation, to make sense of the solution(s)
- Ability to apply knowledge of place value to estimation
- Ability to use critical thinking skills to determine whether an estimate or exact answer is needed in the solution of a word problem

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Domain: Operations and Algebraic Thinking	
Cluster and Standards	**Mathematical Practices**
Major Cluster 3.OA.D-Solve problems involving the four operations, and identify and explain patterns in arithmetic. **Major Standard 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.* **Essential Skills and Knowledge** • Ability to apply knowledge of skip counting (1.OA C.5 and 2.NBT.B.2) and explain "why" the pattern works the way iit does as it relates to the properties of operations • Ability to investigate, discover, and extend number patterns and explain why they work. • Knowledge that subtraction and division are not **commutative** • Knowledge of multiplication and division properties (CCSS, Page 90, Tables 3&4) • Ability to apply knowledge of Properties of operations to explain patterns and why they remain consistent	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

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

Additional Standard 3.NBT.A.1
Use place value understanding to round whole numbers to the nearest 10 or 100.

Essential Skills and Knowledge

Knowledge of place value through 1,000 (2.NBT.A.1) to provide the foundation for rounding whole numbers
Knowledge that place value refers to what a digit is worth in a number
Knowledge that each place in a number is worth 10 times more than the place to the right of it (The tens column is worth ‘
10 ones, the hundreds column is worth 10 tens.)
Ability to use a variety of strategies when rounding (e.g., number line, proximity, and hundreds chart)
Ability to round a three-digit number to the nearest 10 or 100

Additional Standard 3.NBT.A.2
Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

Essential Skills and Knowledge

Knowledge of and ability to apply strategies of decomposing and composing numbers, partial sums, counting up, and counting back by ones, tens, and hundreds.
Ability to apply alternative algorithms as appropriate
Ability to use addition and subtraction interchangeably in computation based on the relationship between the operations

Additional Standard 3.NBT.A.3
Multiply one-digit whole numbers by multiples of 10 in the range of 10-90 (e.g., 9 x 80, 5 x 60) using strategies based on place value and properties of operations.

Essential Skills and Knowledge

Ability to apply knowledge of place value (e.g., 9 x 80 is 9 times 8 tens = 72 tens)
Ability to apply the Properties of Operations (CCSS, Page 90, Tables 3 & 4)

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Domain: Number and Operations – Fractions
(limited to fractions with denominators 2, 3, 4, 6, and 8.)

Cluster and Standards	Mathematical Practices
Major Cluster 3.NF.A- Develop understanding of fractions as numbers. **Major Standard 3.NF.A.1** Understand a fraction *1/b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a/b* as the quantity formed by *a* parts of size *1/b*. **Essential Skills and Knowledge** • Knowledge of the relationship between the number of equal shares and the size of the share (1.G.A.3) • Knowledge of equal shares of circles and rectangles divided into or partitioned into halves, thirds, and fourths (2.G.A3) • Knowledge that unit fractions represent 1 of the total number of parts, for example, the fraction is formed by 1 part of a **whole** which is divided into 4 equal parts • Knowledge that a unit fraction can be repeated to make other fractions, for example, $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{3}{4}$ • Knowledge of the terms **numerator** (the number of parts being counted) and **denominator** (the total number of equal parts in the whole) • Knowledge of and ability to explain and write fractions that represent one whole (e.g. 4/4, 3/3) • Ability to identify and create fractions of a **region** and of a **set**, including the use of concrete materials • Knowledge of the size or quantity of the original whole when working with fractional parts **Major Standard 3.NF.A.2** Understand a fraction as a number on the number line; represent fractions on a number line diagram. **Essential Skills and Knowledge** • Ability to apply knowledge of whole numbers on a number line to the understanding of fractions on a number line • Ability to apply knowledge of unit fractions to represent and compute fractions on a number line • Ability to use linear models (e.g., equivalency table and manipulatives such as fraction strips, fraction towers, Cuisenaire rods) for fraction placement on a number line • Knowledge of the relationship between the use of a ruler in measurement to the use of a ruler as a number line • Knowledge that a number line does NOT have to start at zero • Ability to identify fractions on a number line with tick marks as well as on number lines without tick marks	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

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(limited to fractions with denominators 2, 3, 4, 6, and 8.)</th></tr>
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Major Cluster 3.NF.A-Develop the understanding of fractions as numbers.

Major Standard 3.NF.A.3
Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

Essential Skills and Knowledge
• Ability to use concrete manipulatives and visual models to explain reasoning about fractions
• Knowledge that equivalent fractions are ways of describing the same amount by using different-sized fractional parts. (e.g.,1/2 is the same as 2/4 or 3/6 or 4/8)
• Ability to use a variety of models when investigating equivalent fractions (e.g., number line, Cuisenaire rods, fraction towers, fraction circles, equivalence table, fraction strips)
• Ability to relate equivalency to fractions of a region or fractions of a set
• Ability to use benchmarks of 0, 1/2, and 1 comparing fractions
• Knowledge of and experience with fractional number sense to lay foundation for manipulating, comparing, finding equivalent fractions, etc.

Major Standard 3.NF.A.3a
Represent two fractions as equivalent (equal) if they are the same size, or the same point on the number line.

Essential Skills and Knowledge
• Ability to describe the same amount by using different-sized fractional parts. (e.g. 1/2 is the same as 2/4 or 3/6 or 4/8)
• Ability to use number lines as well as fractions of a set or fractions of a region to model equivalent fractions
• Ability to use a variety of models to investigate relationships of equivalency
• Ability to recognize 1 whole is represented by a fraction with the same numerator and denominator (3/3 or 4/4, etc.) since they are the same size and same point on the number line.

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Major Cluster 3.NF.A-Develop the understanding of fractions as numbers.

Major Standard 3.NF.A.3b
Recognize and generate simple equivalent fractions, e.g., ½ = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model.

Essential Skills and Knowledge

Ability to describe the same amount by using different-sized fractional parts. (e.g.,1/2 is the same as 2/4 or 3/6 or 4/8)
Ability to use fraction models (e.g.,fraction towers, fraction strips) to justify understanding of equivalent fractions

Major Standard 3.NF.A.3c
Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.*

Essential Skills and Knowledge

Knowledge of the denominator as the number of parts that a whole is divided into in order to explain why a denominator of 1 indicates whole number.

Major Standard 3.NF.A.3d
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 conclusions, e.g., by using a visual fraction model.

Essential Skills and Knowledge

Ability to use benchmarks of 0, ½ and 1 to explain relative value of fractions
Knowledge that as the denominator increases the size of the part decreases
Knowledge that when comparing fractions the whole must be the same size
Ability to use a variety of models when comparing fractions (e.g., number line, and manipulatives such as Cuisenaire rods, fraction towers, fraction strips)

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1. **Make sense of problems and persevere in solving them.**
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Domain: Measurement and Data

Cluster and Standards	Mathematical Practices
Major Cluster 3.MD.A Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects **Major Standard 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, e.g., by representing the problem on a number line diagram. **Essential Skills and Knowledge** • Ability to tell time to the nearest 5- minute interval (2.MD.C.7) • Ability to tell time to the nearest minute in a.m. and p.m. • Ability to measure time intervals in minutes • Ability to solve time problems by using the number line model as opposed to an algorithm • Ability to initially add minutes in order to find the end time followed by working backwards to find start time • Ability to find the elapsed time of an event • Ability to relate fractions and time (1/4 with quarter hour, ½ with half past the hour) • Ability to find start time, end time, or elapsed time **Major Standard 3.MD.A.2** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. **Essential Skills and Knowledge** • Participates in multiple hands-on experiences to understand the quantity of grams, kilograms, and liters, as well as how they compare with each other. • Ability to use the tools to measure mass and volume • Ability to explain the differences between mass and volume. • Ability to solve one step word problems involving masses or volumes that are given in the same units using drawings with understanding. • Ability to solve one-step word problems involving masses or volumes using the four operations.	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics .** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

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<tr><th>Cluster and Standard</th><th>Mathematical Practices</th></tr>
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Supporting Cluster 3.MD.B-Represent and interpret data.

Supporting Standard 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 may less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

Essential Skills and Knowledge

- Knowledge that the use of "square" is referring to interval on the scale and that not all graphs will include a "square" but all graphs should include intervals
- Ability to apply experience with constructing and analyzing simple, single-unit scaled bar and picture graphs (pictograph) with no more than 4 categories (2.MD.D.10).
- Knowledge of increased scale and intervals (moving to graphs representing more than one item and the intervals representing 2, 5, 10 on the graph, etc.) and expanding to one-step and two-step problem-solving with given data
- Knowledge that the interval of scale is the amount from one tick mark to the next along the axis and that the scale would be determined based on the values being represented in the data
- Knowledge of and ability to connect understanding of locating points on a number line with locating points between intervals on a given axis. (e.g., if given a scale counting by 5s students would need to be able to estimate the location of 13 between intervals of 10 and 15.
- Ability to apply the information in the Key when interpreting fractions of a symbol on a picture graph

Supporting Standard 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.

Essential Skills and Knowledge

- Ability to apply prior experience with the measurement of lengths being marked and recorded on line plots to the nearest whole unit (3.NF.A.2)

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

Major Standard 3.MD.C.5
Recognize **area** as an attribute of plane figures and understand concept of area measurement.

Essential Skills and Knowledge

- Ability to apply experience with partitioning rectangles into rows and columns to count the squares within (2.OA.C.4)
- Knowledge that area is the measure of total square units inside a region or how many square units it takes to cover a region

Major Standard 3.MD.C.5a
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.

Essential Skills and Knowledge

- Ability to use square units of measure (inch tile) to measure figures and identify length, perimeter, or area to give the total measure..

Major Standard 3.MD.C.5b
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.

Essential Skills and Knowledge

- Ability to use square units of measure to cover a variety of plane figures without gaps or overlaps to provide the total area of the figure.

Major Standard 3.MD.C.6
Measure areas by counting unit squares (square cm, square m, square in., square ft., and improvised units).

Essential Skills and Knowledge

- Ability to use manipulatives and visual models to calculate area

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Domain: Measurement and Data	
Cluster and Standard	**Mathematical Practices**
Major Cluster 3.MD.C-Geometric measurement: understand concepts of area and relate area to multiplication and to addition. **Major Standard 3.MD.C.7** Relate area to the operations of multiplication and addition. **Essential Skills and Knowledge** • Ability to explain the relationship of multiplication arrays and area (3.OA.A.3) **Major Standard 3MD.C.7a** 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. **Essential Skills and Knowledge** • Ability to justify the understanding of area by comparing tiling and counting with repeated addition/multiplication **Major Standard 3.MD.C.7b** Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. **Essential Skills and Knowledge** • Ability to apply the formula for area of a rectangle to solve word problems • Ability to apply the formula for area when the measurement of one side is not given • Use understanding of area to identify false reasoning and explain how to correctly find the area of rectangles.	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

Domain: Measurement and Data	
Cluster and Standard	**Mathematical Practices**
Major Cluster 3.MD.C-Geometric measurement: understand concepts of area and relate area to multiplication and to addition. **Major Standard 3.MD.C.7c** 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* x *b* and *a* x *c*. Use area models to represent the distributive property in mathematical reasoning. **Essential Skills and Knowledge** • Ability to construct rectangles on grid paper and decompose them by cutting them up or color coding them to investigate area • Ability to use a pictorial model of the distributive property to solve area word problems • Knowledge that, for example, when working with a rectangle with side lengths of 7units by 8units, let *a* represent 7 and *b*+*c* represent a decomposition of 8 (e.g. 5+3, 6+2, 4+4, 7+1, etc.) In other words, 7x8 is the same as (7x2)+(7x6) **Major Standard 3.MD.C.7d** Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. **Essential Skills and Knowledge** • This is an extension of 3.MD.C.7c. • Knowledge that rectilinear figures refer to any polygon with all right angles • Ability to apply knowledge of finding area of a single polygon to finding areas of two non-overlapping rectangles to find the area f the whole figure. • Ability to apply knowledge of area for one rectangle to finding the area of rectilinear figures when the measurement for one side is missing.	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

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

Additional Standard 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.

Essential Skills and Knowledge

- Knowledge that the perimeter is the distance around a region
- Ability to use manipulatives and visual models to find the perimeter of a polygon
- Ability to apply a variety of strategies to find the perimeter of a polygon.
- Ability to explain and model the relationships between area and perimeter using concrete materials (e.g.,color tiles and geoboards)
- Use understanding of perimeter to identify false reasoning and explain how to correctly find the perimeter of plane figures
- Knowledge that this is a geometry application of unit fractions (3.NF.A.1) and ability to make use of unit fraction understanding
- Ability to use concrete materials to divide shapes into equal areas (e.g., pattern blocks , color tiles, geoboards)

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

Supporting Standard 3.G.A.1
Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

Essential Skills and Knowledge

Ability to compare and sort polygons based on their attributes, extending beyond the number of sides (2.G.A.1)
Ability to explain why two polygons are alike or why they are different based on their attributes

Supporting Standard3.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 ¼ of the area of the shape.

Essential Skills and Knowledge

Knowledge that this is a geometry application of unit fractions (3.NF.A.1) and ability to make use of unit fraction understanding.
Ability to use concrete materials to divide shapes into equal areas (e.g., pattern blocks , color tiles, geoboards)

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9. Make sense of problems and persevere in solving them.
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Grade 3 MD College and Career Ready Framework Vocabulary

Product: the result when two numbers are multiplied. Example: 5 x 4 = 20 and 20 is the product.

Partitioning: dividing the whole into equal parts.

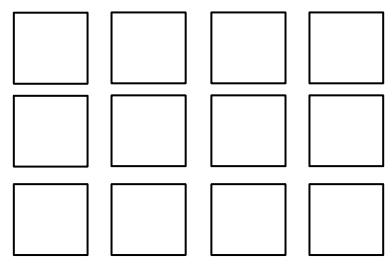
Quotient: the number resulting from dividing one number by another.

Share: a unit or equal part of a whole.

Partitioned: the whole divided into equal parts.

Arrays: the arrangement of counters, blocks, or graph paper square in rows and columns to represent a multiplication or division equation.
Examples:

2 rows of 4 equal 8
2 x 4 = 8



3 rows of 4 equal 12
3 x 4 =12

Measurement quantities: examples could include inches, feet, pints, quarts, centimeters, meters, liters, square units, etc.

Inverse operation: two operations that undo each other. Addition and subtraction are inverse operations. Multiplication and division are inverse operations.
Examples: 4 + 5 = 9; 9 – 5 = 4 or 6 x 5 = 30; 30 ÷ 5 = 6

Fact families: a collection of related addition and subtraction facts, or multiplication and division facts, made from the same numbers. For 7, 8, and 15, the addition/subtraction fact family consists of 7 + 8 = 15, 8 + 7 = 15, 15 – 8 = 7, and 15 – 7 = 8. For 5, 6, and 30, The multiplication/division fact family consists of 5 x 6 = 30, 6 x 5 = 30, 30 ÷ 5 = 6, and 30 ÷ 6 = 5.

Decomposing*:* breaking a number into two or more parts to make it easier with which to work.

Example: When combining a set of 5 and a set of 8, a student might decompose 8 into a set of 3 and a set of 5, making it easier to see that the two sets of 5 make 10 and then there are 3 more for a total of 13.

Decompose the number 4; 4 as 1+3; or 3+1; or 2+2

Decompose the number $\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$ or $\frac{3}{4} = \frac{2}{4} + \frac{1}{4}$

Composing: Composing (opposite of decomposing) is the process of joining numbers into a whole number…to combine smaller parts.Examples: 1 + 4 = 5; 2 + 3 = 5. These are two different ways to "compose" 5.

Properties of operations:. The properties of operations apply to the rational number system, the real number system, and the complex number system.

Zero Property*:* In addition, any number added to zero equals that number.
Example: 8 + 0 = 8
In multiplication, any number multiplied by zero equals zero. Example: 8 x 0 = 0

Identity Property*:* In addition, any number added to zero equals that number.
Example: 8 + 0 = 8
In multiplication, any number multiplied by one equals that number.
Example: 8 x 1 = 8

Commutative Property*:* In both addition and multiplication, changing the order of the factors when adding or multiplying will not change the sum or the product.
Example: 2 + 3 = 5 and 3 + 2 = 5; 3 x 7 = 21 and 7 x 3 = 21

Associative Property*:* in addition and multiplication, changing the grouping of the elements being added or multiplied will not change the sum or product.
Examples: (2 + 3) + 7 = 12 and 2 + (3 + 7) = 12; (2 x 3) x 5 = 30 and 2 x (3 x 5) =30

Distributive Property*:* a property that relates two operations on numbers, usually multiplication and addition or multiplication and subtraction. This property gets its name because it 'distributes' the factor outside the parentheses over the two terms within the parentheses.
Examples:

2 x (7 + 4) = (2 x 7) + (2 x 4)
2 x 11 = 14 + 8
22 = 22

2 x (7 – 4) = (2 x 7) – (2 x 4)
2 x 3 = 14 – 8
6 =6

Fluently: using efficient, flexible and accurate methods of computing

Variable: a letter or other symbol that represents a number. A variable need not represent one specific number; it can stand for many different values.
Examples: 2 x ? = 16 and a + 6 = b.

Equation: is a number sentence stating that the expressions on either side of the equal sign are in fact equal.

Expression: one or a group of mathematical symbols representing a number or quantity;

An expression may include numbers, variables, constants, operators and grouping symbols.
An algebraic expression is an expression containing at least one variable. Expressions do not include the equal sign, greater than, or less than signs. Examples of expressions: 5 + 5, 2x, 3(4 + x)
Non-examples: 4 + 5 = 9, 2 + 3 < 6 2(4 + x) ≠ 11

Estimation strategies: to estimate is to give an approximate number or answer. Some possible strategies include front-end estimation, rounding, and using compatible numbers. Examples:

Front End estimation	Rounding	Compatible Numbers
366 → 300	366 → 370	366 → 360
+ 423 → 400	+ 423 → 420	+ 423 → 420
700	790	780

Whole: In fractions, the whole refers to the entire region, set, or line segment which is divided into equal parts or segments.

Numerator: the number above the line in a fraction; names the number of parts of the whole being referenced.

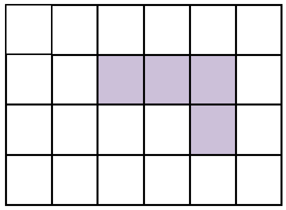
Example: I ate 3 pieces of a pie that had 6 pieces in all. So 3 out of 6 parts of a whole is written $\frac{3}{6}$. The 3 is the numerator, the part I ate. The 6 is the denominator, or the total number of pieces in the pie.

Denominator: the number below the line in a fraction; states the total number of parts in the whole.

Example: I ate 3 pieces of a pie that had 6 pieces in all. So 3 out of 6 parts of a whole is written: $\frac{3}{6}$. The 3 is the numerator, the part I ate. The 6 is the denominator, or the total number of pieces in the pie

Fraction of a region*:* is a number which names a part of a whole area.

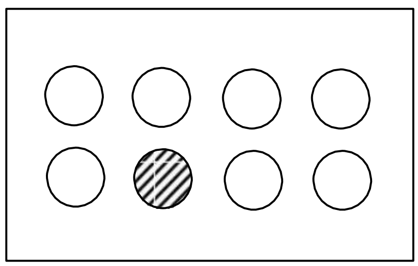
Example:



The shaded area represents $\frac{4}{24}$ of the region.

Fraction of a set*:* is a number that names a part of a set.

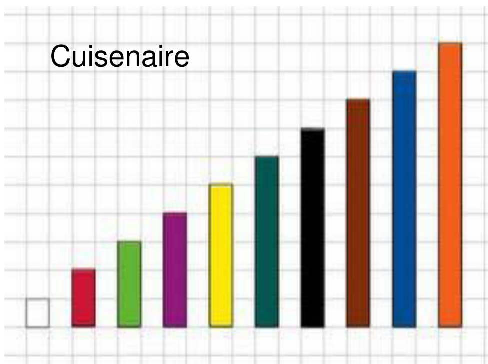
Example:

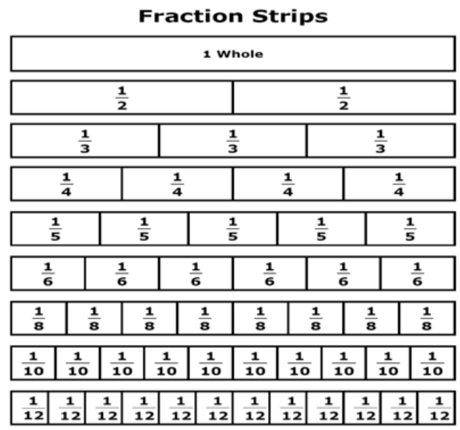


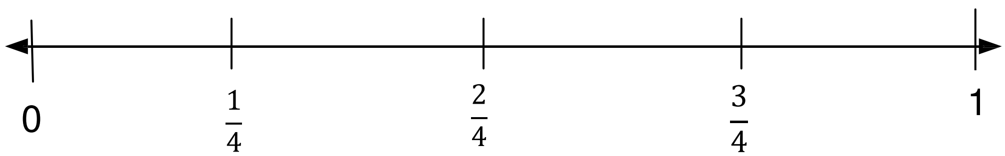
The fraction that names the striped circles in the set is $\frac{1}{8}$

Unit fraction*:* a fraction with a numerator of one. Examples: $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{6}$

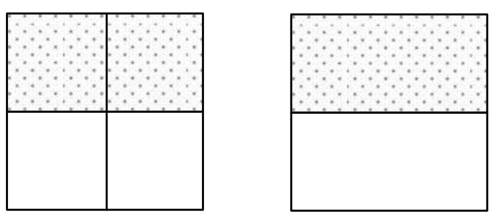
Linear models: used to perform operations with fractions and identify their placement on a number line. Some examples are fraction strips, fraction towers, Cuisenaire rods, number line and equivalency tables.







Equivalent Fraction- different fractions that name the same part of a region, part of a set, or part of a line segment.



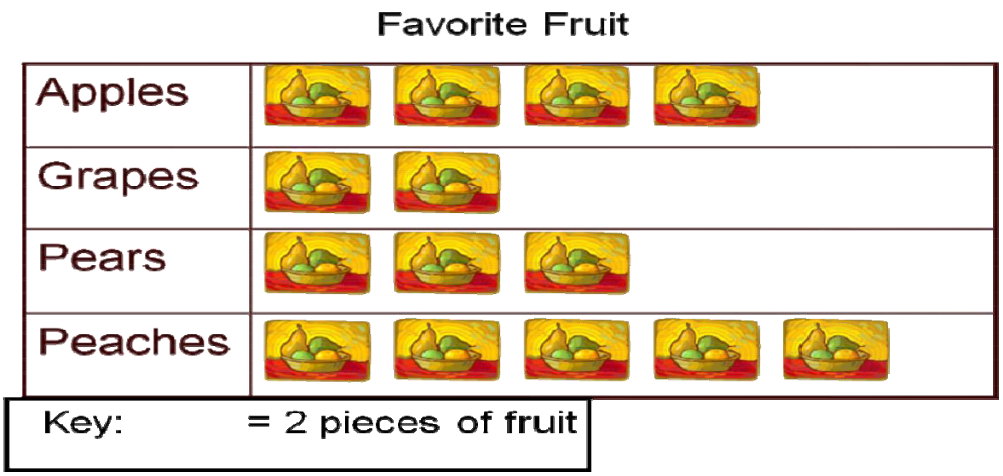
$\frac{2}{4}$ $\frac{1}{2}$

Benchmark fraction*:* fractions that are commonly used for estimation or for comparing other fractions. Example: Is $\frac{2}{3}$ greater or less than $\frac{1}{2}$?

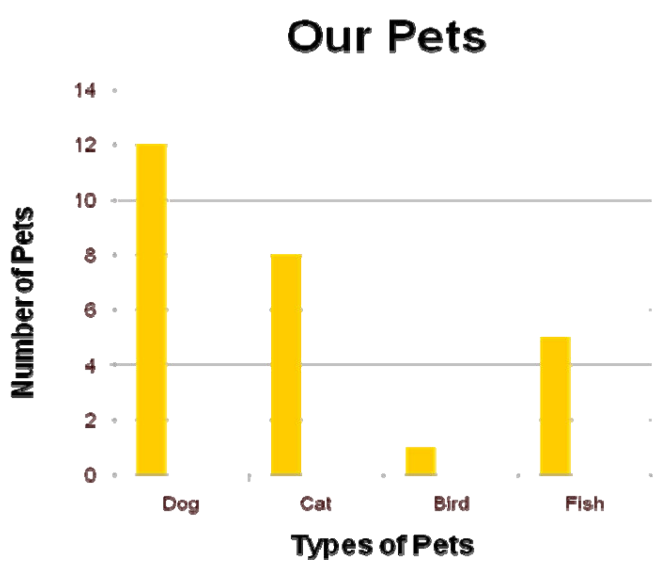
Improper fraction*:* a fraction in which the numerator is greater than or equal to the denominator.

Mixed number: a number that has a whole number and a fraction.

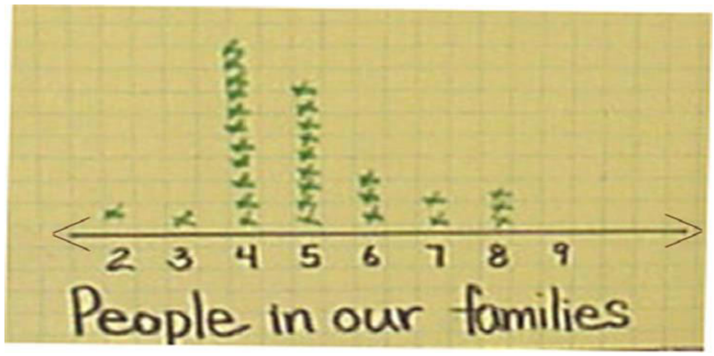
Scaled picture graph*:* more commonly known as a Pictograph. Is a graph constructed using repetition of a single picture or symbol to represent the various categories of data. It includes a scale which explains how many data items are represented by the single graphic. Example:



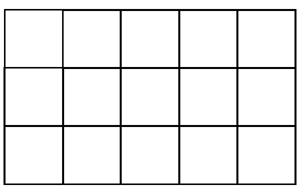
Scaled bar graph*:* a graph that shows the relationship among data by using bars to represent quantities within each category of data. Example:



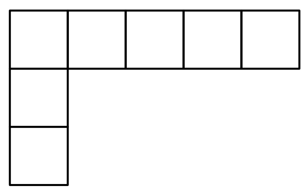
Line plot: a visual display of a distribution of data values where each data value is shown by a mark(symbol) above a number line. (Also referred to as a "dot plot.")



Area: the number of square units needed to cover a region. Examples:



The area of this rectangle equals 12 square units.

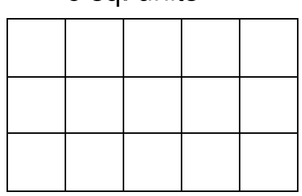


The area of this shape equals 7 square units

Tiling: highlighting the square units on each side of a rectangle to show its relationship to multiplication and that by multiplying the side lengths, the area can be determined. Example:

5 sq. units

3 sq. units.



3 x 5 = 15

The area is 15 sq. units.

Rectilinear figures*:* a polygon which has only 90 degrees and possibly 270 degree angles and an even number of sides.

Examples of Rectilinear Figures**:**