

3.OA Operations and Algebraic Thinking

3.OA.A Represent and solve problems involving multiplication and division.

3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each.

- N.3 Count equal groups
- N.4 Identify multiplication expressions for equal groups
- N.5 Write multiplication sentences for equal groups
- N.6 Relate addition and multiplication for equal groups
- N.7 Multiply by 0 or 1 with equal groups
- N.8 Identify multiplication expressions for arrays
- N.9 Write multiplication sentences for arrays
- N.10 Make arrays to model multiplication
- N.11 Multiply using number lines
- N.12 Write multiplication sentences for number lines
- N.13 Relate addition and multiplication
- S.5 Write two multiplication sentences for an array

3.OA.A.2 Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ 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.

- V.1 Divide by counting equal groups
- V.2 Write division sentences for groups
- V.3 Division sentences with 1 and 0
- V.5 Write division sentences for arrays
- V.6 Make arrays to model division

V.9 Divide using number lines

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.

T.1 Use equal groups and arrays to solve multiplication word problems

T.3 Use strip models to solve multiplication word problems

T.4 Multiplication word problems with factors up to 10

T.6 Multiplication word problems with factors up to 10: find the missing number

AA.1 Use equal groups to solve division word problems

AA.2 Use arrays to solve division word problems

AA.3 Use equal groups and arrays to solve division word problems

AA.4 Use strip models to solve division word problems

AA.5 Division word problems

BB.8 Multiplication and division word problems

EE.3 Solve for the unknown number: multiplication and division only

EE.5 Write equations with unknown numbers to represent word problems: multiplication and division only

3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

P.4 Multiplication facts for 2, 3, 4, 5, and 10: find the missing factor

P.8 Multiplication facts for 6, 7, 8, and 9: find the missing factor

P.12 Multiplication facts up to 10: find the missing factor

X.10 Division facts up to 10: find the missing number

EE.3 Solve for the unknown number: multiplication and division only

3.OA.B Understand properties of multiplication and the relationship between multiplication and division.

3.OA.B.5 Apply properties of operations as strategies to multiply and divide.

- S.1 Properties of multiplication
- S.2 Solve using properties of multiplication
- S.3 Multiply three numbers using properties
- S.4 Multiply by 0 or 1: complete the sentence
- S.6 Distributive property: find the missing factor
- S.8 Multiply using the distributive property
- V.8 Relate multiplication and division

3.OA.B.6 Understand division as an unknown-factor problem.

- V.4 Relate multiplication and division for groups
- V.7 Relate multiplication and division for arrays
- V.8 Relate multiplication and division

3.OA.C Multiply and divide within 100.

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

- O.1 Multiply 0 by numbers up to 10
- O.2 Multiply 1 by numbers up to 10
- O.3 Multiply 2 by numbers up to 10
- O.4 Multiply 3 by numbers up to 10
- O.5 Multiply 4 by numbers up to 10
- O.6 Multiply 5 by numbers up to 10
- O.7 Multiply 6 by numbers up to 10
- O.8 Multiply 7 by numbers up to 10

- O.9** Multiply 8 by numbers up to 10
- O.10** Multiply 9 by numbers up to 10
- O.11** Multiply 10 by numbers up to 10
- P.1** Multiplication facts for 2, 3, 4, 5, and 10
- P.2** Multiplication facts for 2, 3, 4, 5, and 10: true or false?
- P.3** Multiplication facts for 2, 3, 4, 5, and 10: sorting
- P.5** Multiplication facts for 6, 7, 8, and 9
- P.6** Multiplication facts for 6, 7, 8, and 9: true or false?
- P.7** Multiplication facts for 6, 7, 8, and 9: sorting
- P.9** Multiplication facts up to 10
- P.10** Multiplication facts up to 10: true or false?
- P.11** Multiplication facts up to 10: sorting
- P.13** Multiplication facts up to 10: select the missing factors
- P.14** Multiplication sentences up to 10: true or false?
- P.15** Squares up to 10×10
- S.2** Solve using properties of multiplication
- S.4** Multiply by 0 or 1: complete the sentence
- V.8** Relate multiplication and division
- W.1** Divide by 1: quotients up to 10
- W.2** Divide by 2: quotients up to 10
- W.3** Divide by 3: quotients up to 10
- W.4** Divide by 4: quotients up to 10
- W.5** Divide by 5: quotients up to 10
- W.6** Divide by 6: quotients up to 10
- W.7** Divide by 7: quotients up to 10
- W.8** Divide by 8: quotients up to 10
- W.9** Divide by 9: quotients up to 10
- W.10** Divide by 10: quotients up to 10

- X.1 Division facts for 2, 3, 4, 5, and 10
- X.2 Division facts for 2, 3, 4, 5, and 10: true or false?
- X.3 Division facts for 2, 3, 4, 5, and 10: sorting
- X.4 Division facts for 6, 7, 8, and 9
- X.5 Division facts for 6, 7, 8, and 9: true or false?
- X.6 Division facts for 6, 7, 8, and 9: sorting
- X.7 Division facts up to 10
- X.8 Division facts up to 10: true or false?
- X.9 Division facts up to 10: sorting
- X.11 Division facts up to 10: select the missing numbers
- X.12 Division sentences up to 10: true or false?
- BB.1 Multiplication and division facts up to 5: true or false?
- BB.2 Multiplication and division facts up to 10
- BB.3 Multiplication and division facts up to 10: true or false?
- Multiplication input/output tables
- Division input/output tables

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

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.

- DD.1 Two-step addition and subtraction word problems
- DD.2 Two-step multiplication and division word problems
- DD.3 Two-step mixed operation word problems
- DD.4 Two-step word problems: identify reasonable answers
- EE.5 Write equations with unknown numbers to represent word problems: multiplication and division only
- EE.6 Write equations with unknown numbers to represent word problems

3.OA.D.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.

- I.1** Addition patterns over increasing place values
- J.1** Subtraction patterns over increasing place values
- S.10** Identify multiplication patterns in tables
- BB.9** Multiplication and division: real-world patterns
- Multiplication input/output tables: find the rule
- Division input/output tables: find the rule

3.NBT Number and Operations in Base Ten

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

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

- C.1** Round to the nearest ten or hundred using a number line
- C.2** Round to the nearest ten or hundred
- C.3** Round to the nearest ten or hundred in a table

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.

- G.1** Use number lines to add three-digit numbers
- G.2** Use compensation to add: up to three digits
- G.3** Use expanded form to add three-digit numbers
- G.4** Add two numbers up to three digits: without regrouping
- G.5** Add two numbers up to three digits: with regrouping
- G.6** Add two numbers up to three digits
- G.7** Add two numbers up to three digits: word problems

- G.8** Complete the addition sentence: up to three digits
- G.9** Balance addition equations: up to three digits
- G.10** Addition up to three digits: fill in the missing digits
- G.11** Add three numbers up to three digits each
- G.12** Add three numbers up to three digits each: word problems
- H.1** Use number lines to subtract three-digit numbers
- H.2** Use compensation to subtract: up to three digits
- H.3** Use expanded form to subtract three-digit numbers
- H.4** Subtract numbers up to three digits: without regrouping
- H.5** Subtract three-digit numbers: with regrouping
- H.6** Subtract numbers up to three digits
- H.7** Subtract across zeros
- H.8** Subtract numbers up to three digits: word problems
- H.9** Complete the subtraction sentence: up to three digits
- H.10** Balance subtraction equations: up to three digits
- H.11** Subtraction up to three digits: fill in the missing digits
- K.1** Relate addition and subtraction sentences
- K.2** Use number lines to add and subtract three-digit numbers
- K.3** Use compensation to add or subtract: up to three digits
- K.4** Add and subtract three-digit numbers
- K.5** Complete the addition or subtraction sentence: up to three digits
- K.7** Addition and subtraction word problems: up to three digits
- L.1** Properties of addition
- L.2** Complete the equation using properties of addition
- L.3** Add using properties

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

- U.1 Multiply by a multiple of ten using place value
- U.2 Multiply by a multiple of ten

3.NF Number and Operations—Fractions

3.NF.A Develop understanding of fractions as numbers.

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 parts of size $\frac{1}{b}$.

- FF.5 Understand fractions: fraction bars
- FF.6 Understand fractions: area models
- FF.7 Show fractions: fraction bars
- FF.8 Show fractions: area models
- FF.9 Match fractions to models: halves, thirds, and fourths
- FF.10 Match unit fractions to models
- FF.11 Match fractions to models
- HH.1 Unit fractions: modeling word problems
- HH.2 Unit fractions: word problems
- HH.3 Fractions of a whole: modeling word problems
- HH.4 Fractions of a whole: word problems

3.NF.A.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram.

3.NF.A.2a 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.

- GG.1 Fractions of number lines: unit fractions
- GG.4 Identify unit fractions on number lines

GG.6 Graph unit fractions on number lines

3.NF.A.2b Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off $\frac{1}{b}$ 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.

GG.3 Fractions of number lines

GG.5 Identify fractions on number lines

GG.7 Graph fractions less than 1 on number lines

GG.8 Graph fractions on number lines

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

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

II.4 Identify equivalent fractions on number lines

II.5 Find equivalent fractions using number lines

3.NF.A.3b Recognize and generate simple equivalent fractions, (e.g., $\frac{1}{2} = \frac{2}{4}$, $\frac{4}{6} = \frac{2}{3}$). Explain why the fractions are equivalent, e.g., by using a visual fraction model.

II.1 Find equivalent fractions using fraction strips

II.2 Find equivalent fractions using area models: two models

II.3 Find equivalent fractions using area models: one model

II.6 Graph equivalent fractions on number lines

II.7 Identify equivalent fractions

II.8 Find equivalent fractions

3.NF.A.3c Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

- JJ.1** Graph fractions equivalent to 1 on number lines
- JJ.2** Select fractions equivalent to whole numbers using models
- JJ.3** Select fractions equivalent to whole numbers
- JJ.4** Find fractions equivalent to whole numbers

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.

- GG.9** Graph smaller or larger fractions on a number line
- KK.1** Compare fractions with like denominators using models
- KK.2** Graph and compare fractions with like denominators on number lines
- KK.3** Compare fractions with like denominators
- LL.1** Compare fractions with like numerators using models
- LL.2** Graph and compare fractions with like numerators on number lines
- LL.3** Compare fractions with like numerators
- MM.1** Compare fractions using models
- MM.2** Compare fractions using number lines
- MM.3** Graph and compare fractions on number lines
- MM.4** Compare fractions
- MM.5** Compare fractions and justify your answer
- MM.6** Compare fractions in recipes

3.MD Measurement and Data

3.MD.A Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

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.

- UU.1** Match clocks and times
- UU.2** Match analog and digital clocks
- UU.3** Read clocks and write times
- UU.5** Identify times written in words
- VV.1** Find the end time
- VV.2** Find the elapsed time
- VV.3** Find the end time: word problems
- VV.4** Find the start time: word problems
- VV.5** Find the elapsed time: word problems
- VV.6** Find the start time, the end time, or the elapsed time: word problems
- VV.7** Find start and end times: two-step word problems

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.

- XX.2** Read a scale - metric units
- XX.3** Measure liquid volumes - metric units
- XX.6** Which metric unit of mass is appropriate?
- XX.7** Which metric unit of volume is appropriate?
- XX.9** Measurement word problems

3.MD.B Represent and interpret data.

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.

- YY.2** Create scaled bar graphs
- YY.4** Use bar graphs to solve problems
- YY.6** Create scaled picture graphs

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.

- WW.2** Measure using an inch ruler: nearest $\frac{1}{4}$ inch
- YY.10** Create line plots with fractions

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

3.MD.C.5 Recognize area as an attribute of plane figures and understand concepts of area measurement.

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.

- 00.1** Find the area of figures made of unit squares
- 00.3** Select figures with a given area
- 00.4** Select two figures with the same area
- 00.12** Find the area of rectangles with missing unit squares

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.

- 00.7** Create figures with a given area
- 00.8** Create rectangles with a given area

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

- 00.1** Find the area of figures made of unit squares
- 00.2** Find the area of figures made of unit squares: customary and metric units
- 00.3** Select figures with a given area
- 00.12** Find the area of rectangles with missing unit squares

3.MD.C.7 Relate area to the operations of multiplication and addition.

3.MD.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.

- 00.5** Tile a rectangle and find the area
- 00.6** Multiply to find the area of a rectangle made of unit squares
- 00.8** Create rectangles with a given area

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.

- N.10** Make arrays to model multiplication
- 00.10** Find the area of rectangles and squares
- 00.13** Find the area of rectangles: word problems

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 $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.

- S.7** Multiply one-digit numbers using grids
- 00.9** Find the area of a tiled rectangle using the distributive property

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.

- 00.15** Find the area of complex figures by dividing them into rectangles
- 00.16** Find the area of complex figures
- 00.18** Find the area of complex figures: word problems

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

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.

- PP.1** Perimeter of figures on grids
- PP.2** Perimeter of rectangles
- PP.4** Perimeter of rectilinear shapes
- PP.5** Perimeter of polygons
- PP.6** Perimeter: find the missing side length
- PP.7** Perimeter: word problems
- QQ.2** Choose between area and perimeter: word problems
- QQ.3** Rectangles with the same perimeter or area
- QQ.4** Relationship between area and perimeter: find the perimeter
- QQ.5** Relationship between area and perimeter: find the area

3.G Geometry

3.G.A Reason with shapes and their attributes.

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.

- TT.1** Parallel sides in quadrilaterals
- TT.2** Attributes of quadrilaterals
- TT.3** Identify rectangles
- TT.4** Identify parallelograms
- TT.5** Identify rhombuses

- TT.6** Identify trapezoids
- TT.7** Classify squares, rectangles, rhombuses, and parallelograms
- TT.8** Classify squares, rectangles, rhombuses, parallelograms, and trapezoids
- TT.9** Name quadrilaterals more than one way
- TT.10** Draw squares, rectangles, rhombuses, and parallelograms
- TT.11** Draw squares, rectangles, rhombuses, parallelograms, and trapezoids

3.G.A.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

- FF.1** Identify equal parts
- FF.2** Make halves, thirds, and fourths
- FF.3** Make sixths and eighths
- FF.4** Make halves, thirds, fourths, sixths, and eighths
- FF.10** Match unit fractions to models

MP1 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.

- G.12** Add three numbers up to three digits each: word problems
- T.4** Multiplication word problems with factors up to 10
- T.6** Multiplication word problems with factors up to 10: find the missing number
- AA.5** Division word problems
- CC.4** Addition, subtraction, multiplication, and division word problems
- DD.3** Two-step mixed operation word problems
- OO.13** Find the area of rectangles: word problems
- OO.16** Find the area of complex figures
- PP.7** Perimeter: word problems
- QQ.4** Relationship between area and perimeter: find the perimeter
- QQ.5** Relationship between area and perimeter: find the area
- YY.4** Use bar graphs to solve problems

MP2 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.

- N.5** Write multiplication sentences for equal groups
- N.9** Write multiplication sentences for arrays
- V.2** Write division sentences for groups
- V.5** Write division sentences for arrays
- EE.2** Solve for the unknown number: addition and subtraction only
- EE.4** Solve for the unknown number
- EE.6** Write equations with unknown numbers to represent word problems
- FF.5** Understand fractions: fraction bars
- FF.6** Understand fractions: area models
- FF.11** Match fractions to models
- GG.5** Identify fractions on number lines
- HH.2** Unit fractions: word problems
- HH.4** Fractions of a whole: word problems
- MM.4** Compare fractions
- XX.6** Which metric unit of mass is appropriate?

MP3 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.

- F.4** Estimate to compare sums and differences
- L.2** Complete the equation using properties of addition
- S.2** Solve using properties of multiplication
- BB.1** Multiplication and division facts up to 5: true or false?
- BB.3** Multiplication and division facts up to 10: true or false?
- II.2** Find equivalent fractions using area models: two models
- II.5** Find equivalent fractions using number lines
- MM.3** Graph and compare fractions on number lines

MP4 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.

- G.12** Add three numbers up to three digits each: word problems
- H.8** Subtract numbers up to three digits: word problems

- T.4** Multiplication word problems with factors up to 10
- T.6** Multiplication word problems with factors up to 10: find the missing number
- AA.5** Division word problems
- CC.4** Addition, subtraction, multiplication, and division word problems
- DD.3** Two-step mixed operation word problems
- EE.6** Write equations with unknown numbers to represent word problems
- HH.1** Unit fractions: modeling word problems
- HH.3** Fractions of a whole: modeling word problems
- MM.6** Compare fractions in recipes
- OO.13** Find the area of rectangles: word problems
- PP.7** Perimeter: word problems
- YY.4** Use bar graphs to solve problems

MP5 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.

- N.5** Write multiplication sentences for equal groups
- N.9** Write multiplication sentences for arrays
- N.10** Make arrays to model multiplication
- N.12** Write multiplication sentences for number lines
- P.9** Multiplication facts up to 10

- V.2** Write division sentences for groups
- V.5** Write division sentences for arrays
- X.7** Division facts up to 10
- FF.7** Show fractions: fraction bars
- FF.8** Show fractions: area models
- GG.4** Identify unit fractions on number lines
- GG.5** Identify fractions on number lines
- II.2** Find equivalent fractions using area models: two models
- II.4** Identify equivalent fractions on number lines
- II.8** Find equivalent fractions
- JJ.2** Select fractions equivalent to whole numbers using models
- MM.1** Compare fractions using models
- MM.2** Compare fractions using number lines
- MM.4** Compare fractions
- OO.8** Create rectangles with a given area
- WW.2** Measure using an inch ruler: nearest $\frac{1}{4}$ inch

MP6 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.

- P.14** Multiplication sentences up to 10: true or false?
- X.12** Division sentences up to 10: true or false?
- BB.3** Multiplication and division facts up to 10: true or false?

- II.9** Write fractions in lowest terms
- OO.4** Select two figures with the same area
- TT.8** Classify squares, rectangles, rhombuses, parallelograms, and trapezoids
- UU.4** A.M. or P.M.
- UU.5** Identify times written in words
- WW.2** Measure using an inch ruler: nearest $\frac{1}{4}$ inch
- XX.6** Which metric unit of mass is appropriate?
- YY.2** Create scaled bar graphs
- YY.6** Create scaled picture graphs
- YY.10** Create line plots with fractions

MP7 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 $7 \times 5 + 7 \times 3$, 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 .

- L.2** Complete the equation using properties of addition
- N.13** Relate addition and multiplication
- P.11** Multiplication facts up to 10: sorting
- S.2** Solve using properties of multiplication
- S.6** Distributive property: find the missing factor
- S.8** Multiply using the distributive property
- V.4** Relate multiplication and division for groups
- V.7** Relate multiplication and division for arrays

- V.8** Relate multiplication and division
- X.9** Division facts up to 10: sorting
- CC.2** Complete the addition, subtraction, multiplication, or division sentence
- EE.2** Solve for the unknown number: addition and subtraction only
- EE.4** Solve for the unknown number
- FF.4** Make halves, thirds, fourths, sixths, and eighths

MP8 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.

- I.1** Addition patterns over increasing place values
- J.1** Subtraction patterns over increasing place values
- U.2** Multiply by a multiple of ten
 - Multiplication input/output tables
 - Multiplication input/output tables: find the rule
 - Division input/output tables: find the rule
 - Addition input/output tables: up to three digits
 - Subtraction input/output tables: up to three digits
 - Division input/output tables