

Grade 3

3.1. Core Content: Addition, subtraction, and place value

(Numbers, Operations)

Students solidify and formalize important concepts and skills related to addition and subtraction. In particular, students extend critical concepts of the base ten number system to include large numbers, they formalize procedures for adding and subtracting large numbers, and they apply these procedures in new contexts.

Performance Expectations

Students are expected to:

3.1.A Read, write, compare, order, and represent numbers to 10,000 using numbers, words, and symbols.

3.1.B Round whole numbers through 10,000 to the nearest ten, hundred, and thousand.

3.1.C Fluently and accurately add and subtract whole numbers using the standard regrouping algorithms.

3.1.D Estimate sums and differences to approximate solutions to problems and determine reasonableness of answers.

3.1.E Solve single- and multi-step word problems involving addition and subtraction of whole numbers and verify the solutions.

Explanatory Comments and Examples

This expectation reinforces and extends place value concepts.

Symbols used to describe comparisons include $<$, $>$, $=$.

Examples:

- Fill in the box with $<$, $>$, or $=$ to make a true sentence: $3,546 \square 4,356$.
- Is 5,683 closer to 5,600 or 5,700?

Example:

- Round 3,465 to the nearest ten and then to the nearest hundred.

Teachers should be aware that in some countries the algorithms might be recorded differently.

Example:

- Marla has \$10 and plans to spend it on items priced at \$3.72 and \$6.54. Use estimation to decide whether Marla's plan is a reasonable one, and justify your answer.

The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, or equations.

Grade 3

3.2. Core Content: Concepts of multiplication and division

(Operations, Algebra)

Students learn the meaning of multiplication and division and how these operations relate to each other. They begin to learn multiplication and division facts and how to multiply larger numbers. Students use what they are learning about multiplication and division to solve a variety of problems. With a solid understanding of these two key operations, students are prepared to formalize the procedures for multiplication and division in grades four and five.

Performance Expectations

Students are expected to:

- 3.2.A Represent multiplication as repeated addition, arrays, counting by multiples, and equal jumps on the number line, and connect each representation to the related equation.

Explanatory Comments and Examples

Students should be familiar with using words, pictures, physical objects, and equations to represent multiplication. They should be able to connect various representations of multiplication to the related multiplication equation. Representing multiplication with arrays is a precursor to more formalized area models for multiplication developed in later grades beginning with grade four.

The equation $3 \times 4 = 12$ could be represented in the following ways:

- Equal sets:

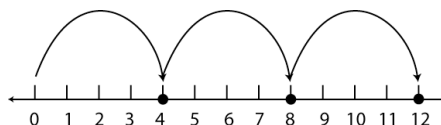


- An array:



- Repeated addition: $4 + 4 + 4$

- Three equal jumps forward from 0 on the number line to 12:



Performance Expectations

Students are expected to:

- 3.2.B Represent division as equal sharing, repeated subtraction, equal jumps on the number line, and formation of equal groups of objects, and connect each representation to the related equation.

- 3.2.C Determine products, quotients, and missing factors using the inverse relationship between multiplication and division.

Explanatory Comments and Examples

Students should be familiar with using words, pictures, physical objects, and equations to represent division. They should be able to connect various representations of division to the related equation.

Division can model both equal sharing (how many in each group) and equal groups (how many groups).

The equation $12 \div 4 = 3$ could be represented in the following ways:

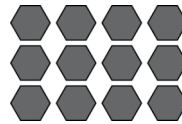
— Equal groups:



Equal sharing:

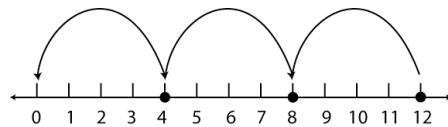


— An array:



— Repeated subtraction: The expression $12 - 4 - 4 - 4$ involves 3 subtractions of 4.

— Three equal jumps backward from 12 to 0 on the number line:



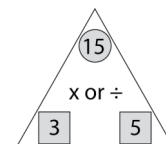
Example:

- To find the value of N in $3 \times N = 18$, think $18 \div 3 = 6$.

Students can use multiplication and division fact families to understand the inverse relationship between multiplication and division.

Examples:

- $3 \times 5 = 15$ $5 \times 3 = 15$
 $15 \div 3 = 5$ $15 \div 5 = 3$



Performance Expectations

Students are expected to:

- 3.2.D Apply and explain strategies to compute multiplication facts to 10 X 10 and the related division facts.

- 3.2.E Quickly recall those multiplication facts for which one factor is 1, 2, 5, or 10 and the related division facts.
- 3.2.F Solve and create word problems that match multiplication or division equations.

Explanatory Comments and Examples

Strategies for multiplication include skip counting (repeated addition), fact families, double-doubles (when 4 is a factor), “think ten” (when 9 is a factor, think of it as $10 - 1$), and decomposition of arrays into smaller known parts.

Number properties can be used to help remember basic facts.

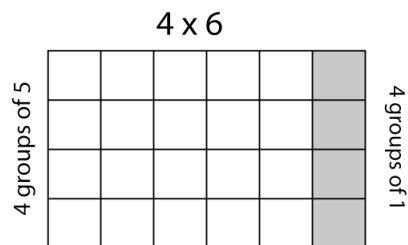
$$5 \times 3 = 3 \times 5 \text{ (Commutative Property)}$$

$$1 \times 5 = 5 \times 1 = 5 \text{ (Identity Property)}$$

$$0 \times 5 = 5 \times 0 = 0 \text{ (Zero Property)}$$

$$5 \times 6 = 5 \times (2 \times 3) = (5 \times 2) \times 3 = 10 \times 3 = 30 \text{ (Associative Property)}$$

$$4 \times 6 = 4(5 + 1) = (4 \times 5) + (4 \times 1) = 20 + 4 = 24 \text{ (Distributive Property)}$$



Division strategies include using fact families and thinking of missing factors.

Many students will learn all of the multiplication facts to 10 X 10 by the end of third grade, and all students should be given the opportunity to do so.

The goal is for students to be able to represent multiplication and division sentences with an appropriate situation, using objects, pictures, or written or spoken words. This standard is about helping students connect symbolic representations to the situations they model. While some students may create word problems that are detailed or lengthy, this is not necessary to meet the expectation. Just as we want students to be able to translate 5 groups of 3 cats into $5 \times 3 = 15$; we want students to look at an equation like $12 \div 4 = 3$ and connect it to a situation using objects, pictures, or words.

Performance Expectations

Students are expected to:

3.2.G Multiply any number from 11 through 19 by a single-digit number using the distributive property and place value concepts.

3.2.H Solve single- and multi-step word problems involving multiplication and division and verify the solutions.

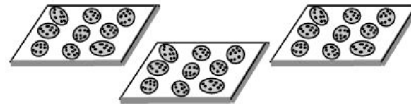
Explanatory Comments and Examples

Example:

- Equation: $3 \times 9 = ?$

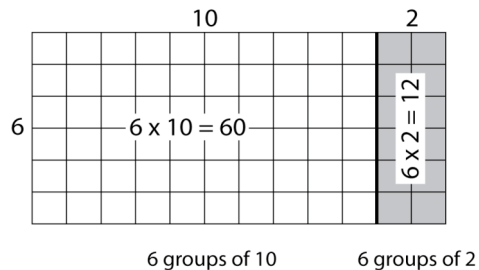
[Problem situation:

There are 3 trays of cookies with 9 cookies on each tray. How many cookies are there in all?]



Example:

- 6×12 can be thought of as 6 tens and 6 twos, which equal 60 and 12, totaling 72.



Problems include using multiplication to determine the number of possible combinations or outcomes for a situation, and division contexts that require interpretations of the remainder.

The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, physical objects, or equations.

Examples:

- Determine the number of different outfits that can be made with four shirts and three pairs of pants.
- There are 14 soccer players on the boys' team and 13 on the girls' team. How many vans are needed to take all players to the soccer tournament if each van can take 5 players?

Grade 3

3.3. Core Content: Fraction concepts

(Numbers, Algebra)

Students learn about fractions and how they are used. Students deepen their understanding of fractions by comparing and ordering fractions and by representing them in different ways. With a solid knowledge of fractions as numbers, students are prepared to be successful when they add, subtract, multiply, and divide fractions to solve problems in later grades.

Performance Expectations

Students are expected to:

3.3.A Represent fractions that have denominators of 2, 3, 4, 5, 6, 8, 9, 10, and 12 as parts of a whole, parts of a set, and points on the number line.

3.3.B Compare and order fractions that have denominators of 2, 3, 4, 5, 6, 8, 9, 10, and 12.

3.3.C Represent and identify equivalent fractions with denominators of 2, 3, 4, 5, 6, 8, 9, 10, and 12.

Explanatory Comments and Examples

The focus is on numbers less than or equal to 1. Students should be familiar with using words, pictures, physical objects, and equations to represent fractions.

Fractions can be compared using benchmarks (such as $\frac{1}{2}$ or 1), common numerators, or common denominators. Symbols used to describe comparisons include $<$, $>$, $=$.

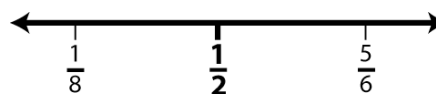
Fractions with common denominators may be compared and ordered using the numerators as a guide.

$$\frac{2}{6} < \frac{3}{6} < \frac{5}{6}$$

Fractions with common numerators may be compared and ordered using the denominators as a guide.

$$\frac{3}{10} < \frac{3}{8} < \frac{3}{4}$$

Fractions may be compared using $\frac{1}{2}$ as a benchmark.



Students could represent fractions using the number line, physical objects, pictures, or numbers.

Performance Expectations

Students are expected to:

- 3.3.D Solve single- and multi-step word problems involving comparison of fractions and verify the solutions.

Explanatory Comments and Examples

The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, physical objects, or equations.

Examples:

- Emile and Jordan ordered a medium pizza. Emile ate $\frac{1}{3}$ of it and Jordan ate $\frac{1}{4}$ of it. Who ate more pizza? Explain how you know.
- Janie and Li bought a dozen balloons. Half of them were blue, $\frac{1}{3}$ were white, and $\frac{1}{6}$ were red. Were there more blue, red, or white balloons? Justify your answer.

Grade 3

3.4. Core Content: Geometry

(Geometry/Measurement)

Students learn about lines and use lines, line segments, and right angles as they work with quadrilaterals. Students connect this geometric work to numbers, operations, and measurement as they determine simple perimeters in ways they will use when calculating perimeters of more complex figures in later grades.

Performance Expectations

Students are expected to:

- 3.4.A Identify and sketch parallel, intersecting, and perpendicular lines and line segments.
- 3.4.B Identify and sketch right angles.
- 3.4.C Identify and describe special types of quadrilaterals.
- 3.4.D Measure and calculate perimeters of quadrilaterals.
- 3.4.E Solve single- and multi-step word problems involving perimeters of quadrilaterals and verify the solutions.

Explanatory Comments and Examples

Special types of quadrilaterals include squares, rectangles, parallelograms, rhombi, trapezoids and kites.

Example:

- Sketch a parallelogram with two sides 9 cm long and two sides 6 cm long. What is the perimeter of the parallelogram?

Examples:

- Julie and Jacob have recently created two rectangular vegetable gardens in their backyard. One garden measures 6 ft by 8 ft, and the other garden measures 10 ft by 5 ft. They decide to place a small fence around the outside of each garden to prevent their dog from getting into their new vegetables. How many feet of fencing should Julie and Jacob buy to fence both gardens?

Grade 3

3.5. Additional Key Content

(Algebra, Geometry/Masurement, Data/Statistics/Probability)

Students solidify and formalize a number of important concepts and skills related to Core Content studied in previous grades. In particular, students demonstrate their understanding of equivalence as an important foundation for later work in algebra. Students also reinforce their knowledge of measurement as they use standard units for temperature, weight, and capacity. They continue to develop data organization skills as they reinforce multiplication and division concepts with a variety of types of graphs.

Performance Expectations

Students are expected to:

3.5.A Determine whether two expressions are equal and use “=” to denote equality.

Explanatory Comments and Examples

Examples:

- Is $5 \times 3 = 3 \times 5$ a true statement?
- Is $24 \div 3 = 2 \times 4$ a true statement?

A common error students make is using the mathematical equivalent of a run-on sentence to solve some problems—students carry an equivalence from a previous expression into a new expression with an additional operation. For example, when adding $3 + 6 + 7$, students sometimes incorrectly write:

$$3 + 6 = 9 + 7 = 16$$

Correct sentences:

$$3 + 6 = 9$$

$$9 + 7 = 16$$

3.5.B Measure temperature in degrees Fahrenheit and degrees Celsius using a thermometer.

The scale on a thermometer is essentially a vertical number line. Students may informally deal with negative numbers in this context, although negative numbers are not formally introduced until grade six.

Measure temperature to the nearest degree.

3.5.C Estimate, measure, and compare weight and mass using appropriate-sized U.S. customary and metric units.

3.5.D Estimate, measure, and compare capacity using appropriate-sized U.S. customary and metric units.

Performance Expectations

Students are expected to:

- 3.5.E Construct and analyze pictographs, frequency tables, line plots, and bar graphs.

Explanatory Comments and Examples

Students can write questions to be answered with information from a graph. Graphs and tables can be used to compare sets of data.

Using pictographs in which a symbol stands for multiple objects can reinforce the development of both multiplication and division skills. Determining appropriate scale and units for the axes of various types of graphs can also reinforce multiplication and division skills.

Grade 3

3.6. Core Processes: Reasoning, problem solving, and communication

Students in grade three solve problems that extend their understanding of core mathematical concepts—such as geometric figures, fraction concepts, and multiplication and division of whole numbers—as they make strategic decisions that bring them to reasonable solutions. Students use pictures, symbols, or mathematical language to explain the reasoning behind their decisions and solutions. They further develop their problem-solving skills by making generalizations about the processes used and applying these generalizations to similar problem situations. These critical reasoning, problem-solving, and communication skills represent the kind of mathematical thinking that equips students to use the mathematics they know to solve a growing range of useful and important problems and to make decisions based on quantitative information.

Performance Expectations

Students are expected to:

- 3.6.A Determine the question(s) to be answered given a problem situation.
- 3.6.B Identify information that is given in a problem and decide whether it is necessary or unnecessary to the solution of the problem.
- 3.6.C Identify missing information that is needed to solve a problem.
- 3.6.D Determine whether a problem to be solved is similar to previously solved problems, and identify possible strategies for solving the problem.
- 3.6.E Select and use one or more appropriate strategies to solve a problem.
- 3.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.
- 3.6.G Explain why a specific problem-solving strategy or procedure was used to determine a solution.
- 3.6.H Analyze and evaluate whether a solution is reasonable, is mathematically correct, and answers the question.
- 3.6.I Summarize mathematical information, draw conclusions, and explain reasoning.
- 3.6.J Make and test conjectures based on data (or information) collected from explorations and experiments.

Explanatory Comments and Examples

Descriptions of solution processes and explanations can include numbers, words (including mathematical language), pictures, physical objects, or equations. Students should be able to use all of these representations as needed. For a particular solution, students should be able to explain or show their work using at least one of these representations and verify that their answer is reasonable.

Examples:

- Whitney wants to put a fence around the perimeter of her square garden. She plans to include a gate that is 3 ft wide. The length of one side of the garden is 19 ft. The fencing comes in two sizes: rolls that are 18 ft long and 24 ft long. Which rolls and how many of each should Whitney buy in order to have the least amount of leftover fencing? Justify your answer.
- A soccer team is selling water bottles with soccer balls painted on them to raise money for new equipment. The team bought 10 boxes of water bottles. Each box cost \$27 and had 9 bottles. At what price should the team sell each bottle in order to make \$180 profit to pay for new soccer balls? Justify your answer.