

A Correlation of

SCOTT FORESMAN ■ ADDISON WESLEY

Mathematics

to the

New Jersey Core Curriculum Content Standards for Mathematics Grades K-6



O/M-147

Introduction

This document demonstrates the high degree of success students will achieve when using **Scott Foresman – Addison Wesley Mathematics** in meeting the objectives of the New Jersey Core Curriculum Content Standards for Mathematics. Correlation page references are to the Teacher Edition, which contains facsimile Pupil Edition pages.

Scott Foresman – Addison Wesley Mathematics was carefully developed to reflect the specific needs of students and teachers at every grade level, while maintaining an overall primary goal: to have math make sense from every perspective. This program is based on scientific research that describes how children learn mathematics well and on classroom-based evidence that validates proven reliability.

● Reaching All Learners

Scott Foresman – Addison Wesley Mathematics addresses the needs of every student through structured instruction that makes concepts easier for students to grasp. Lessons provide step-by-step examples that show students how to think about and solve the problem. Built-in leveled practice in every lesson allows the teacher to customize instruction to match students' abilities. Reaching All Learners, featured in the Teacher Edition, helps teachers meet the diverse needs of the classroom with fun and stimulating activities that are easy to incorporate directly into the lesson plan.

● Test Prep

Scott Foresman - Addison Wesley Mathematics builds understanding through connections to prior knowledge, math strands, other subjects and the real world. It provides practice for maximum results and offers assessment in a variety of ways. Besides carefully placed reviews at the end of each Section, an important Test Prep strand runs throughout the program. Writing exercises prepare students for open-ended and short-or extended-response questions on state and national tests. Spiral review in a test format help students keep their test-taking skills sharp.

● Priority on problem solving:

Problem-solving instruction is systematic and explicit. Reading connections help children with problem-solving skills and strategies for math. Reading for Math Success encourages students to use the reading skills and strategies they already know to solve math problems.

● Instructional Support

In the Teacher Edition, the Lesson Planner provides an easy, at-a-glance planning tool. It identifies objectives, math understandings, focus questions, vocabulary, and resources for each lesson in the chapter. Professional Development at the beginning of each chapter in the Teacher Edition includes a Skills Trace as well as Math Background and Teaching Tips for each section in the chapter.

Ancillaries help to reach all learners with practice, problem solving, hands-on math, language support, assessment and teacher support. Technology resources for both the student and the teacher provide a whole new dimension to math instruction by helping to create motivating and engaging lessons.

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**Scott Foresman – Addison Wesley Mathematics
to the
New Jersey Core Curriculum
Content Standards for Mathematics**

Grades K- 6

STANDARD 4.1 (NUMBER AND NUMERICAL OPERATIONS) ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATIONS ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS.

Cumulative Progress Indicators

*By the end of **Grade 2**, students will:*

A. Number Sense

1. Use real-life experiences, physical materials, and technology to construct meanings for numbers (unless otherwise noted, all indicators for grade 2 pertain to these sets of numbers as well).

- **Whole numbers through hundreds**
- **Ordinals**
- **Proper fractions (denominators of 2, 3, 4, 8, 10)**

K: 53A-53B, 53-54, 55A-55B, 55-56, 57A-57B, 57-58, 59A-59B, 59-60, 69A-69B, 69-70, 77A-77B, 77-78, 79A-79B, 79-80, 81A-81B, 81-82, 83A-83B, 83-84, 85A-85B, 85-86, 93A-93B, 93-94, 103A-103B, 103-104, 105A-105B, 105-106, 107A-107B, 107-108, 109A-109B, 109-110, 111A-111B, 111-112, 215A-215B, 215-216, 289A-289B, 289-290

1: 11A-11B, 11-12, 13A-13B, 13-14, 15A-15B, 15-16, 17A-17B, 17-18, 181A-181B, 181-182, 183A-183B, 183-184, 185A-185B, 185-186, 187A-187B, 187-188, 189A-189B, 189-190, 241A-241B, 241-242, 267A-267B, 267-268

2: 81A-81B, 81-82, 83A-83B, 83-84, 85A-85B, 85-86, 95A-95B, 95-96, 101A-101B, 101-102, 103A-103B, 103-104, 269A-269B, 269-270, 271A-271B, 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

2. Demonstrate an understanding of whole number place value concepts.

K: Preparation: 105A-105B, 105-106, 107A-107B, 107-108, 109A-109B, 109-110, 111A-111B, 111-112, 117A-117B, 117-118, 289A-289B, 289-290

1: 281A-281B, 281-282, 283A-283B, 283-284, 284A-284B, 284-285, 287A-287B, 287-288

2: 81A-81B, 81-82, 83A-83B, 83-84, 85A-85B, 85-86, 91A-91B, 91-92

3. Understand that numbers have a variety of uses.

- K:** 133A-133B, 133-134, 135A-135B, 135-136, 137A-137B, 137-138, 139A-139B, 139-140, 145A-145B, 145-146, 149A-149B, 149-150, 153A-153B, 153-154, 161A-161B, 161-162, 167A-167B, 167-168, 171A-171B, 171-172, 173A-173B, 173-174, 175A-175B, 175-176, 179A-179B, 179-180, 181A-181B, 181-182, 183A-183B, 183-184
- 1:** 205A-205B, 205-206, 207A-207B, 207-208, 209A-209B, 209-210, 211A-211B, 211-212, 343A-343B, 343-344, 345A-345B, 345-346, 347A-347B, 347-348, 365A-365B, 365-366, 383A-383B, 383-384
- 2:** 291A-291B, 291-292, 293A-293B, 293-294, 295A-295B, 295-296, 341A-341B, 341-342, 363A-363B, 363-364

4. Count and perform simple computations with coins.**• Amounts up to \$1.00 (using cents notation)**

- K:** 179A-179B, 179-180, 181A-181B, 181-182, 183A-183B, 183-184, 187A-187B, 187-188
- 1:** 331A-331B, 331-332, 333A-333B, 333-334, 335A-335B, 335-336, 337A-337B, 337-338, 343A-343B, 343-344, 345A-345B, 345-346, 347A-347B, 347-348
- 2:** 109A-109B, 109-110, 111A-111B, 111-112, 113A-113B, 113-114, 115A-115B, 115-116, 117A-117B, 117-118, 119A-119B, 119-120, 121A-121B, 121-122

5. Compare and order whole numbers.

- K:** 63A-63B, 63-64, 65A-65B, 65-66, 87A-87B, 87-88, 89A-89B, 89-90, 91A-91B, 91-92, 121A-121B, 121-122
- 1:** 29A-29B, 29-30, 31A-31B, 31-32, 297A-297B, 297-298, 301A-301B, 301-302
- 2:** 15A-15B, 15-16, 91A-91B, 91-92, 399A-399B, 399-400, 409A-409B, 409-410

B. Numerical Operations**1. Develop the meanings of addition and subtraction by concretely modeling and discussing a large variety of problems.****• Joining, separating, and comparing**

- K:** 225A-225B, 225-226, 227A-227B, 227-228, 229A-229B, 229-230, 231A-231B, 231-232, 235A-235B, 235-236, 237A-237B, 237-238, 245A-245B, 245-246, 247A-247B, 247-248, 265A-265B, 265-266, 267A-267B, 267-268, 269A-269B, 269-270
- 1:** 45A-45B, 45-46, 61A-61B, 61-62, 75A-75B, 75-76
- 2:** 3A-3B, 3-4, 13A-13B, 13-14, 15A-15B, 15-16

2. Explore the meanings of multiplication and division by modeling and discussing problems.

K: Preparation: 287A-287B, 287-288, 293A-293B, 293-294, 295A-295B, 295-296, 297A-297B, 297-298

1: Preparation: 255-256, 257-258, 261-262

2: 467A-467B, 467-478, 469A-469B, 469-470, 471A-471B, 471-472, 473A-473B, 473-474, 475A-475B, 475-476, 483A-483B, 483-484, 485A-485B, 485-486

3. Develop proficiency with basic addition and subtraction number facts using a variety of fact strategies (such as "counting on" and "near doubles") and then commit them to memory.

K: 251A-251B, 251-253, 253A-253B, 253-254, 255A-255B, 255-256, 257A-257B, 257-258, 271A-271B, 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

1: 91A-91B, 91-92, 93A-93B, 93-94, 95A-95B, 95-96, 97A-97B, 97-98, 103A-103B, 103-104, 105A-105B, 105-106, 107A-107B, 107-108, 125A-125B, 125-126, 127A-127B, 127-128, 129A-129B, 129-130, 417A-417B, 417-418, 419A-419B, 419-420, 425A-425B, 425-426, 435A-435B, 435-436, 437A-437B, 437-438, 439A-439B, 439-440

2: 43A-43B, 43-44, 45A-45B, 45-46, 47A-47B, 47-48, 49A-49B, 49-50, 51A-51B, 51-52, 53A-53B, 53-54, 57A-57B, 57-58, 61A-61B, 61-62, 63A-63B, 63-64, 65A-65B, 65-66

4. Construct, use, and explain procedures for performing addition and subtraction calculations with:

- **Pencil-and-paper**
- **Mental math**
- **Calculator**

K: 251A-251B, 251-253, 253A-253B, 253-254, 255A-255B, 255-256, 257A-257B, 257-258, 271A-271B, 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

1: 417A-417B, 417-418, 419A-419B, 419-420, 425A-425B, 425-426, 435A-435B, 435-436, 437A-437B, 437-438, 439A-439B, 439-440; 459A-459B, 459-460, 461A-461B, 461-462, 463A-463B, 463-464, 465A-465B, 465-466, 471A-471B, 471-472, 473A-473B, 473-474, 475A-475B, 475-476, 477A-477B, 477-478

2: 135A-135B, 135-136, 137A-137B, 137-138, 139A-139B, 139-140, 141A-141B, 141-142, 145A-145B, 145-146, 147A-147B, 147-148, 149A-149B, 149-150, 175A-175B, 175-176, 177A-177B, 177-178, 179A-179B, 179-180, 181A-181B, 181-182, 185A-185B, 185-186, 187A-187B, 187-188, 189A-189B, 189-190, 191A-191B, 191-192, 193A-193B, 193-194

5. Use efficient and accurate pencil-and-paper procedures for computation with whole numbers.

- **Addition of 2-digit numbers**
- **Subtraction of 2-digit numbers**

K: Preparation: 251A-251B, 251-253, 253A-253B, 253-254, 255A-255B, 255-256, 257A-257B, 257-258, 271A-271B, 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

1: 459A-459B, 459-460, 461A-461B, 461-462, 463A-463B, 463-464, 465A-465B, 465-466, 471A-471B, 471-472, 473A-473B, 473-474, 475A-475B, 475-476, 477A-477B, 477-478

2: 175A-175B, 175-176, 177A-177B, 177-178, 179A-179B, 179-180, 181A-181B, 181-182, 185A-185B, 185-186, 187A-187B, 187-188, 189A-189B, 189-190, 191A-191B, 191-192, 193A-193B, 193-194

6. Select pencil-and-paper, mental math, or a calculator as the appropriate computational method in a given situation depending on the context and numbers.

K: 251A-251B, 251-253, 253A-253B, 253-254, 255A-255B, 255-256, 257A-257B, 257-258, 271A-271B, 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

1: 417A-417B, 417-418, 419A-419B, 419-420, 425A-425B, 425-426, 435A-435B, 435-436, 437A-437B, 437-438, 439A-439B, 439-440; 459A-459B, 459-460, 461A-461B, 461-462, 463A-463B, 463-464, 465A-465B, 465-466, 471A-471B, 471-472, 473A-473B, 473-474, 475A-475B, 475-476, 477A-477B, 477-478

2: 135A-135B, 135-136, 137A-137B, 137-138, 139A-139B, 139-140, 141A-141B, 141-142, 145A-145B, 145-146, 147A-147B, 147-148, 149A-149B, 149-150, 175A-175B, 175-176, 177A-177B, 177-178, 179A-179B, 179-180, 181A-181B, 181-182, 185A-185B, 185-186, 187A-187B, 187-188, 189A-189B, 189-190, 191A-191B, 191-192, 193A-193B, 193-194

7. Check the reasonableness of results of computations.

K: Preparation: 251A-251B, 251-253, 253A-253B, 253-254, 255A-255B, 255-256, 257A-257B, 257-258, 271A-271B, 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

1: 141A-141B, 141-142, 439A-439B, 439-440

2: 175A-175B, 175-176, 177A-177B, 177-178, 179A-179B, 179-180, 181A-181B, 181-182, 185A-185B, 185-186, 187A-187B, 187-188, 189A-189B, 189-190, 191A-191B, 191-192, 193A-193B, 193-194, 227A-227B, 227-228

8. Understand and use the inverse relationship between addition and subtraction.

K: Preparation: 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

1: 137A-137B, 137-138, 139A-139B, 139-140, 141A-141B, 141-142, 435A-435B, 435-436, 437A-437B, 437-438, 439A-439B, 439-440,

2: 27A-27B, 27-28, 65A-65B, 65-66, 227A-227B, 227-228

C. Estimation**1. Judge without counting whether a set of objects has less than, more than, or the same number of objects as a reference set.**

K: 119A-119B, 119-120

1: 249A-249B, 249-250

2: 401A-401B, 401-402

2. Determine the reasonableness of an answer by estimating the result of computations (e.g., $15 + 16$ is not 211).

K: Preparation: 251A-251B, 251-253, 253A-253B, 253-254, 255A-255B, 255-256, 257A-257B, 257-258, 271A-271B, 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

1: 141A-141B, 141-142, 439A-439B, 439-440

2: 175A-175B, 175-176, 177A-177B, 177-178, 179A-179B, 179-180, 181A-181B, 181-182, 185A-185B, 185-186, 187A-187B, 187-188, 189A-189B, 189-190, 191A-191B, 191-192, 193A-193B, 193-194, 227A-227B, 227-228

3. Explore a variety of strategies for estimating both quantities (e.g., the number of marbles in a jar) and results of computation.

K: Preparation: 251A-251B, 251-253, 253A-253B, 253-254, 255A-255B, 255-256, 257A-257B, 257-258, 271A-271B, 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

1: 141A-141B, 141-142, 249A-249B, 249-250, 439A-439B, 439-440

2: 141A-141B, 141-142, 149A-149B, 149-150, 191A-191B, 191-192, 229A-229B, 229-230, 429A-429B, 429-430, 445A-445B, 445-446

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 3**, students will:*

A. Number Sense

1. Use real-life experiences, physical materials, and technology to construct meanings for numbers (unless otherwise noted, all indicators for grade 3 pertain to these sets of numbers as well).

- **Whole numbers through hundred thousands**
- **Commonly used fractions (denominators of 2, 3, 4, 5, 6, 8, 10) as part of a whole, as a subset of a set, and as a location on a number line**
3: 4A-4B, 4-5, 6A-6B, 6-7, 10A-10B, 10-11, 12A-12B, 12-13, 498A-498B, 498-501, 502A-502B, 502-503, 504A-504B, 504-505, 512A-512B, 512-513, 516A-516B, 516-517, 518A-518B, 518-519

2. Demonstrate an understanding of whole number place value concepts.

3: 4A-4B, 4-5, 6A-6B, 6-7, 8A-8B, 8-9, 10A-10B, 10-11, 12A-12B, 12-13

3. Identify whether any whole number is odd or even.

3: 24A-24B, 24-25, 258

4. Explore the extension of the place value system to decimals through hundredths.

3: 564A-564B, 564-565, 566A-566B, 566-567

5. Understand the various uses of numbers.

- **Counting, measuring, labeling (e.g., numbers on baseball uniforms)**
3: 4A-4B, 4-5, 36A-36B, 36-37, 192A-192B, 192-193, 464A-464B, 464-467, 468A-468B, 468-473, 532A-532B, 532-533

6. Compare and order numbers.

3: 18A-18B, 18-21, 22A-22B, 22-23, 506A-506B, 506-509, 568A-568B, 568-571

B. Numerical Operations

1. Develop the meanings of the four basic arithmetic operations by modeling and discussing a large variety of problems.

- **Addition and subtraction: joining, separating, comparing**

3: 66A-66B, 66-69, 80A-80B, 80-81, 82A-82B, 82-85, 86A-86B, 86-89, 94A-94B, 94-95, 96A-96B, 96-97

- **Multiplication: repeated addition, area/array**

3: 260A-260B, 260-261, 262A-262B, 262-265

- **Division: repeated subtraction, sharing**

3: 370A-370B, 370-371, 372A-372B, 372-737

2. Develop proficiency with basic multiplication and division number facts using a variety of fact strategies (such as "skip counting" and "repeated subtraction").

3: 276A-276B, 276-279, 280A-280B, 280-281, 282A-282B, 282-283, 286A-286B, 286-287, 288A-288B, 288-291, 292A-292B, 292-293, 316A-316B, 316-317, 318A-318B, 318-319, 320A-320B, 320-323, 324A-324B, 324-327, 328A-328B, 328-331, 386A-386B, 386-387, 388A-388B, 388-389, 390A-390B, 390-391, 392A-392B, 392-393, 396A-396B, 396-397, 402A-402B, 402-403

3. Construct, use, and explain procedures for performing whole number calculations with:

- **Pencil-and-paper**

- **Mental math**

- **Calculator**

3: 126A-126B, 126-127, 128A-128B, 128-131, 132A-132B, 132-135, 136A-136B, 136-139, 146A-146B, 146-147, 148A-148B, 148-149, 150A-150B, 150-151, 152A-152B, 152-155, 156A-156B, 156-157, 162A-162B, 162-165, 166A-166B, 166-167

4. Use efficient and accurate pencil-and-paper procedures for computation with whole numbers.

- **Addition of 3-digit numbers**

3: 128A-128B, 128-131, 132A-132B, 132-135

- **Subtraction of 3-digit numbers**

3: 150A-150B, 151-152, 152A-152B, 152-155

- **Multiplication of 2-digit numbers by 1-digit numbers**

3: 282A-282BM 282-283

5. Count and perform simple computations with money.**• Cents notation (¢)****3:** 36A-36B, 36-39, 40A-40B, 40-41, 162A-162B, 162-165**6. Select pencil-and-paper, mental math, or a calculator as the appropriate computational method in a given situation depending on the context and numbers.****3:** 126A-126B, 126-127, 128A-128B, 128-131, 132A-132B, 132-135, 136A-136B, 136-139, 146A-146B, 146-147, 148A-148B, 148-149, 150A-150B, 150-151, 152A-152B, 152-155, 156A-156B, 156-157, 162A-162B, 162-165, 166A-166B, 166-167**7. Check the reasonableness of results of computations.****3:** 80A-80B, 80-81, 82A-82B, 82-83, 86A-86B, 86-89, 90A-90B, 90-91, 94A-94B, 94-95, 96A-96B, 96-97, 98A-98B, 98-101, 160A-160B, 160-161**C. Estimation****1. Judge without counting whether a set of objects has less than, more than, or the same number of objects as a reference set.****3:** Related material: 86A-86B, 86-89, 98A-98B, 98-101**2. Construct and use a variety of estimation strategies (e.g., rounding and mental math) for estimating both quantities and the result of computations.****3:** 80A-80B, 80-81, 82A-82B, 82-83, 86A-86B, 86-89, 90A-90B, 90-91, 94A-94B, 94-95, 96A-96B, 96-97, 98A-98B, 98-101, 160A-160B, 160-161**3. Recognize when an estimate is appropriate, and understand the usefulness of an estimate as distinct from an exact answer.****3:** 160A-160B, 160-161**4. Use estimation to determine whether the result of a computation (either by calculator or by hand) is reasonable.****3:** 80A-80B, 80-81, 82A-82B, 82-83, 86A-86B, 86-89, 90A-90B, 90-91, 94A-94B, 94-95, 96A-96B, 96-97, 98A-98B, 98-101, 160A-160B, 160-161

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 4**, students will:*

A. Number Sense

1. Use real-life experiences, physical materials, and technology to construct meanings for numbers (unless otherwise noted, all indicators for grade 4 pertain to these sets of numbers as well).

- Whole numbers through millions
- Commonly used fractions (denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 16) as part of a whole, as a subset of a set, and as a location on a number line
- Decimals through hundredths

4: 4A-4B, 4-7, 8A-8B, 8-9, 28A-28B, 28-29, 34A-34B, 34-37, 500A-500B, 500-501, 502A-502B, 502-503, 504A-504B, 504-507, 624A-624B, 624-627

2. Demonstrate an understanding of place value concepts.

4: 4A-4B, 4-7, 8A-8B, 8-9, 10A-10B, 10-11, 628A-628B, 628-629

3. Demonstrate a sense of the relative magnitudes of numbers.

4: 16A-16B, 16-19, 522A-522B, 522-523, 524A-524B, 524-527, 534A-534B, 534-536, 630A-630B, 630-631

4. Understand the various uses of numbers.

- Counting, measuring, labeling (e.g., numbers on baseball uniforms), locating (e.g., Room 235 is on the second floor)

4: 28A-28B, 28-29, 190A-190B, 190-191, 464A-464B, 464-467, 468A-468B, 468-472, 588A-588B, 588-589, 652A-652B, 652-653

5. Use concrete and pictorial models to relate whole numbers, commonly used fractions, and decimals to each other, and to represent equivalent forms of the same number.

4: 4A-4B, 4-7, 28A-28B, 28-29, 500A-500B, 500-501, 502A-502B, 502-503, 516A-516B, 516-519, 520A-520B, 520-521, 624A-624B, 624-627

6. Compare and order numbers.

4: 16A-16B, 16-19, 522A-522B, 522-523, 524A-524B, 524-527, 534A-534B, 534-536, 630A-630B, 630-631

7. Explore settings that give rise to negative numbers.

- Temperatures below 0° , debts
- Extension of the number line

4: 664A-664B, 664-665

B. Numerical Operations**1. Develop the meanings of the four basic arithmetic operations by modeling and discussing a large variety of problems.**

- **Addition and subtraction: joining, separating, comparing**

4: 62A-62B, 62-63, 64A-64B, 64-65, 76A-76B, 76-79, 80A-80B, 80-81, 82A-82B, 82-85, 86A-86B, 86-89

- **Multiplication: repeated addition, area/array**

4: 124A-124B, 124-127, 128A-128B, 128-131, 132A-132B, 132-135, 136A-136B, 136-139

- **Division: repeated subtraction, sharing**

4: 146A-146B, 146-147, 148A-148B, 148-149, 150A-150B, 150-151, 152A-152B, 152-153

2. Develop proficiency with basic multiplication and division number facts using a variety of fact strategies (such as "skip counting" and "repeated subtraction") and then commit them to memory.

4: 124A-124B, 124-127, 128A-128B, 128-131, 132A-132B, 132-135, 136A-136B, 136-139, 146A-146B, 146-147, 148A-148B, 148-149, 150A-150B, 150-151, 152A-152B, 152-153

3. Construct, use, and explain procedures for performing whole number calculations and with:

- Pencil-and-paper
- Mental math
- Calculator

4: 76A-76B, 76-79, 80A-80B, 80-81, 82A-82B, 82-85, 86A-86B, 86-89, 270A-270B, 270-273, 274A-274B, 274-277, 332A-332B, 332-335, 336A-336B, 336-337, 380A-380B, 380-383, 386A-386B, 386-389, 390A-390B, 390-391

4. Use efficient and accurate pencil-and-paper procedures for computation with whole numbers.

- **Addition of 3-digit numbers**
- **Subtraction of 3-digit numbers**
4: 76A-76B, 76-79, 80A-80B, 80-81, 82A-82B, 82-85, 86A-86B, 86-89
- **Multiplication of 2-digit numbers**
- **Division of 3-digit numbers by 1-digit numbers**
4: 270A-270B, 270-273, 274A-274B, 274-277, 332A-332B, 332-335

5. Construct and use procedures for performing decimal addition and subtraction.

4: 638A-638B, 638-641, 642A-642B, 642-647

6. Count and perform simple computations with money.

- **Standard dollars and cents notation**
4: 76A-76B, 76-79, 286A-286B, 286-287, 340A-340B, 340-341, 392A-392B, 392-395

7. Select pencil-and-paper, mental math, or a calculator as the appropriate computational method in a given situation depending on the context and numbers.

4: 76A-76B, 76-79, 80A-80B, 80-81, 82A-82B, 82-85, 86A-86B, 86-89, 270A-270B, 270-273, 274A-274B, 274-277, 332A-332B, 332-335, 336A-336B, 336-337, 380A-380B, 380-383, 386A-386B, 386-389, 390A-390B, 390-391

8. Check the reasonableness of results of computations.

4: 62A-62B, 62-63, 64A-64B, 64-67, 68A-68B, 68-71, 72A-72B, 72-73, 258A-258B, 258-261, 316A-316B, 316-319, 368A-368B, 368-371, 636A-636B, 636-637

9. Use concrete models to explore addition and subtraction with fractions.

4: 562A-562B, 562-563, 564A-564B, 564-567, 568A-568B, 568-571, 574A-574B, 574-577, 578A-578B, 578-583

10. Understand and use the inverse relationships between addition and subtraction and between multiplication and division.

4: 100A-100B, 100-101, 148A-148B, 148-149, 166A-166B, 166-167

C. Estimation

1. Judge without counting whether a set of objects has less than, more than, or the same number of objects as a reference set.

4: Related material: 62A-62B, 62-63, 64A-64B, 64-67, 68A-68B, 68-71, 72A-72B, 72-73, 258A-258B, 258-261, 316A-316B, 316-319, 368A-368B, 368-371, 636A-636B, 636-637

2. Construct and use a variety of estimation strategies (e.g., rounding and mental math) for estimating both quantities and the results of computations.

4: 62A-62B, 62-63, 64A-64B, 64-67, 68A-68B, 68-71, 72A-72B, 72-73, 258A-258B, 258-261, 316A-316B, 316-319, 368A-368B, 368-371, 636A-636B, 636-637

3. Recognize when an estimate is appropriate, and understand the usefulness of an estimate as distinct from an exact answer.

4: 600A-600B, 600-601

4. Use estimation to determine whether the result of a computation (either by calculator or by hand) is reasonable.

4: 62A-62B, 62-63, 64A-64B, 64-67, 68A-68B, 68-71, 72A-72B, 72-73, 258A-258B, 258-261, 316A-316B, 316-319, 368A-368B, 368-371, 636A-636B, 636-637

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 5**, students will:*

A. Number Sense

1. Use real-life experiences, physical materials, and technology to construct meanings for numbers (unless otherwise noted, all indicators for grade 5 pertain to these sets of numbers as well).

- **All fractions as part of a whole, as subset of a set, as a location on a number line, and as divisions of whole numbers**
- **All decimals**

5: 26A-26B, 26-27, 84A-84B, 84-85, 394A-394B, 394-397, 398A-398B, 398-399, 400A-400B, 400-401, 404A-404B, 404-405

2. Recognize the decimal nature of United States currency and compute with money.

5: 139, 148-151, 160A-160B, 160-161, 232-233

3. Demonstrate a sense of the relative magnitudes of numbers.

5: 6A-6B, 6-7, 12A-12B, 12-13, 418A-418B, 418-419, 420A-420B, 420-423, 430A-430B, 430-433

4. Use whole numbers, fractions, and decimals to represent equivalent forms of the same number.

5: 410A-410B, 410-411, 412A-412B, 412-413, 416A-416B, 416-417, 426A-426B, 426-429

5. Develop and apply number theory concepts in problem solving situations.

- **Primes, factors, multiples**

5: 162A-162B, 162-163, 164A-164B, 164-167

6. Compare and order numbers.

5: 6A-6B, 6-7, 12A-12B, 12-13, 418A-418B, 418-419, 420A-420B, 420-423, 430A-430B, 430-433

B. Numerical Operations**1. Recognize the appropriate use of each arithmetic operation in problem situations.**

5: 36A-36B, 36-37, 38A-38B, 38-39, 40A-40B, 40-41, 88A-88B, 88-91, 94A-94B, 94-97, 152A-152B, 152-155, 156A-156B, 156-157, 158A-158B, 158-159, 160A-160B, 160-161, 202A-202B, 202-203, 214A-214B, 214-217, 218A-218B, 218-221, 224A-224B, 224-225, 230A-230B, 230-231, 232A-232B, 232-233, 234A-234B, 234-237

2. Construct, use, and explain procedures for performing addition and subtraction with fractions and decimals with:

- **Pencil-and-paper**
- **Mental math**
- **Calculator**

5: 38A-38B, 38-39, 40A-40B, 40-41, 460A-460B, 460-461, 462A-462B, 462-463, 464A-464B, 464-465, 466A-466B, 466-469, 472A-472B, 472-473, 474A-474B, 474-475, 476A-476B, 476-477, 478A-478B, 478-483

3. Use an efficient and accurate pencil-and-paper procedure for division of a 3-digit number by a 2-digit number.

5: 202A-202B, 202-203, 204A-204B, 204-209, 214A-214B, 214-217

4. Select pencil-and-paper, mental math, or a calculator as the appropriate computational method in a given situation depending on the context and numbers.

5: 36A-36B, 36-37, 38A-38B, 38-39, 40A-40B, 40-41, 88A-88B, 88-91, 94A-94B, 94-97, 152A-152B, 152-155, 156A-156B, 156-157, 158A-158B, 158-159, 160A-160B, 160-161, 202A-202B, 202-203, 214A-214B, 214-217, 218A-218B, 218-221, 224A-224B, 224-225, 230A-230B, 230-231, 232A-232B, 232-233, 234A-234B, 234-237, 460A-460B, 460-461, 462A-462B, 462-463, 464A-464B, 464-465, 466A-466B, 466-469, 472A-472B, 472-473, 474A-474B, 474-475, 476A-476B, 476-477, 478A-478B, 478-483

5. Check the reasonableness of results of computations.

5: 28A-28B, 28-31, 68A-68B, 68-70, 86A-86B, 86-87, 138A-138B, 138-143, 204A-204B, 204-209, 474A-474B, 474-475, 494A-494B, 494-495, 672A-672B, 672-675

6. Understand and use the various relationships among operations and properties of operations.

5: 36A-36B, 36-37, 66A-66B, 66-67, 84A-84B, 84-85, 108A-108B, 108-109, 132A-132B, 132-135, 148A-148B, 148-151, 696A-696B, 696-699, 700A-700B, 700-701, 702A-702B, 702-705

C. Estimation**1. Use a variety of estimation strategies for both number and computation.**

5: 28A-28B, 28-31, 68A-68B, 68-70, 86A-86B, 86-87, 138A-138B, 138-143, 204A-204B, 204-209, 474A-474B, 474-475, 494A-494B, 494-495, 672A-672B, 672-675

2. Recognize when an estimate is appropriate, and understand the usefulness of an estimate as distinct from an exact answer.

5: 624A-624B, 624-625

3. Determine the reasonableness of an answer by estimating the result of operations.

5: 28A-28B, 28-31, 68A-68B, 68-70, 86A-86B, 86-87, 138A-138B, 138-143, 204A-204B, 204-209, 474A-474B, 474-475, 494A-494B, 494-495, 672A-672B, 672-675

4. Determine whether a given estimate is an overestimate or an underestimate.

5: 28A-28B, 28-31, 68A-68B, 68-70, 86A-86B, 86-87, 138A-138B, 138-143, 204A-204B, 204-209, 474A-474B, 474-475, 494A-494B, 494-495, 672A-672B, 672-675

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 6**, students will:*

A. Number Sense**1. Use real-life experiences, physical materials, and technology to construct meanings for numbers (unless otherwise noted, all indicators for grade 6 pertain to these sets of numbers as well).**

- All integers
- All fractions as part of a whole, as subset of a set, as a location on a number line, and as divisions of whole numbers
- All decimals

6: 76A-76B, 76-77, 160A-160B, 160-163, 408A-408B, 408-409

2. Recognize the decimal nature of United States currency and compute with money.

6: 86A-86B, 86-89, 90A-90B, 90-93, 94A-94B, 94-97

3. Demonstrate a sense of the relative magnitudes of numbers.

6: 12A-12B, 12-13, 78A-78B, 78-79, 176A-176B, 176-179, 410A-410B, 410-411

4. Explore the use of ratios and proportions in a variety of situations.

6: 300A-300B, 300-301, 302A-302B, 302-305, 316A-316B, 316-317, 318A-318B, 318-321, 322A-322B, 322-323

5. Understand and use whole-number percents between 1 and 100 in a variety of situations.

6: 354A-354B, 354-357, 358A-358B, 358-361, 366A-366B, 366-367, 368A-368B, 368-369, 370A-370B, 370-373, 380A-380B, 380-383, 384A-384B, 384-385, 386A-386B, 386-387

6. Use whole numbers, fractions, and decimals to represent equivalent forms of the same number.

6: 164A-164B, 164-167, 168A-168B, 168-169, 172A-172B, 172-175

7. Develop and apply number theory concepts in problem solving situations.

- Primes, factors, multiples
- Common multiples, common factors

6: 142A-142B, 142-145, 146A-146B, 146-149, 150A-150B, 150-151, 152A-152B, 152-155

8. Compare and order numbers.

6: 12A-12B, 12-13, 78A-78B, 78-79, 176A-176B, 176-179, 410A-410B, 410-411

B. Numerical Operations

1. Recognize the appropriate use of each arithmetic operation in problem situations.

6: 86A-86B, 86-89, 90A-90B, 90-93, 94A-94B, 94-97, 100A-100B, 100-103, 204A-204B, 204-205, 206A-206B, 206-211, 252A-252B, 252-255, 266A-266B, 266-267, 418A-418B, 418-421, 422A-422B, 422-425, 426A-426B, 426-427, 428A-428B, 428-429

2. Construct, use, and explain procedures for performing calculations with fractions and decimals with:

- Pencil-and-paper
- Mental math
- Calculator

6: 86A-86B, 86-89, 90A-90B, 90-93, 94A-94B, 94-97, 100A-100B, 100-103, 204-205, 206A-206B, 206-211, 218A-218B, 218-219, 220A-220B, 220-223, 248A-248B, 248-251, 252A-252B, 252-255, 258A-258B, 258-259, 266A-266B, 266-267, 270A-270B, 270-271

3. Use an efficient and accurate pencil-and-paper procedure for division of a 3-digit number by a 2-digit number.

6: 18A-18B, 18-19

4. Select pencil-and-paper, mental math, or a calculator as the appropriate computational method in a given situation depending on the context and numbers.

6: 86A-86B, 86-89, 90A-90B, 90-93, 94A-94B, 94-97, 100A-100B, 100-103, 204-205, 206A-206B, 206-211, 218A-218B, 218-219, 220A-220B, 220-223, 248A-248B, 248-251, 252A-252B, 252-255, 258A-258B, 258-259, 266A-266B, 266-267, 270A-270B, 270-271

5. Find squares and cubes of whole numbers.

6: 8A-8B, 8-11, 110A-110B, 110-111

6. Check the reasonableness of results of computations.

6: 16A-16B, 16-17, 18A-18B, 18-19, 216A-216B, 216-217, 256A-256B, 256-257, 368A-368B, 368-369

7. Understand and use the various relationships among operations and properties of operations.

6: 24A-24B, 24-27, 28A-28B, 28-29, 30A-30B, 30-31, 48A-48B, 48-51

8. Understand and apply the standard algebraic order of operations for the four basic operations, including appropriate use of parentheses.

6: 24A-24B, 24-27, 28A-28B, 28-29, 30A-30B, 30-31, 48A-48B, 48-51, 430A-430B, 430-433

C. Estimation

1. Use a variety of strategies for estimating both quantities and the results of computations.

6: 16A-16B, 16-17, 18A-18B, 18-19, 216A-216B, 216-217, 256A-256B, 256-257, 368A-368B, 368-369

2. Recognize when an estimate is appropriate, and understand the usefulness of an estimate as distinct from an exact answer.

6: 226A-226B, 226-227

3. Determine the reasonableness of an answer by estimating the result of operations.

6: 16A-16B, 16-17, 18A-18B, 18-19, 216A-216B, 216-217, 256A-256B, 256-257, 368A-368B, 368-369

4. Determine whether a given estimate is an overestimate or an underestimate.

6: 16A-16B, 16-17, 18A-18B, 18-19, 216A-216B, 216-217, 256A-256B, 256-257,
368A-368B, 368-369

STANDARD 4.2 (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.

Cumulative Progress Indicators

By the end of **Grade 2**, students will:

A. Geometric Properties

1. Identify and describe spatial relationships among objects in space and their relative shapes and sizes.

- Inside/outside, left/right, above/below, between
- Smaller/larger/same size, wider/ narrower, longer/shorter
- Congruence (i.e., same size and shape)

K: 3A-3B, 3-4, 5A-5B, 5-6, 7A-7B, 7-8, 9A-9B, 9-10, 199A-199B, 199-200

1: 169A-169B, 169-170

2: 257A-257B, 257-258, 259A-259B, 259-260

2. Use concrete objects, drawings, and computer graphics to identify, classify, and describe standard three-dimensional and two-dimensional shapes.

- Vertex, edge, face, side
- 3D figures – cube, rectangular prism, sphere, cone, cylinder, and pyramid
- 2D figures – square, rectangle, circle, triangle
- Relationships between three- and two-dimensional shapes (i.e., the face of a 3D shape is a 2D shape)

K: 197A-197B, 197-198, 199A-199B, 199-200, 201A-201B, 201-202, 203A-203B, 203-204, 205A-205B, 205-206

1: 157A-157B, 157-158, 159A-159B, 159-160, 161A-161B, 161-162, 165A-165B, 165-166, 167A-167B, 167-168

2: 247A-247B, 247-248, 249A-249B, 249-250, 255A-255B, 255-256

3. Describe, identify and create instances of line symmetry.

K: 211A-211B, 211-212

1: 171A-171B, 171-172

2: 261A-261B, 261-262

4. Recognize, describe, extend and create designs and patterns with geometric objects of different shapes and colors.

K: 39A-39B, 39-40

1: 3A-3B, 3-4, 5A-5B, 5-6

2: 413B

B. Transforming Shapes**1. Use simple shapes to make designs, patterns, and pictures.****K:** 39A-39B, 39-40**1:** 3A-3B, 3-4, 5A-5B, 5-6**2:** 259A-259B, 259-260**2. Combine and subdivide simple shapes to make other shapes.****K:** 209A-209B, 209-210**1:** 181-182, 183-184, 185-186**2:** 255A-255B, 255-256**C. Coordinate Geometry****1. Give and follow directions for getting from one point to another on a map or grid.****K:** Related material: 3A-3B, 3-4, 5A-5B, 5-6, 7A-7B, 7-8, 9A-9B, 9-10**1:** 315A-315B, 315-316, 317A-317B, 317-318**2:** Related material: 325a-325b, 325-326**D. Units of Measurement****1. Directly compare and order objects according to measurable attributes.****• Attributes – length, weight, capacity, time, temperature****K:** 133A-133B, 133-134, 135A-135B, 135-136, 137A-137B, 137-138, 145A-145B, 145-146, 149A-149B, 149-150**1:** 383A-383B, 383-384, 389A-389B, 389-390**2:** 291-292, 297-298, 304, 341A-341B, 341-342, 343-344, 345A-345B, 347A, 353A-353B, 353-354, 363-364, 369**2. Recognize the need for a uniform unit of measure.****K:** 133A-133B, 133-134, 135A-135B, 135-136**1:** 365A-365B, 365-366, 383A-383B, 383-384**2:** 341A-341B, 341-342, 353A-353B, 353-354, 359A-359B, 359-360, 363A-363B-363-364

3. Select and use appropriate standard and non-standard units of measure and standard measurement tools to solve real-life problems.

- Length – inch, foot, yard, centimeter, meter
- Weight – pound, gram, kilogram
- Capacity – pint, quart, liter
- Time – second, minute, hour, day, week, month, year
- Temperature – degrees Celsius, degrees Fahrenheit

K: 133A-133B, 133-134, 135A-135B, 135-136, 137A-137B, 137-138, 139A-139B, 139-140, 141A-141B, 141-142, 145A-145B, 145-146, 147A-147B, 147-148, 149A-149B, 149-150, 151A-151B, 151-152, 153A-153B, 153-154, 171A-171B, 171-172, 173A-173B, 173-174, 175A-175B, 175-176

1: 365A-365B, 365-366, 369A-369B, 369-370, 371A-371B, 371-372, 373A-373B, 373-374, 375A-375B, 375-376, 383A-383B, 383-384, 385A-385B, 385-386, 387A-387B, 387-388, 389A-389B, 389-390, 391A-391B, 391-392, 393A-393B, 393-394, 397A-397B, 397-398

2: 343A-343B, 343-344, 345A-345B, 345-346, 347A-347B, 347-348, 355A-355B, 355-356, 357A-357B-357-358, 365A-365B, 365-366, 367A-367B, 367-368, 369A-369B, 369-370

4. Estimate measures.

K: 141A-141B, 141-142, 147A-147B, 147-148, 151A-151B, 151-152

1: 365A-365B, 365-366, 371A-371B, 371-372, 373A-373B, 373-374, 375A-375B, 375-376, 383A-383B, 383-384, 389A-389B, 389-390

2: 297A-279B, 297-298, 341A-341B, 341-342

E. Measuring Geometric Objects**1. Directly measure the perimeter of simple two-dimensional shapes.**

K: Preparation: 139A-139B, 139-140, 141A-141B, 141-142, 203A-203B, 203-204

1: 377A-377B, 377-378

2: 384

2. Directly measure the area of simple two-dimensional shapes by covering them with squares.

K: Preparation: 203A-203B, 203-204, 205A-205B, 205-206

1: Preparation: 377A-377B, 377-378

2: Preparation: 343A-343B, 343-344, 345A-345B, 345-346

Building upon knowledge and skills gained in preceding grades, by the end of **Grade 3**, students will:

A. Geometric Properties

- 1. Identify and describe spatial relationships of two or more objects in space.**
 - **Direction, orientation, and perspectives (e.g., which object is on your left when you are standing here?)**
 - **Relative shapes and sizes**
3: 432A-432B, 432-433, 456A-456B, 456-457

- 2. Use properties of standard three-dimensional and two-dimensional shapes to identify, classify, and describe them.**
 - **Vertex, edge, face, side, angle**
 - **3D figures – cube, rectangular prism, sphere, cone, cylinder, and pyramid**
 - **2D figures – square, rectangle, circle, triangle, pentagon, hexagon, octagon**
3: 428A-428B, 428-431, 442A-442B, 442-443, 444A-444B, 444-445, 446A-446B, 446-449, 450A-450B, 450-453, 454A-454B, 454-45

- 3. Identify and describe relationships among two-dimensional shapes.**
 - **Same size, same shape**
 - **Lines of symmetry**
3: 456A-456B, 456-459, 460A-460B, 460-461

- 4. Understand and apply concepts involving lines, angles, and circles.**
 - **Line, line segment, endpoint**
3: 442A-442B, 442-443

- 5. Recognize, describe, extend, and create space-filling patterns.**
3: Related material: 432-435, 456-459

B. Transforming Shapes

- 1. Describe and use geometric transformations (slide, flip, turn).**
3: 456A-456B, 456-459

- 2. Investigate the occurrence of geometry in nature and art.**
3: 453

C. Coordinate Geometry

1. Locate and name points in the first quadrant on a coordinate grid.

3: 218A-218B, 218-221

D. Units of Measurement

1. Understand that everyday objects have a variety of attributes, each of which can be measured in many ways.

3: 464A-464B, 464-465, 468A-468B, 468-471, 472A-472B, 472-473, 532A-532B, 532-533

2. Select and use appropriate standard units of measure and measurement tools to solve real-life problems.

- **Length** – fractions of an inch ($\frac{1}{4}$, $\frac{1}{2}$), mile, decimeter, kilometer
- **Area** – square inch, square centimeter
- **Weight** – ounce
- **Capacity** – fluid ounce, cup, gallon, milliliter

3: 468A-468B, 468-471, 532A-532B, 532-533, 680A-680B, 680-683, 690A-690B, 690-693

3. Incorporate estimation in measurement activities (e.g., estimate before measuring).

3: 533, 535, 582-583, 628, 681, 682, 685, 691, 697

E. Measuring Geometric Objects

1. Determine the area of simple two-dimensional shapes on a square grid.

3: 468A-468B, 468-471

2. Determine the perimeter of simple shapes by measuring all of the sides.

3: 464A-464B, 464-465

3. Measure and compare the volume of three-dimensional objects using materials such as rice or cubes.

3: 472A-472B, 472-473

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 4**, students will:*

A. Geometric Properties

- 1. Identify and describe spatial relationships of two or more objects in space.**
 - **Direction, orientation, and perspectives (e.g., which object is on your left when you are standing here?)**
 - **Relative shapes and sizes**
 - **Shadows (projections) of everyday objects**
4: 434A-434B, 434-437, 452A-452B, 452-455

- 2. Use properties of standard three-dimensional and two-dimensional shapes to identify, classify, and describe them.**
 - **Vertex, edge, face, side, angle**
 - **3D figures – cube, rectangular prism, sphere, cone, cylinder, and pyramid**
 - **2D figures – square, rectangle, circle, triangle, quadrilateral, pentagon, hexagon, octagon**
 - **Inclusive relationships – squares are rectangles, cubes are rectangular prisms**
4: 434A-434B, 434-437, 438A-438B, 438-439, 440A-440B, 440-443, 444A-444B, 444-447, 448A-448B, 448-449

- 3. Identify and describe relationships among two-dimensional shapes.**
 - **Congruence**
 - **Lines of symmetry**
4: 452A-452B, 452-455, 456A-456B, 456-457

- 4. Understand and apply concepts involving lines, angles, and circles.**
 - **Point, line, line segment, endpoint**
 - **Parallel, perpendicular**
 - **Angles – acute, right, obtuse**
4: 440A-440B, 440-443

 - **Circles – diameter, radius, center**
4: 448A-448B, 448-449

- 5. Recognize, describe, extend, and create space-filling patterns.**
4: Related material: 452A-452B, 452-455

B. Transforming Shapes**1. Use simple shapes to cover an area (tessellations).**

4: Related material: 452A-452B, 452-455

2. Describe and use geometric transformations (slide, flip, turn).

4: 452A-452B, 452-455

3. Investigate the occurrence of geometry in nature and art.

4: 447

C. Coordinate Geometry**1. Locate and name points in the first quadrant on a coordinate grid.**

4: 212A-212B, 212-215

2. Use coordinates to give or follow directions from one point to another on a map or grid.

4: Related material: 212A-212B, 212-215

D. Units of Measurement**1. Understand that everyday objects have a variety of attributes, each of which can be measured in many ways.**

4: 464A-464B, 464-467, 468A-468B, 468-473, 588A-588B, 588-589, 652A-652B, 651-653

2. Select and use appropriate standard units of measure and measurement tools to solve real-life problems

- Length – fractions of an inch ($\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$), mile, decimeter, kilometer

- Area – square inch, square centimeter

4: 590A-590B, 590-591, 468A-468B, 468-473

- Volume – cubic inch, cubic centimeter

- Weight – ounce

- Capacity – fluid ounce, cup, gallon, milliliter

4: 476A-476B, 476-477, 592A-592B, 592-593, 594A-594B, 594-595, 654A-654B, 654-655, 656A-656B, 656-657

3. Develop and use personal referents to approximate standard units of measure (e.g., a common paper clip is about an inch long).

4: 600A-600B, 600-602

4. Incorporate estimation in measurement activities (e.g., estimate before measuring).

4: 665

5. Solve problems involving elapsed time.

4: 196A-196B, 196-197

E. Measuring Geometric Objects

1. Determine the area of simple two-dimensional shapes on a square grid.

4: 468A-468B, 468-473

2. Distinguish between perimeter and area and use each appropriately in problem-solving situations.

4: 464A-464B, 464-467, 468A-468B, 468-473

3. Measure and compare the volume of three-dimensional objects using materials such as rice or cubes.

4: 476A-476B, 476-477

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 5**, students will:*

A. Geometric Properties

1. Understand and apply concepts involving lines and angles.

- **Notation for line, ray, angle, line segment**
- **Properties of parallel, perpendicular, and intersecting lines**
- **Sum of the measures of the interior angles of a triangle is 180°**

5: 328A-328B, 328-331, 332A-332B, 332-335, 336A-336B, 336-337, 340A-340B, 340-341

2. Identify, describe, compare, and classify polygons.

- Triangles by angles and sides
- Quadrilaterals, including squares, rectangles, parallelograms, trapezoids, rhombi
- Polygons by number of sides.
- Equilateral, equiangular, regular
- All points equidistant from a given point form a circle

5: 340A-340B, 340-341, 342A-342B, 342-345, 346A-346B, 346-351

3. Identify similar figures.

5: 360A-360B, 360-363

4. Understand and apply the concepts of congruence and symmetry (line and rotational).

5: 360A-360B, 360-363, 368A-368B, 368-371

B. Transforming Shapes**1. Use a translation, a reflection, or a rotation to map one figure onto another congruent figure.**

5: 364A-364B, 364-367

2. Recognize, identify, and describe geometric relationships and properties as they exist in nature, art, and other real-world settings.

5: 345, 597

C. Coordinate Geometry**1. Create geometric shapes with specified properties in the first quadrant on a coordinate grid.**

5: 174A-174B, 174-175

D. Units of Measurement**1. Select and use appropriate units to measure angles and area.**

5: 332A-332B, 332-335, 548A-548B, 548-549, 550A-550B, 550-551, 552A-552B, 552-553, 554A-554B, 554-557

2. Convert measurement units within a system (e.g., 3 feet = ___ inches).

5: 536A-536B, 536-539

3. Know approximate equivalents between the standard and metric systems (e.g., one kilometer is approximately 6/10 of a mile).

5: 528A-528B, 528-531, 534A-534B, 534-535

4. Use measurements and estimates to describe and compare phenomena.

5: 332A-332B, 332-335, 532A-532B, 532-533, 540A-540B, 540-541, 548A-548B, 548-549, 550A-550B, 550-551, 552A-552B, 552-553, 554A-554B, 554-557

E. Measuring Geometric Objects

1. Use a protractor to measure angles.

5: 332A-332B, 332-335

2. Develop and apply strategies and formulas for finding perimeter and area.

- **Square**
- **Rectangle**

5: 540A-540B, 540-541, 548A-548B, 548-549, 550A-550B, 550-551, 552A-552B, 552-553

3. Recognize that rectangles with the same perimeter do not necessarily have the same area and vice versa.

5: 540A-540B, 540-541, 548A-548B, 548-549, 550A-550B, 550-551

4. Develop informal ways of approximating the measures of familiar objects (e.g., use a grid to approximate the area of the bottom of one's foot).

5: 528A-528B, 528-531, 532A-532B, 532-533

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 6**, students will:*

A. Geometric Properties

1. Understand and apply concepts involving lines and angles.

- Notation for line, ray, angle, line segment
- Properties of parallel, perpendicular, and intersecting lines
- Sum of the measures of the interior angles of a triangle is 180°
6: 472A-472B, 472-475, 476A-476B, 476-479, 480A-480B, 480-483, 484A-484B, 484-489

2. Identify, describe, compare, and classify polygons and circles.

- Triangles by angles and sides
- Quadrilaterals, including squares, rectangles, parallelograms, trapezoids, rhombi
- Polygons by number of sides.
- Equilateral, equiangular, regular
- All points equidistant from a given point form a circle
6: 494A-494B, 494-495, 496A-496B, 496-499, 500A-500B, 500-501, 502A-502B, 502-503

3. Identify similar figures.

- 6: 506A-506B, 506-509

4. Understand and apply the concepts of congruence and symmetry (line and rotational).

- 6: 506A-506B, 506-509, 514A-514B, 514-515

5. Compare properties of cylinders, prisms, cones, pyramids, and spheres.

- 6: 586A-586B, 586-589

6. Identify, describe, and draw the faces or shadows (projections) of three-dimensional geometric objects from different perspectives.

- 6: 586A-586B, 586-589

7. Identify a three-dimensional shape with given projections (top, front and side views).

- 6: 586A-586B, 586-589

8. Identify a three-dimensional shape with a given net (i.e., a flat pattern that folds into a 3D shape).

6: 586A-586B, 586-589

B. Transforming Shapes

1. Use a translation, a reflection, or a rotation to map one figure onto another congruent figure.

6: 510A-510B, 510-511

2. Recognize, identify, and describe geometric relationships and properties as they exist in nature, art, and other real-world settings.

6: 479, 557

C. Coordinate Geometry

1. Create geometric shapes with specified properties in the first quadrant on a coordinate grid.

6: 510A-510B, 510-511

D. Units of Measurement

1. Select and use appropriate units to measure angles, area, surface area, and volume.

6: 476A-476B, 476-479, 568A-568B, 568-569, 570A-570B, 570-571, 572A-572B, 572-575, 590A-590B, 590-593, 594A-594B, 594-597

2. Use a scale to find a distance on a map or a length on a scale drawing.

6: 330A-330B, 330-333

3. Convert measurement units within a system (e.g., 3 feet = ___ inches).

6: 542A-542B, 542-545, 546A-546B, 546-549

4. Know approximate equivalents between the standard and metric systems (e.g., one kilometer is approximately 6/10 of a mile).

6: 552A-552B, 552-553

5. Use measurements and estimates to describe and compare phenomena.

6: 542A-542B, 542-545, 546A-546B, 546-549, 550A-550B, 550-551

E. Measuring Geometric Objects

1. Use a protractor to measure angles.

6: 476A-476B, 476-479, 484A-484B, 484-489

2. Develop and apply strategies and formulas for finding perimeter and area.

- Triangle, square, rectangle, parallelogram, and trapezoid
- Circumference and area of a circle

6: 564A-564B, 564-567, 568A-568B, 568-569, 570A-570B, 570-571, 572A-572B, 572-575, 576A-576B, 576-579, 580A-580B, 580-581

3. Develop and apply strategies and formulas for finding the surface area and volume of rectangular prisms and cylinders.

6: 590A-590B, 590-593, 594A-594B, 594-597

4. Recognize that shapes with the same perimeter do not necessarily have the same area and vice versa.

6: 570A-570B, 570-571

5. Develop informal ways of approximating the measures of familiar objects (e.g., use a grid to approximate the area of the bottom of one's foot).

6: 550A-550B, 550-551

STANDARD 4.3 (PATTERNS AND ALGEBRA) ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS, AND ALGEBRAIC CONCEPTS AND PROCESSES.

Cumulative Progress Indicators

By the end of **Grade 2**, students will:

A. Patterns

1. Recognize, describe, extend, and create patterns.

- Using concrete materials (manipulatives), pictures, rhythms, & whole numbers
- Descriptions using words and symbols (e.g., "add two" or "+ 2")
- Repeating patterns
- Whole number patterns that grow or shrink as a result of repeatedly adding or subtracting a fixed number (e.g., skip counting forward or backward)

K: 35A-35B, 35-36, 37A-37B, 37-38, 39A-39B, 39-40, 41A-41B, 41-42, 43A-43B, 43-44, 45A-45B, 45-46, 95-96, 293A-293B, 293-294, 295A-295B, 295-296, 297-298

1: 3A-3B, 3-4, 5A-5B, 5-6, 255A-255B, 255-256, 257A-257B, 257-258, 261A-261B, 261-262

2: 99A-99B, 99-100, 413A-413B, 413-414, 467A-467B, 467-468

B. Functions and Relationships

1. Use concrete and pictorial models of function machines to explore the basic concept of a function.

K: Preparation: 293A-293B, 293-294, 295A-295B, 295-296

1: 261A-261B, 261-262

2: Preparation: 99A-99B, 99-100, 413A-413B, 413-414, 467A-467B, 467-468

C. Modeling

1. Recognize and describe changes over time (e.g., temperature, height).

K: Preparation: 141A-141B, 141-142, 153A-153B, 153-154

1: Preparation: 373A-373B, 373-374, 389A-389B, 389-390

2: 323A-323B, 323-324

2. Construct and solve simple open sentences involving addition or subtraction.

- **Result unknown (e.g., $6 - 2 = \underline{\quad}$ or $n = 3 + 5$)**
- **Part unknown (e.g., $3 + \square = 8$)**

K: 255A-255B, 255-256, 275A-275B, 275-276

1: 57A-57B, 57-58, 91A-91B, 91-92, 93A-93B, 93-94, 95A-95B, 95-96, 103A-103B, 103-104, 105A-105B, 105-106, 107A-107B, 107-108, 129A-129B, 129-130, 137A-137B, 137-138, 139A-139B, 139-140, 141A-141B, 141-142

2: 5A-5B, 5-6, 9A-9B, 9-10, 17A-17B, 17-18, 23A-23B, 23-24, 25A-25B, 25-26, 27A-27B, 27-28, 29A-29B, 29-30, 57A-57B, 57-58

D. Procedures**1. Understand and apply (but don't name) the following properties of addition:**

- **Commutative (e.g., $5 + 3 = 3 + 5$)**
- **Zero as the identity element (e.g., $7 + 0 = 7$)**
- **Associative (e.g., $7 + 3 + 2$ can be found by first adding either $7 + 3$ or $3 + 2$)**

K: 251A-251B, 251-253, 253A-253B, 253-254, 255A-255B, 255-256, 257A-257B, 257-258, 271A-271B, 271-272, 273A-273B, 273-274, 275A-275B, 275-276, 277A-277B, 277-278

1: 103A-103B, 103-104, 105A-105B, 105-106, 107A-107B, 107-108, 129A-129B, 129-130, 137A-137B, 137-138, 139A-139B, 139-140, 141A-141B, 141-14

2: 5A-5B, 5-6, 9A-9B, 9-10, 17A-17B, 17-18, 23A-23B, 23-24, 25A-25B, 25-26, 27A-27B, 27-28, 29A-29B, 29-30, 57A-57B, 57-58

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 3**, students will:*

A. Patterns**1. Recognize, describe, extend, and create patterns.**

- **Descriptions using words and number sentences/expressions**
- **Whole number patterns that grow or shrink as a result of repeatedly adding, subtracting, multiplying by, or dividing by a fixed number (e.g., 5, 8, 11, . . . or 800, 400, 200, . . .)**

3: 24-27, 277, 282, 286, 288-289, 332A-332B, 332-335, 340-341, 344-345

B. Functions and Relationships

1. Use concrete and pictorial models to explore the basic concept of a function.

- Input/output tables, T-charts

3: 344A-344B, 344-345

C. Modeling

1. Recognize and describe change in quantities.

- Graphs representing change over time (e.g., temperature, height)

3: 208A-208B, 208-211, 222A-222B, 222-223

2. Construct and solve simple open sentences involving addition or subtraction (e.g., $3 + 6 = \underline{\quad}$, $n = 15 - 3$, $3 + \underline{\quad} = 3$, $16 - c = 7$).

3: 72A-72B, 72-75, 76A-76B, 76-77

D. Procedures

1. Understand and apply the properties of operations and numbers.

- Commutative (e.g., $3 \times 7 = 7 \times 3$)
- Identity element for multiplication is 1 (e.g., $1 \times 8 = 8$)
- Any number multiplied by zero is zero

3: 66A-66B, 66-69, 286A-286B, 286-287

2. Understand and use the concepts of equals, less than, and greater than to describe relations between numbers.

- Symbols ($=$, $<$, $>$)

3: 18A-18B, 18-21, 506A-506B, 506-509, 568A-568B, 568-571

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 4**, students will:*

A. Patterns

1. Recognize, describe, extend, and create patterns.

- Descriptions using words, number sentences/expressions, graphs, tables, variables (e.g., shape, blank, or letter)
- Sequences that stop or that continue infinitely

- Whole number patterns that grow or shrink as a result of repeatedly adding, subtracting, multiplying by, or dividing by a fixed number (e.g., 5, 8, 11, . . . or 800, 400, 200, . . .)
 - Sequences can often be extended in more than one way (e.g., the next term after 1, 2, 4, . . . could be 8, or 7, or ...)
- 4: 10A-10B, 10-11, 90A-90B, 90-91, 366A-366B, 366-367, 641

B. Functions and Relationships

1. Use concrete and pictorial models to explore the basic concept of a function.
 - Input/output tables, T-charts
 - Combining two function machines
 - Reversing a function machine

4: 164A-164B, 164-165, 692A-692B, 692-695

C. Modeling

1. Recognize and describe change in quantities.
 - Graphs representing change over time (e.g., temperature, height)
 - How change in one physical quantity can produce a corresponding change in another (e.g., pitch of a sound depends on the rate of vibration)

4: 206A-206B, 206-207, 216A-216B, 216-221
 2. Construct and solve simple open sentences involving any one operation (e.g., $3 \times 6 = \underline{\quad}$, $n = 15 \square 3$, $3 \times \underline{\quad} = 0$, $16 - c = 7$).
- 4: 76A-76B, 76-79, 98A-98B, 98-99, 100A-100B, 100-101

D. Procedures

1. Understand, name, and apply the properties of operations and numbers.
 - Commutative (e.g., $3 \times 7 = 7 \times 3$)
 - Identity element for multiplication is 1 (e.g., $1 \times 8 = 8$)
 - Associative (e.g., $2 \times 4 \times 25$ can be found by first multiplying either 2×4 or 4×25)
 - Division by zero is undefined
 - Any number multiplied by zero is zero.

4: 124A-124B, 124-127, 146A-146B, 146-147, 166A-166B, 166-167

2. Understand and use the concepts of equals, less than, and greater than in simple number sentences.

- **Symbols (= , < , >)**

4: 16A-16B, 16-19, 524A-524, 524-527, 630A-630B, 630-631

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 5**, students will:*

A. Patterns

1. Recognize, describe, extend, and create patterns involving whole numbers.

- **Descriptions using tables, verbal rules, simple equations, and graphs**

5: 14A-14B, 14-17, 66A-66B, 66-67, 84A-84B, 84-85, 106A-106B, 106-107, 136A-136B, 136-137, 728A-728B, 728-729

B. Functions & Relationships

1. Describe arithmetic operations as functions, including combining operations and reversing them.

5: 106A-106B, 106-107, 728A-728B, 728-729

2. Graph points satisfying a function from T-charts, from verbal rules, and from simple equations.

5: 176A-176B, 176-179, 728A-728B, 728-729

C. Modeling

1. Use number sentences to model situations.

- **Using variables to represent unknown quantities**
- **Using concrete materials, tables, graphs, verbal rules, algebraic expressions/equations**

5: 100A-100B, 100-103, 104A-104B, 104-105, 108A-108B, 108-109, 176A-176B, 176-179, 660A-660B, 660-661, 706A-706B, 706-709

2. Draw freehand sketches of graphs that model real phenomena and use such graphs to predict and interpret events.

- Changes over time
- Rates of change (e.g., when is plant growing slowly/rapidly, when is temperature dropping most rapidly/slowly)

5: 266A-266B, 266-269

D. Procedures

1. Solve simple linear equations with manipulatives and informally

- Whole-number coefficients only, answers also whole numbers
- Variables on one side of equation

5: 108A-108B, 108-109, 700A-700B, 700-701, 702A-702B, 702-705

Building upon knowledge and skills gained in preceding grades, by the end of Grade 6, students will:

A. Patterns

1. Recognize, describe, extend, and create patterns involving whole numbers and rational numbers.

- Descriptions using tables, verbal rules, simple equations, and graphs
- Formal iterative formulas (e.g., NEXT = NOW * 3)
- Recursive patterns, including Pascal's Triangle (where each entry is the sum of the entries above it) and the Fibonacci Sequence: 1, 1, 2, 3, 5, 8, . . . (where NEXT = NOW + PREVIOUS)

6: 212A-212B, 212-213, 444A-444B, 444-447

B. Functions and Relationships

1. Describe the general behavior of functions given by formulas or verbal rules (e.g., graph to determine whether increasing or decreasing, linear or not).

6: 444A-444B, 444-447, 448A-448B, 448-449

C. Modeling

1. Use patterns, relations, and linear functions to model situations.
 - Using variables to represent unknown quantities
 - Using concrete materials, tables, graphs, verbal rules, algebraic expressions/equations/inequalities6: 444A-444B, 444-447, 448A-448B, 448-449

2. Draw freehand sketches of graphs that model real phenomena and use such graphs to predict and interpret events.
 - Changes over time
 - Relations between quantities
 - Rates of change (e.g., when is plant growing slowly/rapidly, when is temperature dropping most rapidly/slowly)6: 638A-638B, 638-641

D. Procedures

1. Solve simple linear equations with manipulatives and informally.
 - Whole-number coefficients only, answers also whole numbers
 - Variables on one or both sides of equation6: 48A-48B, 48-51, 430A-430B, 430-433, 712A-712B, 712-715

2. Understand and apply the properties of operations and numbers.
 - Distributive property
 - The product of a number and its reciprocal is 16: 28A-28B, 28-29, 30A-30B, 30-31, 44A-44B, 44-47

3. Evaluate numerical expressions.
6: 40A-40B, 40-43

4. Extend understanding and use of inequality.
 - Symbols ($<$, $>$, \leq , \geq)6: 698A-698B, 698-699, 700A-700B, 700-705

STANDARD 4.4 (DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS)
ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS AND TECHNIQUES OF DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS, AND WILL USE THEM TO MODEL SITUATIONS, SOLVE PROBLEMS, AND ANALYZE AND DRAW APPROPRIATE INFERENCES FROM DATA.

Cumulative Progress Indicators

By the end of **Grade 2**, students will:

A. Data Analysis

1. Collect, generate, record, and organize data in response to questions, claims, or curiosity.

- **Data collected from students' everyday experiences**
- **Data generated from chance devices, such as spinners and dice**
K: 27A-27B, 27-28, 29A-29B, 29-30, 31A-31B, 31-32, 33A-33B, 33-34
1: 309A-039B, 309-310, 311A-311B, 311-312, 313A-313B, 313-314, 315A-315B, 315-316
2: 311A-311B, 311-312, 313A-313B, 313-314, 315A-315B, 315-316

2. Read, interpret, construct, and analyze displays of data.

- **Pictures, tally chart, pictograph, bar graph, Venn diagram**
- **Smallest to largest, most frequent (mode)**
K: 27A-27B, 27-28, 29A-29B, 29-30, 31A-31B, 31-32, 33A-33B, 33-34
1: 309A-039B, 309-310, 311A-311B, 311-312, 313A-313B, 313-314, 315A-315B, 315-316
2: 319A-319B, 319-320, 321A-321B, 321-322, 323A-323B, 323-324, 325A-325B, 325-326, 327A-327B, 327-328

B. Probability

1. Use chance devices like spinners and dice to explore concepts of probability.

- **Certain, impossible**
- **More likely, less likely, equally likely**
K: Preparation: 213A-213B, 213-214, 215A-215B, 215-216
1: 401A-401B, 401-402, 403A-403B, 403-404
2: 373A-373B, 373-374, 375A-375B, 375-376

2. Provide probability of specific outcomes.

- Probability of getting specific outcome when coin is tossed, when die is rolled, when spinner is spun (e.g., if spinner has five equal sectors, then probability of getting a particular sector is one out of five)
- When picking a marble from a bag with three red marbles and four blue marbles, the probability of getting a red marble is three out of seven

K: Preparation: 213A-213B, 213-214, 215A-215B, 215-216

1: 401A-401B, 401-402, 403A-403B, 403-404

2: 373A-373B, 373-374, 375A-375B, 375-37

C. Discrete Mathematics—Systematic Listing and Counting**1. Sort and classify objects according to attributes.**

- Venn diagrams

K: 11A-11B, 11-12, 13A-13B, 13-14, 15A-15B, 15-16, 17A-17B, 17-18

1: 307A-307B, 307-308

2: 315A-315B, 315-316

2. Generate all possibilities in simple counting situations (e.g., all outfits involving two shirts and three pants).

K: Preparation: 13-14, 15-16, 17-18

1: Preparation: 307A-307B, 307-308

2: Preparation: 315A-315B, 315-316

D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms**1. Follow simple sets of directions (e.g., from one location to another, or from a recipe).**

K: Preparation: 5A-5B, 5-6, 9A-9B, 9-10

1: Related material: 315A-315B, 315-316, 317A-317B, 317-318

2: Related material: 325A-325B, 325-326

2. Color simple maps with a small number of colors.

K: Preparation: 37a-37b, 37-38

1: Related material: 317A-317B, 317-318

2: Related material: 325A-325B, 325-326

3. Play simple two-person games (e.g., tic-tac-toe) and informally explore the idea of what the outcome should be.

K: 2, 26, 52, 76, 102, 132, 160, 196, 224, 244, 264, 286

1: 2, 44, 90, 124, 156, 204, 240, 280, 330, 364, 416, 458

2: 2, 42, 80, 134, 174, 210, 246, 290, 340, 390, 426, 466

4. Explore concrete models of vertex-edge graphs (e.g. vertices as "islands" and edges as "bridges").

- **Paths from one vertex to another**

K: Preparation: 5A-5B, 5-6, 9A-9B, 9-10

1: Related material: 315A-315B, 315-316, 317A-317B, 317-318

2: Related material: 325A-325B, 325-326, 327A-327B, 327-328

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 3**, students will:*

A. Data Analysis

1. Collect, generate, organize, and display data in response to questions, claims, or curiosity.

- **Data collected from the classroom environment**

3: 204A-204B, 204-207, 208A-208B, 208-211

2. Read, interpret, construct, analyze, generate questions about, and draw inferences from displays of data.

- **Pictograph, bar graph, table**

3: 212A-212B, 212-215, 226A-226B, 226-227, 228A-228B, 228-231, 232A-232B, 232-235

B. Probability

1. Use everyday events and chance devices, such as dice, coins, and unevenly divided spinners, to explore concepts of probability.

- **Likely, unlikely, certain, impossible**
- **More likely, less likely, equally likely**

3: 700A-700B, 700-701, 702A-702B, 702-703

2. Predict probabilities in a variety of situations (e.g., given the number of items of each color in a bag, what is the probability that an item picked will have a particular color).

- What students think will happen (intuitive)
- Collect data and use that data to predict the probability (experimental)

3: 700A-700B, 700-701, 702A-702B, 702-703, 704A-704B, 704-707

C. Discrete Mathematics—Systematic Listing and Counting

1. Represent and classify data according to attributes, such as shape or color, and relationships.

- Venn diagrams
- Numerical and alphabetical order

3: 69, 204A-204B, 204-207, 208A-208B, 208-211

2. Represent all possibilities for a simple counting situation in an organized way and draw conclusions from this representation.

- Organized lists, charts

3: 578A-578B, 578-579

D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms

1. Follow, devise, and describe practical sets of directions (e.g., to add two 2-digit numbers).

3: 14-15, 32-33, 140-143, 284-285, 436-439, 528-529, 688-689

2. Explore vertex-edge graphs

- Vertex, edge
- Path

3: Related material: 218A-218B, 218-221

3. Find the smallest number of colors needed to color a map.

3: Related material: 218A-218B, 218-221

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 4**, students will:*

A. Data Analysis

1. Collect, generate, organize, and display data in response to questions, claims, or curiosity.

- **Data collected from the school environment**
4: 222A-222B, 222-223, 230A-230B, 230-231

2. Read, interpret, construct, analyze, generate questions about, and draw inferences from displays of data.

- **Pictograph, bar graph, line plot, line graph, table**
- **Average (mean), most frequent (mode), middle term (median)**
4: 204A-204B, 204-205, 206A-206B, 206-207, 208A-208B, 208-211, 216A-216B, 216-221, 226A-226B, 226-229

B. Probability

1. Use everyday events and chance devices, such as dice, coins, and unevenly divided spinners, to explore concepts of probability.

- **Likely, unlikely, certain, impossible, improbable, fair, unfair**
- **More likely, less likely, equally likely**
- **Probability of tossing "heads" does not depend on outcomes of previous tosses**
4: 700A-700B, 700-703, 706A-706B, 706-709

2. Determine probabilities of simple events based on equally likely outcomes and express them as fractions.

- 4: 706A-706B, 706-709, 710A-710B, 710-713

3. Predict probabilities in a variety of situations (e.g., given the number of items of each color in a bag, what is the probability that an item picked will have a particular color).

- **What students think will happen (intuitive)**
- **Collect data and use that data to predict the probability (experimental)**
- **Analyze all possible outcomes to find the probability (theoretical)**
4: 700A-700B, 700-703, 706A-706B, 706-709, 710A-710B, 710-713

C. Discrete Mathematics—Systematic Listing and Counting

1. Represent and classify data according to attributes, such as shape or color, and relationships.

- Venn diagrams
- Numerical and alphabetical order

4: 704A-704B, 704-705

2. Represent all possibilities for a simple counting situation in an organized way and draw conclusions from this representation.

- Organized lists, charts, tree diagrams
- Dividing into categories (e.g., to find the total number of rectangles in a grid, find the number of rectangles of each size and add the results)

4: 704A-704B, 704-705

D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms

1. Follow, devise, and describe practical sets of directions (e.g., to add two 2-digit numbers).

4: 40-41, 102-103, 168-169, 234-235, 292-293, 344-345, 412-413, 478-479, 540-541, 602-603, 666-667, 716-717

2. Play two-person games and devise strategies for winning the games (e.g., "make 5" where players alternately add 1 or 2 and the person who reaches 5, or another designated number, is the winner).

4: 79, 131, 211, 261, 371, 437, 527, 599

3. Explore vertex-edge graphs and tree diagrams.

- Vertex, edge, neighboring/adjacent, number of neighbors
- Path, circuit (i.e., path that ends at its starting point)

4: 704A-704B, 704-705

4. Find the smallest number of colors needed to color a map or a graph.

4: Related material: 704A-704B, 704-705

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 5**, students will:*

A. Data Analysis

1. Collect, generate, organize, and display data.

- **Data generated from surveys**
5: 260A-260B, 260-261

2. Read, interpret, select, construct, analyze, generate questions about, and draw inferences from displays of data.

- **Bar graph, line graph, circle graph, table**
5: 262A-262B, 262-265, 266A-266B, 266-269, 286A-286B, 286-287
- **Range, median, and mean**
5: 282A-282B, 282-285

3. Respond to questions about data and generate their own questions and hypotheses.

- 5: 262A-262B, 262-265, 266A-266B, 266-269, 270A-270B, 270-275, 286A-286B, 286-287

B. Probability

1. Determine probabilities of events.

- **Event, probability of an event**
- **Probability of certain event is 1 and of impossible event is 0**
5: 296A-296B, 296-299, 300A-300B, 300-301, 302A-032B, 302-305

2. Determine probability using intuitive, experimental, and theoretical methods (e.g., using model of picking items of different colors from a bag).

- **Given numbers of various types of items in a bag, what is the probability that an item of one type will be picked**
- **Given data obtained experimentally, what is the likely distribution of items in the bag**
5: 296A-296B, 296-299, 300A-300B, 300-301, 302A-032B, 302-305

3. Model situations involving probability using simulations (with spinners, dice) and theoretical models.

5: 296A-296B, 296-299, 300A-300B, 300-301, 302A-032B, 302-305

C. Discrete Mathematics—Systematic Listing and Counting**1. Solve counting problems and justify that all possibilities have been enumerated without duplication.**

- **Organized lists, charts, tree diagrams, tables**

5: 80A-80B, 80-81, 300A-300B, 300-301, 302A-032B, 302-305

2. Explore the multiplication principle of counting in simple situations by representing all possibilities in an organized way (e.g., you can make $3 \times 4 = 12$ outfits using 3 shirts and 4 skirts).

5: 80A-80B, 80-81, 300A-300B, 300-301, 302A-032B, 302-305

D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms

1. **Devise strategies for winning simple games (e.g., start with two piles of objects, each of two players in turn removes any number of objects from a single pile, and the person to take the last group of objects wins) and express those strategies as sets of directions.**

5: 25, 75, 179, 217, 291, 335, 423, 469, 539, 699

*Building upon knowledge and skills gained in preceding grades, by the end of **Grade 6**, students will:*

A. Data Analysis**1. Collect, generate, organize, and display data.**

- **Data generated from surveys**

6: 620A-620B, 620-623

2. Read, interpret, select, construct, analyze, generate questions about, and draw inferences from displays of data.

- Bar graph, line graph, circle graph, table, histogram
 - Range, median, and mean
 - Calculators and computers used to record and process information
- 6:** 624A-624B, 624-627, 628A-628B, 628-631, 636A-636B, 636-637, 638A-638B, 638-641, 642A-642B, 642-647

3. Respond to questions about data, generate their own questions and hypotheses, and formulate strategies for answering their questions and testing their hypotheses.

- 6:** 628A-628B, 628-631, 632A-632B, 632-633, 636A-636B, 636-637, 638A-638B, 638-641, 642A-642B, 642-647, 650A-650B, 650-651

B. Probability

1. Determine probabilities of events.

- Event, complementary event, probability of an event
 - Multiplication rule for probabilities
 - Probability of certain event is 1 and of impossible event is 0
 - Probabilities of event and complementary event add up to 1
- 6:** 662A-662B, 662-663, 664A-664B, 664-665

2. Determine probability using intuitive, experimental, and theoretical methods (e.g., using model of picking items of different colors from a bag).

- Given numbers of various types of items in a bag, what is the probability that an item of one type will be picked
 - Given data obtained experimentally, what is the likely distribution of items in the bag
- 6:** 662A-662B, 662-663, 664A-664B, 664-665

3. Explore compound events.

- 6:** 668A-668B, 668-671, 672A-672B, 672-673

4. Model situations involving probability using simulations (with spinners, dice) and theoretical models.

- 6:** 662A-662B, 662-663, 664A-664B, 664-665, 668A-668B, 668-671, 672A-672B, 672-673

5. Recognize and understand the connections among the concepts of independent outcomes, picking at random, and fairness.

6: 662A-662B, 662-663, 664A-664B, 664-665

C. Discrete Mathematics—Systematic Listing and Counting

1. Solve counting problems and justify that all possibilities have been enumerated without duplication.

- Organized lists, charts, tree diagrams, tables
- Venn diagrams

6: 654A-654B, 654-655, 658A-658B, 658-661

2. Apply the multiplication principle of counting.

- Simple situations (e.g., you can make $3 \times 4 = 12$ outfits using 3 shirts and 4 skirts).
- Number of ways a specified number of items can be arranged in order (concept of permutation)
- Number of ways of selecting a slate of officers from a class (e.g., if there are 23 students and 3 officers, the number is $23 \times 22 \times 21$)

6: 654A-654B, 654-655, 658A-658B, 658-661

3. List the possible combinations of two elements chosen from a given set (e.g., forming a committee of two from a group of 12 students, finding how many handshakes there will be among ten people if everyone shakes each other person's hand once).

6: 654A-654B, 654-655, 658A-658B, 658-661

D. Discrete Mathematics—Vertex-Edge Graphs and Algorithms

1. Devise strategies for winning simple games (e.g., start with two piles of objects, each of two players in turn removes any number of objects from a single pile, and the person to take the last group of objects wins) and express those strategies as sets of directions.

6: 29, 93, 255, 361, 443, 715

2. Analyze vertex-edge graphs and tree diagrams.

- **Can a picture or a vertex-edge graph be drawn with a single line? (degree of vertex)**
- **Can you get from any vertex to any other vertex? (connectedness)**

6: 654A-654B, 654-655, 658A-658B, 658-661

3. Use vertex-edge graphs to find solutions to practical problems.

- **Delivery route that stops at specified sites but involves least travel**
- **Shortest route from one site on a map to another**

6: 330A-330B, 330-333

STANDARD 4.5 (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.

Cumulative Progress Indicators

At **each grade level**, with respect to content appropriate for that grade level, students will:

A. Problem Solving

1. Learn mathematics through problem solving, inquiry, and discovery.

K: 19A-19B, 19-20, 21-22, 43A-43B, 43-44, 47-48, 67A-67B, 67-68, 71-72, 95A-95B, 95-96, 97-98, 125A-125B, 125-126, 127-128, 143A-143B, 143-144, 155-156, 185A-185B, 185-186, 191-192, 217A-217B, 217-218, 233A-233B, 233-234, 239-240, 249A-249B, 249-250, 259-260, 279A-279B, 279-280, 281-282, 297A-297B, 297-298

1: 7A-7B, 7-8, 21A-21B, 21-22, 33A-33B, 33-34, 57A-57B, 57-58, 71A-71B, 71-72, 79A-79B, 79-80, 99A-99B, 99-100, 111A-111B, 111-112, 113-113B, 113-114, 133A-133B, 133-134, 143A-143B, 143-144, 145A-145B, 145-146, 177A-177B, 177-178, 191A-191B, 191-192, 193A-193B, 193-194, 215A-215B, 215-216, 223A-223B, 223-224, 229A-229B, 229-230, 251A-251B, 251-252, 261A-261B, 261-262, 269A-269B, 269-270, 291A-291B, 291-292, 317A-317B, 317-318, 319A-319B, 319-320, 339A-339B, 339-340, 351A-351B, 351-352, 353A-353B, 353-354, 369A-369B, 369-370, 379A-379B, 379-380, 405A-405B, 405-406, 431A-431B, 431-432, 445A-445B, 445-446, 447A-447B, 447-448, 467A-467B, 467-468, 481A-481B, 481-482, 483A-483B, 483-484

2: 9A-9B, 9-10, 19A-19B, 19-20, 31-32, 57A-57B, 57-58, 67A-67B, 67-68, 69-70, 89A-89B, 89-90, 105A-105B, 105-106, 123-124, 155A-155B, 155-156, 161A-161B, 161-162, 163-164, 189A-189B, 189-190, 197A-197B, 197-198, 199-200, 221A-221B, 221-222, 233A-233B, 233-234, 235-236, 251A-251B, 251-252, 265A-265B, 265-266, 279-280, 311A-311B, 311-312, 327A-327B, 327-328, 329-330, 351A-351B, 351-352, 377A-377B, 377-378, 379-380, 405A-405B, 405-406, 413A-413B, 413-414, 415-416, 439A-439B, 439-440, 453A-453B, 453-454, 455-456, 479A-479B, 479-480, 487A-487B, 487-488, 489-490

3: 14A-14B, 14-15, 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 140-143, 160A-160B, 160-161, 170-171, 216A-216B, 216-217, 236A-236B, 236-237, 238-239, 270A-270B, 270-273, 284A-284B, 284-285, 294-295, 332A-332B, 332-333, 346A-346B, 346-347, 348-349, 380A-380B, 380-381, 404A-404B, 404-405, 406-407, 436A-436B, 436-439, 474A-

- 474B, 474-475, 476-477, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 590-591, 644A-644B, 644-645, 656A-656B, 656-657, 658-659, 698A-698B, 698-699, 708A-708B, 708-709, 710-711
- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 40-41, 90A-90B, 90-91, 94A-94B, 94-95, 102-103, 140A-140B, 140-143, 156A-156B, 156-157, 168-169, 198A-198B, 198-199, 222A-222B, 222-223, 234-235, 278A-278B, 278-281, 290A-290B, 290-291, 292-293, 326A-326B, 326-329, 342A-342B, 342-343, 344-345, 384A-384B, 384-385, 396A-396B, 396-399, 412-413, 460A-460B, 460-461, 474A-474B, 474-477, 478-479, 512-A512B, 512-513, 538A-538B, 538-539, 540-541, 584A-584B, 584-858, 600A-600B, 600-601, 602-603, 648A-648B, 648-649, 662A-662B, 662-663, 666-667, 696A-696B, 696-697, 714A-714B, 714-715, 716-717
- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 80A-80B, 80-81, 104A-104B, 104-105, 110-111, 144A-144B, 144-145, 168A-168B, 168-169, 180-181, 210A-210B, 210-211, 226A-226B, 226-227, 238-239, 276A-276B, 276-279, 272A-272B, 272-273, 306-307, 352A-352B, 352-355, 356A-356B, 356-357, 372-373, 406A-406B, 406-407, 434A-434B, 434-437, 438-439, 484A-484B, 484-487, 504A-504B, 504-505, 506-507, 558A-558B, 558-559, 570A-570B, 570-571, 572-573, 606A-606B, 606-607, 624A-624B, 624-625, 626-627, 660A-660B, 660-661, 664A-664B, 664-665, 676-677, 706A-706B, 706-709, 720A-720B, 720-721, 730-731
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 54-55, 98A-98B, 98-99, 116A-116B, 116-119, 120-121, 156A-156B, 156-157, 180A-180B, 180-181, 182-183, 212A-212B, 212-213, 226A-226B, 226-227, 228-229, 230-231, 264A-264B, 264-265, 278A-278B, 278-279, 280-281, 312A-312B, 312-313, 324A-324B, 324-235, 334-335, 362A-362B, 362-363, 374A-374B, 374, 375, 388-389, 414A-414B, 414-415, 434A-434B, 434-436, 450-451, 490A-490B, 490-491, 512A-512B, 512-513, 520-521, 560A-560B, 560-561, 582A-582B, 582-583, 598-599, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711, 724-725

2. Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).

- **Open-ended problems**
- **Non-routine problems**
- **Problems with multiple solutions**
- **Problems that can be solved in several ways**

K: 19A-19B, 19-20, 21-22, 43A-43B, 43-44, 47-48, 67A-67B, 67-68, 71-72, 95A-95B, 95-96, 97-98, 125A-125B, 125-126, 127-128, 143A-143B, 143-144, 155-156, 185A-185B, 185-186, 191-192, 217A-217B, 217-218, 233A-233B, 233-234, 239-240, 249A-249B, 249-250, 259-260, 279A-279B, 279-280, 281-282, 297A-297B, 297-298

- 1:** 7A-7B, 7-8, 21A-21B, 21-22, 33A-33B, 33-34, 57A-57B, 57-58, 71A-71B, 71-72, 79A-79B, 79-80, 99A-99B, 99-100, 111A-111B, 111-112, 113-113B, 113-114, 133A-133B, 133-134, 143A-143B, 143-144, 145A-145B, 145-146, 177A-177B, 177-178, 191A-191B, 191-192, 193A-193B, 193-194, 215A-215B, 215-216, 223A-223B, 223-224, 229A-229B, 229-230, 251A-251B, 251-252, 261A-261B, 261-262, 269A-269B, 269-270, 291A-291B, 291-292, 317A-317B, 317-318, 319A-319B, 319-320, 339A-339B, 339-340, 351A-351B, 351-352, 353A-353B, 353-354, 369A-369B, 369-370, 379A-379B, 379-380, 405A-405B, 405-406, 431A-431B, 431-432, 445A-445B, 445-446, 447A-447B, 447-448, 467A-467B, 467-468, 481A-481B, 481-482, 483A-483B, 483-484
- 2:** 9A-9B, 9-10, 19A-19B, 57A-57B, 57-58, 67A-67B, 67-68, 89A-89B, 89-90, 105A-105B, 105-106, 155A-155B, 155-156, 161A-161B, 161-162, 189A-189B, 189-190, 197A-197B, 197-198, 221A-221B, 221-222, 233A-233B, 233-234, 251A-251B, 251-252, 265A-265B, 265-266, 311A-311B, 311-312, 327A-327B, 327-328, 351A-351B, 351-352, 377A-377B, 377-378, 405A-405B, 405-406, 413A-413B, 413-414, 439A-439B, 439-440, 453A-453B, 453-454, 479A-479B, 479-480, 487A-487B, 487-488
- 3:** 14A-14B, 14-15, 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 140-143, 160A-160B, 160-161, 170-171, 216A-216B, 216-217, 236A-236B, 236-237, 238-239, 270A-270B, 270-273, 284A-284B, 284-285, 294-295, 332A-332B, 332-333, 346A-346B, 346-347, 348-349, 380A-380B, 380-381, 404A-404B, 404-405, 406-407, 436A-436B, 436-439, 474A-474B, 474-475, 476-477, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 590-591, 644A-644B, 644-645, 656A-656B, 656-657, 658-659, 698A-698B, 698-699, 708A-708B, 708-709, 710-711
- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 40-41, 90A-90B, 90-91, 94A-94B, 94-95, 102-103, 140A-140B, 140-143, 156A-156B, 156-157, 168-169, 198A-198B, 198-199, 222A-222B, 222-223, 234-235, 278A-278B, 278-281, 290A-290B, 290-291, 292-293, 326A-326B, 326-329, 342A-342B, 342-343, 344-345, 384A-384B, 384-385, 396A-396B, 396-399, 412-413, 460A-460B, 460-461, 474A-474B, 474-477, 478-479, 512-A512B, 512-513, 538A-538B, 538-539, 540-541, 584A-584B, 584-858, 600A-600B, 600-601, 602-603, 648A-648B, 648-649, 662A-662B, 662-663, 666-667, 696A-696B, 696-697, 714A-714B, 714-715, 716-717
- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 80A-80B, 80-81, 104A-104B, 104-105, 110-111, 144A-144B, 144-145, 168A-168B, 168-169, 180-181, 210A-210B, 210-211, 226A-226B, 226-227, 238-239, 276A-276B, 276-279, 272A-272B, 272-273, 306-307, 352A-352B, 352-355, 356A-356B, 356-357, 372-373, 406A-406B, 406-407, 434A-434B, 434-437, 438-439, 484A-484B, 484-487, 504A-504B, 504-505, 506-507, 558A-558B, 558-559, 570A-570B, 570-571, 572-573, 606A-606B, 606-607, 624A-624B, 624-625, 626-627, 660A-660B, 660-661, 664A-664B, 664-665, 676-677, 706A-706B, 706-709, 720A-720B, 720-721, 730-731

6: 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 54-55, 98A-98B, 98-99, 116A-116B, 116-119, 120-121, 156A-156B, 156-157, 180A-180B, 180-181, 182-183, 212A-212B, 212-213, 226A-226B, 226-227, 228-229, 230-231, 264A-264B, 264-265, 278A-278B, 278-279, 280-281, 312A-312B, 312-313, 324A-324B, 324-235, 334-335, 362A-362B, 362-363, 374A-374B, 374, 375, 388-389, 414A-414B, 414-415, 434A-434B, 434-436, 450-451, 490A-490B, 490-491, 512A-512B, 512-513, 520-521, 560A-560B, 560-561, 582A-582B, 582-583, 598-599, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711, 724-725

3. Select and apply a variety of appropriate problem-solving strategies (e.g., "try a simpler problem" or "make a diagram") to solve problems.

- K:** 19A-19B, 19-20, 43A-43B, 43-44, 67A-67B, 67-68, 95A-95B, 95-96, 125A-125B, 125-126, 143A-143B, 143-144, 185A-185B, 185-186, 217A-217B, 217-218, 233A-233B, 233-234, 249A-249B, 249-250, 279A-279B, 279-280, 297A-297B, 297-298
- 1:** 7A-7B, 7-8, 21A-21B, 21-22, 57A-57B, 57-58, 71A-71B, 71-72, 99A-99B, 99-100, 111A-111B, 111-112, 133A-133B, 133-134, 143A-143B, 143-144, 177A-177B, 177-178, 191A-191B, 191-192, 215A-215B, 215-216, 223A-223B, 223-224, 251A-251B, 251-252, 261A-261B, 261-262, 291A-291B, 291-292, 317A-317B, 317-318, 339A-339B, 339-340, 351A-351B, 351-352, 369A-369B, 369-370, 379A-379B, 379-380, 431A-431B, 431-432, 445A-445B, 445-446, 467A-467B, 467-468, 481A-481B, 481-482
- 2:** 9A-9B, 9-10, 19A-19B, 57A-57B, 57-58, 67A-67B, 67-68, 89A-89B, 89-90, 105A-105B, 105-106, 155A-155B, 155-156, 161A-161B, 161-162, 189A-189B, 189-190, 197A-197B, 197-198, 221A-221B, 221-222, 233A-233B, 233-234, 251A-251B, 251-252, 265A-265B, 265-266, 311A-311B, 311-312, 327A-327B, 327-328, 351A-351B, 351-352, 377A-377B, 377-378, 405A-405B, 405-406, 413A-413B, 413-414, 439A-439B, 439-440, 453A-453B, 453-454, 479A-479B, 479-480, 487A-487B, 487-488
- 3:** 14A-14B, 14-15, 32A-32B, 42A-42B, 42-43, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 160A-160B, 160-161, 216A-216B, 216-217, 236A-236B, 236-237, 270A-270B, 270-273, 284A-284B, 284-285, 332A-332B, 332-333, 346A-346B, 346-347, 380A-380B, 380-381, 404A-404B, 404-405, 436A-436B, 436-439, 474A-474B, 474-475, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 644A-644B, 644-645, 656A-656B, 656-657, 698A-698B, 698-699, 708A-708B, 708-709
- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 90A-90B, 90-91, 94A-94B, 94-95, 140A-140B, 140-143, 156A-156B, 156-157, 198A-198B, 198-199, 222A-222B, 222-223, 278A-278B, 278-281, 290A-290B, 290-291, 326A-326B, 326-329, 342A-342B, 342-343, 384A-384B, 384-385, 396A-396B, 396-399, 460A-460B, 460-461, 474A-474B, 474-477, 512-A512B, 512-513, 538A-538B, 538-539, 584A-584B, 584-858, 600A-600B, 600-601, 648A-648B, 648-649, 662A-662B, 662-663, 696A-696B, 696-697, 714A-714B, 714-715

- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 80A-80B, 80-81, 104A-104B, 104-105, 144A-144B, 144-145, 168A-168B, 168-169, 210A-210B, 210-211, 226A-226B, 226-227, 276A-276B, 276-279, 272A-272B, 272-273, 352A-352B, 352-355, 356A-356B, 356-357, 406A-406B, 406-407, 434A-434B, 434-437, 484A-484B, 484-487, 504A-504B, 504-505, 558A-558B, 558-559, 570A-570B, 570-571, 606A-606B, 606-607, 624A-624B, 624-625, 660A-660B, 660-661, 664A-664B, 664-665, 706A-706B, 706-709, 720A-720B, 720-721
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 98A-98B, 98-99, 116A-116B, 116-119, 156A-156B, 156-157, 180A-180B, 180-181, 212A-212B, 212-213, 226A-226B, 226-227, 264A-264B, 264-265, 278A-278B, 278-279, 312A-312B, 312-313, 324A-324B, 324-235, 362A-362B, 362-363, 374A-374B, 374-375, 414A-414B, 414-415, 434A-434B, 434-436, 490A-490B, 490-491, 512A-512B, 512-513, 560A-560B, 560-561, 582A-582B, 582-583, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711

4. Pose problems of various types and levels of difficulty.

- K:** 19A-19B, 19-20, 21-22, 43A-43B, 43-44, 47-48, 67A-67B, 67-68, 71-72, 95A-95B, 95-96, 97-98, 125A-125B, 125-126, 127-128, 143A-143B, 143-144, 155-156, 185A-185B, 185-186, 191-192, 217A-217B, 217-218, 233A-233B, 233-234, 239-240, 249A-249B, 249-250, 259-260, 279A-279B, 279-280, 281-282, 297A-297B, 297-298
- 1:** 7A-7B, 7-8, 21A-21B, 21-22, 33A-33B, 33-34, 57A-57B, 57-58, 71A-71B, 71-72, 79A-79B, 79-80, 99A-99B, 99-100, 111A-111B, 111-112, 113-113B, 113-114, 133A-133B, 133-134, 143A-143B, 143-144, 145A-145B, 145-146, 177A-177B, 177-178, 191A-191B, 191-192, 193A-193B, 193-194, 215A-215B, 215-216, 223A-223B, 223-224, 229A-229B, 229-230, 251A-251B, 251-252, 261A-261B, 261-262, 269A-269B, 269-270, 291A-291B, 291-292, 317A-317B, 317-318, 319A-319B, 319-320, 339A-339B, 339-340, 351A-351B, 351-352, 353A-353B, 353-354, 369A-369B, 369-370, 379A-379B, 379-380, 405A-405B, 405-406, 431A-431B, 431-432, 445A-445B, 445-446, 447A-447B, 447-448, 467A-467B, 467-468, 481A-481B, 481-482, 483A-483B, 483-484
- 2:** 9A-9B, 9-10, 19A-19B, 19-20, 31-32, 57A-57B, 57-58, 67A-67B, 67-68, 69-70, 89A-89B, 89-90, 105A-105B, 105-106, 123-124, 155A-155B, 155-156, 161A-161B, 161-162, 163-164, 189A-189B, 189-190, 197A-197B, 197-198, 199-200, 221A-221B, 221-222, 233A-233B, 233-234, 235-236, 251A-251B, 251-252, 265A-265B, 265-266, 279-280, 311A-311B, 311-312, 327A-327B, 327-328, 329-330, 351A-351B, 351-352, 377A-377B, 377-378, 379-380, 405A-405B, 405-406, 413A-413B, 413-414, 415-416, 439A-439B, 439-440, 453A-453B, 453-454, 455-456, 479A-479B, 479-480, 487A-487B, 487-488, 489-490

- 3:** 14A-14B, 14-15, 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 140-143, 160A-160B, 160-161, 170-171, 216A-216B, 216-217, 236A-236B, 236-237, 238-239, 270A-270B, 270-273, 284A-284B, 284-285, 294-295, 332A-332B, 332-333, 346A-346B, 346-347, 348-349, 380A-380B, 380-381, 404A-404B, 404-405, 406-407, 436A-436B, 436-439, 474A-474B, 474-475, 476-477, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 590-591, 644A-644B, 644-645, 656A-656B, 656-657, 658-659, 698A-698B, 698-699, 708A-708B, 708-709, 710-711
- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 40-41, 90A-90B, 90-91, 94A-94B, 94-95, 102-103, 140A-140B, 140-143, 156A-156B, 156-157, 168-169, 198A-198B, 198-199, 222A-222B, 222-223, 234-235, 278A-278B, 278-281, 290A-290B, 290-291, 292-293, 326A-326B, 326-329, 342A-342B, 342-343, 344-345, 384A-384B, 384-385, 396A-396B, 396-399, 412-413, 460A-460B, 460-461, 474A-474B, 474-477, 478-479, 512-A512B, 512-513, 538A-538B, 538-539, 540-541, 584A-584B, 584-858, 600A-600B, 600-601, 602-603, 648A-648B, 648-649, 662A-662B, 662-663, 666-667, 696A-696B, 696-697, 714A-714B, 714-715, 716-717
- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 80A-80B, 80-81, 104A-104B, 104-105, 110-111, 144A-144B, 144-145, 168A-168B, 168-169, 180-181, 210A-210B, 210-211, 226A-226B, 226-227, 238-239, 276A-276B, 276-279, 272A-272B, 272-273, 306-307, 352A-352B, 352-355, 356A-356B, 356-357, 372-373, 406A-406B, 406-407, 434A-434B, 434-437, 438-439, 484A-484B, 484-487, 504A-504B, 504-505, 506-507, 558A-558B, 558-559, 570A-570B, 570-571, 572-573, 606A-606B, 606-607, 624A-624B, 624-625, 626-627, 660A-660B, 660-661, 664A-664B, 664-665, 676-677, 706A-706B, 706-709, 720A-720B, 720-721, 730-731
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 54-55, 98A-98B, 98-99, 116A-116B, 116-119, 120-121, 156A-156B, 156-157, 180A-180B, 180-181, 182-183, 212A-212B, 212-213, 226A-226B, 226-227, 228-229, 230-231, 264A-264B, 264-265, 278A-278B, 278-279, 280-281, 312A-312B, 312-313, 324A-324B, 324-235, 334-335, 362A-362B, 362-363, 374A-374B, 374, 375, 388-389, 414A-414B, 414-415, 434A-434B, 434-436, 450-451, 490A-490B, 490-491, 512A-512B, 512-513, 520-521, 560A-560B, 560-561, 582A-582B, 582-583, 598-599, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711, 724-725

5. Monitor their progress and reflect on the process of their problem solving activity.

- K:** 19A-19B, 19-20, 43A-43B, 43-44, 67A-67B, 67-68, 95A-95B, 95-96, 125A-125B, 125-126, 143A-143B, 143-144, 185A-185B, 185-186, 217A-217B, 217-218, 233A-233B, 233-234, 249A-249B, 249-250, 279A-279B, 279-280, 297A-297B, 297-298

- 1:** 7A-7B, 7-8, 21A-21B, 21-22, 57A-57B, 57-58, 71A-71B, 71-72, 99A-99B, 99-100, 111A-111B, 111-112, 133A-133B, 133-134, 143A-143B, 143-144, 177A-177B, 177-178, 191A-191B, 191-192, 215A-215B, 215-216, 223A-223B, 223-224, 251A-251B, 251-252, 261A-261B, 261-262, 291A-291B, 291-292, 317A-317B, 317-318, 339A-339B, 339-340, 351A-351B, 351-352, 369A-369B, 369-370, 379A-379B, 379-380, 431A-431B, 431-432, 445A-445B, 445-446, 467A-467B, 467-468, 481A-481B, 481-482
- 2:** 9A-9B, 9-10, 19A-19B, 57A-57B, 57-58, 67A-67B, 67-68, 89A-89B, 89-90, 105A-105B, 105-106, 155A-155B, 155-156, 161A-161B, 161-162, 189A-189B, 189-190, 197A-197B, 197-198, 221A-221B, 221-222, 233A-233B, 233-234, 251A-251B, 251-252, 265A-265B, 265-266, 311A-311B, 311-312, 327A-327B, 327-328, 351A-351B, 351-352, 377A-377B, 377-378, 405A-405B, 405-406, 413A-413B, 413-414, 439A-439B, 439-440, 453A-453B, 453-454, 479A-479B, 479-480, 487A-487B, 487-488
- 3:** 14A-14B, 14-15, 32A-32B, 42A-42B, 42-43, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 160A-160B, 160-161, 216A-216B, 216-217, 236A-236B, 236-237, 270A-270B, 270-273, 284A-284B, 284-285, 332A-332B, 332-333, 346A-346B, 346-347, 380A-380B, 380-381, 404A-404B, 404-405, 436A-436B, 436-439, 474A-474B, 474-475, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 644A-644B, 644-645, 656A-656B, 656-657, 698A-698B, 698-699, 708A-708B, 708-709
- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 90A-90B, 90-91, 94A-94B, 94-95, 140A-140B, 140-143, 156A-156B, 156-157, 198A-198B, 198-199, 222A-222B, 222-223, 278A-278B, 278-281, 290A-290B, 290-291, 326A-326B, 326-329, 342A-342B, 342-343, 384A-384B, 384-385, 396A-396B, 396-399, 460A-460B, 460-461, 474A-474B, 474-477, 512A-512B, 512-513, 538A-538B, 538-539, 584A-584B, 584-588, 600A-600B, 600-601, 648A-648B, 648-649, 662A-662B, 662-663, 696A-696B, 696-697, 714A-714B, 714-715
- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 80A-80B, 80-81, 104A-104B, 104-105, 144A-144B, 144-145, 168A-168B, 168-169, 210A-210B, 210-211, 226A-226B, 226-227, 276A-276B, 276-279, 272A-272B, 272-273, 352A-352B, 352-355, 356A-356B, 356-357, 406A-406B, 406-407, 434A-434B, 434-437, 484A-484B, 484-487, 504A-504B, 504-505, 558A-558B, 558-559, 570A-570B, 570-571, 606A-606B, 606-607, 624A-624B, 624-625, 660A-660B, 660-661, 664A-664B, 664-665, 706A-706B, 706-709, 720A-720B, 720-721
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 98A-98B, 98-99, 116A-116B, 116-119, 156A-156B, 156-157, 180A-180B, 180-181, 212A-212B, 212-213, 226A-226B, 226-227, 264A-264B, 264-265, 278A-278B, 278-279, 312A-312B, 312-313, 324A-324B, 324-235, 362A-362B, 362-363, 374A-374B, 374-375, 414A-414B, 414-415, 434A-434B, 434-436, 490A-490B, 490-491, 512A-512B, 512-513, 560A-560B, 560-561, 582A-582B, 582-583, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711

B. Communication

1. Use communication to organize and clarify their mathematical thinking.

- **Reading and writing**

- **Discussion, listening, and questioning**

K: 1K, 25K, 51K, 75K, 101K, 131K, 159K, 195K, 223K, 243K, 263K, 285K

1: 22, 34, 46, 66, 80, 114, 117, 138, 146, 149, 178, 188, 194, 220, 230, 252, 270, 272, 273, 294, 310, 314, 320, 323, 328B, 340, 354, 356, 368, 382, 406, 409, 414B, 426, 434, 448, 451, 470, 482, 484, 489, 492B

2: 8, 16, 20, 24, 35, 48, 56, 64, 73, 78B, 94, 98, 106, 107, 110, 124, 148, 152, 164, 167, 172B, 176, 196, 200, 202, 203, 224, 232, 236, 238, 239, 244B, 254, 266, 268, 280, 282, 283, 296, 308, 316, 318, 322, 326, 332, 333, 338B, 348, 354, 362, 370, 372, 380, 382, 383, 404, 410, 416, 418, 419, 424B, 440, 442, 454, 456, 458, 459, 468, 486, 492, 493, 498B

3: 14, 32, 42, 74, 76, 102, 138, 140, 160, 234, 268, 330, 332, 346, 378, 380, 404, 434, 436, 474, 526, 528, 540, 576, 578, 588, 642, 644, 656, 686, 688, 708

4: 203, 301, 302-303, 421, 422-423, 603, 635, 651, 662A-662B, 662-663, 669, 675, 676-677, 715, 717, 719, 725, 726-727

5: 292A-292B, 292-293, 356A-356B, 356-357, 570A-570B, 570-571, 664A-664B, 664-665, 720A-720B, 720-721

6: 278A-278B, 278-279, 324A-324B, 324-325, 362A-362B, 362-363, 512A-512B, 512-513, 674A-674B, 674-675

2. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.

K: 23-24, 49-50, 73-74, 99-100, 129-130, 157-158, 193-194, 221-222, 241-242, 261-262, 283-284, 301-302

1: 41-42, 87-88, 121-122, 153-154, 201-202, 237-238, 277-278, 327-328, 361-362, 413-414, 455-456, 491-492

2: 39-40, 77-78, 131-132, 171-172, 207-208, 243-244, 287-288, 337-338, 387-388, 423-424, 463-464, 497-498

3: 52-53, 112-113, 178-179, 246-247, 302-303, 356-357, 414-415, 484-485, 550-551, 598-599, 666-667, 718-179

4: 52-53, 112-113, 178-179, 246-247, 302-303, 356-357, 414-415, 484-485, 550-551, 598-599, 666-667, 718-179

5: 52-53, 118-119, 188-189, 246-247, 314-315, 380-381, 446-447, 514-515, 580-581, 634-635, 684-685, 738-739

6: 62-63, 128-129, 190-191, 136-137, 288-289, 342-343, 396-397, 458-459, 528-529, 606-607, 684-685, 732-733

3. Analyze and evaluate the mathematical thinking and strategies of others.**K:** 1K, 25K, 51K, 75K, 101K, 131K, 159K, 195K, 223K, 243K, 263K, 285K**1:** 22, 34, 46, 66, 80, 114, 117, 138, 146, 149, 178, 188, 194, 220, 230, 252, 270, 272, 273, 294, 310, 314, 320, 323, 328B, 340, 354, 356, 368, 382, 406, 409, 414B, 426, 434, 448, 451, 470, 482, 484, 489, 492B**2:** 8, 16, 20, 24, 35, 48, 56, 64, 73, 78B, 94, 98, 106, 107, 110, 124, 148, 152, 164, 167, 172B, 176, 196, 200, 202, 203, 224, 232, 236, 238, 239, 244B, 254, 266, 268, 280, 282, 283, 296, 308, 316, 318, 322, 326, 332, 333, 338B, 348, 354, 362, 370, 372, 380, 382, 383, 404, 410, 416, 418, 419, 424B, 440, 442, 454, 456, 458, 459, 468, 486, 492, 493, 498B**3:** 85, 135, 221, 471, 509, 635**4:** 79, 131, 211, 261, 371, 437, 527, 599**5:** 25, 75, 179, 217, 291, 335, 423, 469, 539, 699**6:** 29, 93, 255, 361, 443, 715**4. Use the language of mathematics to express mathematical ideas precisely.****K:** 23-24, 49-50, 73-74, 99-100, 129-130, 157-158, 193-194, 221-222, 241-242, 261-262, 283-284, 301-302**1:** 41-42, 87-88, 121-122, 153-154, 201-202, 237-238, 277-278, 327-328, 361-362, 413-414, 455-456, 491-492**2:** 39-40, 77-78, 131-132, 171-172, 207-208, 243-244, 287-288, 337-338, 387-388, 423-424, 463-464, 497-498**3:** 14, 32, 42, 74, 76, 102, 138, 140, 160, 234, 268, 330, 332, 346, 378, 380, 404, 434, 436, 474, 526, 528, 540, 576, 578, 588, 642, 644, 656, 686, 688, 708**4:** 52-53, 112-113, 178-179, 246-247, 302-303, 356-357, 414-415, 484-485, 550-551, 598-599, 666-667, 718-179**5:** 52-53, 118-119, 188-189, 246-247, 314-315, 380-381, 446-447, 514-515, 580-581, 634-635, 684-685, 738-739**6:** 62-63, 128-129, 190-191, 136-137, 288-289, 342-343, 396-397, 458-459, 528-529, 606-607, 684-685, 732-733**C. Connections****1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).****K:** 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 63-64, 65-66, 87-88, 91-92, 95-96, 113-114, 121-122, 255-256, 275-276, 293-294, 295-296, 297-298**1:** 3-4, 5-6, 7-8, 49-50, 51-52, 65-66, 67-68, 71-72, 77-78, 93-94, 133-134, 137-138, 139-140, 141-142, 255-256, 261-262, 297-298, 301-302, 315-316, 421-422, 427-428, 435-436, 437-438, 439-440, 445-446**2:** 5-6, 9-10, 17-18, 19-20, 23-24, 25-26, 27-28, 29-30, 49-50, 57-58, 63-64, 65-66, 91-92, 95-96, 97-98, 99-100, 101-102, 115-116, 117-118, 141-142, 149-150, 157-158, 159-160, 161-162, 187-188, 191-192, 193-194, 221-222, 227-228, 229-230,

- 231-232, 247-248, 249-250, 305-306, 325-326, 355-356, 397-398, 399-400, 401-402, 407-408, 409-410, 429-430, 443-444, 445-446, 453-454, 467-468, 469-470, 473-474, 479-480, 487-488
- 3:** 24-25, 66-69, 70-71, 72-73, 76-77, 168-169, 260-261, 262-263, 286-287, 342-343, 344-345, 384-385, 404-405
- 4:** 94-95, 96-97, 98-99, 100-101, 160-163, 164-165, 166-167, 288-289, 464-467, 468-473, 474-475, 476-477, 690-691, 692-695
- 5:** 70A-70B, 70-71, 100A-100B, 100-103, 104A-104B, 104-105, 106A-106B, 106-107, 108A-108B, 108-109, 172A-172B, 172-173, 174A-174B, 174-175, 176A-176B, 176-177, 542A-542B, 542-545, 550A-550B, 550-551, 552A-552B, 552-553, 554A-554B, 554-557, 610A-610B, 610-613, 696A-696B, 696-699, 700A-700B, 700-701, 702A-702B, 702-705, 706A-706B, 706-709, 712A-712B, 712-115, 716A-716B, 716-717, 718A-718B, 718-719, 724A-724B, 724-727, 728A-728B, 728-729
- 6:** 8-11, 24-27, 28-29, 30-31, 40-43, 44-47, 48-51, 112-115, 116-119, 274-275, 276-277, 328-329, 380-383, 384-385, 386-387, 408-409, 410-411, 412-413, 418-421, 422-425, 426-427, 428-429, 430-431, 698-699, 700-705

2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).

- K:** 19A-19B, 19-20, 43A-43B, 43-44, 67A-67B, 67-68, 95A-95B, 95-96, 125A-125B, 125-126, 143A-143B, 143-144, 185A-185B, 185-186, 217A-217B, 217-218, 233A-233B, 233-234, 249A-249B, 249-250, 279A-279B, 279-280, 297A-297B, 297-298
- 1:** 7A-7B, 7-8, 21A-21B, 21-22, 57A-57B, 57-58, 71A-71B, 71-72, 99A-99B, 99-100, 111A-111B, 111-112, 133A-133B, 133-134, 143A-143B, 143-144, 177A-177B, 177-178, 191A-191B, 191-192, 215A-215B, 215-216, 223A-223B, 223-224, 251A-251B, 251-252, 261A-261B, 261-262, 291A-291B, 291-292, 317A-317B, 317-318, 339A-339B, 339-340, 351A-351B, 351-352, 369A-369B, 369-370, 379A-379B, 379-380, 431A-431B, 431-432, 445A-445B, 445-446, 467A-467B, 467-468, 481A-481B, 481-482
- 2:** 9A-9B, 9-10, 19A-19B, 57A-57B, 57-58, 67A-67B, 67-68, 89A-89B, 89-90, 105A-105B, 105-106, 155A-155B, 155-156, 161A-161B, 161-162, 189A-189B, 189-190, 197A-197B, 197-198, 221A-221B, 221-222, 233A-233B, 233-234, 251A-251B, 251-252, 265A-265B, 265-266, 311A-311B, 311-312, 327A-327B, 327-328, 351A-351B, 351-352, 377A-377B, 377-378, 405A-405B, 405-406, 413A-413B, 413-414, 439A-439B, 439-440, 453A-453B, 453-454, 479A-479B, 479-480, 487A-487B, 487-488
- 3:** 14A-14B, 14-15, 32A-32B, 42A-42B, 42-43, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 160A-160B, 160-161, 216A-216B, 216-217, 236A-236B, 236-237, 270A-270B, 270-273, 284A-284B, 284-285, 332A-332B, 332-333, 346A-346B, 346-347, 380A-380B, 380-381, 404A-404B, 404-405, 436A-436B, 436-439, 474A-474B, 474-475, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 644A-644B, 644-645, 656A-656B, 656-657, 698A-698B, 698-699, 708A-708B, 708-709

- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 90A-90B, 90-91, 94A-94B, 94-95, 140A-140B, 140-143, 156A-156B, 156-157, 198A-198B, 198-199, 222A-222B, 222-223, 278A-278B, 278-281, 290A-290B, 290-291, 326A-326B, 326-329, 342A-342B, 342-343, 384A-384B, 384-385, 396A-396B, 396-399, 460A-460B, 460-461, 474A-474B, 474-477, 512-A512B, 512-513, 538A-538B, 538-539, 584A-584B, 584-585, 600A-600B, 600-601, 648A-648B, 648-649, 662A-662B, 662-663, 696A-696B, 696-697, 714A-714B, 714-715
- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 80A-80B, 80-81, 104A-104B, 104-105, 144A-144B, 144-145, 168A-168B, 168-169, 210A-210B, 210-211, 226A-226B, 226-227, 276A-276B, 276-279, 272A-272B, 272-273, 352A-352B, 352-355, 356A-356B, 356-357, 406A-406B, 406-407, 434A-434B, 434-437, 484A-484B, 484-487, 504A-504B, 504-505, 558A-558B, 558-559, 570A-570B, 570-571, 606A-606B, 606-607, 624A-624B, 624-625, 660A-660B, 660-661, 664A-664B, 664-665, 706A-706B, 706-709, 720A-720B, 720-721
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 98A-98B, 98-99, 116A-116B, 116-119, 156A-156B, 156-157, 180A-180B, 180-181, 212A-212B, 212-213, 226A-226B, 226-227, 264A-264B, 264-265, 278A-278B, 278-279, 312A-312B, 312-313, 324A-324B, 324-235, 362A-362B, 362-363, 374A-374B, 374-375, 414A-414B, 414-415, 434A-434B, 434-436, 490A-490B, 490-491, 512A-512B, 512-513, 560A-560B, 560-561, 582A-582B, 582-583, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711

3. Recognize that mathematics is used in a variety of contexts outside of mathematics.

K: 1K, 25K, 51K, 75K, 101K, 131K, 159K, 195K, 223K, 243K, 263K, 285K

1: 40, 86, 120, 152, 200, 236, 276, 326, 360, 412, 454, 490

2: 38, 76, 130, 170, 206, 242, 286, 336, 386, 422, 462, 496

3: 21, 101, 155, 215, 279, 323, 377, 453, 525, 575, 629, 707

4: 19, 67, 163, 215, 273, 335, 383, 447, 507, 571, 627, 703

5: 31, 97, 155, 221, 285, 345, 429, 499, 545, 597, 675, 727

6: 35, 103, 175, 223, 269, 309, 383, 466, 479, 557, 645, 721

4. Apply mathematics in practical situations and in other disciplines.

K: 1, 25, 51, 75, 101, 131, 159, 195, 223, 243, 263, 285

1: 40, 86, 120, 152, 200, 236, 276, 326, 360, 412, 454, 490

2: 38, 76, 130, 170, 206, 242, 286, 336, 386, 422, 462, 496

3: 21, 101, 155, 215, 279, 323, 377, 453, 525, 575, 629, 70

4: 19, 67, 163, 215, 273, 335, 383, 447, 507, 571, 627, 703

5: 31, 97, 155, 221, 285, 345, 429, 499, 545, 597, 675, 727

6: 35, 103, 175, 223, 269, 309, 383, 466, 479, 557, 645, 721

5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).**K:** 1K, 25K, 51K, 75K, 101K, 131K, 159K, 195K, 223K, 243K, 263K, 285K**1:** 40, 86, 120, 152, 200, 236, 276, 326, 360, 412, 454, 490**2:** 38, 76, 130, 170, 206, 242, 286, 336, 386, 422, 462, 496**3:** 21, 101, 155, 215, 279, 323, 377, 453, 525, 575, 629, 70**4:** 19, 67, 163, 215, 273, 335, 383, 447, 507, 571, 627, 703**5:** 31, 97, 155, 221, 285, 345, 429, 499, 545, 597, 675, 727**6:** 35, 103, 175, 223, 269, 309, 383, 466, 479, 557, 645, 721**6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.****K:** 23-24, 49-50, 73-74, 99-100, 129-130, 157-158, 193-194, 221-222, 241-242, 261-262, 283-284, 301-302**1:** 41-42, 87-88, 121-122, 153-154, 201-202, 237-238, 277-278, 327-328, 361-362, 413-414, 455-456, 491-492**2:** 39-40, 77-78, 131-132, 171-172, 207-208, 243-244, 287-288, 337-338, 387-388, 423-424, 463-464, 497-498**3:** 52-53, 112-113, 178-179, 246-247, 302-303, 356-357, 414-415, 484-485, 550-551, 598-599, 666-667, 718-179**4:** 52-53, 112-113, 178-179, 246-247, 302-303, 356-357, 414-415, 484-485, 550-551, 598-599, 666-667, 718-179**5:** 52-53, 118-119, 188-189, 246-247, 314-315, 380-381, 446-447, 514-515, 580-581, 634-635, 684-685, 738-739**6:** 62-63, 128-129, 190-191, 136-137, 288-289, 342-343, 396-397, 458-459, 528-529, 606-607, 684-685, 732-733**D. Reasoning****1. Recognize that mathematical facts, procedures, and claims must be justified.****K:** 19A-19B, 19-20, 43A-43B, 43-44, 67A-67B, 67-68, 95A-95B, 95-96, 125A-125B, 125-126, 143A-143B, 143-144, 185A-185B, 185-186, 217A-217B, 217-218, 233A-233B, 233-234, 249A-249B, 249-250, 279A-279B, 279-280, 297A-297B, 297-298**1:** 7A-7B, 7-8, 21A-21B, 21-22, 57A-57B, 57-58, 71A-71B, 71-72, 99A-99B, 99-100, 111A-111B, 111-112, 133A-133B, 133-134, 143A-143B, 143-144, 177A-177B, 177-178, 191A-191B, 191-192, 215A-215B, 215-216, 223A-223B, 223-224, 251A-251B, 251-252, 261A-261B, 261-262, 291A-291B, 291-292, 317A-317B, 317-318, 339A-339B, 339-340, 351A-351B, 351-352, 369A-369B, 369-370, 379A-379B, 379-380, 431A-431B, 431-432, 445A-445B, 445-446, 467A-467B, 467-468, 481A-481B, 481-482

- 2:** 9A-9B, 9-10, 19A-19B, 19-20, 31-32, 57A-57B, 57-58, 67A-67B, 67-68, 69-70, 89A-89B, 89-90, 105A-105B, 105-106, 123-124, 155A-155B, 155-156, 161A-161B, 161-162, 163-164, 189A-189B, 189-190, 197A-197B, 197-198, 199-200, 221A-221B, 221-222, 233A-233B, 233-234, 235-236, 251A-251B, 251-252, 265A-265B, 265-266, 279-280, 311A-311B, 311-312, 327A-327B, 327-328, 329-330, 351A-351B, 351-352, 377A-377B, 377-378, 379-380, 405A-405B, 405-406, 413A-413B, 413-414, 415-416, 439A-439B, 439-440, 453A-453B, 453-454, 455-456, 479A-479B, 479-480, 487A-487B, 487-488, 489-490
- 3:** 14A-14B, 14-15, 32A-32B, 42A-42B, 42-43, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 160A-160B, 160-161, 216A-216B, 216-217, 236A-236B, 236-237, 270A-270B, 270-273, 284A-284B, 284-285, 332A-332B, 332-333, 346A-346B, 346-347, 380A-380B, 380-381, 404A-404B, 404-405, 436A-436B, 436-439, 474A-474B, 474-475, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 644A-644B, 644-645, 656A-656B, 656-657, 698A-698B, 698-699, 708A-708B, 708-709
- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 90A-90B, 90-91, 94A-94B, 94-95, 140A-140B, 140-143, 156A-156B, 156-157, 198A-198B, 198-199, 222A-222B, 222-223, 278A-278B, 278-281, 290A-290B, 290-291, 326A-326B, 326-329, 342A-342B, 342-343, 384A-384B, 384-385, 396A-396B, 396-399, 460A-460B, 460-461, 474A-474B, 474-477, 512-A512B, 512-513, 538A-538B, 538-539, 584A-584B, 584-588, 600A-600B, 600-601, 648A-648B, 648-649, 662A-662B, 662-663, 696A-696B, 696-697, 714A-714B, 714-715
- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 80A-80B, 80-81, 104A-104B, 104-105, 144A-144B, 144-145, 168A-168B, 168-169, 210A-210B, 210-211, 226A-226B, 226-227, 276A-276B, 276-279, 272A-272B, 272-273, 352A-352B, 352-355, 356A-356B, 356-357, 406A-406B, 406-407, 434A-434B, 434-437, 484A-484B, 484-487, 504A-504B, 504-505, 558A-558B, 558-559, 570A-570B, 570-571, 606A-606B, 606-607, 624A-624B, 624-625, 660A-660B, 660-661, 664A-664B, 664-665, 706A-706B, 706-709, 720A-720B, 720-721
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 98A-98B, 98-99, 116A-116B, 116-119, 156A-156B, 156-157, 180A-180B, 180-181, 212A-212B, 212-213, 226A-226B, 226-227, 264A-264B, 264-265, 278A-278B, 278-279, 312A-312B, 312-313, 324A-324B, 324-235, 362A-362B, 362-363, 374A-374B, 374-375, 414A-414B, 414-415, 434A-434B, 434-436, 490A-490B, 490-491, 512A-512B, 512-513, 560A-560B, 560-561, 582A-582B, 582-583, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711

2. Use reasoning to support their mathematical conclusions and problem solutions.

- K:** 19A-19B, 19-20, 21-22, 43A-43B, 43-44, 47-48, 67A-67B, 67-68, 71-72, 95A-95B, 95-96, 97-98, 125A-125B, 125-126, 127-128, 143A-143B, 143-144, 155-156, 185A-185B, 185-186, 191-192, 217A-217B, 217-218, 233A-233B, 233-234, 239-240, 249A-249B, 249-250, 259-260, 279A-279B, 279-280, 281-282, 297A-297B, 297-298
- 1:** 7A-7B, 7-8, 21A-21B, 21-22, 33A-33B, 33-34, 57A-57B, 57-58, 71A-71B, 71-72, 79A-79B, 79-80, 99A-99B, 99-100, 111A-111B, 111-112, 113-113B, 113-114, 133A-133B, 133-134, 143A-143B, 143-144, 145A-145B, 145-146, 177A-177B, 177-178, 191A-191B, 191-192, 193A-193B, 193-194, 215A-215B, 215-216, 223A-223B, 223-224, 229A-229B, 229-230, 251A-251B, 251-252, 261A-261B, 261-262, 269A-269B, 269-270, 291A-291B, 291-292, 317A-317B, 317-318, 319A-319B, 319-320, 339A-339B, 339-340, 351A-351B, 351-352, 353A-353B, 353-354, 369A-369B, 369-370, 379A-379B, 379-380, 405A-405B, 405-406, 431A-431B, 431-432, 445A-445B, 445-446, 447A-447B, 447-448, 467A-467B, 467-468, 481A-481B, 481-482, 483A-483B, 483-484
- 2:** 9A-9B, 9-10, 19A-19B, 19-20, 31-32, 57A-57B, 57-58, 67A-67B, 67-68, 69-70, 89A-89B, 89-90, 105A-105B, 105-106, 123-124, 155A-155B, 155-156, 161A-161B, 161-162, 163-164, 189A-189B, 189-190, 197A-197B, 197-198, 199-200, 221A-221B, 221-222, 233A-233B, 233-234, 235-236, 251A-251B, 251-252, 265A-265B, 265-266, 279-280, 311A-311B, 311-312, 327A-327B, 327-328, 329-330, 351A-351B, 351-352, 377A-377B, 377-378, 379-380, 405A-405B, 405-406, 413A-413B, 413-414, 415-416, 439A-439B, 439-440, 453A-453B, 453-454, 455-456, 479A-479B, 479-480, 487A-487B, 487-488, 489-490
- 3:** 14A-14B, 14-15, 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 140-143, 160A-160B, 160-161, 170-171, 216A-216B, 216-217, 236A-236B, 236-237, 238-239, 270A-270B, 270-273, 284A-284B, 284-285, 294-295, 332A-332B, 332-333, 346A-346B, 346-347, 348-349, 380A-380B, 380-381, 404A-404B, 404-405, 406-407, 436A-436B, 436-439, 474A-474B, 474-475, 476-477, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 590-591, 644A-644B, 644-645, 656A-656B, 656-657, 658-659, 698A-698B, 698-699, 708A-708B, 708-709, 710-711
- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 40-41, 90A-90B, 90-91, 94A-94B, 94-95, 102-103, 140A-140B, 140-143, 156A-156B, 156-157, 168-169, 198A-198B, 198-199, 222A-222B, 222-223, 234-235, 278A-278B, 278-281, 290A-290B, 290-291, 292-293, 326A-326B, 326-329, 342A-342B, 342-343, 344-345, 384A-384B, 384-385, 396A-396B, 396-399, 412-413, 460A-460B, 460-461, 474A-474B, 474-477, 478-479, 512A-512B, 512-513, 538A-538B, 538-539, 540-541, 584A-584B, 584-588, 600A-600B, 600-601, 602-603, 648A-648B, 648-649, 662A-662B, 662-663, 666-667, 696A-696B, 696-697, 714A-714B, 714-715, 716-717

- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 80A-80B, 80-81, 104A-104B, 104-105, 110-111, 144A-144B, 144-145, 168A-168B, 168-169, 180-181, 210A-210B, 210-211, 226A-226B, 226-227, 238-239, 276A-276B, 276-279, 272A-272B, 272-273, 306-307, 352A-352B, 352-355, 356A-356B, 356-357, 372-373, 406A-406B, 406-407, 434A-434B, 434-437, 438-439, 484A-484B, 484-487, 504A-504B, 504-505, 506-507, 558A-558B, 558-559, 570A-570B, 570-571, 572-573, 606A-606B, 606-607, 624A-624B, 624-625, 626-627, 660A-660B, 660-661, 664A-664B, 664-665, 676-677, 706A-706B, 706-709, 720A-720B, 720-721, 730-731
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 54-55, 98A-98B, 98-99, 116A-116B, 116-119, 120-121, 156A-156B, 156-157, 180A-180B, 180-181, 182-183, 212A-212B, 212-213, 226A-226B, 226-227, 228-229, 230-231, 264A-264B, 264-265, 278A-278B, 278-279, 280-281, 312A-312B, 312-313, 324A-324B, 324-235, 334-335, 362A-362B, 362-363, 374A-374B, 374, 375, 388-389, 414A-414B, 414-415, 434A-434B, 434-436, 450-451, 490A-490B, 490-491, 512A-512B, 512-513, 520-521, 560A-560B, 560-561, 582A-582B, 582-583, 598-599, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711, 724-725

3. Select and use various types of reasoning and methods of proof.

- K:** 19A-19B, 19-20, 43A-43B, 43-44, 67A-67B, 67-68, 95A-95B, 95-96, 125A-125B, 125-126, 143A-143B, 143-144, 185A-185B, 185-186, 217A-217B, 217-218, 233A-233B, 233-234, 249A-249B, 249-250, 279A-279B, 279-280, 297A-297B, 297-298
- 1:** 7A-7B, 7-8, 21A-21B, 21-22, 57A-57B, 57-58, 71A-71B, 71-72, 99A-99B, 99-100, 111A-111B, 111-112, 133A-133B, 133-134, 143A-143B, 143-144, 177A-177B, 177-178, 191A-191B, 191-192, 215A-215B, 215-216, 223A-223B, 223-224, 251A-251B, 251-252, 261A-261B, 261-262, 291A-291B, 291-292, 317A-317B, 317-318, 339A-339B, 339-340, 351A-351B, 351-352, 369A-369B, 369-370, 379A-379B, 379-380, 431A-431B, 431-432, 445A-445B, 445-446, 467A-467B, 467-468, 481A-481B, 481-482
- 2:** 9A-9B, 9-10, 19A-19B, 57A-57B, 57-58, 67A-67B, 67-68, 89A-89B, 89-90, 105A-105B, 105-106, 155A-155B, 155-156, 161A-161B, 161-162, 189A-189B, 189-190, 197A-197B, 197-198, 221A-221B, 221-222, 233A-233B, 233-234, 251A-251B, 251-252, 265A-265B, 265-266, 311A-311B, 311-312, 327A-327B, 327-328, 351A-351B, 351-352, 377A-377B, 377-378, 405A-405B, 405-406, 413A-413B, 413-414, 439A-439B, 439-440, 453A-453B, 453-454, 479A-479B, 479-480, 487A-487B, 487-488
- 3:** 14A-14B, 14-15, 32A-32B, 42A-42B, 42-43, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 160A-160B, 160-161, 216A-216B, 216-217, 236A-236B, 236-237, 270A-270B, 270-273, 284A-284B, 284-285, 332A-332B, 332-333, 346A-346B, 346-347, 380A-380B, 380-381, 404A-404B, 404-405, 436A-436B, 436-439, 474A-474B, 474-475, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 644A-644B, 644-645, 656A-656B, 656-657, 698A-698B, 698-699, 708A-708B, 708-709

- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 90A-90B, 90-91, 94A-94B, 94-95, 140A-140B, 140-143, 156A-156B, 156-157, 198A-198B, 198-199, 222A-222B, 222-223, 278A-278B, 278-281, 290A-290B, 290-291, 326A-326B, 326-329, 342A-342B, 342-343, 384A-384B, 384-385, 396A-396B, 396-399, 460A-460B, 460-461, 474A-474B, 474-477, 512-A512B, 512-513, 538A-538B, 538-539, 584A-584B, 584-858, 600A-600B, 600-601, 648A-648B, 648-649, 662A-662B, 662-663, 696A-696B, 696-697, 714A-714B, 714-715
- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 80A-80B, 80-81, 104A-104B, 104-105, 144A-144B, 144-145, 168A-168B, 168-169, 210A-210B, 210-211, 226A-226B, 226-227, 276A-276B, 276-279, 272A-272B, 272-273, 352A-352B, 352-355, 356A-356B, 356-357, 406A-406B, 406-407, 434A-434B, 434-437, 484A-484B, 484-487, 504A-504B, 504-505, 558A-558B, 558-559, 570A-570B, 570-571, 606A-606B, 606-607, 624A-624B, 624-625, 660A-660B, 660-661, 664A-664B, 664-665, 706A-706B, 706-709, 720A-720B, 720-721
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 98A-98B, 98-99, 116A-116B, 116-119, 156A-156B, 156-157, 180A-180B, 180-181, 212A-212B, 212-213, 226A-226B, 226-227, 264A-264B, 264-265, 278A-278B, 278-279, 312A-312B, 312-313, 324A-324B, 324-235, 362A-362B, 362-363, 374A-374B, 374-375, 414A-414B, 414-415, 434A-434B, 434-436, 490A-490B, 490-491, 512A-512B, 512-513, 560A-560B, 560-561, 582A-582B, 582-583, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711

4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.

- K:** 19A-19B, 19-20, 21-22, 43A-43B, 43-44, 47-48, 67A-67B, 67-68, 71-72, 95A-95B, 95-96, 97-98, 125A-125B, 125-126, 127-128, 143A-143B, 143-144, 155-156, 185A-185B, 185-186, 191-192, 217A-217B, 217-218, 233A-233B, 233-234, 239-240, 249A-249B, 249-250, 259-260, 279A-279B, 279-280, 281-282, 297A-297B, 297-298
- 1:** 7A-7B, 7-8, 21A-21B, 21-22, 33A-33B, 33-34, 57A-57B, 57-58, 71A-71B, 71-72, 79A-79B, 79-80, 99A-99B, 99-100, 111A-111B, 111-112, 113-113B, 113-114, 133A-133B, 133-134, 143A-143B, 143-144, 145A-145B, 145-146, 177A-177B, 177-178, 191A-191B, 191-192, 193A-193B, 193-194, 215A-215B, 215-216, 223A-223B, 223-224, 229A-229B, 229-230, 251A-251B, 251-252, 261A-261B, 261-262, 269A-269B, 269-270, 291A-291B, 291-292, 317A-317B, 317-318, 319A-319B, 319-320, 339A-339B, 339-340, 351A-351B, 351-352, 353A-353B, 353-354, 369A-369B, 369-370, 379A-379B, 379-380, 405A-405B, 405-406, 431A-431B, 431-432, 445A-445B, 445-446, 447A-447B, 447-448, 467A-467B, 467-468, 481A-481B, 481-482, 483A-483B, 483-484

- 2:** 9A-9B, 9-10, 19A-19B, 19-20, 31-32, 57A-57B, 57-58, 67A-67B, 67-68, 69-70, 89A-89B, 89-90, 105A-105B, 105-106, 123-124, 155A-155B, 155-156, 161A-161B, 161-162, 163-164, 189A-189B, 189-190, 197A-197B, 197-198, 199-200, 221A-221B, 221-222, 233A-233B, 233-234, 235-236, 251A-251B, 251-252, 265A-265B, 265-266, 279-280, 311A-311B, 311-312, 327A-327B, 327-328, 329-330, 351A-351B, 351-352, 377A-377B, 377-378, 379-380, 405A-405B, 405-406, 413A-413B, 413-414, 415-416, 439A-439B, 439-440, 453A-453B, 453-454, 455-456, 479A-479B, 479-480, 487A-487B, 487-488, 489-490
- 3:** 14A-14B, 14-15, 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 140-143, 160A-160B, 160-161, 170-171, 216A-216B, 216-217, 236A-236B, 236-237, 238-239, 270A-270B, 270-273, 284A-284B, 284-285, 294-295, 332A-332B, 332-333, 346A-346B, 346-347, 348-349, 380A-380B, 380-381, 404A-404B, 404-405, 406-407, 436A-436B, 436-439, 474A-474B, 474-475, 476-477, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 590-591, 644A-644B, 644-645, 656A-656B, 656-657, 658-659, 698A-698B, 698-699, 708A-708B, 708-709, 710-711
- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 40-41, 90A-90B, 90-91, 94A-94B, 94-95, 102-103, 140A-140B, 140-143, 156A-156B, 156-157, 168-169, 198A-198B, 198-199, 222A-222B, 222-223, 234-235, 278A-278B, 278-281, 290A-290B, 290-291, 292-293, 326A-326B, 326-329, 342A-342B, 342-343, 344-345, 384A-384B, 384-385, 396A-396B, 396-399, 412-413, 460A-460B, 460-461, 474A-474B, 474-477, 478-479, 512A-512B, 512-513, 538A-538B, 538-539, 540-541, 584A-584B, 584-585, 600A-600B, 600-601, 602-603, 648A-648B, 648-649, 662A-662B, 662-663, 666-667, 696A-696B, 696-697, 714A-714B, 714-715, 716-717
- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 44-45, 80A-80B, 80-81, 104A-104B, 104-105, 110-111, 144A-144B, 144-145, 168A-168B, 168-169, 180-181, 210A-210B, 210-211, 226A-226B, 226-227, 238-239, 276A-276B, 276-279, 272A-272B, 272-273, 306-307, 352A-352B, 352-355, 356A-356B, 356-357, 372-373, 406A-406B, 406-407, 434A-434B, 434-437, 438-439, 484A-484B, 484-487, 504A-504B, 504-505, 506-507, 558A-558B, 558-559, 570A-570B, 570-571, 572-573, 606A-606B, 606-607, 624A-624B, 624-625, 626-627, 660A-660B, 660-661, 664A-664B, 664-665, 676-677, 706A-706B, 706-709, 720A-720B, 720-721, 730-731
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 54-55, 98A-98B, 98-99, 116A-116B, 116-119, 120-121, 156A-156B, 156-157, 180A-180B, 180-181, 182-183, 212A-212B, 212-213, 226A-226B, 226-227, 228-229, 230-231, 264A-264B, 264-265, 278A-278B, 278-279, 280-281, 312A-312B, 312-313, 324A-324B, 324-235, 334-335, 362A-362B, 362-363, 374A-374B, 374, 375, 388-389, 414A-414B, 414-415, 434A-434B, 434-436, 450-451, 490A-490B, 490-491, 512A-512B, 512-513, 520-521, 560A-560B, 560-561, 582A-582B, 582-583, 598-599, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711, 724-725

5. Make and investigate mathematical conjectures.

- **Counterexamples as a means of disproving conjectures**
- **Verifying conjectures using informal reasoning or proofs.**

K: 19A-19B, 19-20, 43A-43B, 43-44, 67A-67B, 67-68, 95A-95B, 95-96, 125A-125B, 125-126, 143A-143B, 143-144, 185A-185B, 185-186, 217A-217B, 217-218, 233A-233B, 233-234, 249A-249B, 249-250, 279A-279B, 279-280, 297A-297B, 297-298

1: 7A-7B, 7-8, 21A-21B, 21-22, 57A-57B, 57-58, 71A-71B, 71-72, 99A-99B, 99-100, 111A-111B, 111-112, 133A-133B, 133-134, 143A-143B, 143-144, 177A-177B, 177-178, 191A-191B, 191-192, 215A-215B, 215-216, 223A-223B, 223-224, 251A-251B, 251-252, 261A-261B, 261-262, 291A-291B, 291-292, 317A-317B, 317-318, 339A-339B, 339-340, 351A-351B, 351-352, 369A-369B, 369-370, 379A-379B, 379-380, 431A-431B, 431-432, 445A-445B, 445-446, 467A-467B, 467-468, 481A-481B, 481-482

2: 9A-9B, 9-10, 19A-19B, 57A-57B, 57-58, 67A-67B, 67-68, 89A-89B, 89-90, 105A-105B, 105-106, 155A-155B, 155-156, 161A-161B, 161-162, 189A-189B, 189-190, 197A-197B, 197-198, 221A-221B, 221-222, 233A-233B, 233-234, 251A-251B, 251-252, 265A-265B, 265-266, 311A-311B, 311-312, 327A-327B, 327-328, 351A-351B, 351-352, 377A-377B, 377-378, 405A-405B, 405-406, 413A-413B, 413-414, 439A-439B, 439-440, 453A-453B, 453-454, 479A-479B, 479-480, 487A-487B, 487-488

3: 14A-14B, 14-15, 32A-32B, 42A-42B, 42-43, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 160A-160B, 160-161, 216A-216B, 216-217, 236A-236B, 236-237, 270A-270B, 270-273, 284A-284B, 284-285, 332A-332B, 332-333, 346A-346B, 346-347, 380A-380B, 380-381, 404A-404B, 404-405, 436A-436B, 436-439, 474A-474B, 474-475, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 644A-644B, 644-645, 656A-656B, 656-657, 698A-698B, 698-699, 708A-708B, 708-709

4: 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 90A-90B, 90-91, 94A-94B, 94-95, 140A-140B, 140-143, 156A-156B, 156-157, 198A-198B, 198-199, 222A-222B, 222-223, 278A-278B, 278-281, 290A-290B, 290-291, 326A-326B, 326-329, 342A-342B, 342-343, 384A-384B, 384-385, 396A-396B, 396-399, 460A-460B, 460-461, 474A-474B, 474-477, 512A-512B, 512-513, 538A-538B, 538-539, 584A-584B, 584-588, 600A-600B, 600-601, 648A-648B, 648-649, 662A-662B, 662-663, 696A-696B, 696-697, 714A-714B, 714-715

5: 32A-32B, 32-33, 42A-42B, 42-43, 80A-80B, 80-81, 104A-104B, 104-105, 144A-144B, 144-145, 168A-168B, 168-169, 210A-210B, 210-211, 226A-226B, 226-227, 276A-276B, 276-279, 272A-272B, 272-273, 352A-352B, 352-355, 356A-356B, 356-357, 406A-406B, 406-407, 434A-434B, 434-437, 484A-484B, 484-487, 504A-504B, 504-505, 558A-558B, 558-559, 570A-570B, 570-571, 606A-606B, 606-607, 624A-624B, 624-625, 660A-660B, 660-661, 664A-664B, 664-665, 706A-706B, 706-709, 720A-720B, 720-721

6: 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 98A-98B, 98-99, 116A-116B, 116-119, 156A-156B, 156-157, 180A-180B, 180-181, 212A-212B, 212-213, 226A-226B, 226-227, 264A-264B, 264-265, 278A-278B, 278-279, 312A-312B, 312-313, 324A-324B, 324-235, 362A-362B, 362-363, 374A-374B, 374-375, 414A-414B, 414-415, 434A-434B, 434-436, 490A-490B, 490-491, 512A-512B, 512-513, 560A-560B, 560-561, 582A-582B, 582-583, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711

6. Evaluate examples of mathematical reasoning and determine whether they are valid.

- K:** 19A-19B, 19-20, 43A-43B, 43-44, 67A-67B, 67-68, 95A-95B, 95-96, 125A-125B, 125-126, 143A-143B, 143-144, 185A-185B, 185-186, 217A-217B, 217-218, 233A-233B, 233-234, 249A-249B, 249-250, 279A-279B, 279-280, 297A-297B, 297-298
- 1:** 7A-7B, 7-8, 21A-21B, 21-22, 57A-57B, 57-58, 71A-71B, 71-72, 99A-99B, 99-100, 111A-111B, 111-112, 133A-133B, 133-134, 143A-143B, 143-144, 177A-177B, 177-178, 191A-191B, 191-192, 215A-215B, 215-216, 223A-223B, 223-224, 251A-251B, 251-252, 261A-261B, 261-262, 291A-291B, 291-292, 317A-317B, 317-318, 339A-339B, 339-340, 351A-351B, 351-352, 369A-369B, 369-370, 379A-379B, 379-380, 431A-431B, 431-432, 445A-445B, 445-446, 467A-467B, 467-468, 481A-481B, 481-482
- 2:** 9A-9B, 9-10, 19A-19B, 57A-57B, 57-58, 67A-67B, 67-68, 89A-89B, 89-90, 105A-105B, 105-106, 155A-155B, 155-156, 161A-161B, 161-162, 189A-189B, 189-190, 197A-197B, 197-198, 221A-221B, 221-222, 233A-233B, 233-234, 251A-251B, 251-252, 265A-265B, 265-266, 311A-311B, 311-312, 327A-327B, 327-328, 351A-351B, 351-352, 377A-377B, 377-378, 405A-405B, 405-406, 413A-413B, 413-414, 439A-439B, 439-440, 453A-453B, 453-454, 479A-479B, 479-480, 487A-487B, 487-488
- 3:** 14A-14B, 14-15, 32A-32B, 42A-42B, 42-43, 76A-76B, 76-77, 102A-102B, 102-103, 104-105, 140A-140B, 160A-160B, 160-161, 216A-216B, 216-217, 236A-236B, 236-237, 270A-270B, 270-273, 284A-284B, 284-285, 332A-332B, 332-333, 346A-346B, 346-347, 380A-380B, 380-381, 404A-404B, 404-405, 436A-436B, 436-439, 474A-474B, 474-475, 528A-528B, 528-529, 540A-540B, 540-541, 578A-578B, 578-579, 588A-588B, 588-589, 644A-644B, 644-645, 656A-656B, 656-657, 698A-698B, 698-699, 708A-708B, 708-709
- 4:** 12A-12B, 12-13, 24A-24B, 24-25, 38A-38B, 38-39, 90A-90B, 90-91, 94A-94B, 94-95, 140A-140B, 140-143, 156A-156B, 156-157, 198A-198B, 198-199, 222A-222B, 222-223, 278A-278B, 278-281, 290A-290B, 290-291, 326A-326B, 326-329, 342A-342B, 342-343, 384A-384B, 384-385, 396A-396B, 396-399, 460A-460B, 460-461, 474A-474B, 474-477, 512-A512B, 512-513, 538A-538B, 538-539, 584A-584B, 584-858, 600A-600B, 600-601, 648A-648B, 648-649, 662A-662B, 662-663, 696A-696B, 696-697, 714A-714B, 714-715

- 5:** 32A-32B, 32-33, 42A-42B, 42-43, 80A-80B, 80-81, 104A-104B, 104-105, 144A-144B, 144-145, 168A-168B, 168-169, 210A-210B, 210-211, 226A-226B, 226-227, 276A-276B, 276-279, 272A-272B, 272-273, 352A-352B, 352-355, 356A-356B, 356-357, 406A-406B, 406-407, 434A-434B, 434-437, 484A-484B, 484-487, 504A-504B, 504-505, 558A-558B, 558-559, 570A-570B, 570-571, 606A-606B, 606-607, 624A-624B, 624-625, 660A-660B, 660-661, 664A-664B, 664-665, 706A-706B, 706-709, 720A-720B, 720-721
- 6:** 20A-20B, 20-21, 36A-36B, 36-37, 52A-52B, 52-53, 98A-98B, 98-99, 116A-116B, 116-119, 156A-156B, 156-157, 180A-180B, 180-181, 212A-212B, 212-213, 226A-226B, 226-227, 264A-264B, 264-265, 278A-278B, 278-279, 312A-312B, 312-313, 324A-324B, 324-235, 362A-362B, 362-363, 374A-374B, 374-375, 414A-414B, 414-415, 434A-434B, 434-436, 490A-490B, 490-491, 512A-512B, 512-513, 560A-560B, 560-561, 582A-582B, 582-583, 648A-648B, 648-649, 674A-674B, 674-675, 676A-676B, 676-677, 706A-706B, 706-707, 710A-710B, 710-711

E. Representations

1. Create and use representations to organize, record, and communicate mathematical ideas.

- **Concrete representations (e.g., base-ten blocks or algebra tiles)**
- **Pictorial representations (e.g., diagrams, charts, or tables)**
- **Symbolic representations (e.g., a formula)**
- **Graphical representations (e.g., a line graph)**

K: 27-28, 29-30, 31-32, 33-34, 53-54, 57-58, 77-78, 79-80, 83-84, 103-104, 125-126, 217-218, 247-248, 267-268, 291-292

1: 11-12, 13-14, 15-16, 17-18, 25-26, 27-28, 47-48, 63-64, 75-76, 97-98, 125-126, 245-246, 291-292, 309-310, 311-312, 313-314, 431-432, 481-482

2: 67A-67B, 67-68, 81A-81B, 81-82, 99A-99B, 99-100, 115A-115B, 115-116, 189A-189B, 189-190, 251A-251B, 251-252, 311A-311B, 311-312, 313A-313B, 313-314, 315A-315B, 315-316, 319A-319B, 319-320, 321A-321B, 321-322, 323A-323B, 323-324, 439A-439B, 439-440, 479A-479B, 479-480

3: 140A-140B, 140-143, 204A-204B, 204-207, 208A-208B, 208-211, 226A-226B, 226-227, 228A-228B, 228-231, 232A-232B, 232-235, 236A-236B, 236-237, 270A-270B, 270-273

4: 4A-4B, 4-7, 8A-8B, 8-9, 28A-28B, 28-29, 34A-34B, 34-37, 204A-204B, 204-205, 206A-206B, 206-207, 208A-208B, 208-211, 212A-212B, 212-213, 216A-216B, 216-221, 500A-500B, 500-501, 502A-502B, 502-503, 504A-504B, 504-507, 624A-624B, 624-627

5: 262A-262B, 262-265, 266A-266B, 266-269, 270A-270B, 270-275, 286A-286B, 286-287, 548A-548B, 548-549, 550A-550B, 550-551, 552A-552B, 552-553, 554A-554B, 554-557

6: 628A-628B, 628-631, 632A-632B, 632-633, 636A-636B, 636-637, 638A-638B, 638-641, 642A-642B, 642-647, 650A-650B, 650-651, 69A-698B, 698-699, 718A-718B, 718-121

2. Select, apply, and translate among mathematical representations to solve problems.

- K:** 27-28, 29-30, 31-32, 33-34, 53-54, 57-58, 77-78, 79-80, 83-84, 103-104, 125-126, 217-218, 247-248, 267-268, 291-292
- 1:** 11-12, 13-14, 15-16, 17-18, 25-26, 27-28, 47-48, 63-64, 75-76, 97-98, 125-126, 245-246, 291-292, 309-310, 311-312, 313-314, 431-432, 481-482
- 2:** 67A-67B, 67-68, 81A-81B, 81-82, 99A-99B, 99-100, 115A-115B, 115-116, 189A-189B, 189-190, 251A-251B, 251-252, 311A-311B, 311-312, 313A-313B, 313-314, 315A-315B, 315-316, 319A-319B, 319-320, 321A-321B, 321-322, 323A-323B, 323-324, 439A-439B, 439-440, 479A-479B, 479-480
- 3:** 140A-140B, 140-143, 204A-204B, 204-207, 208A-208B, 208-211, 226A-226B, 226-227, 228A-228B, 228-231, 232A-232B, 232-235, 236A-236B, 236-237, 270A-270B, 270-273
- 4:** 4A-4B, 4-7, 8A-8B, 8-9, 28A-28B, 28-29, 34A-34B, 34-37, 204A-204B, 204-205, 206A-206B, 206-207, 208A-208B, 208-211, 212A-212B, 212-213, 216A-216B, 216-221, 500A-500B, 500-501, 502A-502B, 502-503, 504A-504B, 504-507, 624A-624B, 624-627
- 5:** 262A-262B, 262-265, 266A-266B, 266-269, 270A-270B, 270-275, 286A-286B, 286-287, 548A-548B, 548-549
- 6:** 628A-628B, 628-631, 632A-632B, 632-633, 636A-636B, 636-637, 638A-638B, 638-641, 642A-642B, 642-647, 650A-650B, 650-651, 69A-698B, 698-699, 718A-718B, 718-121

3. Use representations to model and interpret physical, social, and mathematical phenomena.

- K:** 27-28, 29-30, 31-32, 33-34, 53-54, 57-58, 77-78, 79-80, 83-84, 103-104, 125-126, 217-218, 247-248, 267-268, 291-292
- 1:** 11-12, 13-14, 15-16, 17-18, 25-26, 27-28, 47-48, 63-64, 75-76, 97-98, 125-126, 245-246, 291-292, 309-310, 311-312, 313-314, 431-432, 481-482
- 2:** 67A-67B, 67-68, 81A-81B, 81-82, 99A-99B, 99-100, 115A-115B, 115-116, 189A-189B, 189-190, 251A-251B, 251-252, 311A-311B, 311-312, 313A-313B, 313-314, 315A-315B, 315-316, 319A-319B, 319-320, 321A-321B, 321-322, 323A-323B, 323-324, 439A-439B, 439-440, 479A-479B, 479-480
- 3:** 140A-140B, 140-143, 204A-204B, 204-207, 208A-208B, 208-211, 226A-226B, 226-227, 228A-228B, 228-231, 232A-232B, 232-235, 236A-236B, 236-237, 270A-270B, 270-273
- 4:** 4A-4B, 4-7, 8A-8B, 8-9, 28A-28B, 28-29, 34A-34B, 34-37, 204A-204B, 204-205, 206A-206B, 206-207, 208A-208B, 208-211, 212A-212B, 212-213, 216A-216B, 216-221, 500A-500B, 500-501, 502A-502B, 502-503, 504A-504B, 504-507, 624A-624B, 624-627
- 5:** 262A-262B, 262-265, 266A-266B, 266-269, 270A-270B, 270-275, 286A-286B, 286-287, 548A-548B, 548-549

6: 628A-628B, 628-631, 632A-632B, 632-633, 636A-636B, 636-637, 638A-638B, 638-641, 642A-642B, 642-647, 650A-650B, 650-651, 69A-698B, 698-699, 718A-718B, 718-121

F. Technology

1. Use technology to gather, analyze, and communicate mathematical information.

K: 75K

1: 38, 84, 118, 150, 198, 234, 274, 324, 358, 410, 452, 488

2: 36, 74, 128, 168, 204, 240, 284, 334, 384, 420, 460, 494

3: 39, 89, 131, 195, 207, 231, 291, 327, 401, 449, 467, 501, 571, 621, 693

4: 37, 85, 127, 219, 267, 319, 377, 389, 411, 455, 519, 581

5: 11, 91, 167, 221, 273, 305, 367, 397, 481, 567, 601, 651, 715

6: 43, 109, 163, 167, 209, 255, 333, 357, 425, 499, 519, 575, 593, 597, 627, 641, 661

2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information (cf. workplace readiness standard 8.4-D).

K: 75K

1: 38, 84, 118, 150, 198, 234, 274, 324, 358, 410, 452, 488

2: 36, 74, 128, 168, 204, 240, 284, 334, 384, 420, 460, 494

3: 39, 89, 131, 195, 207, 231, 291, 327, 401, 449, 467, 501, 571, 621, 693

4: 37, 85, 127, 219, 267, 319, 377, 389, 411, 455, 519, 581

5: 11, 91, 167, 221, 273, 305, 367, 397, 481, 567, 601, 651, 715

6: 43, 109, 163, 167, 209, 255, 333, 357, 425, 499, 519, 575, 593, 597, 627, 641, 661

3. Use graphing calculators and computer software to investigate properties of functions and their graphs.

K: Preparation: 75K

1: Related material: 38, 84, 118, 150, 198, 234, 274, 324, 358, 410, 452, 488

2: 36, 74, 168, 204, 240, 420, 460, 494

3: Related material: 327

4: Related material: 127

5: Related material: 91, 167, 715

6: Related material: 43, 425

4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).**K:** 75k**1:** 38, 84, 118, 150, 198, 234, 274, 324, 358, 410, 452, 488**2:** 36, 74, 168, 204, 240, 420, 460, 494**3:** 89, 401, 571, 621, 709**4:** 37, 85, 127, 219, 267, 319, 377, 389, 411, 455, 519, 581**5:** 11, 91, 167, 221, 273, 305, 367, 397, 481, 567, 601, 651, 715**6:** 43, 109, 163, 167, 209, 255, 333, 357, 425, 499, 519, 575, 593, 597, 627, 641, 661**5. Use computer software to make and verify conjectures about geometric objects.****K:** Preparation: 75K**1:** 198**2:** 128, 284, 337, 384**3:** Related material: 39, 89, 131, 195, 207, 231, 291, 327, 401, 449, 467, 501, 571, 621, 693**4:** Related material: 455**5:** Relate material: 11, 91, 167, 221, 273, 305, 367, 397, 481, 567, 601, 651, 715**6:** 43, 163, 597, 627, 641**6. Use computer-based laboratory technology for mathematical applications in the sciences (cf. science standards).****K:** Preparation: 75K**1:** Related material: 38, 84, 118, 150, 198, 234, 274, 324, 358, 410, 452, 488**2:** Related material: 128, 284, 337, 384**3:** Related material: 39, 89, 131, 195, 207, 231, 291, 327, 401, 449, 467, 501, 571, 621, 693**4:** Related material: 37, 85, 127, 219, 267, 319, 377, 389, 411, 455, 519, 581**5:** Related material: 11, 91, 167, 221, 273, 305, 367, 397, 481, 567, 601, 651, 715**6:** Related material: 43, 163, 597, 627, 641