Grade K

The Private Eye® aligned with Common Core State Standards for Mathematical Practice and Content

Welcome!

The Private Eye makes math a language to love, even as it helps build a mathematical vocabulary. It turns math into something personal, intriguing, friendly, alive. The Private Eye's hands-on, interdisciplinary process and instructional strategy braids together three languages: verbal, visual, and mathematical.

The Private Eye begins with four simple questions, everyday objects, and a jeweler's loupe (an almost magical magnification tool). Using The Private Eye process students enhance concentration, heighten their awareness of pattern and detail, and learn to evoke analogic thinking for problem-solving. TPE delivers students directly to the "land of Math" — the science of patterns and relationships. Whenever you use The Private Eye, pattern is "in your face"—you're massaging the math brain, even as you massage the scientist's, writer's, artist's brain.

The Private Eye blends with your existing math course-of-study to develop habits of mind essential to mathematical practice. As you consider your math year, you'll find you can use TPE in your classroom to: introduce, enhance, cement and assess mathematical concepts and content. It helps students settle down and focus as preparation for a new or existing mathematical concept. It calms their fears that a math topic will be too difficult, too foreign. It grounds concepts in a student's personal knowledge and associations and in the five senses. It generates mathematical inquiries that live and breathe.

With its simple tools, rich questioning strategy, and everyday objects, students can write, draw, theorize, count, measure, compute, calculate, estimate, predict and perform mathematical operations. In the process they build four underlying *and interwoven habits of mind* critical to academic success: looking closely, thinking by analogy, changing scale, and theorizing. These are the intellectual "tools" not only for mathematical literacy, but for creativity, literacy, and scientific literacy as well. The book, *The Private Eye —(5X) Looking/Thinking by Analogy: A Guide to Developing the Interdisciplinary Mind,* shows how to fluently develop these essential habits. A special Math Tour of lesson connections begins on page 173.

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This document correlates *The Private Eye—(5X) Looking/Thinking by Analogy* to the mathematical practices and content outlined in the Common Core State Standards for Grade 3. Along the way, the document provides many "how to" examples for meeting and practicing the content of each standard in the context of Private Eye use. (For Private Eye CCSS Literacy correlations, please see our separate publication.)

Common Core State Standards for Mathematics: GRADE K

THE PRIVATE EYE® — (5X) LOOKING / THINKING BY ANALOGY® Correlation

Standards for Mathematical Practice	*THE PRIVATE EYE® — (5X) LOOKING / THINKING BY ANALOGY®* *A Guide to Developing the Interdisciplinary Mind*

Meet all eight CCSS Standards for Mathematical Practice using The Private Eye (TPE) in Math *and* across your curriculum day:

1. Make sense of problems and persevere in solving them. Thinking by Analogy (making associations and using them for theorizing, inferring, modeling) is how we make sense of the world. The Private Eye boosts analogic reasoning as it also builds concentration, ever-increasing attention to detail, and wonder at the world's patterns and relationships. Using TPE builds perseverance incrementally and naturally. The Private Eye's exploratory inquiry generates options to approach problem solving. It builds *problem-solving by analogy* using verbal, visual, and mathematical languages.

2. Reason abstractly and quantitatively.
Analogic reasoning is the abstract reasoning at the heart of mathematical reasoning. TPE process is rooted in analogic reasoning: proportional reasoning, making inferences, theorizing — based on strategic use of associations. (BTW, the term "analogy" was originally a math term!)

"Analogy is the Interstate Freeway of Cognition", notes Douglas Hofstadter. We use analogy in forms verbal, visual, and numerical — creating and using analogs, comparisons, and models — to understand and solve problems. TPE tools and strategy evoke and constantly build analogic / comparative thinking for students and adults. Hands-on explorations quicken abstract reasoning while keeping students grounded in real world applications. Repetition with TPE process makes analogic reasoning in verbal, visual and mathematical languages into a habit for students, an instinctive practice.

3. Construct viable arguments and critique the reasoning of others. TPE's inquiry approach includes: "Why is it like that?" "What's going on here?" TPE gives students a hypothesizing and theorizing strategy to answer these questions using words, numbers, images to generate models. Students work individually and collaboratively, examining and critiquing each other's methods and conclusions.

4. Model with mathematics.
Models are essentially analogies: an exploration and a representation of patterns, structures, behaviors, and relationships we discover in the world around us. Numbers are analogs that explore and represent specific quantities, interactions, operations, measurements, behaviors, and relationships. TPE helps students practice moving between modeling with mathematical analogs and modeling with verbal, visual, and structural analogs.

5. Use appropriate tools strategically.
The Private Eye Tools: a 5X Loupe (a marvelous magnification tool), everyday objects (manipulatives), loupe-drawing, and loupe-analogy observations are all mathematical tools in the context of math explorations. (TPE Questions are tools, as well!) The loupe allows students to change scale — to find mathematical numbers, shapes, concepts and relationships in small places in comparison with large scale situations. The loupe enlarges objects or parts of objects by 5X (10X if two loupes nested) creating a heightened interest in structures, patterns and measurements. It boosts Mathematical Practices #6, 7, and 8.

6. Attend to precision.
The Private Eye's loupe and questioning strategy gives students a jolt of attention to detail: it literally "teaches" what attention to detail and precision *means*. Using TPE students explore real world shapes, structures and relationships in conjunction with analogic observations — verbal, visual, mathematical — to express ever more precise communication / thinking. TPE hones ability to discern and distinguish less obvious similarities and differences.

7. Look for and make use of structure.
TPE loupes and Questions help students habitually look closely for structures, patterns and relationships at changes of scale, small and large. In a math context, this habit of mind translates into a heightened sensitivity to numerical structures and sequences.

8. Look for and express regularity in repeated reasoning. Thinking by Analogy fueled with Looking Closely is fundamental to pattern recognition. Using TPE in math — a repeating loop of questions for investigating and reasoning — sensitizes students to looking for regularity in mathematical structures.

When you use The Private Eye's interdisciplinary process in math, you not only meet math standards correlated to the lesson, but specific Science and Literacy Standards as well. See CCSS Literacy / TPE correlations.

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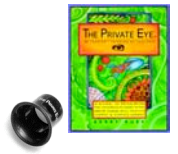
THE PRIVATE EYE® — (5X) LOOKING / THINKING BY ANALOGY® Correlation

Standards for Mathematical Content	*THE PRIVATE EYE® — (5X) LOOKING / THINKING BY ANALOGY®* *— A Guide to Developing the Interdisciplinary Mind —*
KINDERGARTEN	***Prep:*** *Read "Process and Tools", pp. 11-31; and "Math Tour", pp.175-194. Introduce students to The Private Eye (TPE) loupe & process: looking closely, thinking by analogy, changing scale, and theorizing. TPE's holistic math activities connect to multiple standards and can be adapted for any grade. (Along the way, it's easy and fun to create your own lessons.)* ***Practice:*** *In the correlations we provide some "unpacking" of standards, grade-level examples, and a starter list of TPE book connections. On some days, you may choose merely to use the loupe with everyday objects for knock-your-socks-off, content-rich manipulatives to meet detailed elements of a standard. But connect these experiences to a Private Eye-listed activity — even better, to the full, interdisciplinary Private Eye process (TPE Questions / loupe-drawing / writing / science content / theorizing) — and you'll see a real difference in how students think and communicate mathematically. Students will rev up creative and critical thinking in tandem with math skills. They'll fall in love with math.*
Counting and Cardinality K.CC	
Know number names and the count sequence. 1. Count to 100 by ones and tens. 2. Count forward from a given number in a sequence. 3. Write numbers from 0-20.	
Count to tell the number of objects. **K.CC.4** 4. Understand relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number with one and only one object.	**Count to tell the number of objects.** **Overview:** For real world math investigations, concept development, and practice in mathematical operations, provide students with sets of loupe-study objects (beans, pennies, popcorn, rocks, shells, flowers, small twigs, pumpkin seeds, sunflower seeds, cotton balls, a slice of bread cut into small pieces, etc.). You can also use objects with multiple parts (e.g., a flower has petals; a branch has leaves; a ladybug has spots, legs, antennae; and so on). Have students loupe-explore the object first and create a loupe-analogy list to create personal bonds. When students loupe draw the object, they develop pattern sensitivity, kinesthetic and spatial awareness. Before or after the math lesson, link each object to an investigation that broadens into art, writing, reading, science, and/or social studies. 4.a. To help students **understand the relationship between numbers and quantities, have students count objects or parts of loupe-study objects**, **pairing each successive number with a single object** from the group of objects. In this way students **connect counting to cardinality.** **Example:** Students each have a cup of pinto beans to count and a sheet of paper with printed numbers in a line (e.g., 1-10 or 1-20). Students pair each bean in the cup with a number in the number line. Discuss the meaning of the individual names of numbers and how the final number represents how many individual beans are in the cup (group). (continued next page)



Count to tell the number of objects. (continued)

K.CC.4 (continued)

a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number with one and only one object.

b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.

c. Understand that each successive number name refers to a quantity that is one larger.

K.CC.5

5. Count to answer "how many" (up to 20 things arranged in a line, a rectangular array, or circle, or as many as 10 in a scattered configuration; given a number from 1-20, count out that many objects.

Count to tell the number of objects. (continued)

4a, 4b, 4c. To help students **understand the relationship between numbers and quantities,** have students **count objects loupe-study objects** (or parts of such objects), **pairing each successive number with a single object** from the group of objects. Explain that **the final number said (or written) represents the total number of objects** in the group, that the order of the objects doesn't change this number, and that **each number name refers to a quantity that is one larger**.

Example: Give each student a short section of a branch from a shrub (e.g., boxwood, laurel) or tree (e.g., pussy willow, crab apple). Each student has a number line. Students count each leaf or flower bud as they pull it off the branch, and pair each leaf with the succeeding number on the number line. Discuss the meaning of the individual names of numbers and of the final number as "a total" number representing all the individual leaves (or buds) in the group.

Example: Starting with the leaves pulled off the branch, the student counts each leaf as he puts it in a container and writes (or circles) the final number that represents the total in the container.

Example: Students have a collection of mixed loupe-study objects (e.g., a bean, cork, shell, leaf, "rabbit's foot", rock, penny, etc.) to arrange in a row and count, pairing each object with a number. Insure that students understand that each number name represents a quantity that is one larger.

Example: Using the same collection of mixed objects, students say and understand that the last number is the total number of objects. Have each student rearrange the objects to create a new order, count the objects in the group again, and understand that the total number remains the same, regardless of the order of individual objects. Do the same but with groups of objects that are similar: different kinds of leaves; variety of shells; assortment of coins.

- Math Plans & Ticklers: Sequence, p. 175
- Count and Measure: Like Thoreau and Minna Pratt, p. 177 (E.g., Count # of parts on an object: petals on a flower, legs on a bug, eyes on a potato, points on a leaf, etc.)
- Seeds! p. 180 (Skip microscope. Count the number of seeds per plant, per flower, per fruit/vegetable, e.g., seeds in an apple)

5. Students use objects that they will also loupe-observe and investigate with The Private Eye questions, **to count to answer "how many"** (up to 20 objects arranged in a line, a rectangular array, or circle, or as many as 10 in a scattered configuration.) **Given a number from 1-20, students count out that many objects.** Students can also use their loupes to find and count smaller characteristics of objects: How many points on the maple leaf? How many petals on the flower? As usual, the teacher connects their loupe-study counting objects to content areas and investigations across subjects.

Example: Loose objects up to 10: "How many shells are in this basket?" "How many walnuts in the box?" "How many seeds inside this apple?" "Using your loupe, how many stripes can you find on a black and white sunflower seed shell?"

Example: Objects up to 20 arranged in a grid-box: How many specimens are in the collection box? Objects arranged in a line: How many buttons on the shirt? (continued next page)

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Count to tell the number of objects. (continued)

K.CC.5

Compare numbers.

K.CC.6

6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.

K.CC.7

7. **Compare two numbers between 1 and 10** presented as written numerals.

(continued)

Example: A number from 1-20, count out that many objects: If you carve a class pumpkin in October and clean the seeds, have each student count out 20; the teacher can add everyone's set of 20 and tell them the BIG number of seeds in the pumpkin.

Example: Teachers says: "Show me a line of 17 beans." "Make a pile of 7 stones." Etc.

- Math Plans & Ticklers: Sequence, p. 175
- Count and Measure: Like Thoreau and Minna Pratt, p. 177 (E.g., number of parts on an object: petals on a flower; legs on a bug, eyes on a potato, points on a leaf, etc.)
- Seeds! p. 180 (Skip microscope. Count the number of seeds per plant, per flower, per fruit/vegetable, e.g., seeds in an apple)

Compare numbers.

6. Teach the concept of and language of "***greater than, less than, or equal to"*** using multiples of loupe-study objects (shells, pennies, popcorn, beans, leaves, small twigs, horse tails, etc.). Have students **match and count the number of objects in one group and compare to the number in another: Do they each have the same number? I.e., are they *equal to* each other in numer? Is one group *greater than* the other? Does one have *less than* the other?** Arrange and rearrange objects into various groupings and have students identify whether the number of objects in one group is "greater than, less than, or equal to" the number of objects in another group by counting and/or matching strategies. Have students create their own comparison groups and count or match in order to identify whether the number of objects in one group is "more than, less than, or equal to" the number of objects in another group.

Example: Each student has a random number of cut horsetails (Horsetails and scouring rushes grow wild, are related to ferns, and are very interesting under a loupe!). In teams, students lay out their horsetails creating parallel rows, count the number of horsetails they each have, and identify whether one group is greater than, less than, or equal to those in the other group. Repeat with new teams.

- Math Plans & Ticklers: Sequence, p. 175
- Simple Classification, p. 162 (Sort objects into types, then compare # of objects in one class or type to another, discuss < > =; represent with written numerals.)
- Count and Measure: Like Thoreau and Minna Pratt, p. 177 (E.g., number of parts on an object: petals on a flower; legs on a bug, eyes on a potato, points on a leaf, etc.)
- Foxglove Towers, p. 180 (Use with simpler flowers having larger seeds.)
- Seed Collections, p. 144 (Compare different seed totals.)

Operations and Algebraic Thinking K.OA	
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from. **K.OA.1** 1. Represent addition and subtraction with objects, fingers, mental images, drawings*, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. *Drawings need not show details, but should show the mathematics in the problem. (This applies wherever drawings are mentioned in the Standards.)	**Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.** 1. Students **use objects they can loupe-study to count, manipulate, add, subtract and create equations**. Students can also count *parts* of objects, and use the number of parts in adding and subtracting (flowers with petals, plant sprigs with multiple leaves, etc.). **Examples:** 5 seeds = 2 seeds + 3 seeds 5 = 2 + 3 7 shells + 3 shells = 10 shells 7 + 3 = 10 • Math Plans & Ticklers: Sequence, p. 175 • The Simple Touch, p. 136 — Link a simple version of this artistic, close-up study of fingerprints to counting number of fingerprints on one hand added to number on the other. • Seeds! p.180 — combined with Math Plans & Ticklers: *Sequence*, p. 175 (skip microscope) Example: Students loupe-observe seeds from seed packets. They practice representing addition and subtraction problems using the seeds. Example: Students loupe-examine cut sections of fruits / vegetables to view seeds. Students practice representing the subtraction of seeds from cut sections. They can also use the seeds (once removed), to practice representing addition and subtraction problems. Consider using apples, oranges, snap peas, pumpkins, etc.)

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Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from. (continued)	**Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from. (continued)**
K.OA.2 2. Solve + and – word problems, add and subtract within 10. Use objects or drawings to represent the problem.	2. The teacher **creates and demonstrates how to represent + and – word problems (within 10) using sets of loupe-study objects. Students solve the teacher-generated word problems.** Then students generate their own word problems, represent the problem with their loupe-study objects, and give problems for peers to solve. (Also use objects with multiple parts, e.g., flowers have petals, stems have leaves). **Example**: Have students loupe-examine a cotton ball and generate a class loupe-list. Give students 10 cotton balls each. Start with 10 cotton balls, remove 3, and count the number that remain. Rejoin those 3 cotton balls to the 7 to understand the relationship between adding and subtracting as a form of putting together vs. taking apart, and that total number of objects in a group — or the number of parts on a single object — can shift according to what's added or taken away. • Math Plans & Ticklers: Sequence, p. 175 • The Simple Touch, p. 136 — Link a simple version of this artistic, close-up study of fingerprints to counting number of fingerprints: E.g.: one hand's added to number the other's; what if we subtract the thumbs? etc. • Seeds! p.180 — combined with Math Plans & Ticklers: *Sequence*, p. 175 (skip microscope) Example: Students loupe-examine cut sections of fruits / vegetables to view seeds and seed chambers. Students practice adding and subtracting seeds (in word problems the teacher creates) within 10 —using the seeds as objects to represent the problem. (E.g., apples, oranges, sugar snap peas, a group pumpkin, etc.)
K.OA.3 3. Decompose numbers < 10 or =10 into pairs by using objects, drawings. Record equation, e.g., 5=2+3 and 5 = 4+1.	3. Students **decompose numbers** (< 10 or =10) **using loupe-study objects** (beans, seeds, walnuts, leaves, pennies, etc). **With a given # of loupe-study objects** have students create two different groupings that add up to the same number — and then record equations to represent the groupings. **Example:** 5 seeds = 2 seeds + 3 seeds and 5 seeds = 4 seeds +1 seed. 5 = 2 + 3 and 5 = 4 + 1 • Math Plans & Ticklers: Sequence, p. 175 • Seeds! p.180 — combined with Math Plans & Ticklers: *Sequence*, p. 175 (skip microscope) (Use seeds from seed packets, seedpods, cut slices of fruits and vegetables — e.g., apples, oranges, sugar snap peas — and after loupe-examinations, move into decomposing numbers (< 10 or =10).

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from. (continued)	**Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from. (continued)**
K.OA.4 4. For any number 1-9, find the number that makes 10 when added to the given number, e.g., using objects and drawings, and record the answer with a drawing or equation.	4. **For any number 1-9, find the number that, when added to it, makes 10**, **using loupe-study objects, and record the answer with a drawing or equation**. **Example:** I have 8 chestnuts. How many more do I need to make 10 chestnuts? 8 chestnuts + 2 chestnuts = 10 chestnuts 8 + 2 = 10 • Math Plans & Ticklers: Sequence, p. 175 • The Simple Touch, p. 136 — Since students often use their fingers as counters, link a simple version of this lesson — an artistic, close-up study of fingerprints — to finding the number of fingerprints on one hand added to number on the other. • Seeds! p.180 — combined with Math Plans & Ticklers: *Sequence*, p. 175 (skip microscope) (Use seeds from seed packets, seed pods, or cut sections of fruits / vegetables: e.g., apples, oranges, sugar snap peas, etc.)
K.OA.5 5. Fluently add and subtract within 5.	5. With loupe-study objects, **practice fluently adding and subtracting within 5**. • Math Plans & Ticklers: Sequence, p. 175 • Seeds! p.180 (Loupe-study cut sections of fruits / vegetables to view seeds. Practice adding and subtracting seeds: e.g., sugar snap peas, apples, oranges.)
Numbers and Operations in Base Ten K.NBT	
Work with numbers 11–19 to gain foundations for place value.	**Place value: Work with numbers 11–19 to gain foundation understanding.**
K.NBT.1 1. Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.	1. Students **practice composing and decomposing numbers from 11 to 19 into ten ones and some further ones,** by manipulating loupe-study objects (beans, leaves, pebbles, bugs, crackers, pennies, etc.). Students **record each composition or decomposition** by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones. You can also loupe-study objects with multiple parts (e.g., flowers) as the basis for composing and decomposing. **Example:** 10 pebbles + 3 more pebbles = 13 pebbles thus: 10 + 3 = 13 • Math Plans & Ticklers: Sequence, p. 175

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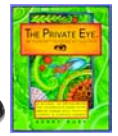

Measurement and Data **K.MD**	
Describe and compare measurable attributes. **K.MD.1** 1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.	**Describe and compare measurable attributes.** 1. The Private Eye process lends itself to describing **many attributes of a single object.** The teacher helps students select from their brain-stormed group lists (or individual lists) those attributes that can be measured. (Note: Though *number* is an attribute, it's countable vs. *measurable*.) After students use The Private Eye process and loupes to **describe attributes of an object, they learn how to recognize and generate comparisons that involve measurable attributes such as length, weight, size, and color.** **Example**: Have students use natural vision and then loupes to closely examine objects that connect to your science and literacy content. E.g., students begin with loupe-studying an index finger. After generating a group "Loupe-list" of comparisons, discuss which attributes in the list can be measured, such as by length or weight. "My finger is as long as two paper clips. It's as wide as a pea." Help students measure or weigh objects. Have students add more comparisons to the list emphasizing measurable attributes: e.g., "The twig is as long as ____ (e.g., as long as my finger)." "The leaf is as light as a _____." • "Preview… The Private Eye Process", p. 16-17 • "The Private Eye, like mathematics itself…" (Introduction) p. 174 • Thoreau's Backpack and a Tape Measure, p. 177 • Count and Measure: Like Thoreau and Minna Pratt, p. 177 • A Yard of Yard, p. 148 (Describe measurable attributes of objects: grass blade, pine cones, insects, etc.) • The Ultimate Portrait, pp. 177-178 (Use larger natural objects)
K.MD.2 2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.	2. Students **directly compare an attribute in common between two of the loupe-studied objects to see which has "more of"/"less of" the attribute, and describe the difference**. **Example**: A student observing two leaves closely might say "one is big as an elephant and the other reminds me of a feather". A discussion of *Why* helps students explore underlying characteristic shared between the object and what it was compared to, e.g., the leaf and elephant. Ask whether it was size or weight or both, or some other characteristic that the student was thinking of when she thought "elephant". Weight and measure the two leaves, teaching the language of "more of / less of, longer than / shorter than, heavier than / lighter than, etc. Have students practice analyzing and comparing in this way. • "Preview… The Private Eye Process, p. 16-17 • "The Private Eye, like mathematics itself…" (Introduction) p. 174 • Thoreau's Backpack and a Tape Measure, p. 177 • Count and Measure: Like Thoreau and Minna Pratt, p. 177 • A Yard of Yard, p. 148 (Compare objects found in a yard of yard.) • The Ultimate Portrait, pp. 177-178 (Use larger natural objects)

Classify objects and count the number of objects in each category. **K.MD.3** 3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count. (Limit category counts to be less than or equal to 10.)	**Classify objects and count the number of objects in each category.** 3. Students **classify loupe-study objects into given categories; count the numbers of objects in each category and sort the categories by count.** • Simple Classification, p. 162 (Apply the activity to all kinds of sorting and classifications, e.g., leaves.) • What to Collect, pp. 70-71 (Students sort mixed category collections into groups.) • Pick a Pocket Museum p. 77 (ideas for classifications) • Yard of Yard, p. 148 (find green things vs. brown; living vs. non-living, etc.)
Geometry **K.G**	
Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). **K.G.1** 1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	**Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).** 1. **To describe objects in the environment using names of shapes" — and to do so regardless of their orientations or overall size,** students first use bigger objects and natural vision as they look for geometric shapes found in nature and manmade things (e.g., soccer ball's hexagons). Like *Horton Hears a Who*, students then hunt for tiny geometric shapes found in smaller objects from the environment (the back of their hand, sponges, shells, leaves, cloth, etc.,) — using the loupe to aid discovery and TPE Questions focused for math. While loupe-observing students use the first TPE Question, focused for math: "What else does this remind me of in math? What else does this remind me of in shapes?" Students describe the relative positions of the objects and where on the object they found the geometric shape. **Examples:** "On the back of my hand I see little squares and triangles." "In the middle of the petals I see a circle." "The berries on the branch are spheres." "The bubbles are squished into hexagons." • "Preview… The Private Eye Process, p. 16-17 • Math Plans & Ticklers: Sequence, p. 175 ("What math shape does this object remind me of? What shapes can I find in my object?" What tiny math shapes do the parts of the object remind me of?") • Your Hand, p. 84 ("What math shapes do I see in my hand?") • Geometry in Nature: Angles and Shapes in Nature, p. 184 • Nature's Geometry, p. 176 • The Efficient Suitcase, p. 186-189 (simplify for kindergarten) • Tessellations, p. 190-192 (simplify for kindergarten)

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). (continued)	**Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres). (continued)**
K.G.2 2. Correctly name shapes regardless of their orientations or overall size.	2. After students **have correctly learned name shapes of objects — regardless of their orientations or overall size,** they can move from abstract drawings and puzzle-piece shapes to naming shapes of objects in the environment. Have students first name the shapes of bigger objects and then smaller objects in the room or outside and proceed to a loupe-examination of the surface texture (e.g., a basketball, baseball, small rubber ball are all spheres. Students then loupe-examine the skin and lacing of each ball, asking what else it reminds them of, what it's made of, they discuss the game it's used for, etc.) Now, like *Horton Hears a Who*, students loupe-hunt for tiny versions of geometric shapes found in natural and manmade objects (the back of a hand, a sponge, shell, leaf, cloth, etc.). While loupe-observing objects, students use the first TPE Question, focused for math: "What else does this remind me of in math? What else does this remind me of in shapes?" • "Preview… The Private Eye Process, p. 16-17 • Math Plans & Ticklers: Sequence, p. 175 ("What math shape does this object remind me of? What shapes can I find in my object?" What tiny math shapes do the parts of the object remind me of?") • Your Hand, p. 84 ("What math shapes do I see in my hand?") • Geometry in Nature: Angles and Shapes in Nature, p. 184 • Nature's Geometry, p. 176 • Tessellations, p. 190-192 (Good background for the teacher; simplify for kindergarten)
K.G.3 3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").	2. Students **will identify shapes as 2-D ("flat") or 3-D ("solid") and extend to loupe-study objects.** **Example:** Students loupe-observe and identify which object is 2D and which is 3D: postage stamps vs. sponges newsprint vs. rocks fabric swatch vs. leaf **Example:** Students loupe-observe an object (e.g., pine cone; flower) and model it in clay larger than the object is in nature, then compare to a photograph of the object. **Example:** Students compare images (photos and drawings) of objects they have loupe-studied and discuss and identify whether the shape and representation is 2-D or 3-D. **Example:** Students loupe-draw an object and experience the shift from 3D to 2D in their drawing and practice, again, identifying the drawing as "two-dimensional" and the object source as "three-dimensional". • "Preview… The Private Eye Process, p. 16-17 • Math Plans & Ticklers: Sequence, p. 175 ("What math shape does this object remind me of? What shapes can I find in my object?" What tiny math shapes do the parts of the object remind me of?") • Your Hand, p. 84 ("What math shapes do I see in my hand?") • Geometry in Nature: Angles and Shapes in Nature, p. 184 • Nature's Geometry, p. 176

Analyze, compare, create, and compose shapes. **K.G.4** 4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length). **K.G.5** 5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.	**Analyze, compare, create, and compose shapes.** 5. Students learn that abstract shapes are the foundation structures of manmade objects and natural objects. Students loupe-examine an object (e.g., a flower, a thumb, a leaf, a coin, a cork**), identify the shapes composing the object, then create a loupe-drawing of the object or model it in clay**. As they loupe-draw objects, or fashion a model in play dough or clay, encourage them to fill the objects with the geometric patterns and shapes they discovered while loupe-observing. When students loupe-draw, subtle analysis of shapes continues but now they **"model shapes in the world by drawing them"**. **Example:** Like *Horton Hears a Who*, students hunt for tiny geometric shapes found in smaller objects from the environment (the back of their hand, sponges, shells, leaves, cloth, etc.,) — using the loupe for close observation and TPE Questions focused for math: "What else does this remind me of in math? What else does this remind me of in shapes? What tiny shapes do I see?" When students use the loupe and the first TPE Question focused for math, they are analyzing and comparing 2-D and 3-D geometric shapes in different sizes and orientations, and they are using informal language to describe their similarities, differences, parts. Remind students that their objects are 3-D and their drawings are 2-D. As students prepare to loupe-draw their objects and the small shapes and patterns in the object, hold discussions of what shapes students see through their loupe in various objects. This meets the **"analyze and compare"** piece of the standard. **Examples:** Students will loupe-study and draw a sand dollar. As students loupe-examine the sand dollar, they'll discover the hexagon components in the shell, how the hexagons fit together to make the sand dollar's structure and surface. A prelude class disccussion / geometric analysis of objects helps in the drawing. To draw composite flowers, e.g., daisies, students analyze the component geometric structures, starting with a circle which, under a loupe, reveals that it is filled with tiny pentagons and hexagons. The tip of a ray petal includes a triangle form. • Math Plans & Ticklers: Sequence, p. 175 ("What else does this remind me of in geometric shapes?") • "Drawing as Close Observation" p. 26; "Loupe-Draw" p. 125, and "Drawing Tips", p. 127. • Nature's Geometry, p. 176 • The Hexagon Kit, p. 184 (simplify for kindergarten) • For background knowledge for the teacher: The Efficient Suitcase: Packing in Nature" p. 186-189

Analyze, compare, create, and compose shapes. (continued)	**Analyze, compare, create, and compose shapes.** (continued)
K.G.6 6. Compose simple shapes to form larger shapes. For example, "Can you join these two triangles with full sides touching to make a rectangle?"	6. Students create loupe-drawings of their loupe-study objects to help them see the small structures that build up to form larger structures and discover how geometric shapes appear in nature. As **students loupe-draw they "compose simple shapes to form larger shapes"** and continue to **"model shapes in the world by drawing them"**. Drawing also lays a foundation for clay models that capture detail and accuracy. **Example**: When students loupe-study and draw a sand dollar, for example, they'll discover the hexagons in the shell, how the hexagons fit together to make the sand dollar's structure and surface. The geometric analysis helps in the drawing. To draw composite flowers, e.g., daisies, students analyze the component geometric structures, starting with a circle which, under a loupe, reveals that it is filled with tiny pentagons and hexagons. The tip of a ray petal includes a triangle form. • Math Plans & Ticklers: Sequence, p. 175 ("What else does this remind me of in geometric shapes?") • "Drawing as Close Observation" p. 26; "Loupe-Draw" p. 125, and "Drawing Tips", p. 127. • Your Hand, p. 84 (observe the shapes within shapes and then loupe-draw one finger or model it in clay) • Nature's Geometry, p. 176 • The Hexagon Kit, p. 184 • For background knowledge for the teacher: The Efficient Suitcase: Packing in Nature" p. 186-189

