Overview

| Purpose | The tasks are intended to formatively assess students’ ability to put together and take apart numbers as well as their ability to apply mathematics to a context. Each situation is open ended, providing for multiple correct solutions. |
| Grade Level(s) | 1st Grade |
| Task Format | • The opening task is worded as if designed for one-on-one assessment with a single student, but it also makes an excellent whole-class teaching activity, giving the teacher a good sense of the group and giving students a rich exchange of ideas in preparation for later tasks. With a group activity, one gets less specific information about the individuals, but the benefits may outweigh that relatively minor loss.  
• The second task also is a good group activity. The variety of responses that may spontaneously arise in a group is greater than a single individual is likely to produce, and this helps open up students to new ideas.  
• Later tasks can also be done as a whole group, giving a sense of where the students are, but it may be more useful to administer those to individuals or, at most, two students at a time. |
| Materials Needed | • Color copies of the pictures provided at the end of this document. The tasks are not nonverbal — both teacher and students will talk — but some of the situations are picture based to minimize effects of reading or auditory language processing dysfluencies. |
| Prerequisite Concepts and Skills | For key prerequisite skills and concepts, see kindergarten “Operations and Algebraic Thinking” (K.OA) in the Common Core State Standards. |
| This task belongs to the major work of the K–2 grade band. For more information, see the PARCC Model Content Frameworks for Mathematics. |
Standards Assessed

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<tr>
<td><strong>1.OA.A.1</strong></td>
<td>Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.</td>
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<tr>
<td><strong>1.OA.A.2</strong></td>
<td>Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.</td>
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Notes:

1. These tasks center on smaller numbers; there are no problems with numbers in the teens, such as 13 – 8 = 5. Standards 1.OA.A.1 and 1.OA.A.2 cover all single-digit sums and related differences.

2. This task does not directly assess or require fluency. By the end of 1st grade, students are expected to demonstrate fluency when adding and subtracting within 10 (see 1.OA.C.6).

Standards for Mathematical Practice Embedded in this Task

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<tr>
<td><strong>MP1</strong></td>
<td>Make sense of problems and persevere in solving them.</td>
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<td><strong>MP3</strong></td>
<td>Construct viable arguments and critique the reasoning of others.</td>
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<td><strong>MP4</strong></td>
<td>Model with mathematics.</td>
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<tr>
<td><strong>MP6</strong></td>
<td>Attend to precision.</td>
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Recording Students’ Work

On the following pages are observation points that are labeled A–CC. As the student(s) work through the task, record the letters that are applicable to that student. Add any extra notes you think would be useful for you to remember when working with the student or that you might want to recall when talking or writing to parents. One 3” × 5” card per student should be sufficient for these notes. A tablet computer with a camera (or similar device) could let you keep photos and audio recordings of the work, too.
Preparing for the Task

1. **Make the basic set of materials.** A color print of the pictures is included at the end of this document.

2. **Read the entire task set 1–5 before starting Task 1.** Each step in this task plays a role in the assessment. Reading the entire task will give you the big picture of what portions of the task are intended to assess which portions of the standards. It will also remind you how far to take each task to avoid circumventing one of the intermediate steps in the assessment.

3. **Treat the tasks as puzzles and teaching opportunities.** These tasks present challenges that tell you about a student’s ability to make a mathematical connection to a context as well as the student’s ability to put together and take apart a number. They do not predict whether the student will or will not be good at this kind of task in some long-term future. That future depends on chances to learn and stretch, and the tasks here can give you the kind of information that will let you stretch your students’ thinking.

   To get the most useful information, you need to know what your students can do when they are thinking about the task and not distracted by thinking about how well they are doing, how they might look to you or how they might compare with other students.

   For that reason, try to keep the student’s experience as natural and playful as possible: You are a teacher, so you may teach, and your students are children, so they may play with the tasks and challenges or enjoy solving puzzles. And as a teacher, try to keep your responses informative (“I see three strawberries” or “I wonder why there are more red fruits than green fruits.”) rather than evaluative (“Very good!”) or consoling without clarifying (“That’s close; try again”).
Implementing the Task
Throughout the document, when specific language is suggested, it is shown in blue text.

**TASK 1: Making Sense of a Scenario**
Before working with a specific task, it is useful to know what the student spontaneously describes and what the student may not do spontaneously but can do when asked. This very open-ended task asks students simply to describe what they observe. For students, it is an opportunity to describe by classifying and counting at varying levels of specificity and precision. For the teacher, it is an opportunity to see both what the students do spontaneously and what they may not do spontaneously but can do when asked.

**TASK STEPS**

1. Show fruit picture and ask student to describe what he or she sees.
2. Accept any descriptions and ask, “What else can you say?”
3. Probe: If student does describe categories (e.g., apple/strawberry or red/green) but does not give any quantitative information, name one pair of categories that the student identified and ask, “Are there more <category1> or <category2>?”

**COMMENTS ON TASK OR STUDENT RESPONSES**

This general task assesses the baseline: What does the student observe? Can the student count? Does the student spontaneously classify (red, green; large, small; apple, strawberry; lots of leaves, one leaf, two leaves, no leaves; fruit)? Does the student spontaneously comment on quantities (more apples, three strawberries, four green apples, that one doesn’t have leaves, that’s a lot of fruit)?

- The design of the art is intentional: two sizes of apple, two colors of fruit, variations in the fruit (no two fruits alike), more red fruits than green fruits, more green apples than red apples, green apples have different numbers of leaves. These categories create the possibility for a variety of numerical combinations: 4 + 6 (green + red or small + large); 3 + 7 (strawberries + apples); 8 + 2 (leaves + no leaves); 3 + 4 + 3 (red apples + green apples + strawberries). Other possible include partial comparisons 6 + 1 (apples by size).
- In step 3 (“Are there more ___ or ___?”), does student count to find out? Does student report the numbers or just the conclusion (e.g., “There are more red ones.”)?

At this point in the task, if students attach calculations to their descriptions — for example, saying, “I see six big apples and one little apple, so that’s seven apples” — accept it but don’t push for it. The goal in this portion of the task is descriptions of the picture; other sections will address students’ ability to attach and perform calculations.
OBSERVATIONS OF STUDENTS

A. Student does not try.
B. Student gives a single qualitative description, like “fruit” or “apples,” with no further detail (number, color, size, kind of fruit or comparisons).
C. Student categorizes by only one attribute (color, kind of fruit or size), does not see or attempt a second categorization, and does not include number as part of the description. For example, student says, “Strawberries and apples” or “Green fruits and red fruits.”
D. Student includes a single quantitative description, for example, counting all objects together or counting only one subset (by color, kind of fruit or size) but does not count more than one subset. For example, student says, “I see three strawberries,” but does not mention or count the apples.
E. Student is able to categorize in several different ways (kind of fruit, color, number of leaves, size, etc.) and names the quantities of at least some of these sets.
F. Student correctly answers the question — “Are there more ___ or ___?” — by counting the objects in each category.
G. Student correctly answers the prompt without counting out loud.

TASK 2: Problem-Posing Scenario

Students are given a standard and simple word-problem scenario — Eva has six strawberries and Jackson has four strawberries — but without a question. Instead, they are invited to suggest observations and/or questions.

TASK STEPS

1. If you are working with a group, call up two students and use their own names. If you are working with one student, ask the student to pretend one hand is Eva and the other hand is Jackson (or whatever names appeal to you and the student). Using no objects of any kind, pretend to put six strawberries in one hand as you say, “Eva has six strawberries.” Nothing is there, of course, but ask the student to “check” to make sure that Eva got just the right amount. If the student doesn’t seem to realize that the whole game is pretend, make that clear. Then pretend to put four strawberries in the other hand as you say, “Jackson has four strawberries.”

COMMENTS ON TASK OR STUDENT RESPONSES

Why invisible strawberries? Why not use counters or something else real to make it more concrete? Mathematics depends on many foundations. One of them is good working memory. We help students expand their capacity by providing opportunities to mentally visualize quantities and to “hold” multiple pieces of information in their heads. In not providing counters or a picture, we also move the student more toward mental computation instead of counting to come up with the response. Understanding that this is a formative assessment task, we gain insight into the student’s ability in this area.
Why go through the extra step of having the student “check” things that don’t exist? Children generally find this step quite funny and a nice invitation to dive into the problem with all their ability to pretend. But there’s also a serious mathematical side. Asking the student to check focuses attention on the number because the student has to pretend-count, and it also helps the student create a mental image of the objects in each hand.

OBSERVATIONS OF STUDENTS

H. Student does not try to engage in the pretend scenario. If this happens, name your own hands and “put” the pretend strawberries in them. Then proceed to the next step.

I. Student indicates that he or she understands the play and gives an indication that he or she recognizes that one of the quantities is greater than the other.

2. Ask, “What good questions can you make up about this situation?” Depending on the prior experiences of students in your class, you might word this differently — perhaps “If you were going to make up a story problem (or word problem), what questions might you include in your problem?” You may need to clarify: “So far, the story problem says ‘Eva has six strawberries. Jackson has four strawberries.’ What question can you ask to make this into a word problem?”

3. Accept every question you get, whether it is mathematical or not, and don’t ask the student (or class) to restrict his or her answers. If you get only one, ask, “Can you (anyone) think of any more?”

   The first few times you do this, you want to hear everything so that you get to know your students’ thinking — you are assessing as well as teaching — and so that they get to hear a wide variety of responses and don’t self-censor. If you are working with the class, you might write each question on a chart, using two columns: one for mathematical questions and one for nonmathematical ones. At the end, comment that some are mathematical and others are social but don’t say one kind is better than another. After all, “Why does Jackson have fewer?” and “Will Eva share?” might, in some circumstances, really be the most important and relevant questions!

4. “Any more?” At this age, and especially the first time, students may well run out of questions (or repeat earlier ones just to join in) after only two or three. Count in your head to 20 to leave time for thinking, but if nothing comes, say, “OK, well maybe there aren’t any more good ones!” and be done.

   If you don’t get at least one question about combining (e.g., “How many … altogether?”) or comparing (e.g., “How many more … ?”), make the missing ones up and add them to the list. You will need them for the next task.

COMMENTS ON TASK OR STUDENT RESPONSES

Many questions are possible. Some of the following are quite common. Some are rare. Notice that some are not mathematical and that one of the mathematical ones makes no real sense in this context.

- Who has more strawberries?
- Why does Jackson have less?
- How many more strawberries does Eva have?
- Jackson wants to have as many as Eva. How many more does he need?
- How many do the two of them have together?
- If they give them all to me, how many will I get?
- Will Eva share?
- Can they share equally without cutting any strawberries?
- I brought strawberries for lunch today!
- They each ate half of their strawberries. Now how many do they have?
- If Jackson takes one of Eva’s strawberries, how many do they have now?
- How much is six take away four?

Students at this age don’t always reliably distinguish questions and observations that are mathematical (more, less, total, can they share?) from ones that are social or personal (Why does Jackson have less? Will Eva share? I brought strawberries.). Also, the mathematical questions that they ask may be restricted to types that have become familiar in class, which may limit the variety you hear. A common default of adults, but less so with children, is, “How many do they have altogether?”

And students may ask questions that use information from the problem but not in a way that shows clearly that they are intending to be relevant to the situation. For example, “How much is six take away four?” uses the numbers, and even describes a calculation that could be relevant (e.g., for seeing how many more Eva has), but as stated, it doesn’t say what the computation 6 – 4 would tell us about the situation.

One goal of teaching is to help students, over time, learn to distinguish mathematical questions from nonmathematical ones and to increase the variety of mathematical ways of looking at the situation and the variety of questions they ask.

If you do this kind of activity with the entire class regularly (e.g., for just a few minutes at “morning time” two or three times a week, taking any suitable word problem from whatever curriculum you are using and removing the associated question) and you occasionally introduce 1st grade appropriate question(s) of your own, students do develop a greater repertoire over the course of the year.

**OBSERVATIONS OF STUDENTS**

J. Student does not respond with a question or observation about the story situation. Child may say nothing or describe only the reality (“I don’t see anything in my hands”) or simply restate the story scenario (“Eva has six strawberries”).

K. Student asks one relevant question but only about the stated facts of the situation (“How many strawberries does Eva have?”), not about unstated information that can be derived from those facts (like who has more).
L. Student asks a nonmathematical question.

M. Student asks a genuinely mathematical question, easy or hard, that could
imaginably be used in a word problem but, even with prompting, finds only one
such question to ask.

N. With prompting, student provides more than one question, showing mathematical
flexibility within this scenario.

O. Student spontaneously offers more than one relevant mathematical question.

**TASK 3: Compare or Combine Scenario**

Student(s) will answer a question created in the previous task.

**TASK STEPS**

1. Choose a problem that involves combining the two collections of strawberries or counting them all.

   - How many ... altogether?
   - If they both gave me all their strawberries, how many would I have?

Have the student(s) do the necessary calculation to answer the question.

**COMMENTS ON TASK OR STUDENT RESPONSES**

Depending on prior experience, students might be able to add the two numbers or recognize them as a 10-pair (two numbers whose sum is 10). Otherwise, they might just count the nonexistent objects mentally. Recognizing that this task is intended to assess the student(s)’ ability to perform this calculation without physical objects, this is not the time to provide these counters or pictures. Make note of this need and provide those aids for the students who need them during a future lesson. Whether the child answers correctly or not, you might ask, “How did you come up with that answer?” to determine more information about whether the student counted all the objects, counted on from one of the addends or recognized the 10-pair.

**OBSERVATIONS OF STUDENTS**

P. Student is not able to calculate the correct sum to answer the question.

Q. Student is able to provide the correct answer.

R. In both cases, the teacher should make note of the method the student described for the calculation.

2. Choose a problem that involves comparing the two collections of strawberries.

   - How many more does Eva have than Jackson?
   - How many more does Jackson need to have the same as Eva?
   - How many does Eva need to eat so that she and Jackson have the same number?
Have the student(s) do the necessary calculation to answer the question.
COMMENTS ON TASK OR STUDENT RESPONSES

Problems of this type can be calculated several ways. One goal is to determine whether or not the student can answer the question correctly. Another is to ascertain how the student calculates the answer. These problems can be viewed as a difference problem (6 – 4 = ?) or an unknown addend problem (4 + ? = 6). (See Common Core State Standards for Mathematics Glossary, page 88, for more details.) It does not matter which of these methods is the student’s preference, but knowing which the student chooses helps you understand how the student approaches the calculation. Again, whether the student answers correctly or not, ask, “How did you come up with that answer?” and make note of the response.

OBSERVATIONS OF STUDENTS

S. Student is not able to calculate the correct sum to answer the question.

T. Student is able to provide the correct answer.

U. In both cases, the teacher should make note of the method described.

TASK 4: Partitioning Scenario

The student tries to find as many ways as possible to partition 10 pennies, giving some to each of the three space people, with the most going to Red, fewer to Blue and the fewest to Yellow. Use counters (preferably real pennies) and pictures of the three creatures (provided) or three cups in three different colors if you prefer.

TASK STEPS

1. Show students the picture of the three people and give the student 10 pennies (or other counters) to experiment with. Tell the student, “Three very small and very colorful space people just came to visit you. You have 10 pennies, and you decide to give them all to your visitors as a present. Yellow says, ‘That’s a very nice present. Thank you very much. I’m tiny, and pennies are quite big. Please, can I have the fewest?’ And Blue says, ‘That’s a very, very nice present. Thank you very, very much. But I’m small, too, and pennies are big. I can carry more than Yellow, but not as much as Red. Can I have a middle-size amount?’ And then Red says, ‘That’s a very, very, very nice present. Thank you very, very, very much. They’re right. Pennies are big. But I’m the biggest, and I don’t want them to have to carry too much! I’m willing to take the most.’ You giggle and then give all of your pennies to them, making sure Red gets the most and Yellow gets the least. Show one way that you can do that!”

COMMENTS ON TASK OR STUDENT RESPONSES

Any question you give students should be as clear and unambiguous as possible so that the effort they expend is on the mathematics and not on figuring out what you meant. But, especially in formative assessment, it is often useful to start with the least scaffolded question and provide additional support if necessary for clarification. This gives you the most information about what the student is able to do on his or her own. You will also want to respond with questions or information rather than evaluation, positive or negative, and keep the interaction
playful. Whether their arrangement is correct or not, you can say, “OK, let’s check to see if you’ve done what they asked for! I’ll read the story again, and you check to make sure they all got what they wanted.” That suggests a way for students to evaluate the correctness of their solution on their own, rather than “Great job!” or “Almost; try again,” which make you the evaluator of correctness.

Whether the student’s answer happened to be correct or not, if a student cannot seem to judge the correctness, keep a record of that, and see if asking leading questions helps. You’re handling understanding the story much the way you might do it in an English language arts class. “Do you remember who wanted the least? Why did that one want the least? And who should get the most? Why? Now let’s check. Did Yellow get the least? Did Red get the most? Did Blue get a middle-size amount?”

**OBSERVATIONS OF STUDENTS**

V. Student does not attempt the task or seems uncertain what to do. If this happens, offer to read the story again.

W. Student still does not attempt the task. So you start by giving 4 to Red, 3 to Blue and 3 to Yellow and say, “OK, let’s check to see if you’ve done what they asked for! I’ll read the story again, and you check to make sure they all got what they wanted.” At each critical point in the story, ask the student to check to make sure things are right and, if not, “fix” them.

X. Student gives pennies to the space people but not in a way that meets the rule. “OK, let’s check to see if you’ve done what they asked for! I’ll read the story again, and you check to make sure they all got what they wanted.” At each critical point in the story, ask the student to check to make sure things are right and, if not, “fix” them. Then check again by rereading the story.

Y. Student gives pennies to the space people in a way that meets the rule. “OK, let’s check to see if you’ve done what they asked for! I’ll read the story again, and you check to make sure they all got what they wanted.” At each critical point in the story, ask the student to check to make sure things are right. If student cannot judge the correctness, ask questions to elicit what the student understands from the story. “Do you remember who wanted the least? Why did that one want the least? And who should get the most? Why? Now let’s check. Did Yellow get the least? Did Red get the most? Did Blue get a middle-size amount?”

Z. Student gives pennies correctly and can check correctly.

2. Once the student has provided a correct scenario, ask if there is any other way to give Yellow the least and Red the most. Continue this until student declares that there are no other ways.

**COMMENTS ON TASK OR STUDENT RESPONSES**

Enumerating combinations per se is not in the 1st grade standards. But asking students to find as many ways as possible to meet a set of criteria has two purposes. It builds perseverance, and it begins the process of a student trying to think of a way to determine whether he or she has found all of the possibilities. Because this is a formative assessment, this portion of the task is included to help you ascertain where the student falls on these two spectra. One way to do this
problem is to start with an amount that you can give to Red and then give Yellow and Blue the remaining coins. Solutions include (R-Y-B): 7-2-1, 6-3-1, 5-4-1 and 5-3-2.
OBSERVATIONS OF STUDENTS

AA. Student stops after finding one solution.
BB. Student finds a few solutions but not all of them.
CC. Student is able to systematically determine that he or she has found all of the solutions to this problem.