Part-whole word problem lessons for grades 1-2

**Lesson 1:**

Goal for this lesson: Make sure everyone understands the meaning of the words we use in Part-Whole problems.

Bigger goal: Listen to or read a word problem and figure out if you can think of it as parts that make up a whole.

General notes: This will be too easy for most children at grade 1, but will be helpful for a few. It’s a good idea to skip this lesson for the more advanced students. The best learning and discussing will probably happen in a group that’s a mix of children who struggle and children who are at a middle level—you want to have some variety of levels of understanding, but you don’t want to include children who might be disruptive because they are bored with the level of the questions.

This lesson can be split up if the discussions are taking longer than you expect and/or longer than the children’s attention span.

Materials:

* About 20 objects that are the same except for a characteristic such as color or size (in 2 colors or sizes). The instructions below are written for blue and red cubes—please adapt the wording for the counters you are using.
* An object that can be used to hide some of the counters. The instructions are written for a felt square—please adapt the wording for the object you are using.
* Word problems (adapt for the children in your class to use their names, things they would be interested in, the objects you are using, etc.).

Lesson norms to establish for the children to do:

* Children wait to share their ideas until everyone has a chance to think.
* If you are working with a larger group of children (5 or more?), encourage them to show when they have an answer or idea by holding their thumb up next to their chest (where you can see it, but it doesn’t distract the other children)

Lesson norms to establish for you to do:

* Wait a few seconds longer than you think you need to so all children have a chance to think before interrupting for an answer: if using the thumbs up strategy wait until all or almost all children have a thumb up.
* After a child gives an answer with an important or tricky idea, invite the other children to restate it in their own words (for example: “A. had a really interesting idea. I wonder if anyone can explain A’s idea in another way”)

Lesson:

**Question: When a problem asks how many “in all” or how many “all together”, what does that mean?**

To do: give children a few seconds to think. Call on children to answer. Accept the answer “it means to add the numbers together”, but probe for other answers that don’t use the work “add”. The next prompt builds on this, so if the only answers you get are “add”, just go on.

*First set of questions (objects arranged by an attribute such as red/blue)*

**Set up: put out about 5 red and about 7 blue cubes**

**Question: I want someone who can show me what cubes I should count if I want to know how many red cubes there are.**

To do: call on a child to show the group. Encourage them to touch and move the cubes to show which ones to count. If they also count the cubes that’s OK, but make sure that there’s a clear visual of the red cubes, and name that group as the red cubes.

**Question: I want someone who can show me what cubes I should count if I want to know how many blue cubes there are.**

To do: repeat the previous process for the blue cubes.

**Question: I want someone who can show me what cubes I should count if I want to know how many cubes there are in all.**

To do: give children a few seconds to think (this is the important one). Call on someone to show what cubes to count. Reinforce that they are counting the blue and red cubes both.

**Set up: arrange the cubes in a line with the red cubes on one end and the blue ones on the other end**

**Question: Could I find how many cubes by counting the red cubes first and then the blue ones? Count with me to find out how many cubes there are in all.**

To do: Count the red cubes and pause and say: **should I start over at with this** [point to the first blue cube] **or do I go on with my counting?** [pause for children to respond] **I’m going to go on to the next number because I want to count all of the cubes together.** Finish the counting sequence (or go back to the beginning and do the full count.

**Question: Could you count them all starting with the blue? Who would like to show how to do that?**

To do: call on a child to count starting with the blue. Reinforce (or remind) that the child counted (or should count) all of the cubes together, not the red and blue separately.

**Question: Could we mix them all up and count?** [mix up the order of the cubes] **Who would like to show how to mix them all up and count?**

To do: this is a good problem to call on a child who might be confused—the process of mixing the blue and red cubes up before counting is helpful for children who are struggling with the idea of putting together different kinds of things.

*Second set of questions (objects separated by ownership)*

**Set up: Choose 2 students to hold some cubes. (In the following, I’ll call them A…. and B……). Give A…. 3 cubes and give B….. 2 cubes.**

**Question: Who can tell me what I should count if I want to know how many cubes A… has?**

To do: pause briefly, then call on someone to tell and/or show.

**Question: Who can tell me what I should count if I want to know how many cubes B… has?**

To do: pause briefly, then call on someone to tell and/or show.

**Question: Who can tell me what I should count if I want to know how many cubes A… and B… have all together?**

To do: pause a few seconds longer, then call on someone to tell and/or show.

**Question:** **So what does “all together” mean?**

To do: call on a child to answer or restate the previous answer.

If no one has yet answered how many A… and B… have altogether, then ask that question now. Take back the cubes.

**Question:** **Now I have some mental math questions for you. I want you to give me a thumbs up when you think you know the answer.**

**Problem: Suppose I gave A… 1 cube and B… 5 cubes. How many cubes would they have all together?**

To do: wait until everyone or almost everyone has their thumb up, and then:

* Call on someone to tell the answer. Record it on your paper or whiteboard
* Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
* Ask if anyone got a different answer. If so, record it on your paper or whiteboard
* Ask someone to explain how they got their answer.

**Problem: Suppose C… had 8 pencils and D… had 3 pencils. How many pencils would they have all together?** Note: adjust the numbers to be appropriate for the mental math skills these students are working on.

To do: wait until everyone or almost everyone has their thumb up, and then:

* Call on someone to tell the answer. Record it on your paper or whiteboard
* Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
* Ask if anyone got a different answer. If so, record it on your paper or whiteboard
* Ask someone to explain how they got their answer.

*Note: this could be a stopping point if children are mentally tired*

**Problem: This one is trickier, so I want you to do your best thinking for this one. Imagine that A… has some cubes and B… has some cubes, and they have 5 cubes all together. What does that mean, when I say they have 5 cubes all together?**

To do: pause, and ask someone to explain all together. Restate it clearly yourself (for example, “if A… and B… put their cubes in a mixed up pile on the table, and I counted those cubes, I’d get 5 cubes in the pile”).

**Continue: OK, so they have 5 cubes all together. I’m going to tell you that B… has only 1 cube. Can you figure out how many cubes A… has?**

To do: wait until everyone or almost everyone has their thumb up, and then:

* Call on someone to tell the answer. Record it on your paper or whiteboard
* Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
* Ask if anyone got a different answer. If so, record it on your paper or whiteboard
* Ask someone to explain how they got their answer.

**Set up: hide 2 blue and 5 red cubes under the felt square**

**Problem:** **This is our last problem for this lesson. I have some cubes hidden under this felt square—some are blue and some are red. There are 7 cubes in all, and there are 2 blue cubes. I want to know how many of the cubes are red. Give me a thumbs up when you have an answer**

To do: wait until everyone or almost everyone has their thumb up, and then:

* Call on someone to tell the answer. Record it on your paper or whiteboard
* Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
* Ask if anyone got a different answer. If so, record it on your paper or whiteboard
* Ask someone to explain how they got their answer.
* Uncover the cubes to show the answer. Group the blue and red cubes together and repeat that there are 2 blue cubes and 5 red cubes. Push the groups together and repeat that there are 7 cubes all together.

**Lesson 2:**

Goal for this lesson: Make a labelled number-bond diagram (also called a math mountain) for a part-whole problem.

Bigger goal: Listen to or read a word problem and figure out if you can think of it as parts that make up a whole.

General notes: Number bonds are used to show parts and wholes in an addition or subtraction problem, especially in grades 1 and 2. In this lesson we’re not only going to put numbers in the number bonds, we’re also going to write labels to say how we’re connecting the diagram to our problem. Number bonds show a whole made of 2 parts—lines connect the whole to each of the parts. Number bonds most commonly have the whole at the top (hence the name math mountain), but can also be drawn with the whole on the right or the left. Number bonds can show both addition and subtraction situations:

8 + 4 = ? 10 - 3 = ?

children

boys

girls

A labelled number bond has both numbers and words:

Some of the children in the class are girls, and some are boys.

There are 10 boys and 9 girls. How many children?

Materials:

* A large blank number bond drawn on a whiteboard or similar
* About 6 word Part-Whole problems (see samples on the next page).
* Word strips with the part-whole labels for each word problem you are planning to use (write onto a slip of paper and have tape or magnets ready to stick it onto the number bond diagram) Option: have blank word strips and markers for children to write their own labels
* A marker for writing in the numbers.
* Several items of the type used for lesson 1 (blue and red cubes), and word strips that correspond to the items (for example, “red cubes”, “blue cubes”, “all cubes”). See lesson introduction.

Using the samples on the next page as a starting point:

* Choose or adapt 2-3 PPW-WU (whole unknown) problems and about 2-3 PPW-PU (part unknown) problems (PPW stands for Part-Part-Whole). (4-6 total)
* Include at least 2 problems with wording similar to the \*-ed samples (don’t include the word “all”)
* Adapt the problems by choosing numbers that are at an appropriate mental math level for the students in the lesson (small enough numbers that they should not need pencil and paper for these). Try to make the numbers reasonable for the items in the problem.
* Adapt the problems by changing the names to names of children in your class, and changing the objects to objects that are familiar to the children in your class as desired.

(See lesson 1 for suggestions on classroom norms for these of lessons)

**Sample word problems:** Diagram with given info:

white T-shirts

blue T-shirts

In all

**Problem type**: PPW-WU

**Labels for word strips**: White T-shirts; Blue T-shirts; In all

**Problem**: Blake has 3 white T-shirts and 6 blue T-shirts. How many T-shirts does he have in all?

All together

Peter’s dinosaurs

Zach’s dinosaurs

**Problem type**: PPW-WU

**Labels for word strips**: Zach’s dinosaurs; Peter’s dinosaurs; All together

Zach has 7 dinosaurs. Peter has 5 dinosaurs. How many dinosaurs do they have all together?

All together

Anne’s stickers

Kendra’s stickers

**Problem type**: PPW-WU

**Labels for word strips**: Kendra’s stickers; Anne’s stickers; All together

**Problem**: Kendra has 6 butterfly stickers. Anne has 12 butterfly stickers. How many butterfly stickers do they have all together?

**Problem type**: PPW-WU \*

Toy animals

Hard animals

Stuffed animals

**Labels for word strips**: Stuffed toy animals; Hard toy animals; Toy animals

**Problem** There are 5 stuffed toy animals in the toy box, and 3 hard plastic toy animals in the toy box. How many toy animals are in the toy box?

Gum balls

White gum balls

Purple gum balls

**Problem type**: PPW-PU \*

**Labels for word strips**: Purple gum balls; White gum balls; Gum balls

**Problem**: There are 9 gum balls in the drawer. 4 of the gum balls are purple and the rest are white. How many of the gum balls are white?

Books

Chapter books

Picture books

**Problem type**: PPW-PU \*

**Labels for word strips**: Chapter books; Picture books; Books

**Problem**: Kelly has 16 books. 5 of the books are chapter books, and the rest are picture books. How many are picture books?

**Problem type**: PPW-PU

In all

Small erasers

Large erasers

**Labels for word strips**: Large erasers; Small erasers; In all

**Problem**: There are some large erasers and some small erasers. Three of the erasers are small. In all there are 8 erasers. How many erasers are large?

**Problem type**: PPW-PU \*

People

Adults

Children

**Labels for word strips**: Children; Adults; People

**Problem**: There are 8 people sitting at the table. 2 of the people are children. How many of the people are adults?

Lesson:

*Set up:*

*Introduction:*

B

R

R

**Set up: Set out 4 blue and 3 red cubes. Place the word strips “red cubes”, “blue cubes” and “all cubes where children can see them. Have the blank number bond drawn and ready to go.**

B

B

B

R

**Explain: If we have a math question about these cubes, we can count just the red cubes or just the blue cubes or we can count them all together. This diagram is called a number bond, and it lets us show how the red cubes and blue cubes fit together with all of the cubes. I’m going to put the label “red cubes” next to one of these circles at the bottom, and the label “blue cubes” next to the other bottom circles. Those circles tell what the cubes are like when they are in two parts. I’m going to put the label “all cubes” next to the top circle. The top circle shows what the cubes are when we put them all together.**

*Completed:*

all cubes

blue cubes

red cubes

**Call on a child to count and tell you how many red cubes there are, and write the number in the red cube circle.**

all cubes

**Call on a child to count and tell you how many blue cubes there are, and write the number in the blue cube circle.**

**Call on a child to tell you how many cubes there are in all, and write that number in the top circle.**

blue cubes

red cubes

**Repeat that the two bottom circles show two parts, and the top circle is what you have when you put the parts together. Note that it doesn’t matter in what order you show the parts—red could be either on the right or the left.**

*Main lesson discussion: (follow the same pattern for each of the word problems.)* ***Alternate between whole-unknown and part-unknown problems***

**Instructions: I’m going to read some math problems, and I want you to help me figure out what goes where on the number bond. Also give instructions here on how you want children to signal when they have an answer (for example: give me a thumbs up in front of your body when you know the answer)**

**For each word problem:**

**Erase or take down the information from the previous problem**

**Lay out the word strips with the labels for the problem where the children can see them.**

**Read the word problem out loud (repeat the word problem as necessary for all children to hear and process the problem. Variations:**

* Have the problem printed and ask a child to read it.
* Have the problem printed and read it aloud in unison
* Simplify the wording of the problem so it’s easier to understand when read out loud.

Discuss:

* **Ask: who can tell me which things in this problem are the parts, and which is the whole (the parts put together)?**
  + Pause for a couple of seconds.
  + Call on a child to answer (if they give the number answer instead, tell them that it will be time to share that in a minute and repeat the question that you want to know which word strips belong to the parts and the whole).
  + Move the word strips to the appropriate circles on the number bond.
  + Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
  + Ask if anyone got a different answer. If so, move the word strips to show the other answer
  + Ask someone to explain how they decided which labels go where.
* Ask the children to check the answer by deciding if it makes sense that the parts are part of the whole. (for example: are the red cubes part of all of the cubes? are the blue cubes part of all of the cubes?)
* Ask the children where you should write the numbers that are given in the problem (for example: the problem said that there are 3 red cubes and 7 cubes in all. Where should I write 3? Where should I write 7?) (this completes the diagram to the stage “diagram with given info” on the samples page)
  + Ask the children what number goes in the third circle.
  + Call on a child to answer, and write that number in on the diagram
  + Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
  + Ask if anyone got a different answer. If so, write that on the diagram too
  + Ask someone to explain how they got their answer.
  + Discuss until there is a consensus about the correct answer.

Repeat for your prepared problems (at least 4). This lesson can be split into two days if desired.

**Lesson 3:**

Goal for this lesson: Make a labelled number-bond diagram (also called a math mountain) for an Add To problem. Note that in an add-to problem, if you were making a movie of what happens, there would be an amount, something would be added to it, and then there would be a new amount at the end. Any of the amounts (start, end, change) can be the unknown, so these are not necessarily addition problems

Bigger goal: Listen to or read a word problem and figure out if you can think of it as parts that make up a whole.

General notes: An add-to (or Join) problem can be represented in an equation as start + change = result. In a number bond, it looks like one of these. Join is the Congnitively Guided Instruction name for what is called Add To in the Common Core Math Standards.

Materials:

* A large blank number bond drawn on a whiteboard or similar
* About 8 Add to (Join) problems (see samples on the next page).
* Word strips with the part-whole labels for each word problem you are planning to use (write onto a slip of paper and have tape or magnets ready to stick it onto the number bond diagram) Option: have blank word strips and markers for children to write their own labels
* A marker for writing in the numbers.
* Counters of the sort used in lesson 1, but with only one attribute (for example: blue cubes)
* Word strips that say “had first”, “got more”, and “has at the end”

Using the samples on the next page as a starting point:

* Choose or adapt 1-2 JRU (result unknown) problems, 1-2 JCU (change unknown) problems of the amount needed type (\*), 1-2 JCU (change unknown) problems of the type where the change happened in the past (without \*), and 1-2 JSU (start unknown) problems. Total 4-8 problems. (note that the \*-ed problems: how many needed, are easier for most students than the change in the past problems)
* Adapt the problems by choosing numbers that are at an appropriate mental math level for the students in the lesson (small enough numbers that they should not need pencil and paper for these). Try to make the numbers reasonable for the items in the problem.
* Adapt the problems by changing the names to names of children in your class, and changing the objects to objects that are familiar to the children in your class as desired.

(See lesson 1 for suggestions on classroom norms for these of lessons)

**Sample word problems:** Diagram with given info:

had before

found

has now

**Problem type**: JRU Add to result unknown

**Labels for word strips**: Had before, found, has now

**Problem**: Luke had 7 markers. When he cleaned his room, he found 3 more markers. How many markers does he have now?

has now

got from mom

had before

**Problem type**: JRU Add to result unknown

**Labels for word strips**: Had before, for from mom, has now

**Problem:** Alice had 12 stickers. Her mom gave her 3 more stickers. How many stickers does she have now?

wants to have

needs to make

made already

**Problem type**: JCU\* Add to change unknown, need more

**Labels for word strips**: made already, needs to make, wants to have

**Problem**: Sarah made 5 clay animals. How many more does she have to make to have 7 clay animals?

**Problem type**: JCU \* Add to change unknown, need more

total to finish

more needed

has done

**Labels for word strips**: has done, more needed, total to finish

**Problem:** Sam has done 8 math problems. How many more does he need to do to have 12 problems done?

has now

found

had before

**Problem type**: JCU Add to change unknown, change in past

**Labels for word strips**: had before, found, has now

**Problem**: Connor had 7 bouncy balls. When he cleaned his room, he found some more bouncy balls, and then he had 9 bouncy balls. How many bouncy balls did he find?

has now

got for Birthday

had before

**Problem type**: JCU Add to change unknown, change in past

**Labels for word strips**: had before, got for birthday, has now

**Problem**: Lisa had 7 dolls. She got some more for her birthday, and now she has 11 dolls. How many did she get for her birthday?

**Problem type**: JSU Add to start unknown

in all

made today

made yesterday

**Labels for word strips**: made yesterday, made today, in all

**Problem**: Yesterday Jeremy made some paper airplanes. Today, he made 4 more paper airplanes. In all, he made 10 paper airplanes. How many paper airplanes did he make yesterday?

**Problem type**: JSU Add to start unknown

has now

painted more

had to begin with

**Labels for word strips**: had to begin with, painted more, has now

**Problem**: Ethan had some pictures he painted in his bedroom. He painted 3 more pictures. Now he has 8 pictures. How many were in his bedroom to begin with?

Lesson:

*Set up:*

*Introduction:*

B

B

B

**Set up: Have 7 blue cubes ready. Have the blank number bond drawn on the white board or easel. Put the word strips “had first”, “got more” and “has now” face down.**

B

B

B

B

**Remind: Remember that we use this diagram to show parts of a story problem when there is a whole amount that is made of two smaller parts. I have a different sort of problem today, and I’m wondering if you can help me find the parts and wholes in this problem.**

*Completed:*

has now

got more

had first

**Present the problem: Ask a child (A\_\_\_) to help you act out the math story. Give A\_\_\_\_ four of the cubes. “In this problem, A\_\_\_ starts out with 4 cubes. Now I’m going to give him 3 more cubes. The question is how many cubes does he have now?.” Invite a child to tell the answer to the problem. Then ask: “Does this problem have parts and a whole?”**

**Call on a child to explain the parts and whole. The whole should be all of the cubes that A\_\_\_\_ has at the end, and the two parts should be the amount he had to start with and the amount you gave him.**

has now

**Ask another child to restate the parts and whole. “So even though it’s not blue cubes and red cubes, and the cubes are all blue, we can still think of them as being in two parts. Who can explain again what the parts are and what the whole is? (Call on another child to explain/restate)**

got more

had first

**Turn over the word cards and ask “could we use these words to explain the parts and whole?” Invite a child to put the word strips on the diagram where they belong, and write in the numbers.**

*Main lesson discussion: (follow the same pattern for each of the word problems.)* ***Cycle through the problems in the order: Result Unknown, Change Unknown\*, Change Unknown, Start Unknown***

**Instructions: I’m going to read some math problems, and I want you to help me figure out what goes where on the number bond. Also give instructions here on how you want children to signal when they have an answer (for example: give me a thumbs up in front of your body when you have an answer)**

**For each word problem:**

**Erase or take down the information from the previous problem**

**Lay out the word strips with the labels for the problem where the children can see them.**

**Read the word problem out loud (repeat the word problem as necessary for all children to hear and process the problem. Variations:**

* Have the problem printed and ask a child to read it.
* Have the problem printed and read it aloud in unison
* Simplify the wording of the problem so it’s easier to understand when read out loud.

Discuss:

* **Ask: who can tell me which things in this problem are the parts, and which is the whole (the parts put together)?**
  + Pause for a couple of seconds.
  + Call on a child to answer (if they give the number answer instead, tell them that it will be time to share that in a minute and repeat the question that you want to know which word strips belong to the parts and the whole).
  + Move the word strips to the appropriate circles on the number bond.
  + Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
  + Ask if anyone got a different answer. If so, move the word strips to show the other answer
  + Ask someone to explain how they decided which labels go where.
* Ask the children to check the answer by deciding if it makes sense that the parts are part of the whole. (for example: are the red cubes part of all of the cubes? are the blue cubes part of all of the cubes?)
* Ask the children where you should write the numbers that are given in the problem (for example: the problem said that there are 3 red cubes and 7 cubes in all. Where should I write 3? Where should I write 7?) (this completes the diagram to the stage “diagram with given info” on the samples page)
  + Ask the children what number goes in the third circle.
  + Call on a child to answer, and write that number in on the diagram
  + Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
  + Ask if anyone got a different answer. If so, write that on the diagram too
  + Ask someone to explain how they got their answer.
  + Discuss until there is a consensus about the correct answer.

Repeat for your prepared problems (at least 4). This lesson can be split into two days if desired.

**Lesson 4:**

Goal for this lesson: Make a labelled number-bond diagram (also called a math mountain) for an Take From problem. Note that in a take-from problem, if you were making a movie of what happens, there would be an amount, something would be taken from it, and then there would be a new amount at the end. Any of the amounts (start, end, change) can be the unknown, so these are not necessarily subtraction problems

Bigger goal: Listen to or read a word problem and figure out if you can think of it as parts that make up a whole.

General notes: A take-from (or Separate) problem can be represented in an equation as start - change = result. In a number bond, it looks like one of these. Separate is the Congnitively Guided Instruction name for what is called Take From in the Common Core Math Standards. Notice that in a Take-From problem, the start amount is the whole.

Materials:

* A large blank number bond drawn on a whiteboard or similar
* About 6 take from (separate) problems (see samples on the next page).
* Word strips with the part-whole labels for each word problem you are planning to use (write onto a slip of paper and have tape or magnets ready to stick it onto the number bond diagram) Option: have blank word strips and markers for children to write their own labels
* A marker for writing in the numbers.
* Counters of the sort used in lesson 1, but with only one attribute (for example: blue cubes)
* Word strips that say “had first”, “gave away”, and “has at the end”

Using the samples on the next page as a starting point:

* Choose or adapt 1-2 SRU (result unknown) problems, 1-2 SCU (change unknown) problems, and 1-2 JSU (start unknown) problems. Total 3-6 problems.
* Adapt the problems by choosing numbers that are at an appropriate mental math level for the students in the lesson (small enough numbers that they should not need pencil and paper for these). Try to make the numbers reasonable for the items in the problem.
* Adapt the problems by changing the names to names of children in your class, and changing the objects to objects that are familiar to the children in your class as desired.

(See lesson 1 for suggestions on classroom norms for these of lessons)

**Sample word problems:** Diagram with given info:

gave away

has left

had before

**Problem type**: SRU Take from result unknown

**Labels for word strips**: Had before, gave away, has left

**Problem**: Anne had 14 Barbies. She gave 6 Barbies to Michelle. How many Barbies does Anne have left?

had before

has now

popped

**Problem type**: SRU Take from result unknown

**Labels for word strips**: Had before, popped, has now

**Problem:** Sarah had 9 balloons. 4 of her balloons popped. How many balloons does she have left?

had

has left

gave away

**Problem type**: SCU Take from change unknown

**Labels for word strips**: had, gave away, has now

**Problem**: Jane had 8 Webkinz. She gave some Webkinz to Gina. Now she has 5 Webkinz left. How many Webkinz did she give away?

**Problem type**: SCU Take from change unknown

had first

has left

ate

**Labels for word strips**: had first, ate, has left

**Problem:** Gus had 7 cookies. He ate some of his cookies. Now he has 2 cookies left. How many cookies did he eat?

had before

has now

gave away

**Problem type**: SSU Take from start unknown

**Labels for word strips**: had before, gave away, has now

**Problem**: Shane had some glow in the dark bugs. He gave 3 glow in the dark bugs to Zach. Now he has 6 left. How many glow in the dark bugs did Shane have to begin with?

had start

left at end

sold

**Problem type**: SSU Take from start unknown

**Labels for word strips**: had start, sold, has now

**Problem**: Ms. Anderson sold 6 plates of cookies at the bake sale. She had 4 plates of cookies left at the end. How many plates of cookies did she have to start with?

Lesson:

*Set up:*

*Introduction:*

B

B

B

**Set up: Have 7 blue cubes ready. Have the blank number bond drawn on the white board or easel. Put the word strips “had first”, “gave away” and “has at end” face down.**

B

B

B

B

**Remind: Remember that we use this diagram to show parts of a story problem when there is a whole amount that is made of two smaller parts. I have a different sort of problem today, and I’m wondering if you can help me find the parts and wholes in this problem. This kind is a little trickier so I want you to do your best thinking today.**

*Completed:*

has at end

gave away

had first

**Present the problem: Ask two children (A\_\_\_ and B\_\_\_) to help you act out the math story. Give A\_\_\_\_ 7 cubes. “In this problem, A\_\_\_ starts out with 7 cubes. then she give 3 cubes to B\_\_\_\_.” [prompt A\_\_\_ to give 3 cubes to B if necessary] “ The question is how many cubes does A\_\_\_ have now?.” Invite a child to tell the answer to the problem. Then ask: “Does this problem have parts and a whole?”**

**Call on a child to explain the parts and whole. The whole should be all of the cubes that A\_\_\_\_ had to start with, and that got split into two parts: one part given to B\_\_\_ and the other part A\_\_\_ kept.**

had first

**Ask another child to explain the whole. “Can anyone help us understand why the whole is the amount A\_\_\_ had to start with?”**

has at end

gave away

**Take the cubes back from A\_\_\_ and B\_\_\_ and invite a student: “Who can show us with the cubes how the whole got split into 2 parts?”**

**Turn over the word cards and ask “could we use these words to explain the parts and whole?” Invite a child to put the word strips on the diagram where they belong, and write in the numbers.**

*Main lesson discussion: (follow the same pattern for each of the word problems.)* ***Cycle through the problems in the order: Result Unknown, Change Unknown\*, Change Unknown, Start Unknown***

**Instructions: I’m going to read some math problems, and I want you to help me figure out what goes where on the number bond. Also give instructions here on how you want children to signal when they have an answer (for example: give me a thumbs up in front of your body when you have an answer)**

**For each word problem:**

**Erase or take down the information from the previous problem**

**Lay out the word strips with the labels for the problem where the children can see them.**

**Read the word problem out loud (repeat the word problem as necessary for all children to hear and process the problem. Variations:**

* Have the problem printed and ask a child to read it.
* Have the problem printed and read it aloud in unison
* Simplify the wording of the problem so it’s easier to understand when read out loud.

Discuss:

* **Ask: who can tell me which things in this problem are the parts, and which is the whole (the parts put together)?**
  + Pause for a couple of seconds.
  + Call on a child to answer (if they give the number answer instead, tell them that it will be time to share that in a minute and repeat the question that you want to know which word strips belong to the parts and the whole).
  + Move the word strips to the appropriate circles on the number bond.
  + Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
  + Ask if anyone got a different answer. If so, move the word strips to show the other answer
  + Ask someone to explain how they decided which labels go where. *Spend more time on this step with these problems than in lesson 3—turning take-away problems into part-whole problems is trickier than doing it with Add to problems. It’s also more important for understanding how addition and subtraction are related, so it’s worth the time investment!*
* Ask the children to check the answer by deciding if it makes sense that the parts are part of the whole. (for example: are the red cubes part of all of the cubes? are the blue cubes part of all of the cubes?)
* Ask the children where you should write the numbers that are given in the problem (for example: the problem said that there are 3 red cubes and 7 cubes in all. Where should I write 3? Where should I write 7?) (this completes the diagram to the stage “diagram with given info” on the samples page)
  + Ask the children what number goes in the third circle.
  + Call on a child to answer, and write that number in on the diagram
  + Ask children to give you a thumbs up (or another sign of your choice) if they agree with that answer
  + Ask if anyone got a different answer. If so, write that on the diagram too
  + Ask someone to explain how they got their answer.
  + Discuss until there is a consensus about the correct answer.

Repeat for your prepared problems (at least 4). This lesson can be split into two days if desired.

**Where to go next:**

Children will still need practice putting add-to and take-away problems into a part-whole interpretations. Practice with mixed problem types is useful. Similar discussion lessons with mixed problem types, especially with children who are on the edge of understanding how to make part-whole diagrams, is really useful.

You can use my random problem generator to make some problems (but make sure you keep editing them to be at the right level for your students!) You’ll notice that the problems get kind of repetitive after a while, and then hopefully you’ll start writing your own (after all—you know way better than me, and especially my computer, do about what your students will find interesting).

CGI part-whole problem generator:

<https://tinyurl.com/mghkqaw>

<http://langfordmath.com/ElEdMath/Number/Quizzes/SampleCGIProbs.html>