

Session 3: Expanding Benchmarks and Picturing Subtraction

Goals:

I can carry out number talks (with symbols, number lines, open number lines, and Rekenreks) focused on operations with whole numbers.

I can leverage mistakes while engaging in number talks.

I can use recording strategies that highlight connections and differences among student strategies.

I can distinguish among three different ways that students use to think about subtraction.

I can identify mathematical goals of number talks

Rehearsals - Making thinking visible and leveraging mistakes.

Routines for Number Talks with Rekenreks

Meet the Rekenrek (first time using the Rekenrek/Number Rack)

Allow ample time for free exploration of this tool and ask the following questions:

- What do you notice?
- How many beads do you see? What colors do you see?
- How did you count the beads? Did anyone count them a different way?

Establish norms for the use of this tool. Beads always begin on right side and as they are used are moved to the left. Helpful to draw a star or place a sticker in upper right corner of the rekenrek. This is the start or ready position. Demonstrate how to move the beads using pushes of single beads AND pushing multiple beads at the same time. Students practice.

A. Rekenrek Flash

Teacher has large Rekenrek.
Students do not have anything.

Routine

1. Slide target number on Rekenrek (do not show this to students).
2. Flash number on the Rekenrek (long enough time for students to see number but not long enough for them to count one by one).
3. Elicit guess for target number. How many did you see?
4. Flash again.
5. Elicit guesses. Allow students to keep original guess or make a change.
6. Ask for reasons. How did you see it? (goal here is to get different chunking strategies).
Teacher can show Rekenrek during student justification or not.

B. Show Me

Teacher and students have Rekenreks.

Routine

1. Teacher states a target number (T: "Show me 12 on your Rekenrek.").
2. Ask for construction method (T: "How did you make 12?" S: "I have 6 on top and 6 on the bottom.")
3. Ask for justification (T: "How do you know that is 12?" S: "5 plus 5 is 10, 2 more is 12.")
4. Ask for different strategies (T: "Did anyone do it another way?")

C. Guess My Way

Teacher and students have Rekenreks.

Routine

1. Make a target number [10] on Rekenrek and cover (do not show students).
2. Announce target number (T: "I have 10 on my Rekenrek. Guess my way.")
3. Teacher pauses while students try to represent the target number on their own Rekenreks.
4. Teacher selects a student to explain how they made the target number on the Rekenrek. (S: I made 10 by putting 8 on top and 2 on the bottom.)
5. Teacher asks for justification (T: "How do you know that makes 10?")
6. Teacher records strategy and gives feedback (T: [Records 8+2 somewhere] "That is a way to make 10, but it is not my way.").
7. Students can change their Rekenrek guess if they had created the target number in the same way.
8. Teacher asks for another student to share (T: "Who has a different way to make 10?").
9. Repeat until a student guesses the correct way.

D. Matching the Target

Teacher and students have Rekenreks.

Routine

1. Teacher asks students to show a number in a particular way on the Rekenrek and models on large Rekenrek (T: "Show 7 on the top row of your Rekenrek.")
2. State target number (T: "The number of the day is 12. Move additional beads to make 12.")
3. Teacher elicits strategies (T: "How did you move beads to make 12?" S: "I moved 3 more on top to make 10 and 2 more on the bottom to make 12.")
4. Teacher comments on strategy and models on large Rekenrek (T: "That is a 2-push strategy to make 12.")
5. Teacher elicits additional strategies (T: "Who made 12 in a different way? [pause for volunteers] Explain how you did it.")

Optional: Teacher asks for specific strategy (T: "How could we get 12 in one push?")

Additional Anticipated Strategies

Student Strategy	Type of Strategy
"I pulled another on top to make 8, then another to make 9, another to make 10, then another on the bottom to make 11, and another 1 to make 12.	5-push
"I put five on the bottom because 5 and 5 is 10 and 2 more is 12."	1-push

E. What is Missing? (Similar to Guess My Way.)

Teacher and students have Rekenreks.

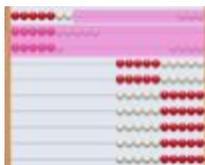
The target numbers need to be 20 or less if Rekenreks have 2 rows of beads.

Target numbers can be larger if Rekenreks with 10 rows of beads are used.

Routine

Teacher states target number and shows a number represented on Rekenrek. (T: “The number of the day is 23. My Rekenrek is showing 7 but the rest is hidden. What is missing on my Rekenrek to make 23?”)

1. Students use their Rekenreks to make the target number while trying to match the target number.
2. Teacher calls on students to share strategy (T: “How did you make 23? S: “I pushed 3 more on top row to make 10 then added 10 more on second row to make 20, then added 3 on bottom row to make 23.”)



3. Teacher records strategy and gives feedback (T: [Records $7+3=10$, $10+10=20$, $20+3=23$ somewhere] “So you added 3 then 10, then 3 more to 7 to get 23. $3+10+3=16$, so you added 16 to 7 to get 23 [write $7+16=23$ somewhere].”).
4. Students can change their Rekenrek guess if they had created the target number in the same way.

$$\begin{array}{l} 7+3=10 \\ 10+10=20 \\ 20+3=23 \\ 3+10+3=16 \\ 7+16=23 \end{array}$$

5. Teacher asks for another student to share (T: “Who has a different way to make 23?”).
6. Repeat until a student guesses the correct way.

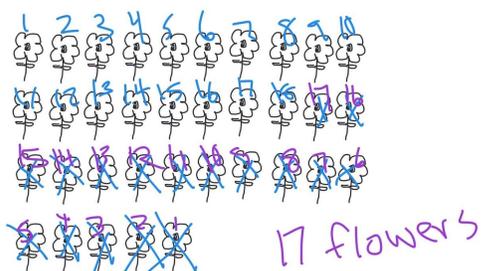
Commenting on Student Work - Session 3

(<http://goo.gl/forms/Z2ebHhLzkrWQLgdv1>)

Separate (change unknown)

Yesenia has 35 marigold flowers in her garden. Rabbits ate several of the flowers last night and now she only has 18 flowers left in her garden. How many flowers did the rabbits eat?

Ann



Bobbi

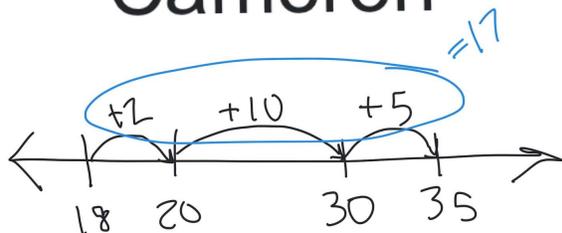
$$35 - 18 = 23$$

$$3 - 1 = 2$$

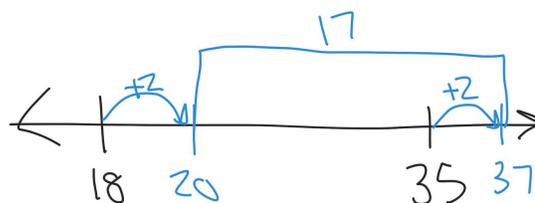
$$5 - 8 = 3$$

Arrows point from the equations below to the result '23' in the equation above.

Cameron



Denise



Answer Key for Sorting Activity

<p>Join (Result Unknown) Anne has 6 carrots. Brooke gives her 8 more carrots. How many carrots does Anne have now?</p>	<p>Joining All Allan begins with 6 cubes. He counts out 8 additional cubes and combines the cubes. He recounts the entire set and gets 14.</p>	<p>Counting On Boris says 8, then says 9, 10, 11, 12, 13, 14. 14 is the answer.</p>
<p>Join (Change Unknown) Bob has 6 flowers. Val gives him some more flowers, now he has 8 flowers. How many flowers did Val give Bob?</p>	<p>Joining To Cass puts out 6 cubes. He adds additional cubes, counting "7, 8" until there is a total of 8 cubes. He keeps the two additional cubes separate from the initial set. He responds 2.</p>	<p>Counting On To Danny says, "One more is 7, two more is 8. The answer is 2."</p>
<p>Separate (Result Unknown) There are 8 birds on a branch. 6 of the birds fly away. How many birds are on the branch?</p>	<p>Separating From Eli puts 8 tick marks on a piece of paper. He crosses out 6 of them and counts the remaining marks. He states that the answer is 2.</p>	<p>Counting Down Franny counts backwards saying "7, 6, 5, 4, 3, 2" showing 6 fingers. Her answer is the last number in the counting sequence, "2".</p>
<p>Separate (Change Unknown) Sam had 8 animal crackers. His sister ate some of them. Now Sam has 6 animal crackers. How many animal crackers did Sam's sister eat?</p>	<p>Separating To Gena shows 8 cubes. She removes 2 cubes and counts to see that there are 6 left. She says that the answer is 2.</p>	<p>Counting Down To Hannah counts one cube and says, "7 left." She counts another cube and says, "6 left." She says the answer is 2.</p>
<p>Compare (Difference Unknown) Thomas has 6 goals. Zach has 8 goals. How many more goals does Zach have than Thomas?</p>	<p>Matching India makes a tower of 6 cubes and another tower of 8 cubes. She puts the towers next to each other and notices that one tower is 2 cubes taller than the other. She says "2."</p>	<p>No commonly used strategy corresponding to the action or relationship described in the problem.</p>
<p>Join (Start Unknown) Cindy has some dollars. Lou gives her 6 more dollars, now Cindy has 8 dollars. How many dollars did Cindy start with?</p>	<p>Trial and Error Jade puts out an initial set of 3 cubes. Adds 6 more cubes and counts 9 cubes. 9 is too big so she keeps trying different initial</p>	<p>Trial and Error Kate guesses 5 then counts 6, 7, 8, 9, 10, 11. Says "5 is too big" and changes guess until she gets the right beginning guess of 2.</p>

	amounts.	
<p>Separate (Start Unknown) Otis had some dog treats. He gave his dog 8 dog treats, now he has 6 left. How many dog treats did Otis start with?</p>	<p>Trial and Error Leon puts out an initial set of 15 cubes. Removes 8 cubes and counts out remaining cubes. Since the remaining amount is too big, he changes the initial amount until he gets the correct remaining amount. The answer is the initial amount.</p>	<p>Trial and Error Maddie guesses 20 as an initial amount. Counts 19, 18, 17, 16, 15, 14, 13, 12. Says, "12 is too big." She changes her initial amount until she counts the correct remaining amount.</p>
<p>Part-Part-Whole (Part Unknown) There are 6 boys and some girls on the math team. There are 8 people on the team. How many girls are on the math team?</p>	<p>No commonly used strategy corresponding to the action or relationship described in the problem.</p>	<p>No commonly used strategy corresponding to the action or relationship described in the problem.</p>

Recording Thinking for 43-18

Teacher needs recording space

Students will use mental strategies

Routine

1. Write number sentence on board (43-18)
2. Students think about solution strategies and put fingers up representing a different solution strategy
3. Teacher asks for solutions and records for discussion.
4. Teacher selects a students to share one strategy. Student's name and description is recorded by teacher using symbols or an open number line.
5. More strategies are shared.

Open Number Line	Symbols	Type

Working with a Partner

25-17

Verbal	Recording with open number line.	Record with symbols later	Subtraction type
I started at 17 then added 3 to get to 20. I then added 5 to get to 25. My answer is 8.			
I started at 25 then went back 10 to get to 15, then subtracted 5 to get to 10, then subtracted 2 from 10 to get to 8. My answer is 8.			
I added 3 to 17 to get 20 and 3 to 25 to get 28. 28 minus 20 is 8 so my answer is 8.			
I started at 25 and counted back on my fingers 24, 23, 22, 21, 20, 19, 18, ..., 8.			
I took 10 from 20 to get 10. Then I took 7 from 5 to get negative 2. 10 plus negative 2 is 8.			
I took 20 from 25 to get 5. I then added 3 back to the 5 to get 8.			

Performing a Subtraction Number Talk

Definition	Characteristics of Student Behavior During a Math Talk
<p>A number talk is a 5 to 10 minute whole class conversation that allows students to share thinking strategies around important ideas. Teachers intentionally select problems that invite alternative solutions. Teachers actively facilitate the conversation to include different ways of thinking, justifying reasoning, asking questions, and connecting strategies.</p>	<ul style="list-style-type: none"> ● Compose and decompose flexibly. ● Look for relationships. ● Look at a problem and think about it before deciding what to do. ● Develop own strategy. ● Listen to other students. ● Critically analyze the thinking of others.

How to participate in a Number Talk

Put in as a poster for students.

1. Think
2. Listen and Share thinking
3. Explain/Defend
4. Question

Planning Sheet for 5 Minute Number Talk

Mathematical Goal	
Mental Images Required	
Number Talk What is the difference? How do you see the difference? What is a different way to see the difference?	Recording Anticipated Strategies How will you make student thinking public? List specific strategies that you anticipate seeing and how you will record strategies. This list of anticipated strategies include ideas that students might bring up but let the students' responses guide the flow of the conversation. We are practicing open number lines for this one.