WORD PROBLEMS
AS A PORTAL TO
DAILY INSTRUCTION

Word problems are arguably one of the trickiest components of math instruction. It requires the student to draw upon various skills in order to solve for the "right" answer: background knowledge, language skills, conceptual understanding, reading comprehension skills, communication, I could go on...

Many teachers of math use a problem-based approach to teaching math instruction, where a word problem can serve as a "grapple," "anchor task," or "entrance ticket" to the daily instruction.

In the following pages of this performance task, I will outline how teachers can utilize a word problem to address mathematical standards, how to intervene for support and enrichment, and how to structure a math lesson around the "grapple" of the day.
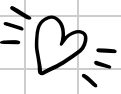
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KELLI LARRUBIA

WORD PROBLEM ANALYSIS

Grade 1 Word problem:

Paco the dog played outside for 5 hours today. His brother Bennie played outside for 3 hours today. How many more hours did Paco play than Bennie?

CCSS Math Standards Addressed:

CCSS.MATH.CONTENT.1.OA.A.1 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.
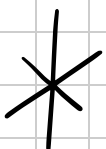
CCSS.MATH.CONTENT.1.OA.B.4 Understand subtraction as an unknown-addend problem. *For example, subtract 10 − 8 by finding the number that makes 10 when added to 8.*

targeted math ideas:

In reviewing the Grade 1 word problem, I recognize this problem targets two important Operations and Algebraic Thinking math skills: **number sense** (comparing) and **subtraction** (solving for the missing addend). Though the numerals used in this problem are within 10, I see this fitting into a unit on addition and subtraction strategies within 20, because the **Common Core State Standards for Grade 1** state that first graders should be able to solve addition and subtraction word problems within 20 (CCSS.MATH.CONTENT.1.OA.A.1). This problem would likely be used toward the beginning of that unit.
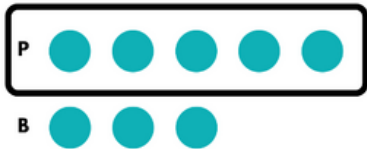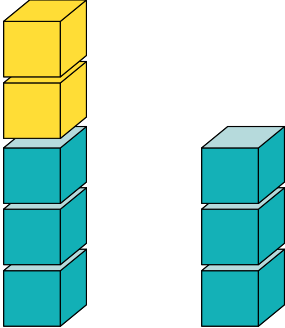
More specifically, I see this problem being introduced after a review on comparing numbers within 10 (per the Kindergarten math standards: **CCSS.MATH.CONTENT.K.CC.C.6** and **CCSS.MATH.CONTENT.K.CC.C.7**) when introducing **subtraction strategies** to solve for the difference between two numbers, or solving for the **unknown addend** in an equation (**CCSS.MATH.CONTENT.1.OA.B.4**).

Teachers might consider utilizing the **CPA** (**Concrete - Pictorial - Abstract**) approach to math instruction by encouraging students to start with a concrete representation of this problem, showing how to determine "how many more" hours Paco plays than Bennie (i.e. 5 counting cubes to represent the Paco's play hours and 3 to represent Bennie's play hours). To extend this lesson to pictorial or abstract representations, teachers might encourage students to draw a mathematical drawing highlighting the extra hours of play, or writing a number sentence or number bond to indicate the missing addend.
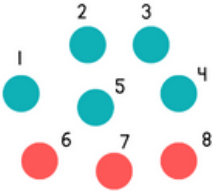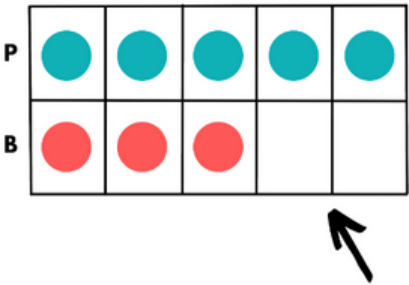
KELLI LARRUBIA

LESSON STRATEGIES

Possible Student Responses	Example:	Suggested Intervention
Incorrect Answer 1: Comparing The student misinterprets the problem as a comparison problem.	**Possible Drawing 1:** 1 2 3 4 5 ● ● ● ● ● **Possible Drawing 2:** P ● ● ● ● ● B ● ● ● **Possible Written Responses:** "5" "5 is more" "Paco gets more"	**Strategy - Scaffolding:** Start with positive feedback, then provide support. **Teacher talk might include:** "You noticed that 5 is more than 3. That is a correct statement. What else do you notice?" Teacher encourages the student to use manipulatives such as counting cubes to show a concrete example of the dogs' play hours, guiding the student to align the two representations together to notice the difference. "How many more cubes does Bennie need to have the same amount as Paco?" If further scaffolding is required, the teacher can color-code the cubes he/she uses, drawing attention to the difference of 2.

LESSON STRATEGIES

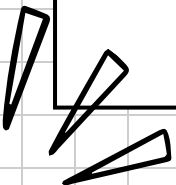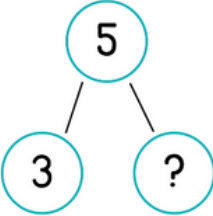| Possible Student Responses	Example:	Suggested Intervention
Incorrect Answer 2: Addition *very common misconception for this age group with this type of word problem The student misunderstands the purpose of the task, thinking that adding the two numbers would solve for how many more.	Student adds 5 to 3 for a total of 8. **Possible Drawing 1:** **Possible Drawing 2:** **Possible Written Responses:** "8" "5 + 3 = 8" "Paco gets 8 more."	**Strategy - Visualization:** Bring the word problem "to life" through visualization. **Teacher talk might include:** "Let's pretend we are the dogs! I know, that's a bit silly. But this will help us picture the problem in our minds. You can be Paco and I will be Bennie. Woof woof!" "Now, let's use counters to show how many hours of play we each get today. We can put the counters in this ten frame." "What do you notice about how many hours of play you get? What about me?" "How many more hours do you get than me?" "If I wanted to get as much playtime as you, how many more counters would I have to add to this ten frame?" Visual representation for support:

LESSON STRATEGIES

Possible Student Responses	Example:	Suggested Intervention
Correct Answer 1: Solve for Missing Addend Strategy The student understands this problem to be an "unknown-addend problem" where they solve the problem with a subtraction strategy. CCSS.MATH.CONTENT.1.OA.B.4	Student subtracts 5 - 3 by finding that 2 makes 5 when added to 3. **Possible Drawing:** **Possible Written Response:** "3 + _ = 5 → 3 + 2 = 5" "Two more hours" "Paco gets two more hours of playtime."	**Strategy - Enrichment:** Since this student understood the concept of the problem, they can be challenged to extend their math thinking with an enrichment opportunity. **Teacher talk might include:** "How would the solution change if Paco got 10 hours of play each day?" "Draw a picture to match your thinking." "Create a number sentence to match your thinking."

LESSON STRATEGIES

Possible Student Responses	Example:	Suggested Intervention
Correct Answer 2: Subtraction The student understands this problem to be a subtraction problem, where they use the two numbers to solve for the difference.	Minuend - subtrahend = difference **Possible Drawing:** **Possible written responses:** "5 - 3 = 2" "Two more hours" "Paco gets two more hours of playtime."	**Teaching Strategy - Enrichment:** Since this student understood the concept of the problem, they can be challenged to extend their math thinking with an enrichment opportunity. **Teacher talk might include:** "How would the solution change if Paco got 10 hours of play each day?" "Draw a picture to match your thinking." "Create a number sentence to match your thinking." **OR** if the goal of this problem was to understand unknown-addend problems (**CCSS.MATH.CONTENT.1.OA.B.4**) teacher talk might sound like this: "Besides "5 - 3 = ___" what other subtraction sentence is true for this problem?" → answer: 5 - _ = 3" Now create two true subtraction sentences for this new problem… [teacher presents a similar problem or tweaks the current problem using different numbers within 20]."

LESSON PLAN

Date: Summer 2022

Lesson: Subtraction Strategies

Grade: 1   **Subject:** Math   **Topic:** Unknown Addends

Materials

- word problem printout
- pencils
- counting cubes
- counters
- tens frame
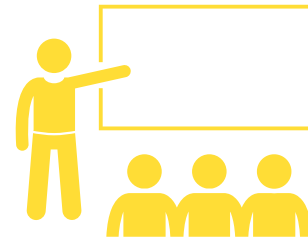- number bonds

Connection

Introduce the lesson with a meaningful connection.

Example:
Share a picture of two dogs (different breeds, such as a Great Dane and a Border Collie) and an excerpt about their exercise needs. Explore the "research" to discover that different breeds require different amounts of exercise each day.

Grapple

Present the word problem for the class. Read the problem aloud and invite students to work through the problem independently on their printed sheets.

Teacher Interventions

Monitor:
Gather informal, formative student data from the grapple task. A quick dipstick will provide foci for student supports and enrichment opportunities.

Support:
Guide students to use math manipulatives to make the problem concrete.
Questions: Which dog gets more playtime? How many more hours does it get?

Enrichment:
Provide a complex twist to the problem.
Question: How would the answer be different if... ? (change the numbers/amount of addends)

Synthesis

Unpack the learning target/daily goal: Invite students to share what they think the learning target will be for the day, based on the grapple problem and their math work.

Revisit the targeted skill goal for the day: Regardless of whether the students identify the daily goal for the day during the unpacking, ensure to explicitly state today's goal - finding the difference between two numbers using math strategies.

KELLI LARRUBIA