



WORD PROBLEMS

Grade 2, Mission 2

Explore Length

Word Problems

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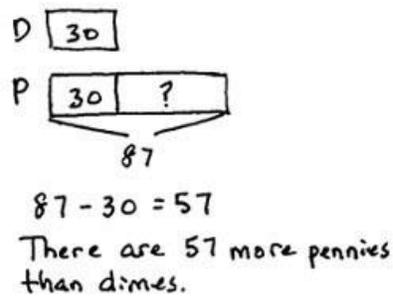
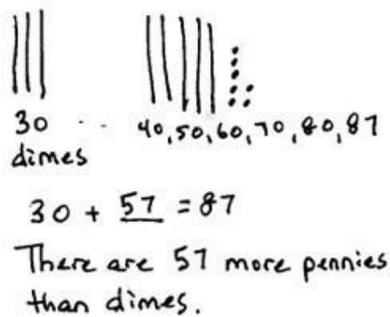
Topic A: Understand Concepts About the Ruler

Topic A opens with students exploring concepts related to the centimeter ruler and ends with students using their unit rulers to measure lengths (2.MD.1), thereby connecting measurement with a ruler.

LESSON 1

Word Problem (8 min)

Vincent counts 30 dimes and 87 pennies in a bowl. How many more pennies than dimes are in the bowl?



Note: This *compare with difference unknown* problem presents an opportunity to work through the common misconception that *more* means add. After drawing the two tapes, ask guiding questions such as, “Does Vincent have more dimes or pennies?” “Does Vincent have 30 pennies?” (Yes!) “Tell me where to draw a line to show 30 pennies.” “This part of the tape represents 30 pennies. What does this other part of the pennies tape represent?” (The part that is more than the dimes.) This will help students recognize that they are comparing, not combining, the quantities.

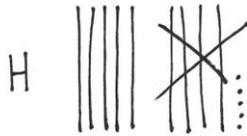
This problem has an interesting complexity because, though there are more of them, the pennies are worth less. Ask students, “Could you buy more with Vincent’s pennies or with his dimes? How do you know?”

Multiple Means of Expression: To avoid inhibiting children’s natural drawings during the RDW process, be careful not to communicate that the tape diagram is the best or “right” way. If a drawing makes sense, it is right. Regularly guide students through the modeling of a problem with the tape so that this important model gradually enters their tool kit.

LESSON 2

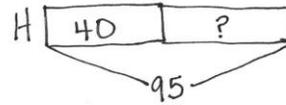
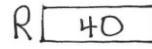
Word Problem (6 min)

With one push, Brian's toy car traveled 40 centimeters across the rug. When pushed across a hardwood floor, it traveled 95 centimeters. How many more centimeters did the car travel on the hardwood floor than across the rug?



$$95 - 40 = 55$$

The car traveled 55 more centimeters on hardwood.



$$95 - 40 = 55$$

The car traveled 55 more centimeters when on hardwood.

 **Note:** This *compare with difference unknown* problem gives students further practice with comparing quantities. A new complexity is to compare length measurements rather than numbers of discrete objects.

 **Differentiating the Word Problem:** The 9 Word Problems of Mission 2 are all comparison situations.

- Lessons 1 and 2: *compare with difference unknown*
- Lessons 3 and 4: *compare with bigger unknown*
- Lessons 5 and 6: *compare with smaller unknown*
- Lesson 7: *compare with smaller unknown using more than*
- Lesson 8: *compare with bigger unknown using less than*
- Lesson 9: *compare with bigger unknown using shorter than*

The challenging situation types in Lessons 7, 8, and 9 might be frustrating if students have not been successful in Lessons 1–6. Consider editing the situations in Lessons 7–9 to instead repeat those of Lessons 1–6, returning to the more challenging problem types in either Mission 3 or 4 after students have gained more confidence with the simpler comparison situations.

LESSON 3

Word Problem (8 min)

Jamie has 65 flash cards. Harry has 8 more cards than Jamie. How many flash cards does Harry have?

$65 + 8 = 73$
 Harry has 73 flashcards.

$65 + 8 = 73$
 $65 + 5 = 70$
 $70 + 3 = 73$

Harry has 73 flash cards.

Note: This problem type, *compare with bigger unknown*, challenges students to make sense of the situation and determine the operation to solve. It follows the two previous *compare with difference unknown* Word Problems to alert students to read and understand the situation instead of relying on key words that tell the operation. This problem exemplifies the error in using *more than* as a key word to subtract, since in this situation students solve by adding the parts. The problem could be represented using one tape, but since students are just beginning to do comparison problems at this level of sophistication with larger numbers, it may be wise to draw one tape to represent each boy's cards emphasizing the fact of the comparison.

Topic B: Measure and Estimate Length Using Different Measurement Tools

Students build skill in measuring using centimeter rulers and meter sticks in Topic B. They learn to see that a length unit is not a cube, or a portion of a ruler (which has width), but is a segment of a line.

LESSON 4

Word Problem (7 min)

Caleb has 37 more pennies than Richard. Richard has 40 pennies. Joe has 25 pennies. How many pennies does Caleb have?

$40 + 37 = 77$
 Caleb has 77 pennies.

$40 + 37 = 77$
 Caleb has 77 pennies.

 **Note:** This problem has the added complexity of extraneous information, Joe’s pennies. Ask, “Do I need to draw Joe’s pennies?” Depending on the needs of students, this can be omitted in order to focus on the *compare with bigger unknown* problem where *more than* is used to compare two quantities, and addition is used to solve.

LESSON 5

Word Problem (7 min)

Ethan has 8 fewer playing cards than Tristan. Tristan has 50 playing cards. How many playing cards does Ethan have?

T



$$50 - 8 = 42$$

T

50

$$50 - 8 = 42$$

40 10

E



Ethan has 42
playing cards.

E

?

$$10 - 8 = 2$$

$$40 + 2 = 42$$

Ethan has 42 playing cards.



Note: This *compare with smaller unknown* problem uses the word *fewer*, which probably will suggest subtraction to students. The numbers were purposely chosen so students have the opportunity to use the take from ten strategy to solve.

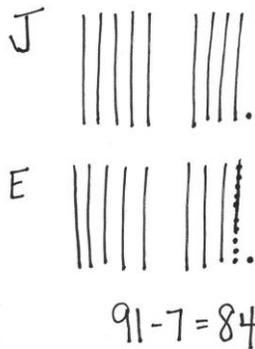
Topic C: Measure and Compare Lengths Using Different Length Units

In Topic C, students measure and compare to determine how much longer one object is than another (2.MD.4). They also measure objects twice using different length units, both standard and non-standard, thereby developing their understanding of how the total measurement relates to the size of the length unit (2.MD.2).

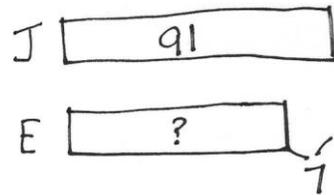
LESSON 6

Word Problem (7 min)

Eve is 7 centimeters shorter than Joey. Joey is 91 centimeters tall. How tall is Eve?



Eve is 84 centimeters tall.



$$\begin{array}{r} 91 - 7 = 84 \\ \overline{) 91} \\ \underline{81} \\ 10 \end{array}$$

$$\begin{array}{r} 10 - 7 = 3 \\ 81 + 3 = 84 \end{array}$$

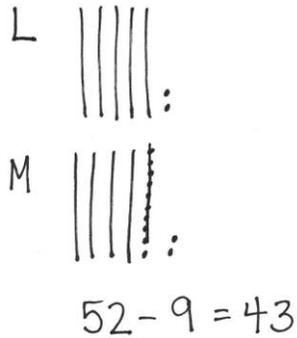
Eve is 84 centimeters tall.

 **Note:** In Small Group Lesson 6, students measure and compare lengths in centimeters and meters. This *compare with smaller unknown* problem is similar to the problem in Lesson 5, but here measurement units are used with *shorter than* rather than *less than* or *fewer than*.

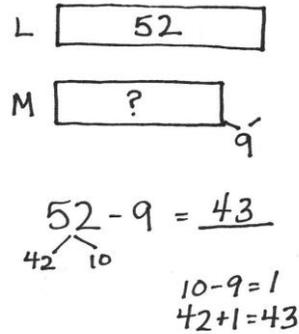
LESSON 7

Word Problem (6 min)

Luigi has 9 more books than Mario. Luigi has 52 books. How many books does Mario have?



Mario has 43 books.



Mario has 43 books.



Note: This *compare with smaller unknown* problem has the complexity that we subtract to find the number of books Mario has, though there is no action of taking away, and the word *more* in the first sentence might suggest addition to students. *More* and *more than* are often mistakenly taught as key words signaling either to add or subtract. This approach distracts students from the more essential task of considering the part-whole relationships within a problem after representing it with a drawing.

Topic D: Relate Addition and Subtraction to Length

The mission culminates as students relate addition and subtraction to length. They apply their conceptual understanding to choose appropriate tools and strategies, such as the ruler as a number line, benchmarks for estimation, and tape diagrams for comparison, to solve word problems (2.MD.5, 2.MD.6).

LESSON 8

Word Problem (6 min)

Bill the frog jumped 7 centimeters less than Robin the frog. Bill jumped 55 centimeters. How far did Robin jump?

B |||||

R |||||

$$55 + 7 = 62$$

Robin jumped 62 centimeters.

B

55

R

55	7
----	---

?

$$55 + 7 = 62$$

5 2

55 + 5 = 60
60 + 2 = 62

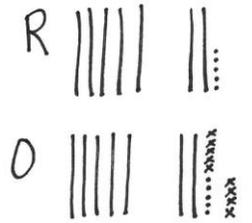
Robin jumped 62 centimeters.

 **Note:** This *compare with smaller unknown* problem uses the word *less*, which presents an opportunity for students to work through the easy mistake that *less* or *less than* means to subtract. Ask guiding questions such as, who jumped farther? This, along with a tape diagram, helps students recognize that Robin jumped farther and helps them determine the operation, addition.

LESSON 9

Word Problem (6 min)

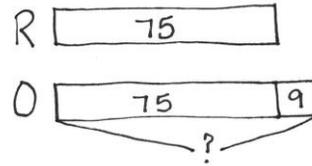
Richard's sunflower is 9 centimeters shorter than Oscar's. Richard's sunflower is 75 centimeters tall. How tall is Oscar's sunflower?



$$75 + 9 = 84$$

5 4

Oscar's sunflower is
84 centimeters tall.



$$75 + 9 = 84$$

5 4

$$75 + 5 = 80$$

$$80 + 4 = 84$$

Oscar's sunflower is 84
centimeters tall.



Note: This compare with *bigger unknown* problem is similar to the problem in Lesson 8, but here the word "shorter" relates to measurement. This is in anticipation of Small Group Lesson 9, wherein students measure lengths of strings and use tape diagrams to represent and compare lengths.

LESSON 10

There is no Word Problem for this lesson.