Story Problem Detectives Within 100

Teacher		**Class**	Grade 2
Subject	Math	**Topic**	Addition and subtraction word problems
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students learn to picture stories and write equations with ? for any missing number. They solve one-step and two-step addition and subtraction stories within 100.

Curriculum links

- Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, by using drawings and equations with a symbol for the unknown number to represent the problem [3][4].
- Show, solve, and explain solutions to single-step and multistep real-life problems (like joining, separating, part-part-whole, and comparison) involving addition or subtraction of whole numbers where the numbers do not exceed 100 [1].

Learning objectives

- Students will solve one-step stories within 100 with unknowns in any spot.
- Students will draw bars and write equations with ? to show each story.
- Students will solve two-step stories within 100 using two equations.

Success criteria

- I can picture parts and total and choose adding or subtracting.
- I can write an equation with ? and solve it.
- I can solve a two-step story in two steps and check it.

What students already know

Show 8 + 5 = ? and 13 - ? = 8 on the board. Students show answers on dry-erase boards in 2 minutes to check recall within 20.

Key words

equation	a number sentence with plus, minus and equals to show amounts
unknown	a missing number shown by ? in a story
whole	all pieces joined together into one total [1]
part	one piece of a larger total [1]
compare	looking at two amounts to find the extra gap [10]

Materials

- story cards with printed one-step and two-step stories within 100
- dry-erase boards, markers, box for ? card
- base-ten blocks, linking cubes, counters, part-part-whole mats, ten-frames
- printed copies of Worksheet Task B and Task C
- Slides 1-7 and 10-12, Video clip 1 ready to play

Before the lesson

- Print story cards and copies of Worksheet Task B and Task C, one per pair
- Test Video clip 1 (0:00-4:29) and load Slides 1-7 and 10-12
- Set out dry-erase boards, markers, box for ? card, cubes, counters and part-part-whole mats
- Clear floor space for acting and turn-and-talk

Lesson outline

0–5 min **Starter** 5 min · Whole class

To hook students and recall picturing take-away stories.

YOU DO

1. Welcome class as Story Problem Detectives and say the hook: The starting number ran away and left a question mark. Can you detectives find it?
2. Show Slides 1-2 and read the question: 35 books on a shelf. A student takes 12 away. How can you picture it?
3. Lead turn-and-talk: ask partners how to draw it fast with tens sticks and ones dots.
4. Collect 2 ideas and link to today's goal: find a missing number anywhere in the story.

STUDENTS DO

1. Turn and talk about how to picture 35 take away 12.
2. Show thumbs up for subtract and say why a piece is missing.

Say: You are detectives today. A number is hiding under a ?. Your job is to draw the story, write the number sentence with ?, and find the hider. Let's warm up with books on a shelf.

Ask: Do we add or subtract when 12 books are taken away? (Subtract, because a piece leaves the total.) · What equation with ? shows this story? (35 - 12 = ?)

Check understanding: All hold up 1 finger for add or 2 for subtract. If split, redraw 35 as 3 tens sticks and 5 dots and cross out 12.

Support: Let students act it with 35 counters and take 12 away with base-ten blocks. **Stretch:** Ask: what if ? was at the start, ? - 12 = 23, how would you find the start?

Use: Slides 1-2

5–17 min **Teaching - Model** 12 min · Whole class

To model bar pictures and ? equations for part-whole and compare stories.

YOU DO

1. Show Slides 3-5 and explain two story families: parts join to make a total, and two amounts side by side where you find the gap [10].
2. Model Card 1 with bars: lay 47 strip and 28 strip under a whole strip. Both pieces are known and the total is missing, so add [8].
3. Model compare with 52-cube and 35-cube towers side by side. Show the gap is found by subtracting the smaller from the larger [10].
4. Write both equations with ? and check by putting the answer back into the story [10].

STUDENTS DO

1. Copy bars on dry-erase boards and read equations aloud with ?.
2. Point to whole or pieces and say add or subtract.

Say: Draw a quick bar to see pieces and total. If both pieces are known and the total is missing, add. If the total and one piece are known, subtract. For compare, line them up and subtract to find the gap.

Worked example: Art shelf: The art shelf has 47 blue crayons and 28 red crayons. How many crayons are there in all? Draw whole bar with parts 47 and 28. Write 47 + 28 = ?. Solve: 47 + 20 = 67, 67 + 8 = 75. Answer 75 crayons. Check: 75 - 28 = 47. Compare: One tower has 52 cubes. The other has 35 cubes. How many more in the taller tower? Draw two bars, write 52 - 35 = ?. Solve: 52 - 30 = 22, 22 - 5 = 17. Answer 17 more. Check: 35 + 17 = 52.

Ask: How do you know 47 + 28 finds a missing total? (Both pieces are known, so add for the total.) · Why is 52 - 35 right even though it says more? (How many more asks for the gap, so subtract [10].) · What does the ? stand for? (The number hiding that we must find [4].)

Check understanding: Boards up with bar and 47 + 28 = ?. Reteach bar if whole and pieces are flipped.

Support: Use totals under 20 with counters on a part-part-whole mat that shows pieces and total. **Stretch:** Change 75 total to missing piece: 75 crayons in all, 47 are blue, how many are red?

Use: Slides 3-5

17–30 min **Guided Practice** 13 min · Whole class

To practise the detective routine and start-unknown stories together.

YOU DO

1. Play Video clip 1 and tell students to watch for tens sticks and ones dots and for ? where the number hides.
2. Show Slide 7 routine: read twice, draw quick bar or tens and ones, write equation with ?, solve and check back in story.
3. Model start-unknown together: The supply box had some pencils. A helper put in 5 more pencils. Now there are 13 pencils. How many pencils were in the box to start?
4. Write ? + 5 = 13, solve by counting on from 5 to 13 or by 13 - 5 = 8, and check 8 + 5 = 13.

STUDENTS DO

1. Watch, then chant routine steps and draw bars with teacher.
2. Solve Worksheet Task B stories in pairs and write an equation with ? for each.

Say: Read twice. First time for the story, second time for numbers. Draw it, write it with ?, then solve. Always put your answer back in the story to check it makes sense.

Worked example: ? + 5 = 13. Count on: 6,7,8,9,10,11,12,13 is 8 jumps. So ? = 8 pencils. Check with subtraction 13 - 5 = 8 and story: 8 plus 5 more is 13. This shows join with start unknown, one of the join, separate, part-part-whole, and compare actions [6].

Ask: What is the whole and what are the pieces in ? + 5 = 13? (Total 13 is whole, pieces are start ? and 5.) · Could you also solve it with subtraction? (Yes, 13 - 5 = 8 because addition and subtraction undo each other [2].)

Check understanding: Hinge: show ? + 18 = 63 on boards. Look for 63 - 18. Pull small group if they add 63 + 18.

Support: Give result-unknown cards first with totals under 20 and a ten-frame for modeling. **Stretch:** Ask students to write a change-unknown twin: 8 + ? = 13 and explain the same answer.

Use: Video clip 1 (0:00–4:29)

30–50 min **Main Activity** 20 min · Groups

To solve join and separate stories with the unknown in any position.

YOU DO

1. Hand out story cards, boards, and ? box. Explain teams draw, model with cubes, write ? equation, solve within 100, then sort into Start Unknown, Change Unknown, Result Unknown piles [6].
2. Read cards aloud: Card 1: The art shelf has 47 blue crayons and 28 red crayons. How many crayons are there in all? Card 2: There were 61 students signed up for art class. 59 students showed up. How many students missed the class? Card 3: The supply box had some pencils. A helper put in 5 more pencils. Now there are 13 pencils. How many pencils were in the box to start? Card 4: One tower has 52 cubes. The other tower has 35 cubes. How many more cubes does the taller tower have?
3. Circulate, prompt bar drawing and equation with symbol for unknown [4], and ask teams to show, solve and explain in two steps for two-step cards [1].
4. Add two-step Card 5 for finishers: There are 32 small toy prizes on a table. Students win 18 prizes. Then a helper adds 10 more prizes. How many prizes are on the table now?

STUDENTS DO

1. Draw cards, build with cubes, draw bars, write ? equations and solve.
2. Sort solved cards into piles and read one equation aloud to the group.

Say: Detectives, pick a card, build it, draw it, write it with ?. Sort it when you solve it. If you finish, crack the two-step card with two equations. You must show two drawings and two ? equations.

Worked example: Card 5 two-step: Step 1: 32 - 18 = ?. 32 - 10 = 22, 22 - 8 = 14. Step 2: 14 + 10 = ?. Answer 24 prizes. Check: does 14 + 10 rebuild the table after winning? Yes. Write both equations to show the steps [2].

Ask: Where is ? in this story: start, change, or end? (Name position and show it in bar, e.g., start unknown ? + 5 = 13.) · How do you check a compare answer? (Add gap to smaller to rebuild larger, 35 + 17 = 52.)

Check understanding: Teams show piles and one solved board with bar + equation + answer sentence. If equations lack ?, model again with box for ?.

Support: Start with totals under 20 using counters on a part-part-whole mat that shows parts and whole. **Stretch:** Add two-step cards where students must write two equations with ? to reach the final answer.

Use: Worksheet Task C

50–60 min **Plenary** 10 min · Whole class

To review whole-part thinking and check one-step and two-step solving.

YOU DO

1. Show Slide 10 big idea: picture total and pieces, and let ? show where to solve.
2. Run Slide 12 true-false: 47 + 28 = ? finds missing total; How many more always means you add; 35 - ? = 23 needs subtraction.
3. Take Slide 11 vote on trickiest type and have partners defend with bar: whole or piece?
4. Give 3-question exit ticket on boards.

STUDENTS DO

1. Vote, defend choice with The difference is __ because __.
2. Answer exit ticket and show boards.

Say: Good detectives do not just hunt key words. Picture what is happening. Whole missing? Add the pieces. Piece or gap missing? Subtract. Check by putting the answer back in the story.

Ask: True or false: How many more always means you add? (False. Find the gap by subtracting [10].) · When do you add to find the answer? (When both pieces are known and the total is missing [8].)

Check understanding: Exit ticket boards: 3 correct shows goal met. Re-teach small group tomorrow if ? misplaced.

Support: Provide pre-drawn bar frames and equation starters ___ + ___ = ?. **Stretch:** Ask: write a new compare story using 63 and 18 that needs 63 - 18 = ?.

Use: Slides 10-12

Common mistakes

Mistake	How to spot it	How to fix it
Adding when story says more, e.g., 52 + 35 for how many more	Answer larger than both towers and no gap shown	Line up towers and show gap must be smaller; subtract smaller from larger to find difference [10].
Using key words only, e.g., circling gave and adding	Wrong operation though drawing does not match story	Cover numbers, ask Is something being joined or separated, then draw bar before choosing [8].
Missing second step in two-step story, stopping at 14 for 32 - 18	Only one equation with ? and answer does not fit end of story	Use two-box storyboard for step one and step two and write two equations to show steps [1][2].

Support

- Start with totals under 20 using counters on a part-part-whole mat and ten-frame
- Pre-drawn bars and two-box storyboard for step one and step two

Stretch

- Add two-step cards where students must write two equations with ? to reach the final answer
- Turn same numbers into missing-piece or compare question and to subtraction check

For the LSE or teaching assistant

Stay with main activity groups. Help target students place cubes on part-part-whole mat, point to whole vs pieces, and prompt ? equation before solving.

Check for understanding

Question	Answer
There are 34 stickers and a helper gives 26 more. Write equation and solve.	34 + 26 = ?; ? = 60 stickers
A box had some crayons. 18 were added. Now 63. How many to start?	? + 18 = 63; ? = 45 crayons (63 - 18 = 45)
32 prizes, 18 won, then 10 added. How many now? Show two steps.	32 - 18 = 14; 14 + 10 = 24 prizes

Homework

Draw a bar and write a ? equation for one adding story at home within 50.

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