Word Problems:

From Flustered to Fearless

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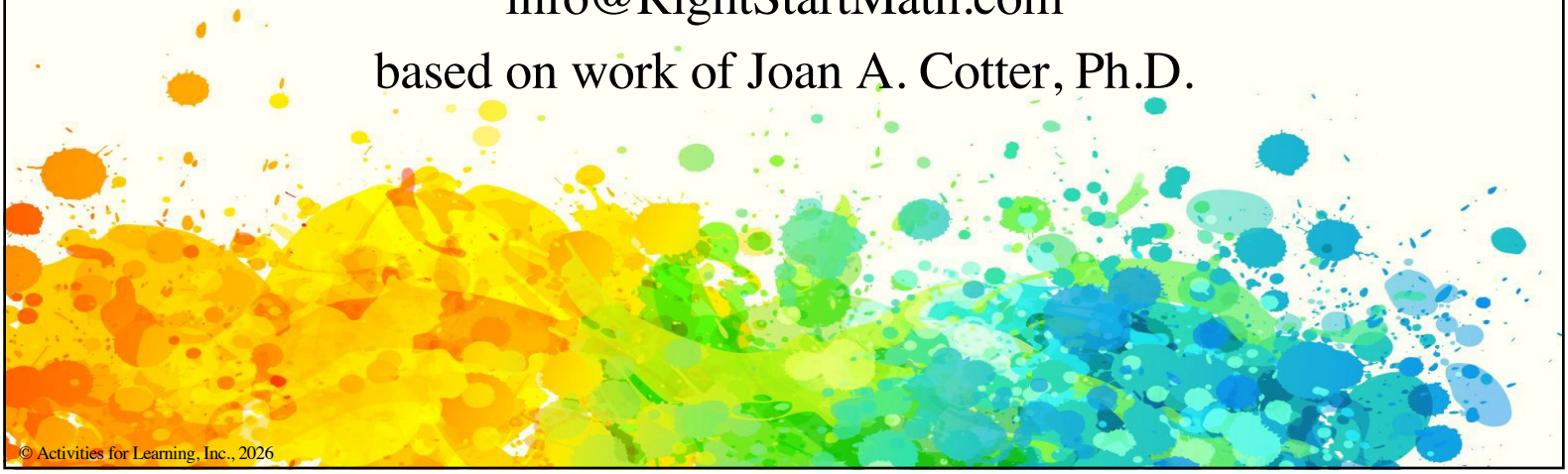
based on work of Joan A. Cotter, Ph.D.



Problem Solving

- The essence of solving story problems isn't performing calculations.
- The essence is determining the question, then deciding the process and procedures to find the answer to the question.

The purpose of learning math is solving problems; calculations are only the means to the end.

And Yet....

- My child knows the math, but they freeze with word problems
- Guessing begins
- Tears begin to well up
- We parents/teachers are unsure what to do or how to help

Word problems aren't about math facts—it's finding an answer for a situation!

General Considerations

1. Solving problems is about **thinking**, not trying to recall a particular specific process.
2. Unfortunately, traditional textbooks had a part in promoting a misconception regarding story problems.
3. Problems do not promote growth and learning if the solution is obvious.

General Considerations

4. Some people are under the impression there is only one way to solve a problem.
5. Actually, solving a problem in a different way is a check on correctness, an important aspect in real life.
6. If we didn't find new ways to solve problems, we wouldn't be advancing our world.

Preschooler Problem Solving

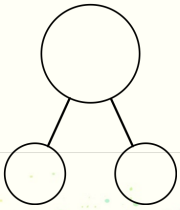
- Problem solving starts when a preschooler assembles a jigsaw puzzle.
- This work does the following:
  - helps the child master frustrations
  - acquire perseverance
  - learn there is more than one way to do the puzzle
  - experience the joy of success

Preschooler Problem Solving

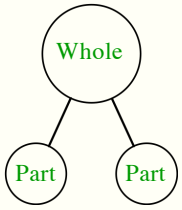
- Role of the parent/teacher:
  - to provide the appropriate puzzle
  - prevent distractions
  - offer bits of encouragement
  - rejoice at the completion

Elementary Problem Solving

- For simple addition and subtraction problems, use part-whole circles.



Part-Whole Circles



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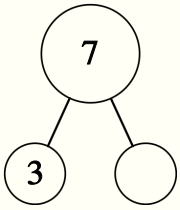
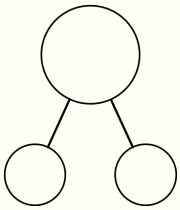


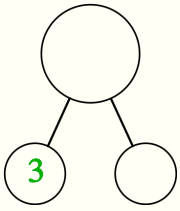
What is the other part?

Part-Whole Circles



Lee received 3 goldfish as a gift. Now there are 5. How many did Lee have to start with?

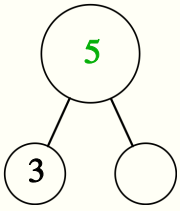
Part-Whole Circles



Is 3 a part or whole?

Lee received 3 goldfish as a gift. Now there are 5. How many did Lee have to start with?

Part-Whole Circles



Is 5 a part or whole?

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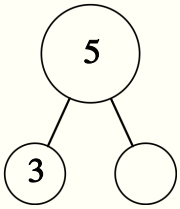
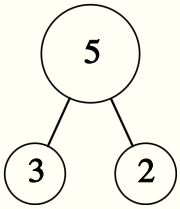
Part-Whole Circles



What is the missing part?

Lee received 3 goldfish as a gift. Now there are 5. How many did Lee have to start with?

Part-Whole Circles



Write the equation.

3 + 2 = 5
2 + 3 = 5
5 – 3 = 2

Lee received 3 goldfish as a gift. Now there are 5. How many did Lee have to start with?

Elementary Problem Solving

- Part-whole circles help **solve** problems.
- Often a simple sketch can make a problem seem clearer.
- Math problems need to be read several times.
- Even good mathematicians read problems more than once.
- Ask the child to tell the story back to you.

Elementary Problem Solving

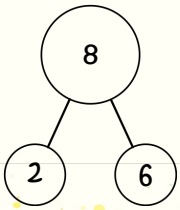
- Change the problem by using the child's name and their interests or circumstances.
- Also helpful for children to make up their own problems.
- Everyday events can lend themselves to great story problems.

Elementary Problem Solving

- Role of the parent/teacher:
  - remind the child to reread the problem
  - ask them what the question is
  - encourage using the part-whole circle sets
  - encourage sketching to help visualize the situation
  - give them time to think
  - do not prompt for the equation or answer

Word Problem #2

Al's cat had 8 kittens. Two are grey and the rest have stripes. How many kittens have stripes?



Six kittens have stripes.

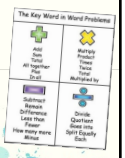
2 + 6 = 8

8 = 2 + 6

8 – 2 = 6

Some Tips

- Review answers to make sure it is logical.
- Avoid teaching the child to look for key words.
  - Do NOT teach that "altogether" or "total" means *add* or "times" and "by" means *multiply*.
  - In real-life situations, do you look for key words??

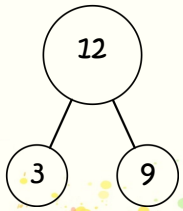


Some Tips

- Children should not expect to know how to solve every problem.
- Problems can be used to **teach** a concept.
- Japanese teachers give a problem to work on. Then, they ask the students to explain their solutions, simplest first and the more complex last.
- Mistakes are treated as a normal part of learning.

Word Problem #3

Drew has 12 eggs, which is a dozen. Drew accidently dropped 3 eggs and they broke. How many eggs are not broken?



Nine eggs are not broken.

12 = 3 + 9

3 + 9 = 12

12 – 3 = 9

More Tips

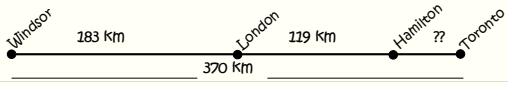
- When a child gets really stuck, have them go do something else. Their brain will continue working in the background.
- When they return, they will likely have new insights.
- **Persistence is required for success.**

More Tips

- Who has ever completed a puzzle by always finding the wanted piece on the first try?
- What baby has learned to walk without frustrations and falls?
- **Some frustration is expected.**
- **Persistence is required.**

Word Problem #4

The distance from Windsor, Canada to Toronto is 370 km with London and Hamilton between the two cities. The distance from Windsor to London is 183 km. The distance from London to Hamilton is 119 km. What is the distance from Hamilton to Toronto?



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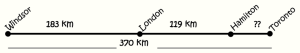
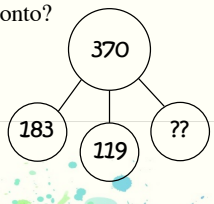




Word Problem #4

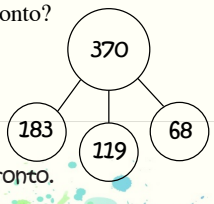
The distance from Windsor, Canada to Toronto is 370 km with London and Hamilton between the two cities. The distance from Windsor to London is 183 km. The distance from London to Hamilton is 119 km. What is the distance from Hamilton to Toronto?

370 – 183 – 119 = 68

370 – (183 + 119) = 68

183 + 119 + 68 = 370

It's 68 km from Hamilton to Toronto.



Word Problem #5

Zoey has $20 in her wallet and wants to buy 5 gifts that cost $5 each. Aspen also has $20 and wants to buy 6 gifts that cost $3 each. Does each girl have enough money for the gifts?

Zoey's spending = 5 × 5 = $25, which is more than $20

Aspen's spending = 6 × 3 = $18, which is less than $20

Zoey does not have enough money and Aspen does have enough.

Word Problem #6

Matthew's dog, Barky, is a black lab. Today is Barky's birthday and she is nine years old. How many days old is Matthew's dog?

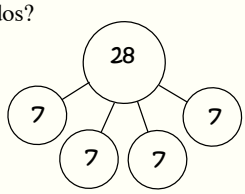
1 year = 365 days

365 × 9 = 3285

Barky is 3,285 days old today!

Word Problem #7

Avocados are packed with 7 in a bag. How many bags are needed for 28 avocados?

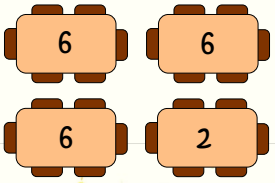


4 bags are needed for the 28 avocados.

28 ÷ 7 = 4

Word Problem #8

A group of twenty people enters a restaurant. Only six people can sit around a table. How many tables does the group need?

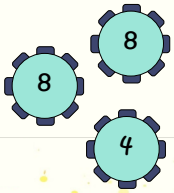


20 ÷ 6 = 3 r2

Group needs 4 tables!

Word Problem #9

The same group of twenty people is visiting another restaurant, but now **eight** people can sit around a table. How many tables do they need?



20 ÷ 8 = 2 r4

Group needs 3 tables.

Problem Solving

- Problem solving is the **reason** for mathematics.
- Word problems prepare the child for real life situations.
- Approach math problems like a puzzle.
- Struggling is natural and necessary. It's part of learning.
- Develop persistence. **It's part of life!**