

PLAYFUL MATH SINGLES

WORD PROBLEMS

from *Literature*

STUDENT WORKBOOK



DENISE GASKINS

Author of *Let's Play Math: How Families Can Learn Math Together—and Enjoy It*

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For answers and fully worked-out solutions, see the companion book *Word Problems from Literature: Help Students Master Problem Solving in Elementary to Middle School Math*.

*Storying—
encountering the world
and understanding it contextually
by shaping ideas,
facts,
experience itself
into stories—
is one of the most fundamental means
of making meaning.
As such, it is an activity
that pervades all learning.*

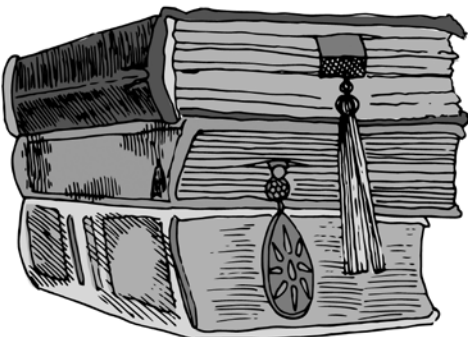
— GORDON WELLS



*Math ain't about numbers.
If you think that math is about numbers,
you probably think that Shakespeare
is all about words.
You probably think that dancing
is all about shoes.
You probably think that music
is all about notes.*

*Math ain't about numbers!
Math is about logic,
it's about beauty,
it's about connections.
It's about how you get
from one place to another.*

—CLIFF STOLL



1

Tools for Mathematical Problem-Solving

ARCHIMEDES TRIED TO FIND THE distance around a circle and almost discovered calculus. Pierre de Fermat predicted the result of a gambling game and laid the foundations of probability. Leonhard Euler went for an afternoon walk over the bridges of Königsberg and invented topology. Georg Cantor created a way to count infinity and opened a whole new world of modern math.

Through the centuries, mathematics has grown as mathematicians struggled with and solved challenging puzzles.

Problems are the raw material of math, the ore we dig, grind up, and melt, refining it to produce ideas. Our understanding of math grows as we play with problems, puzzle them out, and look for connections to other situations. The threads that connect these problems become the web of ideas we call mathematics. Each puzzle we solve adds a new thread to the web, or strengthens one that already exists, or both.

What If I'm Not Good at Math?

Do you struggle with math problems? Many people, when they get stuck or frustrated, decide that they're just not good at math.

But the truth is that *nobody* is good at math, if you define

“good at math” to mean they can see the answer instantly. Here’s a more useful definition: You’re good at math if you have problem-solving tools and know how to use them.

And *that* is something everyone can learn.

When you’re faced with a math problem, you need to combine the given facts in some way to reach the required answer. But rarely can you do it in a single leap. So you need to take one little step at a time. Can you think of a way to get closer to the goal?

Ask yourself these problem-solving questions...

(1) What Do I Know?

Read the problem carefully. Reread it until you can describe the situation in your own words.

List the facts or information given in the problem. Notice math vocabulary words like *factor*, *multiple*, *area*, or *perimeter*. What do you remember about those topics?

Sometimes a problem tries to trick you. Watch out for mixed units: If one length is given in inches and another is given in yards, make them consistent.

Try to express the facts in math symbols or using the visual algebra of a bar model diagram.

To solve math problems, be like a detective looking for clues.



(2) What Do I Want?

Describe the goal, what the problem is asking you to find. What will your answer look like?

Notice important words like *product*, *sum*, *next*, or *not*. Small words like “not” are especially easy to miss.

Try to express the goal in math symbols or using the visual algebra of a bar model diagram.

(3) What Can I Do?

Imagine yourself in the story situation, applying your hard-earned common sense. If this actually happened to you, what would you do?

Mix things around in your mind. Combine the given facts. Have you worked a problem like this before? How did you solve that one? Will that method, or something like it, work here?

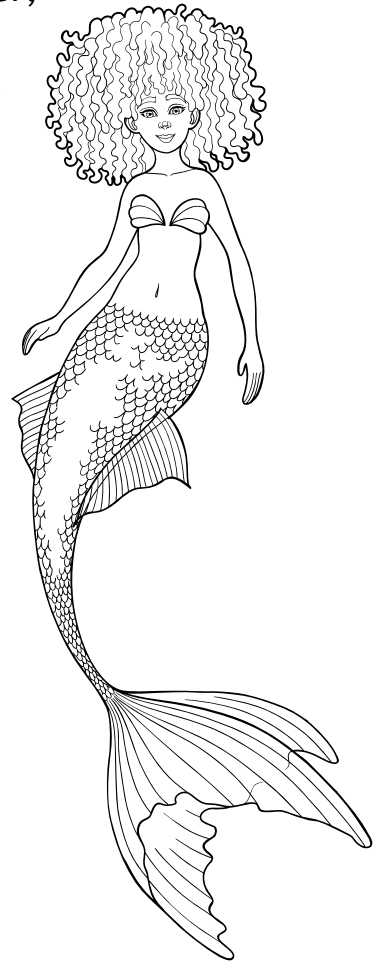
If you’re using a bar model, think about ways you might move or cut the blocks to discover new relationships.

Try a tool from your problem-solving toolbox:

- ◆ Draw and label a diagram or sketch.
- ◆ Act the problem out, step by step.
- ◆ Make a systematic list, chart, table, or graph.
- ◆ Look for a pattern.
- ◆ Simplify the problem. Try it with smaller numbers.
- ◆ Change your focus. Restate the problem in another way.
- ◆ Look for a related problem. How is it the same? How is it different?
- ◆ Think about “before” and “after” situations.
- ◆ Work backwards. Start at the end of the problem and find a path back to the beginning.

*If you wish
to learn swimming
you have to go into the water,
and if you wish
to become a problem solver
you have to solve problems.*

—GEORGE PÓLYA



2

Lay the Foundation: One-Step Problems

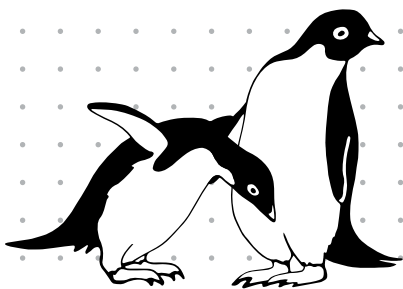
Inspired by;

Mr. Popper's Penguins ©1938 Richard and Florence Atwater

A family of four adopts several penguins
and teaches them to perform tricks.



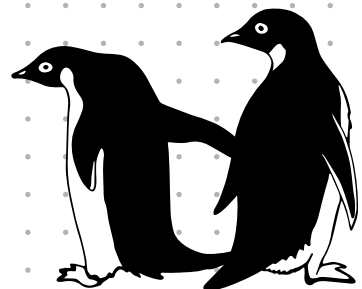
[1] During the winter, Papa read 34 books about Antarctica. Then he read 5 books about penguins. How many books did Papa read in all?



[2] When Papa opened the windows and let snow come into the living room, his children made snowballs. The girl made 18 snowballs. Her brother made 14 more than she did. How many snowballs did the boy make? How many snowballs did the children make altogether?

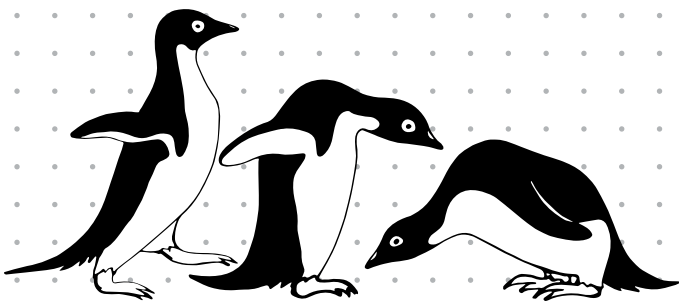
[3] Papa had 78 fish. The penguins ate 40 of them. How many fish did Papa have left?

[4] The family dressed in their best clothes for their meeting with the show manager. Mama had a ribbon 90 centimeters long. She had 35 cm left after making a bow for her daughter's hair. How much ribbon did Mama use to make the bow?



[5] The penguins did theater shows for 2 weeks. They performed 4 shows every week. How many shows did the penguins perform?

[6] While they were staying at the hotel, Papa put a leash on one of the penguins and took him for a walk. They climbed up 3 flights of stairs. There were 10 steps in each flight. Then the penguin flopped onto his stomach and slid down all the stairs. He pulled Papa with him all the way. How many steps did Papa fall down?



Make Your Own Math

What kind of things do the characters in your favorite story world count? Do they measure or cut things, or do crafts? What do they like to collect or share, or what are their favorite foods? What kind of math stories will you create?

[7] Write a changing-amount problem set in the world of a book or movie you enjoy. Your story will include:

- ◆ A beginning amount.
- ◆ Some type of change—joining or separation, giving or taking, growth or shrinking.
- ◆ And the final amount.

Tell any two of these numbers. Then ask your reader to figure out the third.

[8] Write a collection problem set in the world of a book or movie you enjoy. Your story will include:

- ◆ A whole amount (the collection).
- ◆ Two types or groups of people, animals, or things that are parts of the collection.

Leave either the whole or one of the parts a secret. Then ask your reader to find it out.

[9] Write a comparison problem set in the world of a book or movie you enjoy. Your story will include:

- ◆ A smaller amount.
- ◆ A larger amount.
- ◆ The difference between them.

Leave one of these numbers a secret. Then ask your reader to figure it out.

[10] Write a problem that contains some sort of this-per-that unit.

For example, where in your story world would people think about the number of legs per animal, cookies per child, dollars per item they buy, or something like that?

Your problem has three numbers:

- ◆ How many same-size units.
- ◆ The size of a single unit.
- ◆ The total amount.

Tell any two of these numbers. Then ask your reader to figure out the third.

[11] Write any kind of problem you like.

How to Solve Math Puzzles

You know how to solve math problems. Like a detective, you sift each clue until you solve the mystery. But what can you do when you come across a real stumper?

The *Word Problems Student Workbook* offers problem-solving tools you can use to conquer the worst math monsters. Try your detective skills on story problems inspired by several classic books and movies, from *Mr. Popper's Penguins* to *The Lord of the Rings*. Then make up new puzzles of your own, using your favorite story worlds.

Don't let the math scare you. Never give up. If you stick with it, you *will* be good at math!

Grab your copy of the *Word Problems Student Workbook* today and prepare your way for mathematical success.



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