NORD PROBLEMS WORD PROBLEMS from *iterature* STUDENT WORK BOOK

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

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About the Font:

The Cadman font was designed by P.J. Miller designed to be as readerfriendly as possible. Letters are distinct and easy to distinguish, especially those most easily confused by students and people with dyslexia. Cadman is suitable wherever a clear and legible sans serif font with open type features is required.

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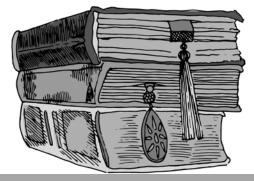
For answers and fully worked-out solutions, see the companion book Word Problems from Literature: Help Students Master Problem Solving in Elementary to Middle School Math. Storying encountering the world and understanding it contextually by shaping ideas, facts, experience itself into stories is one 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



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 problemsolving 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 hardearned 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?

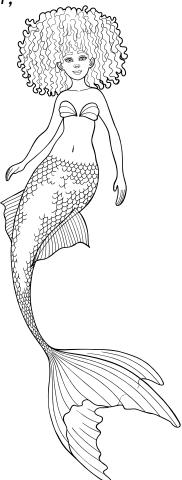
If you're using a bar model, think about ways you might move or cut the blocks to discover new relationships.

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



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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.



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0	٠	۰	0	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.															•	•	•	•											
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Lay the Foundation: One-Step Problems — 23

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