

Wonderful Word Problems!

Teaching Kids to Write Their Own Story Problem

Topics involved: Formulating questions, problem solving, researching topics of interest

Grade Level: 3rd and up

Materials: Paper, pencil, possibly research materials and magazines

Relation to NCTM Standards: Recognize and apply mathematics in contexts outside of mathematics

Word problems—it is a phrase that dredges up memories of nightmarish train schedules, and evokes groan in even the most well-adjusted of adults. Although they represent an important application of mathematics, word or story problems can be a source of boredom, confusion, or even anxiety for many learners.

In an effort to teach students how to solve word problems, Rachel McAnallen (a.k.a. Ms. Math) began to examine the specific problems featured in most textbooks. “I realized that the problems do not make sense to kids, because most of them are not written through a child’s eyes,” she explains. “The stories are not within a child’s reality, and the students don’t understand where these questions come from.”

The best way to give students a solid understanding of word problems, Rachel reasoned, was to teach them how to make up their own problems. “This is absolutely the hardest lesson in the world to teach,” she admits. “In this lesson, students are learning how to formulate questions; they are learning how to solve their own problems, and the problems of their classmates; they are learning where the word problem comes from. If you want something easy, don’t do this lesson. But if you want something that is going to stick with the kids, then go for it.”

When Rachel first began teaching this lesson, she would use old magazines as a springboard. Student would cut a picture out and write a story around the picture. “National Geographics are great,” she says. “One of the advantages of using magazines is that

kids can do research about topics they love,” she admits.

Rachel recalls teaching this lesson at a small school in Vermont. “There was a little boy who was very quiet. But as he was going through a stack of magazines for this activity, he found loads of pictures of spiders. He wrote his story problem about them, with prices and everything, and we eventually learned that he had spiders at home. As a result of this lesson, he opened up and began to talk about his collection.”

Because Rachel travels extensively, she has had to adapt the lesson with her suitcase in mind. “It’s easier for me to work from the students’ realities – I can’t always take bunches of magazines into schools with me.”

Reality Check

Since one of the objects of the lesson is to have students create story problems from their own reality and interests, Rachel begins by modeling this concept for learners.

She tells them, “Here is my reality: I have a house. I have pet. I have a mortgage payment. I have to buy food. I play golf. I use my computer every day. I have to catch an airplane once a week. I have to pack a suitcase with loads of math materials.”

After she identifies the things important to her reality, Rachel asks the class questions about their reality: “How many of you have a mortgage payment? How many of you have to catch a plane every week?” No hands are in the air for these first questions. “How many of you have pets?” she asks. Several hands are raised in reply. “Oh,” notes Rachel.

"There is one thing in your reality that crosses over to my reality."

The next step is to ask students to volunteer their own details about their realities. "Kids are absolutely wonderful," says Rachel. "They have all sorts of suggestions – school, friends, parents and siblings, sports, animals, computers, books, etc..... The older the students are, the more things they have in their reality."

Ask a Simple Question

To successfully create their own word problems, students must have the ability to ask questions about their story in which the answer is embedded within the text. As a preliminary exercise, Rachel will go around the room and allow each student to ask her a question about herself, with the good-natured caveat that it not be "not personal." She writes both their questions and her answers on a transparency for the overhead projector.

"Do you like ice cream?" asks one student.

"Yes," replies Rachel.

"How old are you?"

"Sixty-four."

"Do you like math?"

"Yes."

It is very rare that a student will begin by asking a questions that requires a more complex reply, such as "Why do you love math so much?"

"In the beginning, kids will ask me questions with one word answers," says Rachel. "If a student asks me whether I have a favorite flavor ice cream, I say 'yes.' I don't tell them what flavor it is, because they didn't ask me that."

As they go around the room, students begin to realize that the more detailed they are with their questions, the more detailed Rachel is with her answers. Rachel refers to these questions as "inquiry questions."

Before students begin composing their own stories, Rachel shares a story she

has written about her animals. "I make sure that my story is about things they can relate to," she explains. The story is displayed on the overhead projector so the class may read it together:

Ms. Math's Pets

There are four animals that live in my house with me and I love each of them, but each in a different way. Rufus is a yellow lab and his nickname is Wigglebutt. Every time he is petted his butt just wiggles and wiggles to the point that I think his whole rear end along with his tail is going to fall off. Auggie is a black lab and she had her birthday on April 15th. Even though she is 6 years old, she still has a lot of puppy traits like chewing my old smelly socks (yuck!) and piddling on the floor when I scold her for doing naughty things. Then there is Petey, the mutt dog. I don't know what kind of dog he is, or where he came from because he just showed up at my door about 13 years ago. I think someone dropped him off because they did not want him so I became his foster mother. He is the smallest of the three dogs, but he is the best watchdog.

Three years ago a big yellow longhaired cat appeared on my porch and never left. I named him Googol (a math name). He catches mice, moles, squirrels and chipmunks, which I don't mind very much, but I hate that he terrorizes the birds. I can't really get too mad at him because that is cat behavior. As you can see I really love my pets and they are considered a part of my family.

Once they've read Ms. Math's story, students are instructed to think of questions they can ask about the tale, in which the answer can be found by reading the information within the story.

Rachel writes down their questions on a blank transparency sheet:

"How many dogs does Ms. Math have?"

"How many cats does Ms. Math have?"

"Why is Rufus sometimes called 'Wigglebutt'?"

“What is Auggie’s bad habit?”

“How many animals live with Ms. Math?”

“How many legs do Ms. Math’s pets have all total?”

“We write down as many as we can think of,” says Rachel. “The kids get so creative.”

Sometimes students will ask a questions that cannot be answered by the story, for instance: “How old is Rufus?”

“We can’t answer that from the information in my story,” Rachel explains. “So that question does not fit.”

Math Homework: Story Time!

Once the class has worked on Ms. Math’s story, she gives them their first homework assignment. “For tomorrow, I want you to write a story about your reality,” she instructs them. “At the end of your story, write down some questions, just as we did with my story.” She reminds them to make sure that they can answer their questions from the information in their story. Students are told to write the answers to their questions on a separate sheet of paper.

“I get great stuff,” says Rachel.

“Wonderful stuff. Young writers may ask if they can write fantasy stories—stories that aren’t real. Anything they write about is okay, because if it’s in their mind, then it’s a reality. Creative writing is part of their reality.”

The KISS Method (Keep It Simple Sweetie)

“Keep in mind there is no math involved here yet,” Rachel comments. “You’re teaching a lot in this lesson that isn’t strictly math-related. The best thing for the teacher to do is use the KISS (Keep It Simple Sweetie) for the first assignment.”

The next day, each student exchanges their story with a classmate. After reading their partner’s story and answering the questions, students compare their answers to the answer sheet. “Disagreements will crop up,” says Rachel. “Perhaps a question wasn’t worded correctly, or there is not enough

information in the story to answer it.” Students help one another clean up any discrepancies before they take the next step—adding numbers into their story.

“Now, the next thing I do is take my story and put numbers into it,” says Rachel.

“Depending upon the grade level I’m teaching, I will put how much I spend per month on dog food, how much I spend on vet bills, birth dates – anything that involves numbers.

Ms. Math’s Pet (Number Version)

There are four animals that live in my house with me and I love each one of them but each in a different way. Rufus, a big yellow lab, is nicknamed Wigglebutt and weighs in at about 85 pounds. Auggie Doggie is a black lab who weighs about 70 pounds, and little Petey, who is a mutt, weighs about 7 pounds.

I have to buy one bag of dog food every week for the dogs which costs \$7.99 per bag, and one bag of cat food a month, which costs \$12.95 per bag. Last year I had to take each animal to the vets for their annual rabies shots and general check-up. Each trip cost \$45 and in addition to that Petey had a major operation on his leg which cost \$359. Auggie had an eye infection, which cost \$55 for the vet/trip and medication. I also spend about \$5 a month on little goodies for them like rawhide bones. I think I may spend a lot of money on my pets.

This new version of her story is placed on the overhead screen for students to read. “What are math questions we can ask?” says Rachel. As before, she uses a transparency and writes down all the questions the class comes up with:

“How much do you spend on vet bills a year?”

“How much do you spend on dog food?”

“How much do you spend on cat food?”

“How much more do you spend on dog food than cat food?”

“We come up with loads of questions, and figure out the answers as we go,” Rachel explains. “Then their homework is to add numbers to their stories, and ask math questions.”

If they like, students are allowed to write a new story for this assignment. Rachel requires that they have at least 5 math questions from their story. Students must work out the answers to their questions and bring them in on a separate sheet. The next day, the classmates again trade their revised stories, answer the math questions and work out any mistakes.

Story Problem Secret Revealed!

“Now,” Rachel tells students in a conspiratorial tone, “I want to let you in on a secret about story problems! Your teacher doesn’t want me to tell you this, but I don’t care!” The classroom teacher plays along with this, agreeing that she will be very upset if Ms. Math spills the beans.

Undeterred, Rachel reveals her inside knowledge. “People who write good word problems put useless information into the story to try and TRICK you!”

“Once the secret is out, I go back to my story and the class helps me put in numbers and information that I would never ask a question about,” explains Rachel.

At this time, students may go back and revise their own stories again. In their final revision, learners are allowed to illustrate their problems by cutting out pictures from magazines or doing whatever artistic work they wish.

When the class has completed their story problems, they compare their work to the work problems in their textbooks. “Kids look at the questions in their textbooks and they will say, ‘Gee, these are dull and boring,’ or ‘These are awfully easy,’” says Rachel. “Most of the time, kids will make up problems that are harder than what is in the textbooks for their grade level.”