

Word Problems in Grades 1-8

(Taken from *Making Math meaningful – A Source Book for Teaching Math in Grades 1-5, and from Grades 6-8 workbooks.*)

At times, word problems are held up as being more important than they really are. Some say that word problems show how math can be useful in the real world, and that word problems help to develop problem-solving abilities. Neither is necessarily true. In truth, many students (especially in the upper grades) quickly learn to hate word problems; they shut down as soon as they see a word problem.

There are many different types of word problems, and many levels. It is helpful to keep in mind that the analytical thinking abilities needed for true problem solving only really blossom toward the end of high school.

Our point here is not to say that word problems should be avoided until high school. Word problems should be brought into the classroom, starting in first grade, through stories and images. But we should be very careful! We need to keep in mind the pedagogical purpose of word problems. Word problems can help students see the interconnectedness of language – how English can be used to express a math problem. Word problems – if well chosen – can show how mathematics can appear in our everyday lives. We need to carefully consider how to bring word problems to the class in a way that isn't traumatizing. Keep it simple, and make it fun!

Second Grade. In second grade, word problems may still be done through imaginative stories, and they can also be done more simply during the mental arithmetic section of the lesson. Here are some examples:

- An empty bus stops and picks up 8 people. At the next stop, 3 people get off and then 4 get on. How many people are now on the bus?
- A mother went to the market with her two children. They bought 24 oranges. They looked so delicious and all three of them ate one orange right away. On their way home, the children met a friend and all three children ate another orange. How many oranges were in the mother's basket when they got home?
- A father was working in the garden during the fall. He found a hole with 5 nuts in a tree, later he found 6 nuts buried in the ground, and then he found 8 nuts on a shelf in the garden shed. How many nuts were there in total?

Third Grade. Simple puzzles, riddles, and games can be valuable at this age. (See *A list of Games* in the appendix.)

Fourth Grade.

- Simple written word problems are now introduced. Here are some examples of word problems to be done in fourth grade:
- How can we divide \$2292 evenly between six people?
(This problem can be worked on in groups as part of an introduction to the full process for vertical division. See *A Step-by-Step Progression for Vertical (Long) Division* below.)
- If we cut 8 apples into quarters, how many pieces do we have?
- If Mary's mother buys oranges for \$4.50 and peaches for \$3.10, how much does she have to pay? If she gives the cashier a \$10 bill, what should she get back for change? (Give many problems like this where the students need to determine how much change is given.)
- Our puzzle and game book. Fourth grade can also be a great time to bring riddles and puzzle problems to the class. Our *Making Math Meaningful Puzzle and Game Book* is intended as a resource for math teachers in grades four through twelve, in part to supplement the normal classroom material. It provides ideas for that "something different".

Fifth Grade. Word problems given in fifth grade should be more practical, such as:

- If a pound of cheese is divided evenly between 8 people, then how much does each person get?
- 23 fifth graders are working on a garden project. Every one works $1\frac{1}{2}$ hours. How many working-hours is that altogether?
- Simple *unit cost* problems, including:
 - If oranges cost 74¢ per pound, then how much do you need to pay for 5 pounds of oranges?
 - If 4 pounds of oranges cost \$5.16, then what is the price per pound?
 - If 4 pounds of oranges cost \$5.16, how much do 7 pounds of oranges cost?
 - If 4.3 pounds of oranges cost \$5.16, then what is the price per pound?
 - If 4.3 pounds of oranges cost \$5.16, then how much do 7 pounds of oranges cost?

Sixth Grade. Sample word problems for this grade include:

- 3 quarts of maple syrup cost \$19.47. How much do 3 gallons of maple syrup cost?
- $10\frac{1}{2}$ tons of compost is to be divided evenly between 60 gardens. How many pounds of compost does each garden get?
- A store is having a 60%-off sale. What is the new discounted price of a shirt that was originally marked at \$35?
- Bill can make a chair at a cost of \$36, including parts and labor. What must his selling price be (rounded to the nearest dollar) if he wants to make a 30% profit?
- Bill earns \$356 in a 40-hour week. What is his hourly wage?
- Kate is paid \$60/day. How long does it take her to make \$720?
- How long does it take the plane to go 3000 miles?
- A recipe calls for 2 quarts of water, 3 eggs, 5 cups of flour, and 2 teaspoons of salt. What is the ratio of flour to water?

Seventh Grade. Sample word problems for this grade include:

- A group of 24 people have found 7.2kg of gold. Assuming the gold is split evenly, how much gold does each person get (in grams)?
- A bag, which weighs 1.75kg empty, is filled with 350 balls, each weighing 180g. What is the total weight of the full bag (in kg)?
- Tom has a book that is, without the cover, 3.2cm thick. If the book has 800 pages, then how thick is the average page, in millimeters?
- A recipe calls for $1\frac{1}{4}$ cups of milk and $3\frac{1}{2}$ cups of flour. How much milk is needed if the recipe is enlarged to include $4\frac{1}{2}$ cups of flour?
- A gallon of milk is poured into two pitchers such that the ratio of their volumes is 3 to 5. How much milk is in each pitcher (in fl.oz.)?
- The length of a shadow of a tree is 25 feet. A $4\frac{1}{2}$ -foot pole next to it has a shadow $2\frac{1}{2}$ feet long. How tall is the tree?
- A bank offers a savings account with 2% interest compounded annually. What will be the balance of an account after 5 years, if the initial deposit was \$600?
- What do you end up with if you increase 55 by 40%, and then decrease that result by 40%?
- A bike, originally priced at \$480, was sold at a discount for \$345.60. What percentage discount rate is it?
- Bill weighs 75kg and Jeff weighs 60kg. If Bill sits 2.8m out from the fulcrum of a seesaw, then how far out does Jeff need to sit for the seesaw to balance?
- What is the fuel efficiency (in mpg – miles per gallon) of Mark's moped if it uses 1.4 gallons in 200 miles?
- How long does it take Bob to bike 65 miles at 13 mph?
- Dan left his house at 1:55pm to drive to Tom's house, 176 miles away. If he drove at an average speed of 55 mph, then at what time did he arrive at Tom's house?
- Water is leaking out of a tank at a rate of 20ml every minute. How long does it take 6ℓ to leak out?

Eighth Grade. Sample word problems for this grade include:

- The population of a city is about 100,000, and is increasing by 2.5% per year. Approximately, what will its population be in 50 years, if that growth rate continues?
- Kevin has 16% more money than Dan. How much does Dan have if Kevin has \$21.75?
- In the year 2000, Japan had a population of 127 million with a 0.23% growth rate, and Nigeria had a population of 123 million with a 2.6% growth rate. Assuming that those growth rates continue, what will Japan's population be in 2010?
- What is the average speed of a cyclist who goes up a 10-mile hill in 3 hours and 25 minutes, and then comes down in just 20 minutes?
- A cylindrical bucket has a 1-foot diameter and an 18-inch height. Calculate its capacity.
- There are two maps of Japan on the wall of a classroom. The one next to the door has a scale of 1:2000 000, and the one next to the window has a scale of 1:5000 000. Which map is larger?
- What is the density (in lb/ft³) of a ball that is 18" in diameter and weighs 18 pounds? What percent as dense as water is it?
- A concrete block measures 30cm by 15cm by 20cm. What does the block weigh (in kg) if the density of concrete is 2.1 g/cm³?
- Charlie's lawnmower uses $1\frac{1}{4}$ gallons of gas to mow $\frac{3}{4}$ of his lawn. How much gas does it take to mow his whole lawn?