

Tips for Word Problems

It isn't always obvious what math to use when reading a word problem. The way we use words in English is much more complicated than simple math formulas! Here are some pointers.

Translating English to Math

- **“Of” means multiply.** Usually when people use “of” in math, they mean multiply. Here are some examples: 15% of \$20. 5 boxes of a dozen donuts each. We never say 5 of 12, since that would sound funny, but as soon as you add units to the first number, it makes sense: 5 boxes of 12 or 15% of 20.
- **“Out of” means divide.** 4 out of 5 dentists. This one is easy and doesn't need units because the phrase “out of” implies that the units on the top and bottom of the fraction are the same.
- **“Per” also means divide.** 55 miles per hour. The word “per” is used for division when the units for the two numbers are not the same. It also makes sense if the units are the same, but it sounds weird: 4 dentists per 5 dentists.
- **“And” usually means add.** You already know this. One big exception is when you are counting branching possibilities. For example, if Alice had 4 children, and each child had 3 children of their own, then Alice would have 12 grand children.
- **“Is” means equals.** This one sounds obvious, but people often forget to that to solve for an unknown, you usually need to solve an equation.
- **“What”/“How” questions indicate unknowns.** If a problem asks ‘how much’ or ‘what is’, that means there is an unknown quantity. Pick a letter to represent the unknown.

Getting Started

First ask:

1. **Can arithmetic solve the problem?** Many word problems just need addition, subtraction, multiplication and/or division. Use **factor-label method** to deal with unit conversions.

If not, then you'll need algebra.

2. If it helps, **draw a picture.**
3. **Pick a letter to represent an unknown quantity.** Try to avoid using more than one letter unless you have to. Make sure to focus on the important variable in the question.
4. **Translate words into formulas.** Use the guide above to help. Once you have an equation, use algebra to solve it.
5. **Substitute to get rid of extra variables and equations.** Typically you need one equation for each unknown in algebra.