

Percentages: Problems

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1. 22% of my friends are mathematicians. 83% of my friends who are mathematicians like their job. What percentage of my friends are mathematicians who like their job?
2. This time last year I had 120 friends in my address book. Today I checked and I now have 164 friends in my address book. What was the percent change? Use it in a sentence.
3. When shopping for a laptop, I've narrowed it down to two models: one costs \$2,200 and the other costs \$1,875. What is the percent difference in costs? There are two possible answers to this question; compute them both.
4. Last semester I had a student whose grades looked like this:

Area	Grade
Homework	22%
Quizzes	34%
Project	15%
Tests	75%

- A passing grade is 63% and above. Do you have enough information to know if they passed? If not, explain why not, and give an example to back up your explanation.
5. This last problem is about polygraphs, though it could just as well be about many types of tests.

A *polygraph* is a machine which, by measuring a person's vital signs, tries to determine if the person is lying. In a typical polygraph examination, the subject sits in a

special chair while answering a series of yes/no questions. A typical polygraph measures the subject's breathing, heart rate, the degree to which the subject's palms are sweating, and a sensor in the chair measures how much the subject is shifting around. In the United States, 19 states allow polygraphs to be admitted as evidence in court. The federal government also uses polygraphs in evaluating job candidates for security clearances.

Let's take a look at a hypothetical polygraph situation. While the reliability of the polygraph is widely disputed, the most generous estimates (according to a quick Google search) say that it correctly determines if a subject is lying or not roughly 93% of the time.

Suppose we test a group of 1000 people, of which 10 are lying, while the other 990 are not. How many people will the machine say are lying? How many people will the machine say are not lying? What is the percent difference between the number the machine accuses and the number who are actually lying? Based on this, does it make sense to assume a person is lying if they fail a polygraph test?