

Pomona College
Department of Mathematics

Math 29. Advanced Problem Solving
Fall 2013

Problem Set #2

Note: You will be working in groups on these problems during class and in the mentor sessions. Try to make as much progress as possible and keep good notes on how your group arrives at a solution. Outside of class, you will write up solutions to the problems that you have solved in class and in the mentor sessions. Write up solutions neatly in your *Problem Solving Journal*. To be complete and understandable, a solution often needs complete English sentences intertwined with mathematical calculations. Your aim is to make the solution clear to someone who does not know how to do the problem.

1. Watermelon are assumed, for present purposes, to be a substance that is 99% water by weight. If 500 pounds of watermelon are allowed to stand overnight, and if the partially evaporated substance that remains in the morning is 98% water, how much is the morning weight?
2. A jeweler has two bars of gold alloy in stock, one 12-carat and the other 18-carat (24-carat gold is pure gold, 12-carat gold is $\frac{12}{24}$ pure, 18-carat gold is $\frac{18}{24}$ pure, and so on). How many grams of each alloy must be mixed to obtain 10 grams of 14-carat gold?
3. Suppose you find a rock of mass 47 grams, and you think it might be gold. You fill a container with 10 cm^3 of water, and drop the rock in the water. The volume of the water with the rock in it is now 13.7 cm^3 . Given that the density of gold varies between 15.3 and 19.3 gr/cm^3 , can you conclude anything about whether or not the rock is gold?
4. Polluted water runs through a series of filters, each with a finer mesh than the previous one. Suppose each filter removes 20% of the pollutants in the water. What is the minimum number of filters that the water has to pass through so that the result will contain no more than 7% of its original pollutants?