

1. Start with a stack of monopoly money: seven bills ranging from \$500 to \$1, with the smallest on top. On each turn, you may remove the top bill from a stack and either place it on top of another stack or start a new stack. You may not put a larger bill on top of a smaller nor have more than three stacks at any time. Is it possible to end with two stacks, one of which has a \$50 bill on top? How about \$100? \$500?
2. Seven pirates meet on a desert island to divide up their treasure evenly. When they share out their pieces-of-eight, there is one left over. The pirate chief claims it as his own, so the others shoot him, choose a new chief, and try to divide them again. There is again one piece left over, which the new chief claims as his own. So they stab him, choose a new chief, and try again. This time, the pieces can be divided evenly. Assuming that there are no more than 250 pieces to share, how many does each of the five remaining pirates get?
3. If x stands for the repeating decimal $.0909090909\dots$, why is

$$100x = x + 9,$$

and why does that mean that $x = \frac{1}{11}$? Use the fact that $27 \cdot 37 = 999$ to write does the repeating decimal for $\frac{1}{27}$.

4. You have seven coins which weigh 1 ounce each and one coin which weighs 0.9 ounces. You also have an accurate digital scale. How can you figure out which coin is underweight in three weighings? (In each weighing, you take some of your coins, put them on the scale, and press the button to find the total weight of the pile.)