1. A municipality wants to reduce the pollution in a small lake, which has about 4 million gallons of water, by 50%. For this, they are pumping fresh water at the rate of 50 gal/min and the well-stirred polluted water is allowed to flow out of the lake at the same rate. How long does it take them to achieve the goal?

2. A tank contains 1200 gal of pure water. A sugar-water solution containing 2 lbs of sugar per gal enters the tank at a rate of 2 gal per minute and simultaneously a drain is opened at the bottom of the tank allowing the well stirred sugar solution to leave at 2 gal per minute. Find the amount of sugar after 20 minutes of this process.

3. A tank with a capacity of 500 gal originally contains 400 gal of water with 5% salt dissolved in it. Water containing 1 lb of salt per gallon enters at a rate of 2 gal/min, and the mixture is allowed to flow out of the tank at a rate of 4 gal/min. Find the amount of the salt in the tank (in lbs) after 10 minutes of this process.

4. A 500 gal holding tank initially contains 300 gal of water with a salt concentration of 0.20 lb per gallon. Water containing 1 lb of salt per gallon enters at a rate of 3 gal/min, and the well-stirred mixture is allowed to flow out of the tank at a rate of 2 gal/min. Find the amount of the salt in the tank (in lbs) at the moment the water begins to overflow.