Problem 1. 2009 has the following property: if you switch digits (numbers cannot start with zero) then the resulting number is always larger. Which is the next larger number for which this is the case? (3 points)

Problem 2. Divide the two figures below into 8 equal parts. Draw your solution inside the lower right-hand figure. (4 points)
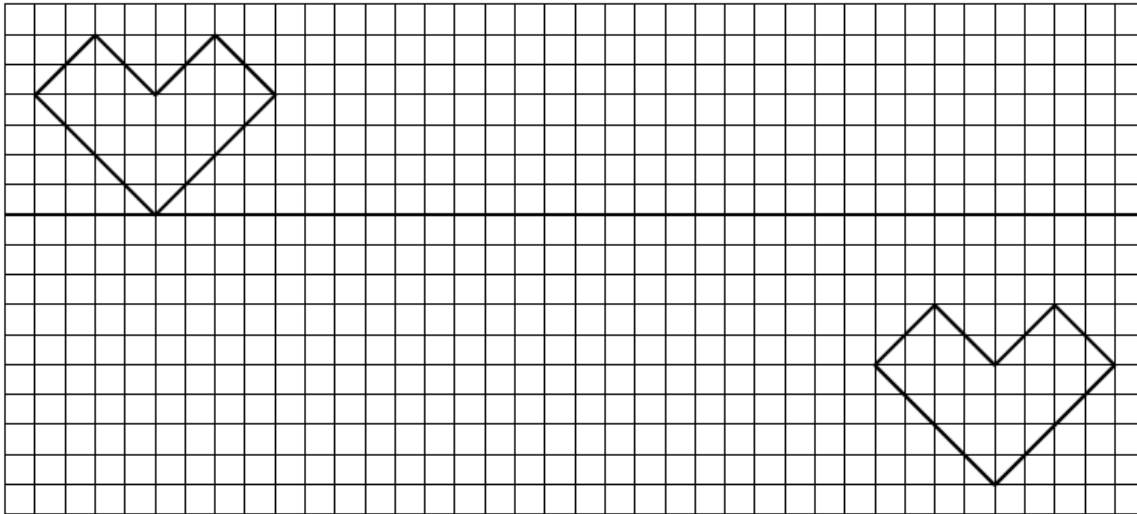

Problem 3. In a park grew limetrees and maple trees. The maples initially made up 60% of the trees.   The next spring limetrees were planted were planted in such a quantity that after the planting the maples made up 20% of the trees. But then the next fall maples were planted in such a quantity that maples once again made up 60% of the trees. By how many times did the number of trees grow that year? (6 points)

Problem 4. If an octopus has an even number of legs it always tells the truth; if it has an odd number of legs it always lies.

The green octopus once said to the blue octopus: "I have 8 legs. But you only have 6 legs". "No", said the blue octopus , "I have 8 legs, and you only have 7 legs". The violet octopus then said: "The blue octopus actually does have 8 legs. But I have 9 legs!" The striped octopus then entered the conversation and said: "None of you has 8 legs – only I have 8 legs".

Which of the octopi actually has/have 8 legs? (7 points)

Problem 5. The curious tourist wanted to walk along the streets of the Old City from the train station (point A) to her hotel (point B). The tourist wanted her walk to be as long as possible, but did not want to ever reach the same crossing twice. Draw the longest possible path and prove that it is indeed the longest. (7 points)
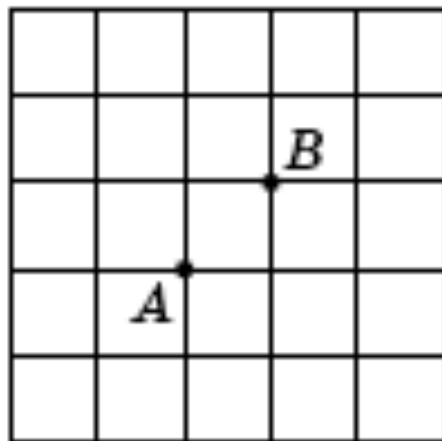
Problem 6. A) A stingy knight kept golden coins in six chests. Once, when he counted the coins, he noticed that if one opened any two chests then it was possible to distribute the coins evenly between the two chests. He also noticed that if one opened any three, four or five chests then it was also possible to divide the coins in those evenly among the open chests. Suddenly there was a knock on the door, and the old miser did not know whether it was possible to distribute all the coins evenly among all six chests. Is it possible to answer this question without looking in the chests?   (5 points)

B) If there were eight chests, and the coins could be evenly distributed in any two, three, four, five, six or seven chests, would the stingy knight then be able to know whether he would be able to distribute the coins evenly across all eight chests? (5 points)