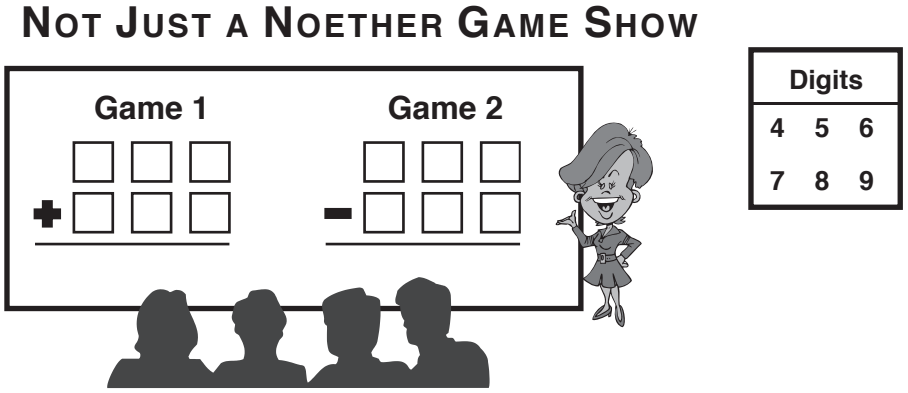
Emmy Noether – Circle 1 for 2004-2005

Part I: Problems

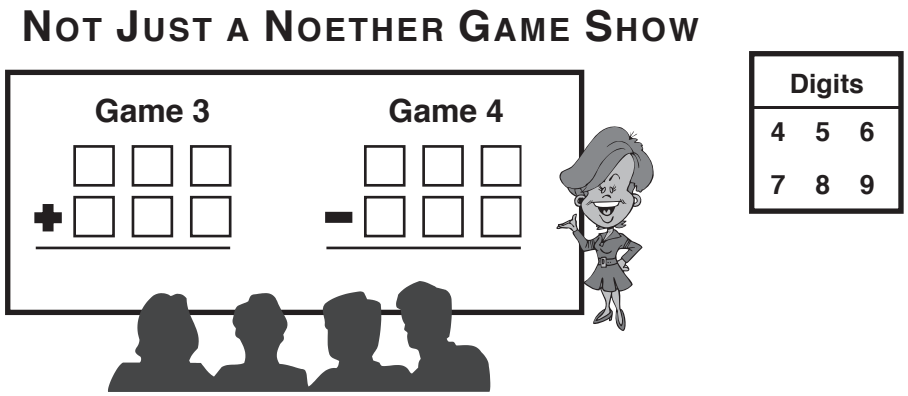
Problem 1:

a) Welcome to "Not Just a Noether Game Show!" The goal is to arrange the digits 4, 5, 6, 7, 8, 9 in the given boxes to achieve the greatest possible answer, using each digit once.
Compare with your classmates – there may be more than one winner!



Digits		
4	5	6
7	8	9

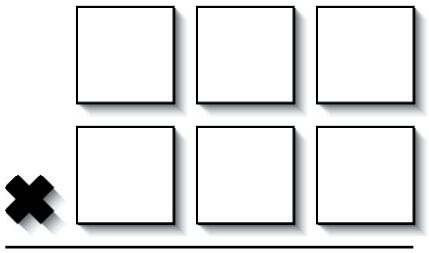
b.) Repeat Games 1 and 2 of part a), but this time try to achieve the least possible answer. In Game 4, the answer must be positive.



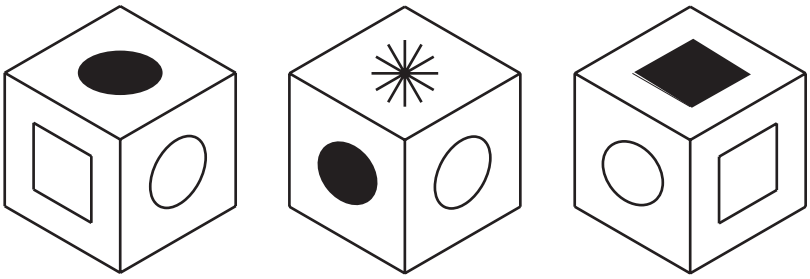
Digits		
4	5	6
7	8	9

Extension:

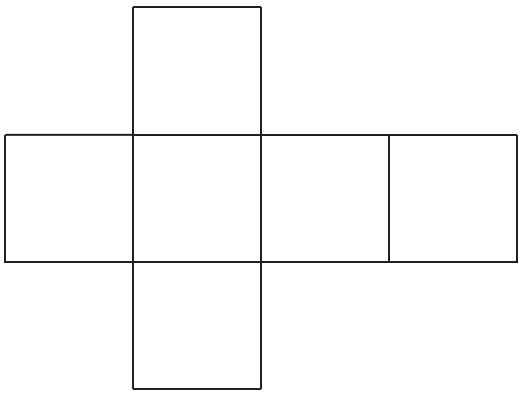
Arrange the digits 1,2,3,4,5,6 in the given boxes to achieve the greatest possible answer. (Repeat for least answer if desired.)



Problem 2:



The six symbols ■ □ ● ○ △ ✳ appear on the faces of a cube. Three views of the cube are shown. Label the faces of the net below so that it can be used to construct the cube.



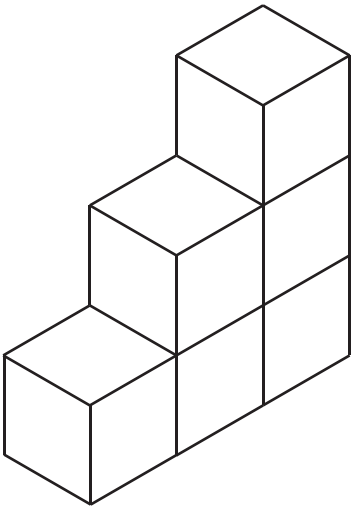
Extension:
Construct at least two additional different nets for this cube.

Problem 3:

Grandma Bev has 1024 identical candle stubs. She can make one new candle from 8 stubs.
a) How many new candles can she make from 1024 stubs?
b) If she then burns all these candles to stubs, how many new candles can she then make?
c) If she continues to burn all her candles to stubs and make new candles, what is the greatest number of candles can she make in total?

Problem 4:

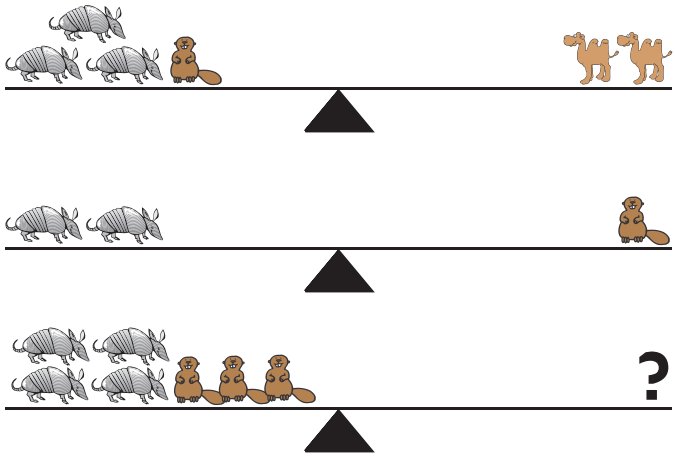
This stairway is made up of cubes. How many cubes would be needed to make the stairway 9 steps high? 99 steps high?



Extension:
It takes 30ml of paint to cover one face of a cube of the size used in your stairway. How much paint would you need to paint all the faces except the bottom in your 9-step stairway (i.e., all the exposed faces)?

Problem 5:

Each scale shown below is in perfect balance, showing **A**rmadillos, **B**eavers, and **C**amels. How many **C**amels are required to balance scale 3?



Problem 6: (Suggested for groups of 2 or 3 students. You will need scissors.)

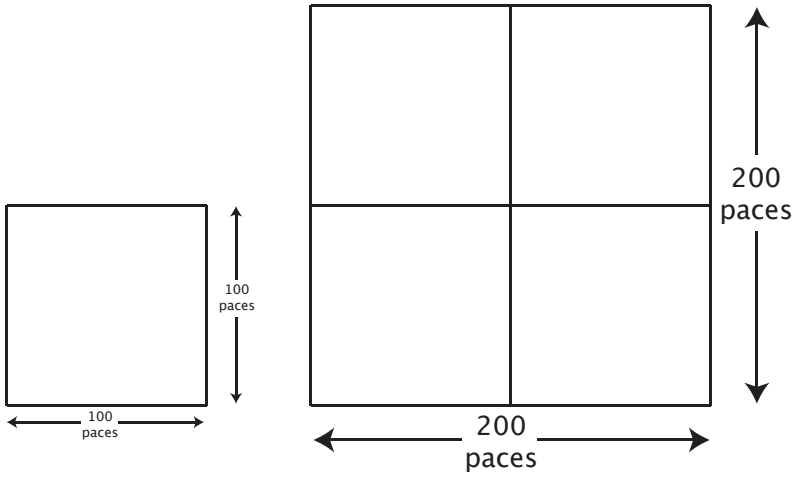
Long ago there was a farmer whose land was in the shape of a square. Each side of the square was exactly 100 paces long.

One day, a tired, dusty woman knocked on the farmer's door and asked for something to eat. The farmer, being a kind person, gave her a nice lunch of burgers and fries.

After the woman had eaten, she said, "Farmer, I am your queen! As a reward for your kindness in giving me food when you thought I was just a humble stranger, you may double the area of your land. However, your land must remain in the shape of a square."

The farmer was overjoyed, for now he could plant twice as many crops. He went out at once to measure his new land so that he could put a fence around it. But suddenly, he found he had a problem.

At first, the thought of his square of land seemed easy. Since each side of the square was 100 paces long, it seemed as if the sides of the new square should be 200 paces long – twice the length of the old sides. But this didn't work! His new square, with sides 200 paces long, wasn't twice as big as the old square – it was four times as big.



The farmer had a hard time coming up with a way to double the size of his land while keeping it a square. He sought out the advice of the village philosopher. You are this person! You must help the farmer solve his problem.

Combining the 2 squares below gives the proper size of the new field. You may cut them any way you like. You must use all of both squares, and the new field must be in the shape of a square.