MATH ϟ☽⋆ Homework Due: 3 October 2012

(1) One of the players in the *happy game* will never lose, no matter how clever the other player is. Play the *happy game* until you figure out which player can win, and how they can guarantee that they don't lose. Write a careful description of the strategy you use to never lose. Do you want to go first or second? Explain your strategy clearly enough so that a fellow student could follow your instructions. EXTRA CREDIT: Explain why your plan handles *all* possible counter-strategies your opponent might use.

(2) Do these subtraction problems. (Pictures might help!)

(a) $\star\heartsuit - \Delta\square$

(b) $\square\square - \heartsuit\star$

(c) $\text{ϟ}\heartsuit\square - \star\,☽$

(d) $\heartsuit☺☺ - \square\star$

(3) A happy student was doing arithmetic on a dusty floor when her friend walked through some of her work. Can you fill in the numbers that got erased?

$$\begin{array}{rr} & \Delta\ \ \star \\ -\ & \heartsuit\ \ \ \\ \hline & \ \ \ \heartsuit \end{array} \qquad \begin{array}{rrr} & & \heartsuit \\ -\ & \square & \square \\ \hline & \text{ϟ} & \end{array} \qquad \begin{array}{rrrr} & ☽ & \star & \\ -\ & \Delta & & \square \\ \hline & & ☺ & ☽ \end{array} \qquad \begin{array}{rrrr} & \text{ϟ} & \text{ϟ} & \heartsuit \\ -\ & \Delta & & \\ \hline & & \star & \heartsuit \end{array}$$

(4) Write down clearly two real-life math questions requiring the subtraction $33 - 19$ to solve them. Make them as different from one another as possible and include answers (if appropriate with correct units). For one of your examples, illustrate how you could use the real-life situation to explain to your students the steps needed to subtract 19 from 33.