11. There is only one honest politician because at any given time s/he could be paired with another politician who would have to be crooked because at least one in a pair must be crooked. You can't have two honest politicians in a pair so there can't be more than one honest politician. good! 2

12. There would be 105 lines connecting 15 dots around a circle. The first dot would have 14 lines. The second would have 13 because you can't count a line twice. If you add 14+13+12 and so on to one you get 105. good. 2

13. Fill the 9-qt pail and pour from it into the 5-qt. pail. Throw the 5-qt's water out and pour the remaining 4 qts in the 9 into the 5. Re-fill the 9 from the source and carefully fill up the 5qt pail from the 9-qt pail leaving 8 qts. Throw the water from the 5 out and refill it from the 9 leaving 3 qts in the 9-qt. pail. Throw the water in the 5-qt. pail out and pour the 3 qts from the 9-qt pail into the 5-qt. pail. Re-fill the 9 from the source and fill the 5 up from the 9. You now have exactly 7 qts of water in the 9-qt. pail. 2

Problem 4, HW set 1:

There are several ways to do this one!

1. You could list them all out... tedious!

2. One idea I had: Make 2 groups, called group A and group B.
In group A, put all the odds from 1-100, then put 2 times all the odds in group B.
Now put $2 \times (2 \times \text{odds})$ in group A, and $2 \times (2 \times (2 \times \text{odds}))$ in B. If you continue in this way until all the numbers are accounted for, you ensure that there is no one in a group that has 2 times the amount of someone else in the same group.

$A = \{\text{odds}, 2^2 \times \text{odds}, 2^4 \times \text{odds}, 2^6 \times \text{odds}\}$

$B = \{2 \times \text{odds}, 2^3 \times \text{odds}, 2^5 \times \text{odds}\}$

(up to 100 only! for all of these...)

$A = \{1, 3, 5, 7, 9, 11, 13, \ldots, 99;\ 4, 12, 20, 28, 36, 44, \ldots 100;$
$\quad 16, 48, 80;\ 64\}$

$B = \{2, 6, 10, 14, 18, \ldots, 98;\ 8, 24, 40, 56, 72, 88;\ 32, 96\}$

3. Another idea someone in class had:

basically, follow the pattern

$$\begin{cases} A: & n \to 2n-1 \\ B: & 2n \to 4n-1 \\ A: & 4n \to 8n-1 \end{cases}$$

↖ this is always 1 less than 2 x start #.

this way we always make sure that 2 times any number is in the other group!

So if we let $n=1$:

A	1	
B	$2 \to 3$	$\Rightarrow A = \{1, 4, 5, 6, 7, 16, 17, 18, 19,$
A	$4 \to 7$	$20, 21, 22, 23, 24, 25,$
B	$8 \to 15$	$26, 27, 28, 29, 30, 31,$
A	$16 \to 31$	$64, 65, 66, \ldots, 100\}$
B	$32 \to 63$	$B = \{2, 3, 8, 9, 10, 11, 12, 13,$
A	$64 \to 100$	$14, 15, 32, 33, \ldots, 63\}$

* if B contains the numbers $2n$ up to $4n-1$, then 2 times those are all between $4n$ and $8n-2$ which we've put in A!