Puzzle Set 3: Lewis Carroll

This set features problems originally set by, or inspired by, Lewis Carroll (aka Charles Dodgson). References and further reading on the class website.

Pillow Problems

1. Prove that three times the sum of three squares is also a sum of four squares. [Example: $3(1^2 + 3^2 + 7^2) = 2^2 + 4^2 + 6^2 + 11^2$.]

2. A bag contains a counter, known to be either white or black [with equal probability for each case]. A white counter is put in, the bag is shaken, and a counter is drawn out, which proves to be white. What is now the chance of drawing a white counter?

3. Prove that, if any three numbers be taken, which cannot be arranged in arithmetic progression, and whose sum is a multiple of 3, the sum of their squares is also the sum of another set of 3 squares, the 2 sets having no common term. [Example: take 4, 5 and 9 as the original numbers; we have $4^2 + 5^2 + 9^2 = 3^2 + 7^2 + 8^2$.]

4. Some men sat in a circle, so that each had 2 neighbours; and each had a certain number of shillings. The first had 1 more than the second, who had 1 more than the third, and so on. The first gave 1 to the second, who gave 2 to the third, and so on, each giving 1 more than he received, as long as possible. There were two neighbours, one of whom had 4 times as much as the other. How many men were there? And how much had the poorest man at first?

Logic Puzzles

L1. My saucepans are the only things I have that are made of tin.
I find all your presents very useful.
None of my saucepans are of the slightest use.

L2. No ducks waltz.
No officers ever decline to waltz.
All my poultry are ducks.

L3. All puddings are nice.
This dish is a pudding.
No nice things are wholesome.

L4. All my sons are slim.
No child of mine is healthy who takes no exercise.
All gluttons, who are children of mine, are fat.
No daughter of mine takes any exercise.

L5. The only animals in this house are cats.
Every animal is suitable for a pet, that loves to gaze at the moon.
When I detest an animal, I avoid it.
No animals are carnivorous, unless they prowl at night.
No cat fails to kill mice.
No animals ever take to me, except what are in this house.
Kangaroos are not suitable for pets.
None but carnivora kill mice.
I detest animals that do not take to me.
Animals, that prowl at night, always love to gaze at the moon.

Doublets

- Put MILK into PAIL

- WELL DONE

- Put INK into PEN

- Make FIRE produce HEAT

- Make GREEN turn BROWN

- Turn SLEEP into DREAM

- Increase ONE to TWO

- Use BREAD for TOAST

- Transpose FLUTE into CELLO

- Turn LINEN into SHEET

Create some (Marlboro-themed?) doublets of your own.