HW 4 assigned 19 Sept 2002, due 25 Sept 2002, hand in during class on stapled loose leaf paper

1. The neighborhood betterment committee has been given \( r \) trees to distribute to \( s \) families living along one side of a street.

(a) In how many ways can they distribute all of them if the trees are distinct, there are more families than trees, and each family can get at most one?
(b) In how many ways can they distribute all of them if the trees are distinct, any family can get any number, and a family may plant its trees where it chooses?
(c) In how many ways can they distribute all the trees if the trees are identical, there are no more trees than families, and each family receives at most one?
(d) In how many ways can they distribute them if the trees are distinct, there are more trees than families, and each family receives at most one (so there could be some leftover trees)?
(e) In how many ways can they distribute all the trees if they are identical and anyone may receive any number of trees?
(f) In how many ways can all the trees be distributed and planted if the trees are distinct, any family can get any number, and a family must plant its trees in an evenly spaced row along the road?
(g) Answer the question in part (f) assuming that every family must get a tree.
(h) Answer the question in part (e) assuming that each family must get at least one tree.

2. You paint each side of a rectangular wooden block with a different color of paint. You have ten colors of paint to choose from.

(a) How many different painted \( 2\text{cm} \times 2\text{cm} \times 2\text{cm} \) blocks can you make in this way? (Two blocks are considered to be the same if you can rotate one so that the colors on corresponding faces match.)
(b) How many \( 2\text{cm} \times 4\text{cm} \times 4\text{cm} \) blocks?
(c) How many \( 2\text{cm} \times 4\text{cm} \times 6\text{cm} \) blocks?