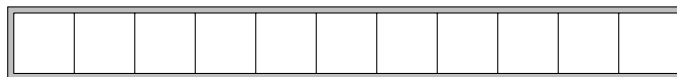


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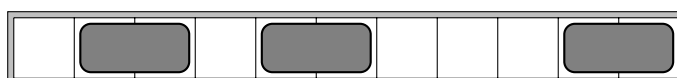
Student No: _____

Grade: For each answer, **provide a short argument.**

1. (4 points) We have a *board* consisting of a row of 11 unit squares:



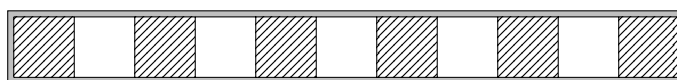
We would like to arrange 3 *dominoes* (i.e., 2×1 rectangular blocks) on the board in such a way that every domino covers exactly two squares and no two dominoes overlap. An example of a valid arrangement of the dominoes is the following:



- (a) How many valid arrangements are there?

Answer:

Suppose that every other square on the board is painted black, starting with the one on the left:



- (b) What is the chance that, in a random valid arrangement of the dominoes, the left half of each domino sits on a black square?

Answer:

2. (4+ points) A jar contains 3 blue balls and 7 red balls. We draw a ball from the jar at random, record its color, and replace it back into the jar along with 2 more balls of the same color. Then, we draw another ball from the jar at random.

(a) What is the chance that the second ball is blue?

Answer:

(b) If the second ball is blue, what is the chance that the first ball has also been blue?

Answer:

- (bonus) (c) Suppose we repeat the first step of the experiment over and over. In other words, we repeat drawing balls from the jar; each time, we record the color of the drawn ball and then put it back into the jar along with 2 more balls of the same color. What is the chance that the 8th ball we draw is blue?

Answer: