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Individual Assignments #58

Assignment: Section 4.2: 2, 4, 12, 30

# Q2

We are told that the first, second and third domino all fall down. We are also told that when a domino falls the domino 3 farther down the line also falls down. Hence the base case is satisified.

For the inductive step we assume that all k dominos fall down. As long as k > 3 the k+1 domino will fall because the k-2 domino fell.

# Q4

1. P(18) = 2 each of 7 cent stamps and 1 each 4 cent stamp for a total of 18 cents postage.  
   P(19) = 3 each of 4 cent stamps and 1 each 7 cent stamp for a total of 19 cents postage.  
   P(20) = 5 each of 4 cent stamps for a total of 20 cents postage.  
   P(21) = 3 each of 7 cent stamps for a total of 21 cents postage.
2. If all P(k) postages are validly made from 4 cent and 7 cent stamps where .
3. All P(k+1) postages to be valid using 4 cent and 7 cent stamps.
4. Because we know that P(k-3) is true, postage of k-3 is proven. Add a single 4 cent stamp and k+1 is valid.
5. Since the basis and inductive step are done it si shown that the statement is true for any integer by strong induction.

# Q12

Prove all positive integers of n can be written as a summation of powers of 2.

Even numbers

+

…

For P(k+1) to be even P(k) must be odd.

For the even case if the can be represented as powers of two because is shown already to be made up of sums of powers of two and adding gets us to .

Odd numbers

Assum k is even so that is odd. Since k is even it is shown above to be made up of sums of powers of two. Adding to k yields .

# Q30

If we assume as the “proof” assumes then as it states. . Thus, by using the logic of the proof, the expression reduces:

Since P(k) → P(k+1) is false and the proof is invalid.