

Math 220 - Discrete Mathematics - Fall 2016

Homework 1a

Due Monday, September 12

1. BOOK PROBLEMS

Section 1.1 # 1, 3, 4, 6, 9, 12, 17, 19, 21, 24, 27, 29, 32, 33, 36, 39, 43, 45, 46

Section 1.2 # 2, 6, 7, 9, 11, 13, 17, 20

2. ADDITIONAL PROBLEMS

- (1) A very familiar trick for checking whether a number is divisible by 3 is to check whether the sum of its digits is also divisible by 3. In this exercise, you will attempt to prove that fact. Here are the pieces of the proof, as well as relevant facts:

- Let the number be N and suppose N has digits given by d_k , $0 \leq k \leq n$, i.e.,

$$N = \sum_{k=0}^n d_k 10^k.$$

In this language, 3 divides N if (and only if) 3 divides $\sum_{k=0}^n d_k$.

- $x^k - 1 = (x - 1)(x^{k-1} + x^{k-2} + \cdots + x + 1)$, $k \geq 2$.
- If $a = b + c$, then two types of statements are true:
 - If d divides b and c , then d divides a .
 - If d divides a and b , then d divides c .

Hint:

$$N = \sum_{k=0}^n d_k 10^k = \sum_{k=1}^n d_k (10^k - 1) + \sum_{k=0}^n d_k.$$

- (2) There is actually one other number that this type of statement is true for (replace 3 with something else)... From the proof of the above, can you figure out which number that is?