Math 181: Number Theory
Modular Arithmetic and Number Bases Practice

1. Evaluate the following expressions. (Find the smallest positive number that satisfies the expression.)
   
   (a) \(-17 \pmod{8}\)  
   (b) \(17 \pmod{8}\)  
   (c) \(45278134 \pmod{5}\)  
   (d) \(43872301 \pmod{10}\)

2. Repeat the problems above, but this time find the number with the smallest absolute value that satisfies the expression.

3. Put the following numbers in base 10.
   
   (a) \(36_8\)  
   (b) \(321_5\)  
   (c) \(52a_{16}\) (in base 16, \(a = 11\))

4. Simplify the following expressions without using a calculator.
   
   (a) \(213423 \times 454342 \pmod{10}\)  
   (b) \(3^{131} \pmod{4}\)  
   (c) \(53423 - 5342 + 5342 - 331 + 42 \pmod{2}\)  
   (d) \(2311/4232 \pmod{3}\)

5. The following numbers are all in base 10. Rewrite them in the base given in parentheses.
   
   (a) \(9 \text{ (base 2)}\)  
   (b) \(32 \text{ (base 3)}\)  
   (c) \(423 \text{ (base 9)}\)