Discrete Math HW 11: Learning goals N1, N3, N5

due Monday, April 20

N1: I can determine whether one integer is divisible by another, or whether a natural number up to 100 is prime.

Exercise 1 Determine which of the following numbers are prime. Remember that to test n for primality, you only need to test for divisibility by primes $\leq \sqrt{n}$.

- 2
- 3
- 0
- 1
- 10
- 51
- 53
- 86
- 87
- 89
- 91
- 101
- 103
- 1001
- 1003
- 1005
- 1007
- 1009

N3: I can compute the greatest common divisor of two natural numbers using the Euclidean Algorithm.

Exercise 2 Use the Euclidean Algorithm to compute each of the following. Be sure to show the steps of the process, not just the final result.

(a) $\gcd(1,5)$

(b) $\gcd(123,277)$

(c) $\gcd(78,104)$

(d) $\gcd(88,72)$

Exercise 3 Write a Disco function to find the GCD of two natural numbers using the Euclidean algorithm, by filling in the following template:

```
gcd : (N * N) -> N
gcd(a,0) = ???
gcd(a,b) = ???
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Use your Disco function to find $\gcd(518303142726377580, 169429189188136020)$.

N5: I can solve modular equivalences in one variable involving addition, subtraction, and multiplication by a constant.

Exercise 4 Solve each of the following equivalences for x. Express your answers in the form $x \equiv_m r$ where $0 \leq r < m$.

(*These are the same problems from last week's homework, since we didn't make it as far last week as I thought we would. If you didn't have a chance to do them last week, you can do them now (but no need to complete them twice).*)

1. $x + 12 \equiv_7 99$
2. $27x + 27 \equiv_{13} 2727$
3. $2x - 12 \equiv_8 x + 7$
4. $77x + 15 \equiv_7 5 - 22x$