

Discrete Math HW 10: Learning goals N1, N2
due Monday, April 13

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 divisibility relationships hold.

- $2 \mid 90$
- $3 \mid 90$
- $4 \mid 90$
- $5 \mid 10$
- $10 \mid 5$
- $10 \mid -10$
- $0 \mid 6$
- $6 \mid 0$
- $0 \mid 0$
- $247 \mid 13585$
- $(-2) \mid 4$
- $2 \mid (-4)$
- $(-4) \mid 2$

Exercise 2 List all the positive integer divisors of 60, that is, the elements of the set

$$\{d \mid d \in \mathbb{Z}^+, (d \mid 60)\}.$$

Exercise 3 Prove that the divisibility relation is transitive: that is, for all $a, b, c \in \mathbb{Z}$, if $a \mid b$ and $b \mid c$, then $a \mid c$.

N2: I can calculate quotients and remainders according to the Division Algorithm.

Exercise 4 Calculate each of the following quotients and remainders.

- $60 \text{ div } 12$
- $60 \text{ mod } 12$
- $60 \text{ div } 7$
- $60 \text{ mod } 7$
- $0 \text{ div } 12$
- $0 \text{ mod } 12$
- $12983 \text{ div } 527$
- $12983 \text{ mod } 527$
- $(-25) \text{ div } 7$
- $(-25) \text{ mod } 7$

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

Exercise 5 Solve each of the following equivalences for x . Express your answers in the form $x \equiv_m r$ where $0 \leq r < m$.

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

