

# Homework 16 Solutions

## Problems

1. (a) Find the addition and multiplication tables for arithmetic modulo 7.
- (b) In arithmetic mod 7, what is  $3 - 6$ ? Remember, this is the number that, when added to 6, gives a result of 3.
- (c) In arithmetic mod 7, what is  $2/5$ ? Remember, this is the number that, when multiplied by 5, gives a result of 2.
- (d) In arithmetic mod 7, what is  $5 - 3$ ?
- (e) In arithmetic mod 7, what is  $3 - 5$ ?
- (f) In arithmetic mod 7, what is  $4/6$ ?
- (g) In arithmetic mod 7, what is  $6/4$ ?
- (h) In arithmetic mod 7, what is  $0/2$ ?

If we write down the tables [elided here], we see that each row and column of the addition table has every value in  $\{0, 1, 2, 3, 4, 5, 6\}$ , so subtraction is well-defined. Similarly, every value appears in each nonzero row and nonzero column of the multiplication table, so division (by nonzero values) is well-defined.

Using our table we observe that  $4 + 6 = 3$  hence  $\boxed{3 - 6 = 4}$ .

Using our table we observe that  $5 \times 6 = 2$  hence  $\boxed{2/5 = 6}$ .

Using our table we observe that  $2 + 3 = 5$  hence  $\boxed{5 - 3 = 2}$ .

Using our table we observe that  $5 + 5 = 3$  hence  $\boxed{3 - 5 = 5}$ .

Using our table we observe that  $3 \times 6 = 4$  hence  $\boxed{4/6 = 3}$ .

Using our table we observe that  $5 \times 4 = 6$  hence  $\boxed{6/4 = 5}$ .

Using our table we observe that  $0 \times 2 = 0$  hence  $\boxed{0/2 = 0}$ .