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 $\boxed{0/2 = 0}$.