# Axioms[1]

1. Problem # 1. (C level)

   (a) $\mathbb{Q}_{2,3}$ = the set of all fractions, written in lowest terms, with denominator 2, or 3. Is $(\mathbb{Q}_{2,3}, +)$ closed? Explain.

   (b) $\mathbb{Q}_{1,2,4}$ = the set of all fractions, written in lowest terms, with denominator 1, 2, or 4. Is $(\mathbb{Q}_{1,2,4}, +)$ closed? Explain.

2. Problem # 2. Let $a \oplus b = ab - b$ for all $a, b \in \mathbb{Z}$.

   (a) Is $(\mathbb{Z}, \oplus)$ closed? Explain.

   (b) Is $(\mathbb{Z}, \oplus)$ commutative? Explain.

   (c) Is $(\mathbb{Z}, \oplus)$ associative? Explain.

   (d) Does $(\mathbb{Z}, \oplus)$ have an identity element? Explain.

[1] Abstract Algebra and Solution by Radicals, John E. Maxfield and Margaret W. Maxfield, Dover