(1) Let $a$ be an integer. Prove that there are uniquely specified integers $q$ and $e$ such that

$$a = 5q + e$$

with $|e| < 3$.

(2) Let $f : X \to Y; x \mapsto f(x)$ be a function.

(a) Show that there is a subset $Y'$ of $Y$ such that

$$g : X \to Y'; x \mapsto f(x)$$

is surjective.

(b) Show that there is a subset $X'$ of $X$ such that

$$h : X' \to Y'; x \mapsto f(x)$$

is bijective.

(3) Consider the figure

Writing each element as a product of disjoint cycles, determine

(a) the group of symmetries of the figure in 2-space and

(b) the group of symmetries of the figure in 3-space.

(4) Show that $\log_{10} 3$ is irrational.