Problem 1.

$\{a|a \in \mathbb{Z}, -3 \le a \le 11\}$

Problem 2.

$\{\emptyset, \{7\}, \{8\}, \{9\}, \{7,8\}, \{7,9\}, \{8,9\}, \{2,8,9\}\}$

Problem 3.

a. The set of even natural numbers: $E = \{0, 2, 4, 6, ...\}$
   1. $0 \in E$
   2. If $n \in \mathbb{N}$ and $\mod(n, 2) = 0$ then $n \in E$
   3. Nothing else is in E

b. The set of natural numbers that when divided by 7 have a remainder of $3 : R = \{3, 10, 17, 24, ...\}$
   1. $3 \in R$
   2. $n \in \mathbb{N}$ and $\mod(n, 7) = 3$ then $n \in E$
   3. Nothing else is in E

c. The set of positive integers whose decimal representations contain only the digit $5 : F = \{5, 55, 555, 5555, ...\}$
   1. $5 \in F$
   2. If $n \in F$ then $10n + 5 \in F$
   3. Nothing else is in F

d. The set of positive integers whose decimal representations contain only the digits 5 and 7: $S = \{5, 7, 55, 57, 75, 77, ...\}$
   1. $5 \in S$ and $7 \in S$
   2. If $n \in S$ then $10n + 5$ and $10n + 7 \in F$
   3. Nothing else is in F

Problem 4.

a. The set of natural numbers that contain only the repeated digit sequence $345 : A = \{345, 345345, 345345345, ...\}$
   1. $345 \in A$
   2. If $n \in A$ then $1000n + 345 \in A$
   3. Nothing else is in A

b. The set of natural numbers that are not multiples of $4 : B = \{1, 2, 3, 5, 6, 7, 9, 10, 11, ...\}$
   1. $n \in \mathbb{N}$ and $\mod(n, 4) \ne 0$ then $n \in B$
   2. Nothing else is in B

c. The set of natural numbers that are powers of $2 : C = \{1, 2, 4, 8, 16, ...\}$
   1. $1 \in C$
   2. If $n \in \mathbb{N}$ then $2n \in C$
   3. Nothing else is in C

d. The set of natural numbers that contain an odd number of occurrences of the digit $4 : D = \{4, 444, 44444, ...\}$
   1. $4 \in D$
   2. If $n \in D$ then $100n + 44 \in D$
   3. Nothing else is in D

e. The set of integers that are both negative and odd. $E = \{-1, -3, -5, ...\}$
   1. $-1 \in E$
   2. If $n \in E$ then $n - 2 \in E$
   3. Nothing else is in E