1a. To show that \( \triangle \) is an equivalence relation, we must show that it is i) reflexive, ii) symmetric, and iii) transitive.

i) To show reflexivity, it must be shown that \( m \triangle m \) holds. Since the set of digits in \( m \) is obviously the same as the set of digits in itself, \( \triangle \) is reflexive.

ii) To show symmetry, it must be shown that if \( m \triangle n \) holds, \( n \triangle m \) must also hold. If \( m \triangle n \) holds, then \( m \) and \( n \) have the same set of digits appearing in them, therefore, \( n \triangle m \) must hold.

iii) To show transitivity, it must be shown that if \( m \triangle n \) holds, and \( n \triangle o \) holds, \( m \triangle o \) must hold. Since \( m \triangle n \), the sets of digits appearing in \( m \) and \( n \) are the same. Since \( n \triangle o \), the sets of digits appearing in \( n \) and \( o \) are the same. Therefore, the sets of digits appearing in \( m \) and \( o \) are the same, and \( m \triangle o \) holds.

b. The equivalence classes of \( \text{Nat} \) under \( \triangle \) are the members of the power set of the digits 0-9. Since \( \triangle \) compares the sets of digits appearing in members of \( \text{Nat} \), equivalence classes will be

\[
\triangle[0] = \{0\}
\]

\[
\triangle[1] = \{1, 11, 111, \ldots\}
\]

\[
\ldots
\]

\[
\triangle[0123456789] = \{1023456789, 1023456798, \ldots\}
\]

c. \( \triangle \) is not a congruence for addition. For example, \( m = 15 \), \( n = 51 \), \( j = 10 \), \( k = 100 \). \( m \triangle n \) and \( j \triangle k \), but \( m + j = 25 \) and \( n + k = 151 \). Clearly, \( 25 \triangle 151 \) does not hold, so \( m + j \triangle n + k \) does not hold, so \( \triangle \) is not a congruence for addition.

See website for Miranda solutions to 2 and 3.