1. (a) $-5, -8$
This is an arithmetic sequence with first term $a_1 = 7$ and common difference $d = -3$, so the $n$th term is $7 + (n - 1)(-3)$, which simplifies to $10 - 3n$.

(b) $\frac{1}{32}, -\frac{1}{64}$
This is a geometric sequence with first term $a_1 = \frac{1}{2}$ and common ratio $\frac{-1}{2}$, so the $n$th term is \left( \frac{1}{2} \right) \left( \frac{-1}{2} \right)^{n-1}$, which may be rewritten as $\frac{(-1)^{n-1}}{2^n}$.

2. (a) $\frac{1}{4} < \frac{7}{12} < \frac{7}{10} < \frac{1}{5}$
(b) $2.23 < 2.\overline{23} < 2.3 < 2.3\overline{2} < 2.3$

3. (a) $\left( 2 \frac{1}{2} \div \frac{3}{4} - \left( \frac{3}{2} \right)^{-2} \right) \cdot \frac{\frac{3}{4}}{\frac{1}{2}} = \frac{5}{2} \cdot \frac{3}{3} - \frac{1}{(3/2)^2} = \frac{10}{3} - \frac{1}{9/4} = \frac{10}{3} - \frac{4}{9} = \frac{10}{3} - \frac{4}{9} = \frac{26}{9}$ or $2 \frac{8}{9}$
(b) $\frac{1}{ac} + \frac{1}{ab} = \frac{b}{abc} + \frac{c}{abc} = \frac{b + c}{abc}$

4. Since $\frac{1}{4}$ cm represents 5 km, we find, by multiplying by 4, that 1 cm represents 20 km. Then, by multiplying by 7, we find that 7 cm represents $(20)(7) = 140$ km. Thus the two cities are 140 km apart.

5. $\frac{11}{40}, \frac{5}{64}, \frac{12}{75}$ (When written in simplest form, these are the fractions for which the prime factorization of the denominator contains no primes other than 2 or 5. See Theorem 7-1 on p. 338 of the text. Note that $\frac{12}{75} = \frac{4}{25}$.)

6. (a) 0.375
(b) 0.0\overline{1}
7. (a) \[ \frac{105}{1000} = \frac{21}{200} \]

(b) Let \( n = 0.1\overline{5} = 0.151515 \ldots \). Then

\[
\begin{align*}
100n &= 15.151515 \ldots \\
- n &= 0.151515 \ldots \\
99n &= 15
\end{align*}
\]

Therefore \( n = \frac{15}{99} = \frac{5}{33} \).

(c) Let \( n = 4.31\overline{5} = 4.3151515 \ldots \). Then

\[
\begin{align*}
100n &= 431.5151515 \ldots \\
- n &= 4.3151515 \ldots \\
99n &= 427.2
\end{align*}
\]

Therefore \( n = \frac{427.2}{99} = \frac{4272}{990} = \frac{712}{165} \).

8. (a) False. Counterexample: Let \( a = 2, b = 1, c = 3 \). Then \( a+b+c = 2-1+3 = 1+3 = 4 \) (or you can think of this as \( 2 + (-1) + 3 \) ) and \( a-(b+c) = 2-(1+3) = 2-4 = -4 \). (Many other counterexamples are possible. Note that the equation will be true whenever \( c = 0 \), however.)

(b) True. (Remember that the set of integers is the set \( \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots \} \). If you take any two elements from this set, and subtract one from the other, you will get another element of this set.)

(c) False. Counterexample: Let \( a = 1, b = 2, c = 3 \). Then \( \frac{a+b}{a+c} = \frac{1+2}{1+3} = \frac{3}{4} \) and \( \frac{b}{c} = \frac{2}{3} \).

(d) True. (Since \( \frac{ab+bc}{b} = \frac{b(a+c)}{b} = a+c \).)

(e) False. Counterexample: \( \frac{1}{3} \) is a rational number that cannot be written as a finite decimal. (Remember that a rational number is a number that is equal to a quotient of two integers, that is, \( \frac{a}{b} \) where \( a, b \) are integers and \( b \neq 0 \).)

(f) True. (The technique used in #7 converts repeating decimals to quotients of integers. In this way, you can see that they are all rational numbers.)