Homework problems: Math for Elementary Teachers

Dr. Monks - University of Scranton

Sequences

1. Find the 523rd term of the following sequences:
   a. the constant sequence $2.5, 2.5, 2.5, 2.5, \ldots$
   b. $\overline{4}$
   c. $\overline{2,3,1}$
   d. $\overline{2,3,4,1}$
   e. $\overline{2,3}$
   f. $\overline{2,5,0,7,6,3,9,4,1}$
   g. $\overline{2.3, 5.6, 0.01, 7.3, {}^-6}$

2. Find the 500th term of the following arithmetic sequences and find the common difference.
   a. $0, 1, 2, 3, \ldots$
   b. $0, {}^-1, {}^-2, {}^-3, \ldots$
   c. $5, 1, {}^-3, {}^-7, \ldots$
   d. $\frac{1}{2}, \frac{5}{6}, \frac{7}{6}, \frac{3}{2}, \ldots$
   e. $2, 1.9, 1.8, 1.7, \ldots$
   f. $\frac{1}{2}, \frac{1}{6}, -\frac{1}{6}, -\frac{1}{2}, \ldots$

3. Find the 5th term in the following geometric sequences and find the common ratio:
   a. $4, 4, 4, \ldots$
   b. $4, 8, 16, \ldots$
   c. $4, 2, 1, \ldots$
   d. $4, {}^-4, 4, \ldots$
   e. ${}^-4, 2, {}^-1, \ldots$
   f. $1.3, 2.86, 6.292, \ldots$

4. Use the method of finite differences to compute the next two terms in the following sequences:
   a. $1, 1, 0, {}^-4, {}^-10, {}^-14, {}^-9, 15, \ldots$

b. $3, 2, 2, 2, 1, {}^{-}2, {}^{-}8, \ldots$

c. $0, 2, 5, 6, 4, 0, {}^{-}3, \ldots$

d. $3, 2, 2, 2, 3, 5, 4, {}^{-}11, \ldots$

5. Find the next three terms in the Fibonacci sequence:

  a. $2, 1, 3, \ldots$

  b. $0, {}^{-}1, {}^{-}1, \ldots$

  c. $1.2, 1.3, 2.5, \ldots$

  d. $0, 0, 0, \ldots$

  e. $1, {}^{-}1, 0, \ldots$

6. Find the first ten triangular numbers.

Gauss's formula

1. Compute the sum.

  a. $1 + 2 + 3 + \cdots + 999999 + 1000000$

  b. $1 + 2 + 3 + \cdots + 624 + 625$

  c. $500 + 501 + 502 + \cdots + 999 + 1000$

  d. $64 + 65 + 66 + \cdots + 123 + 124$

  e. $2 + 4 + 6 + \cdots + 84 + 86$

  f. $-1 - 2 - 3 - \cdots - 499 - 500$

  g. $33 + 36 + 39 + \cdots + 996 + 999$

Base b Conversion

1. Convert the following numbers to base ten

  a. $2301_{(4)}$

  b. $2301_{(5)}$

  c. $2301_{(6)}$

  d. $2301_{(10)}$

  e. $1CAB_{(16)}$

  f. $101101001_{(2)}$

  g. $101101001_{(3)}$

2. 2. Convert the number 1999 into the following bases:

   a. two

   b. three

   c. four

   d. five

   e. six

   f. seven

   g. eight

   h. nine

   i. ten

   j. sixteen

3. Convert $1342_{(5)}$ to base two.

Base b Arithmetic

1. Compute the following sums by working in the indicated base.

   a. $1342_{(5)} + 344_{(5)}$

   b. $1021_{(3)} + 2212_{(3)}$

   c. $A09_{(16)} + 31D_{(16)}$

   d. $1001011_{(2)} + 1101101_{(2)}$

   e. $20313_{(4)} + 12321_{(4)}$

2. Compute the following differences by working in the indicated base.

   a. $1342_{(5)} - 344_{(5)}$

   b. $2212_{(3)} - 1021_{(3)}$

   c. $1101101_{(2)} - 1001011_{(2)}$

   d. $20313_{(4)} - 12321_{(4)}$

3. Compute the following products by working in the indicated base (it helps to make the multiplication table for the indicated base first).

   a. $1342_{(5)} \times 344_{(5)}$

   b. $1021_{(3)} \times 2212_{(3)}$

   c. $204_{(6)} \times 310_{(6)}$

   d. $1001011_{(2)} \times 1101101_{(2)}$

e. $20313_{(4)} \times 12321_{(4)}$

4. Compute the following products using (a) the horizontal method, (b) the vertical method, (c) the traditional method, (d) the lattice method, and (e) the Russian peasant method.

    a. 53×68

    b. 4032×909

Base b Representation

1. Convert the following base b representations to a common fraction whose numerator and denominator are in base ten.

    a. $0.10\overline{010}_{(2)}$

    b. $2.0\overline{31}_{(4)}$

    c. $1.\overline{4}_{(5)}$

    d. $0.\overline{13}_{(6)}$