University of Guyana
Faculty of Technology

EMT 121

Problem Set III (Arithmetic and Geometric Series)

February 15, 2011

1. If air resistance is neglected, a falling object travels 16 ft during the first second, 48 ft during the next, 80 ft during the next, and so on. These distances form the arithmetic sequence 16,48, 80, . . .

   (a) Find a formula for the n^{th} term in the sequence of distances. Calculate the fifth and tenth terms.

   (b) Calculate S_1,S_2, and S_3, the total distance an object falls in 1, 2, and 3 seconds respectively.

   (c) Give a formula for S_n, the distance fallen in n seconds.

2. Expand the sums.

   (a) $\sum_{i=1}^{5} i^2$

   (b) $\sum_{i=10}^{20} (i+1)^2$

   (c) $\sum_{n=1}^{7} (-1)^{n-1} 2^n$

3. Write each sum using sigma notation.

   (a) 3+6+9+12+15+18+21

   (b) 30+25+20+15+10+5

   (c) 1/2+1+3/2+2+5/2+3+7/2+4

4. Find the sum of the first nine terms of the series: 7+14+21+ . . ..

5. Find the sum of the geometric series $\sum_{i=0}^{17} 7(-z)^i$

6. A patient is given a 20mg injection of a therapeutic drug. Each day , the patient's body metabolizes 50% of the drug present, so that after 1 day only half of the original amount remains, after 2 days only one-fourth remains, and so on. The patient is given a 20 mg injection of the drug every day at the same time.

   (a) Write a geometric series that gives the drug level in this patient's body right after the n^{th} injection.

   (b) What quantity of the drug remains in the patient's body after the 10^{th} injection.

7. Worldwide consumption of oil was 27.5 billion barrels in 2001. Assume that consumption continues to increase at 1.2% per year, the rate for the previous decade.

   (a) Write a sum representing the total oil consumption between the start of 2001 and the end of 2025.

   (b) Evaluate this sum.