EMT112 Practice Problems

Arithmetic and Geometric Series

September 15, 2010

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.
   (a) Find a formula for the n^{th} term in the sequence of distances.
   (b) Calculate S_3, the total distance an object falls in 3 seconds.
   (c) Give a formula for S_n, the distance fallen in n seconds.
2. An auditorium has 30 seats in the first row, 34 seats in the second row, 38 seats in the third row, and so on. If there are twenty rows in the auditorium, how many seats are there in the last row? How many seats are there in the auditorium?
3. A deposit of \$200,000 is made once a year, starting today, into a bank account earning 3% interest per year, compounded annually. If 20 deposits are made, what is the balance in the account on the day of the last deposit?
4. A patient is given a 20 mg injection of a therapeutic drug. Each day, the patient's body metabolizes 50% of the drug present, so that after 1 day only one-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?
5. 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.
6. A ball is dropped from a height of 10 feet and bounces. Each bounce is 3/4 of the height of the previous bounce.
   (a) Find an expression for the height to which the ball rises after it hits the floor the n^{th} time.
   (b) Find an expression for the total vertical distance the ball has traveled when it hits the floor for the first, second , third and n^{th} times.