Arithmetic & Geometric Progressions

Problem Set 13

1. For each of the following arithmetic progressions, find the first term a and the common difference d.

   (a) $7, 11, 15, 19, ...$

   (b) $10, 4, -2, -8, ...$

   (c) $-3, -6, -9, -12, ...$

   (d) $1, \frac{3}{2}, 2, \frac{5}{2}, ...$

2. Using the nth term formula given below, write down the first four terms of the sequences described.

   (a) $a_n = 2n - 1$

   (b) $a_n = 3n$

   (c) $a_n = n^2$

   (d) $a_n = -5 - 4n$

3. For each of the following arithmetic progressions, find a formula for the nth term and then use this to calculate the 100th term.

   (a) $8, 14, 20, ...$

   (b) $53, 49, 45, ...$

4. The first term of an arithmetic progression is 7 and the tenth term is -20. Find the formula for the nth term.

5. The third term of an arithmetic progressions is 20 and the sixth term is 47. Find the sequence and the 20th term.

6. For the following arithmetic progressions,

   (a) $6, 10, 14, ...$ Find the sum of the first 20 terms.

   (b) Find $13 + 16... + 109$

   (c) $7 + 12 + 17 + ...$ Find a formula for the sum of the first n terms.

   (d) $9 + 5 + 1 + ...$ Find S_{100}.

7. For each of the following geometric progressions, find the first term a and the common ratio r.

   (a) $16, 64, 256, ...$

   (b) $8, 4, 2, 1, ...$

   (c) $-1, 1, -1, 1, ...$

   (d) $2, \frac{2}{3}, \frac{2}{9}, \frac{2}{27}, ...$

8. For each of the following geometric progressions in question 7 above, find a formula for the nth term and then use this to calculate the 10th term.

9. The third term of an geometric progression is 20 and the sixth term is 160. Find

   (a) the first three terms.

   (b) the formula for the nth term

   (c) the 100th term

10. The third term of a geometric progression is 64 and the eighth term is 2. Find the 17th term.

11. For the following geometric progressions,

    (a) Find the sum of the first 10 terms of $3, 6, 12, 24, ...$

    (b) Find the sum of the first 8 terms of the sequence described by $a_n = 2^n$.

    (c) $\frac{8}{9} + \frac{4}{3} + 2 + ...$ Find S_6.

12. Find the limiting sums

    (a) $12 + 6 + 3 + ...$

    (b) $200 - 40 + 8 - ...$

13. Find the following sums

    (a) $\sum_{i=1}^{i=n} 3i$

    (b) $\sum_{m=1}^{m=25} 2m + 3$

    (c) $\sum_{k=1}^{k=6} 2.3^{k-1}$

    (d) $\sum_{k=1}^{\infty} 2^{-k}$

14. Ann commences work on a salary of \$31200. Each year her salary increases by \$1200.

    (a) Find her salary in the tenth year.

    (b) Find the total amount she would have earned after 10 years.

15. A leak develops in a dam. On the first day 120 litres of water escape. Each day thereafter the amount that escapes is 80% of the amount of the previous day.

    (a) How much water will have escaped after 20 days?

    (b) How much water will escape altogether?