IB Mathematics – Sequences and Series Test

1. Find the nth term of each sequence:
   a) 5, 9, 13, 17, ...
   b) 40, 32, 24, 16, ...
   c) 3, 12, 48, 192, ...
   d) –4, 1, 6, 11, ...

2. Find the terms indicated in each arithmetic sequence:
   a) 7, 15, 23, ...   18th term
   b) 12, 5, –2, ...   14th term
   c) 4, 10, 16, 22, ...   20th term

3. Find how many terms each of these sequences has:
   a) 10, 7, 4, ... , –14
   b) –6, –1, 4, ... , 44
   c) 2, 6, 18, ... , 1458

4. Determine the first term and common difference from each formula:
   a) $u_n = 9n - 4$
   b) $u_n = 2n + 7$
   c) $u_n = 15 - 3n$

5. The seventh term of an arithmetic sequence is 31 and the 12th term is 56.
   Find the first term and the common difference.

6. The fifth term of a geometric sequence is 162 and the eighth term is 4374.
   Find the common ratio and the first term.

7. Three consecutive terms of an arithmetic sequence multiply to –270.
   If the middle term is 5 more than the first, find the three numbers.

8. A worker earns $48,000 per year. She receives annual raises of $1200.
   How much will she earn in her 12th year?

9. Find the value of each sigma expression:
   a) $\sum_{r=1}^{5} (4r + 3)$
   b) $\sum_{r=0}^{4} (-1)^r (r + 2)$
   c) $\sum_{r=1}^{6} r(2r - 1)$

10. Write each of the following series in sigma notation:
    a) 6 + 11 + 16 + 21 + 26
    b) 3 + 9 + 27 + 81 + ...
    c) –5 + 10 – 20 + 40 – 80

Answer Key

1.
a) $u_n = 4n + 1$
b) $u_n = 40 - 8n$
c) $u_n = 3 \cdot 4^{n-1}$
d) $u_n = 5n - 9$

2.
a) 147
b) −79
c) 118

3.
a) 9 terms
b) 11 terms
c) 9 terms

4.
a) $a = 5$, $d = 9$
b) $a = 9$, $d = 2$
c) $a = 12$, $d = -3$

5. $a = 6$, $d = 5$

6. $r = 3$, $a = 2$

7. Numbers: −5, 0, 5

8. $61,200

9.
a) 115
b) 4
c) 161

10.
a) $\sum_{r=1}^{5} (5r + 1)$
b) $\sum_{r=0}^{\infty} 3 \cdot 3^{r}$
c) $\sum_{r=1}^{5} (-1)^{r} \, 5 \cdot 2^{r-1}$