## SEQUENCES & SERIES (Q 5, PAPER 1) 2010 5. (a) The first term of a geometric sequence is 4 and the common ratio is 0.5. Write down the first five terms of the sequence. (b) In an arithmetic series, the first term is 6 and the fifth term is 22. (i) Find *d*, the common difference. (ii) Find $T_{14}$ , the fourteenth term. (iii) Find $S_{20}$ , the sum of the first twenty terms. (c) In a geometric series, the fourth term is 9 and the seventh term is 243. (i) Find *r*, the common ratio. (ii) Find *a*, the first term. (iii) Find $S_8$ , the sum of the first eight terms. **SOLUTION** 5 (a) To produce a GEOMETRIC SEQUENCE, start with a number, a = 4, r = 0.5*a*, and keep on multiplying by a number, *r*, forever. Geometric Sequence: 4, 2, 1, 0.5, 0.25 5 (b) (i) $a = 6, T_5 = 22$ $T_5 = a + 4d = 22$ **Ex**. The fifty-sixth term of an arithmetic sequence: $T_{56} = a + 55d$ $\therefore$ (6) + 4*d* = 22 4d = 16 $\therefore d = 4$ 5 (b) (ii) $T_{14} = a + 13d$ $\therefore T_{14} = 6 + 13(4) = 6 + 52 = 58$ 5 (b) (iii) $S_{20} = \frac{20}{2} [2(6) + (20 - 1)4]$ Summing formula: $S_n = \frac{n}{2} [2a + (n - 1)d]$ =10[12+(19)4]=10[12+76]=10[88]= 880

5 (c) (i)  

$$T_4 = 9 \Rightarrow ar^3 = 9...(1)$$
 General term:  $T_n = ar^{n-1}$   
 $T_7 = 243 \Rightarrow ar^6 = 243...(2)$  Ex. The tenth term of a geometric sequence:  $T_{10} = ar^9$   
Divide Eqn. (1) into Eqn. (2).  
 $\frac{ar^6}{ar^3} = \frac{243}{9} \Rightarrow r^3 = 27$   
 $\therefore r = 3$   
5 (c) (ii)  
Replace *r* by its value in Eqn. (1) to find *a*.  
 $ar^3 = 9 \Rightarrow a(3)^3 = 9$   
 $27a = 9$   
 $\therefore a = \frac{1}{3}$   
5 (c) (iii)  
 $S_8 = \frac{\frac{1}{3}(1-3^8)}{1-3} = \frac{\frac{1}{3}(1-6561)}{-2}$  Summing formula:  $S_n = \frac{a(1-r^n)}{(1-r)}$   
 $= \frac{\frac{1}{3}(-6560)}{-2} = \frac{1}{3}(3280)$