CS441 – Discrete Structures for Computer Science
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Problem from Section 2.4

16. a) The terms of this sequence alternate between 2 (if j is even) and 0 (if j is odd). Thus the sum is $2+0+2+0+2+0+2+0+2=10$.

b) We can break this into two parts and compute $\left(\sum_{j=0}^{8} 3^j\right) - \left(\sum_{j=0}^{8} 2^j\right)$. Each summation can be computed from the formula for the sum of a geometric progression. Thus the answer is

$$\frac{3^9-1}{3-1} - \frac{2^9-1}{2-1} = 9841 - 511 = 9330\,.$$

c) As in part (b) we can break this into two parts and compute $\left(\sum_{j=0}^{8} 2\cdot 3^j\right) + \left(\sum_{j=0}^{8} 3\cdot 2^j\right)$. Each summatio can be computed from the formula for the sum of a geometric progression. Thus the answer is

$$\frac{2\cdot 3^9-2}{3-1} + \frac{3\cdot 2^9-3}{2-1} = 19682 + 1533 = 21215\,.$$

d) This could be worked as in part (b), but it is easier to note that the sum telescopes (see Exercise 19 Each power of 2 cancels except for the -2^0 when $j=0$ and the 2^9 when $j=8$. Therefore the answer $2^9 - 2^0 = 511$. (Alternatively, note that $2^{j+1} - 2^j = 2^j$.)

18. We will just write out the sums explicitly in each case.

a) $(1-1)+(1-2)+(2-1)+(2-2)+(3-1)+(3-2)=3$

b) $(0+0)+(0+2)+(0+4)+(3+0)+(3+2)+(3+4)+(6+0)+(6+2)+(6+4)+(9+0)+(9+2)+(9+4)=$

c) $(0+1+2)+(0+1+2)+(0+1+2)=9$

d) $(0+0+0+0)+(0+1+8+27)+(0+4+32+108)=180$