

In sequence one, each next term is as result of multiplication by 3, so 3, 9, 27...  
Alison rewrites her Sequence (S) as powers, so 3,  $3 \times 3$ ,  $3 \times 3^2$  which is just  $(3 \times 3 \times 3) \dots$  and so on until  $3 \times 3^{14}$

Then she does a little trick whereby she multiplies the sequence by the common ratio, so,  $3S = 3 \times 3$ ,  $3 \times 3^2$ ,  $3 \times 3^3 \dots 3 \times 3^{15}$

Finally she subtracts S from 3S, and most of the terms cancel out to leave only  $2S = 3 \times 3^{15} - 3$

To follow this up you just simplify the answer to  $S = (3 \times 3^{15} - 3) / 2$

Thus, the total of the sequence is 21523559

This method is fairly self-explanatory, and can be applied in the same way to sequences 2 (answer 20475), sequence 3 (which I will go on to explain) and sequence 4.

It gets a tad more complicated on sequence 3 with the use of sigma, but if you understand that, it continues in much the same way.  $\sum_{i=1}^{20}$  means that term i can have a progressing value from 1 up to and including 20. This makes the sequence look a little like this: 1, 2, 3, 4... 20

When this is applied to the sequence in the question ( $3 \times 2^{i-1}$ ), it appears as  $3 \times 2^0$  (because sigma increases with each term, its initial value is 1, take 1 is 0. And for reference, any number to the power of zero is one.) so it continues  $3 \times 2^1$ ,  $3 \times 2^2 \dots 3 \times 2^{19}$

We can make it even easier by taking the x3 outside of the bracket, creating sequence  $S/3 = 2^0, 2^1, 2^2 \dots 2^{19}$

Then we continue as Alison mentioned and create a second sequence using the common ratio (2S/3), and subtract the first sequence from this leaving a result of  $S/3 = 2^{20} - 2^0$

Multiply this by 3 and you are left with total 3145725

And finally we use this to solve sequence 4, which multiplies by  $\frac{1}{2}$  so:  $\frac{1}{2}$ ,  $\frac{1}{4} \dots$  and we try to find this to the 10<sup>th</sup> term.

When we take S from  $\frac{1}{2}S$  we have negative S/2, so when we go on to find S the formula is  $2(-\frac{1}{2} \times \frac{1}{2^{10}} + \frac{1}{2})$  which becomes  $-1 \times \frac{1}{2^{10}} + 1$