Before writing your answers to these questions, think about the following:
There is – or there is not – room on this sheet of paper to neatly write your solutions.
(Sometimes there will be, sometimes not.)

In the following, we will make specific reference to the sums problems 32 and 23 in the worksheet which accompanies Lesson 0.

First, some comments on Lesson 0 and the set of sums given there.

The instructions for the problems say “Write each sum in summation notation.” This means that you should give an expression, using summation notation, which is EQUAL to the corresponding sum given in the problem. (You are given a sum using + signs and ellipses (...), and you are to [re]write it, more precisely, using summation notation.) Since the answer you write should be EQUAL to the sum given, there should be an \(=\) between the sum given and your answer. You are not simply using an algorithm to generate an expression with a \(\sum\) in it from an expression with + signs in it. You are generating an expression which is EQUAL to what you are given, and that should be indicated on your solutions.

**Now, to the problems for this Lesson.** In the following, \(n\) will be used to denote an arbitrary positive integer. (If it helps to avoid confusion, you can assume \(n \geq 5\) if you wish, but you don’t have to, and if you don’t understand why someone might want to do this, don’t worry about it.)

1. Give a well-known formula for the sum in Problem 32. (This is not a “summation notation” problem. There is a simple formula for the sum of the first \(n\) positive integers.) No explanation needed.

2. Write the sum in Problem 32 using summation notation. No explanation needed.

3. Use the result of Problem 1 above (in this Lesson) to give a formula for the sum in Problem 23. (This is not a “summation notation” problem. There is a simple formula for the sum of the first \(n\) positive even integers.)

4. Write the sum in Problem 23 using summation notation. No explanation needed.

5. In this problem, you are GIVEN sums in \(\Sigma\)-notation (summation notation), and you are supposed to evaluate them. Determine the numerical value of the following sums; some answers may contain an \(n\); some answers may be just numbers; some answers may be \(\infty\); some answers may be “doesn’t make sense”; some answers may be repeated from above. Explain if an explanation is needed.

   a. \(\sum_{k=1}^{n} 2k\)  
   b. \(\sum_{k=1}^{5} 2k\)  
   c. \(\sum_{k=1}^{666} 2k\)  
   d. \(\sum_{k=1}^{\infty} 2k\)

   e. \(\sum_{k=1}^{n} 2n\)  
   f. \(\sum_{k=1}^{10} 2 \cdot 10\)  
   g. \(\sum_{n=1}^{n} 2n\)

h. Is it correct to say that the sum in Problem 23 is equal to the sum in (d) above? Why/why not?

**More comments:** Note that the worksheet is titled “College Algebra Sums”. Summation notation (sigma notation) is a college algebra concept – which is often a high school course. These problems are plagiarized directly from a “College Algebra” textbook. (That is the reason for the strange numbering, starting with 23. That is the way the problems are numbered in the textbook.) This is a concept which is in the prerequisites of the prerequisites for Math 422/522.