



Try these problems before watching the lesson.

1. What is the units digit of the product  $1 \times 3 \times 5 \times \cdots \times 2015$ ?
2. A series of figures are created with dots as shown below. After Figure 1, each figure is created by adding a new row of dots that has one more dot than the previously added row of dots. How many dots total are there in Figure 10?

Figure 1



Figure 2



Figure 3

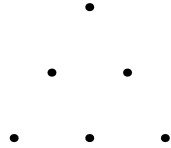
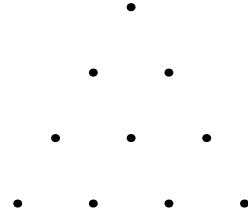


Figure 4



3. Evaluate the sum

$$(4 - 3) + (5 - 4) + (6 - 5) + (7 - 6) + \cdots + (2010 - 2009).$$

4. How many ordered triples  $(x, y, z)$  of positive integers have the property that  $x + y + z = 6$ ?



The sequence  $a_n$  is defined by  $a_1 = 20$ ,  $a_2 = 19$  and for  $n \geq 3$ ,  $a_n = |a_{n-1}| - |a_{n-2}|$ . What is the value of  $a_{2019}$ ?

 *Follow-up Problems*

5.  $x$ ,  $y$  and  $z$  are positive odd integers. What is the remainder when  $x^2 + y^2 + z^2$  is divided by 4?
6. We draw the same sequence of figures as in Problem 2, but we connect the dots in each figure following the pattern shown below. If each segment from a dot to its nearest neighbors has length 1, then what is the total length of all of the segments in Figure 10?

Figure 1



Figure 2



Figure 3

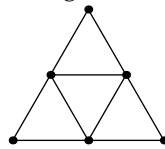
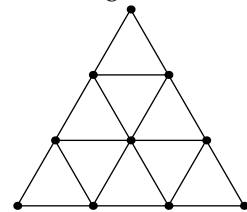



Figure 4



7. The first term of an arithmetic sequence is 1, another term of the sequence is 91 and all of the terms of the sequence are integers. How many distinct arithmetic sequences meet these three conditions?
8. How many collections of six positive, odd integers have a sum of 18? Note that  $1 + 1 + 1 + 3 + 3 + 9$  and  $9 + 1 + 3 + 1 + 3 + 1$  are considered to be the same collection.

 *Share Your Thoughts*

Have some thoughts about the video? Want to discuss the problems on the Activity Sheet? Visit the MATHCOUNTS Facebook page or the Art of Problem Solving Online Community ([www.artofproblemsolving.com](http://www.artofproblemsolving.com)).