This project is worth twenty points. Please submit one completed project for each group. All members of the group are expected to participate and understand their group’s answers; you may be called upon to present solutions to the class.

1. One method used to explore the number of positive divisors of a whole number is to form rectangular arrays to represent the number. For example, the number 12 can be represented as a 1 by 12, 2 by 6 or 3 by 4 array. Therefore the positive divisors of 12 are 1, 2, 3, 4, 6 and 12.
   a. Draw rectangular arrays to count the divisors for the numbers 1 through 12.
   b. Make a table like the one below by identifying the numbers less than or equal to 50 that have the indicated number of divisors. For example, 12 is in the 6 column because it has 6 factors.

<table>
<thead>
<tr>
<th>Number of Divisors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
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<tr>
<td>4</td>
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<tr>
<td>5</td>
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<td>6</td>
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<td>7</td>
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<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

Once you have completed the table, answer the following:

   c. Will there be any other entries in the 1 column? Why?
   d. What are the next three entries in the 3 column?
   e. Find an entry for the 7 column.
   f. What kind of numbers have an odd number of factors? Why?

2. To determine whether it is necessary to divide 101 by 2, 3, 4, 5, 6, . . . , 100 to check if it is prime, answer the following (justify your answers):

   a. If 2 is not a divisor of 101, could any multiple of 2 be a divisor of 101?
   b. If 3 is not a divisor of 101, what other numbers could not be divisors of 101?
   c. If 5 is not a divisor of 101, what other numbers could not be divisors of 101?
   d. If 7 is not a divisor of 101, what other numbers could not be divisors of 101?
   e. Conjecture what numbers we have to check for divisibility in order to determine if 101 is prime.
   f. What is the largest number we will have to check for divisibility in order to determine if 10001 is prime?
   g. In general, what is the largest number we will have to check for divisibility in order to determine if a whole number \( n \) is prime?