**MATH CIRCLE**
Session 1: Numbers as Geometric Shapes

A. **Drawing Figurate Numbers**

1. Using the marbles, represent the numbers 3, 6, 9 and 10 each in more than one way. Draw your designs for 6 below:

B. **Square Numbers**: Numbers that can be arranged into a square shape

2. Play with your tiles making different squares.

How many tiles are in a 7-by-7 square? ____________ tiles.

How many tiles are in a 20-by-20 square? ____________ tiles.
3. Practice forming square numbers and record your answers below:

\[
\begin{align*}
1^2 &= \_\_\_ \\
2^2 &= \_\_\_ \\
3^2 &= \_\_\_ \\
4^2 &= \_\_\_ \\
5^2 &= \_\_\_ \\
6^2 &= \_\_\_ \\
7^2 &= \_\_\_ \\
8^2 &= \_\_\_ \\
9^2 &= \_\_\_ \\
10^2 &= \_\_\_ \\
\end{align*}
\]

C. **Rectangular Arrangements**: Find the number of all possible rectangular arrangements and fill in the table below.

<table>
<thead>
<tr>
<th>Tiles</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tiles</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

D. **Triangular Numbers**: Find the total number of coins used in forming triangles with the given sides and fill in the table below.

<table>
<thead>
<tr>
<th>Side</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coins, total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>