1A Sequences and rules

1. Use each of the following term-to-term rules with 1st term 2. Create the sequences with 5 terms each.
   
   a. add 3  
   b. add 6  
   c. treble  
   d. multiply by 5  
   e. add 100  
   f. multiply by 10

2. Write the next two terms in each sequence. Describe the term-to-term rule you have used.
   
   a. 1, 3, 5, 7, ...  
   b. 20, 30, 40, 50, ...  
   c. 5, 13, 21, 29, ...  
   d. 5, 10, 15, 20, ...  
   e. 6, 13, 20, 27, ...  
   f. 10, 110, 210, 310, ...

3. Fill in the gap to make at least one sequence, fully describing the term-to-term rule you have used.
   
   a. 3, ..., 7  
   b. 1, ..., 9  
   c. 10, ..., 50  
   d. 2, ..., 14  
   e. 6, ..., 16  
   f. 20, ..., 100

4. a. Add any two sequences from question 2, term-by-term.  
   b. Write down the 1st term and term-to-term rule.  
   c. You could answer part b without adding the sequences. How?

1B Finding missing terms

1. In each of the following sequences, find the 5th and 50th terms.
   
   a. 1, 5, 9, 13, ...  
   b. 3, 5, 7, 9, ...  
   c. 4, 12, 20, 28, ...  
   d. 5, 15, 25, 35, ...  
   e. 2, 8, 14, 20, ...  
   f. 10, 30, 50, 70, ...  
   g. 2, 5, 8, 11, ...  
   h. 0, 5, 10, 15, ...  
   i. 4, 11, 18, 25, ...

2. In each of the following sequences, find the missing terms and the 30th term.

<table>
<thead>
<tr>
<th>Term</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>8th</th>
<th>...</th>
<th>30th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequence A</td>
<td></td>
<td></td>
<td></td>
<td>13</td>
<td>16</td>
<td>19</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence B</td>
<td></td>
<td>9</td>
<td>16</td>
<td></td>
<td>30</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence C</td>
<td></td>
<td></td>
<td>25</td>
<td></td>
<td>45</td>
<td></td>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence D</td>
<td></td>
<td>11</td>
<td>19</td>
<td></td>
<td>27</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
1. Use the function to complete the output for each of the following function machines.

   - **a** add on 2
   - **b** divide by 5
   - **c** subtract 6

<table>
<thead>
<tr>
<th>input</th>
<th>output</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>?</td>
</tr>
<tr>
<td>7</td>
<td>?</td>
</tr>
<tr>
<td>8</td>
<td>?</td>
</tr>
<tr>
<td>9</td>
<td>?</td>
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<td>20</td>
<td>?</td>
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<td>30</td>
<td>?</td>
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<tr>
<td>40</td>
<td>?</td>
</tr>
<tr>
<td>50</td>
<td>?</td>
</tr>
</tbody>
</table>

2. Express these simple functions in words.

   - **a** add on 2, multiply by 2
   - **b** divide by 5, subtract 1
   - **c** subtract 6, multiply by 4

3. Draw diagrams to illustrate the following functions. Start with any numbers you like for the input, but remember, the larger the numbers the more difficult the problem.

   - **a** add 3, multiply by 2
   - **b** multiply by 4, subtract 1

4. Write down the inverse function of

   - **a** subtract 8
   - **b** multiply by 4.

5. Each of the following functions are made up from two operations as above. Find the combined functions.

   - **a**
     - Input: 1, 2, 3, 4
     - Output: 5, 7, 9, 11
   - **b**
     - Input: 1, 2, 3, 4
     - Output: 13, 16, 19, 22
   - **c**
     - Input: 1, 2, 3, 4
     - Output: 15, 25, 35, 45
1D Using letter symbols to represent functions

1. Write down what the expression \( x + 10 \) is equal to when:
   i. \( x = 3 \)  ii. \( x = 10 \)  iii. \( x = 18 \)  iv. \( x = 50 \)  v. \( x = 120 \)

2. Write down what the expression \( 4n \) is equal to when:
   i. \( n = 4 \)  ii. \( n = 1 \)  iii. \( n = 7 \)  iv. \( n = 12 \)  v. \( n = 0 \)

3. Write the following rules in symbolic form, e.g. \( x \rightarrow x + 4 \)
   a. subtract 5  b. treble  c. add 9  d. divide by 3

4. Draw mapping diagrams to illustrate the following functions:
   a. \( x \rightarrow x + 25 \)  b. \( x \rightarrow 3x \)  c. \( x \rightarrow 3x - 1 \)  d. \( x \rightarrow 4x + 4 \)

5. Express the following functions in symbols as in question 3.
   a. \[
   \begin{array}{c|c}
   8 & 12 \\
   9 & 13 \\
   10 & 14 \\
   11 & 15 \\
   \end{array}
   \]
   b. \[
   \begin{array}{c|c}
   2 & 12 \\
   3 & 18 \\
   4 & 24 \\
   5 & 30 \\
   \end{array}
   \]
   c. \[
   \begin{array}{c|c}
   1 & 5 \\
   2 & 7 \\
   3 & 9 \\
   4 & 11 \\
   \end{array}
   \]
   d. \[
   \begin{array}{c|c}
   1 & 1 \\
   2 & 4 \\
   3 & 7 \\
   4 & 10 \\
   \end{array}
   \]

1E The general term (\( n \)th term)

1. Find i the first three terms and ii the 100th term, of sequences whose \( n \)th term is given by:
   a. \( 3n - 1 \)  b. \( 5n + 2 \)  c. \( 6n - 5 \)
   d. \( 10n - 1 \)  e. \( 3n + 8 \)  f. \( \frac{1}{2}n + 1\frac{1}{2} \)