Discussion 3: Domain, Range, Lists and HOFs

Domain and Range

1. Determine the domain and range of the following Snap! blocks:

   a. ![contains block]
      - Domain: ________________, ________________
      - Range: ________________

   b. ![set var to foo block]
      - Domain of foo: ________________
      - Range of foo: ________________
      - Data type of var: ________________

2. Fill in the table with the domain and range of the following higher order functions:

<table>
<thead>
<tr>
<th>Higher Order Function</th>
<th>Domain</th>
<th>Range</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>![map over block]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>![keep items such that from block]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>![combine with items of block]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Higher Order Function Practice

1. Fill in the blanks so the keep block returns a list of the numbers from MyList.

   MyList = [3, hello, goodbye, 5, 6]
   Keep items such that ________________________ from ______________

2. Write an expression that returns the sum of the squares of the numbers in YourList.

   YourList = [1, 2, 3, 4]
   __________________________________________________________________________
   __________________________________________________________________________

3. Complete the following block so it works as described. Note: You may find the sentence -> list block helpful.

   __________________________________________________________________________
   __________________________________________________________________________

4. Describe (in words) what the following block outputs. Assume OurList is a list of words.

   __________________________________________________________________________

Challenge Problems

1. Determine the domain and range of the following blocks:

   a. _______________________________________________________________________
      Domain of Foo: ___________________     Range of Foo: ______________________

   b. _______________________________________________________________________
      Domain of Foo: ___________________     Range of Foo: ______________________
2. If the output of Mystery is true, which of the following can you say for sure?

- [ ] A must be true
- [ ] B must be true
- [ ] A must be false
- [ ] B must be false
- [ ] None of these

3. You realize you could replace the entire body of Mystery with a single report statement. What could we report instead so that Mystery would have the same exact behavior? (Select all that apply)

- [ ] A and B
- [ ] A or B
- [ ] not A and not B
- [ ] not A or not B
- [ ] not < A or B
- [ ] not < A and B

4. Given the following expression, what does NAMES evaluate to?

- a. 1, 2
- b. 2, Garcia
- c. 1, Garcia
- d. 1, 2

5. One of the most common data storage technologies is databases, think of them as Tables/Charts, with columns and rows. Let’s say you’re given a table that looks like the following:

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Height(inches)</th>
<th>Year</th>
<th>2 Favorite Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dan</td>
<td>75</td>
<td>4</td>
<td>[10, 61]</td>
</tr>
<tr>
<td>2</td>
<td>Mansi</td>
<td>65</td>
<td>4</td>
<td>[161, 10]</td>
</tr>
<tr>
<td>3</td>
<td>Bob</td>
<td>70</td>
<td>3</td>
<td>[70, 170]</td>
</tr>
<tr>
<td>4</td>
<td>Alice</td>
<td>71</td>
<td>1</td>
<td>[10, 160]</td>
</tr>
<tr>
<td>5</td>
<td>Nick</td>
<td>68</td>
<td>3</td>
<td>[161, 162]</td>
</tr>
<tr>
<td>6</td>
<td>Eve</td>
<td>64</td>
<td>2</td>
<td>[270, 370]</td>
</tr>
<tr>
<td></td>
<td></td>
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</tbody>
</table>
You’re given a reporter block, \textbf{Column}, that takes in the name of a column in the database and reports a list of all of the elements in that column in order. An example call is shown to the left.

For this problem, you can assume that you are only given the 3 HOFs, \textbf{Column}, and any operators (green blocks) in Snap! For each of the subparts before, determine if the problem can be solved using only the given blocks.

\begin{itemize}
  \item[a] Report the total sum of heights \hspace{1cm} \textbf{Yes} \hspace{1cm} \textbf{No}
  \item[b] Report a list of the names of people who are in year 4 \hspace{1cm} \textbf{Yes} \hspace{1cm} \textbf{No}
  \item[c] Report the number you get when you multiply the squares of all of the heights above 70 inches together. \hspace{1cm} \textbf{Yes} \hspace{1cm} \textbf{No}
  \item[d] Calculate the sum of all of the numbers in the “2 Favorite Numbers” column \hspace{1cm} \textbf{Yes} \hspace{1cm} \textbf{No}
\end{itemize}

6. Indicate whether each set of blocks below is equivalent:

\begin{itemize}
  \item[a]
    \begin{align*}
    \text{map} \quad \text{+} \quad 2 \quad & \text{over} \\
    \text{keep items such that} \quad \text{>} \quad 3 \quad & \text{from} \quad \text{list} \quad 2 \quad 3 \quad 4 \quad 4
    \end{align*}
  \item[b]
    \begin{align*}
    \text{map} \quad \text{+} \quad 3 \quad & \text{over} \\
    \text{map} \quad \text{+} \quad 2 \quad & \text{over} \\
    \text{map} \quad \text{+} \quad 3 \quad & \text{over}
    \end{align*}
  \item[c]
    \begin{align*}
    \text{map} \quad \text{+} \quad 3 \quad & \text{over} \\
    \text{map} \quad \text{+} \quad 6 \quad & \text{over} \\
    \text{map} \quad \text{+} \quad 3 \quad & \text{over}
    \end{align*}
  \item[d]
    \begin{align*}
    \text{keep items such that} \quad \text{not} \quad \text{not} \quad & \text{from} \\
    \text{list} \quad \text{false} \quad \text{true} \quad & \text{true} \\
    \text{keep items such that} \quad \text{not} \quad & \text{from} \\
    \text{not} \quad \text{list} \quad \text{false} \quad \text{true}
    \end{align*}
\end{itemize}