Question 1: Powers of 2

Exercise
Write a function \(\text{powers2} \ \text{start} \ \text{count}\) that returns a \((\text{listof Int})\) containing \text{count} powers of two where the first value is \(2^{\text{start}}\).

\[(\text{powers2} \ 3 \ 4) \Rightarrow (\text{list} \ 8 \ 16 \ 32 \ 64)\]

Hint
Read the documentation on \text{expt}.

Exercise
Using \text{powers2} as a helper, write a function \((\text{total-powers} \ \text{start} \ \text{count})\) that returns the sum of the \text{count} powers of two where the first value is \(2^{\text{start}}\).

\[(\text{total-powers} \ 3 \ 4) \Rightarrow 120\]

Question 2: Countdown

Exercise
Write a function \((\text{countdown} \ n)\) that returns a \text{Str} depicting a countdown from \(n\), with "... " between the values, and ending with "blastoff!".

\[(\text{countdown} \ 5) \Rightarrow "5... 4... 3... 2... 1... blastoff!"\]

Hint
You will need to use \text{range, map}, and \text{foldr} on this question. You will need to write a helper function to use with \text{map}.

Question 3: Multiply by position

Exercise
Write a function \((\text{multipos} \ L)\) that consumes a \((\text{listof Int})\). It returns a \((\text{listof Int})\) where the first item has been multiplied by 1, the second by 2, the third by 3, and so on.

\[(\text{multipos} \ (\text{list} \ 1 \ 1 \ 1)) \Rightarrow (\text{list} \ 1 \ 2 \ 3)\]

\[(\text{multipos} \ (\text{list} \ 2 \ 3 \ 5 \ 7)) \Rightarrow (\text{list} \ 2 \ 6 \ 15 \ 28)\]

Hint
You can use \text{map} with multiple lists, then it will take one item from each list and combine them with the function.

For example,

\[(\text{map} + (\text{list} \ 1 \ 2 \ 3) (\text{list} \ 4 \ 5 \ 11)) \Rightarrow (\text{list} \ (+ \ 1 \ 4) (+ \ 2 \ 5) (+ \ 3 \ 11)) \Rightarrow (\text{list} \ 5 \ 7 \ 14)\]

See if you can use this idea to solve the lab question!
Question 4: Length to power

Write a function \( (l2p \ L) \) that consumes a \( \text{(listof Any)} \). It returns 2 to the power of the length of the list.

\[
(l2p \ (\text{list 17 42 "foobar"})) \Rightarrow 8 \\
(l2p \ ()) \Rightarrow 1
\]

Do not use \texttt{expt} or \texttt{length} on this question.

Hint: Use \texttt{foldr}.