The Potter and Kimble Bubble Gum Factories

(*Taken from Lessons for Algebraic Thinking: Grades 6-8*)

Show all work on a separate sheet of paper to receive full credit.

1.	At the Potter Bubble Gum Factory, lengths of gum are stretched to larger lengths by putting them through stretching machines. There are 100 stretching machines, numbered 1 through 100. Machine 1 does nothing to a piece of gum; machine 2 stretches pieces of gum to twice their original length; machine 3 triples the length of the gum, and so forth. So, machine 23, for example, will stretch a piece of gum to 23 times its original length. **Gum can go through as many machines as necessary and may travel through the same machine more than once.** An order has just come in for a piece of bubble gum 26 inches in length. The factory has pieces of gum that are only 1 inch in length, and machine number 26 is broken. Mr. Mangham, a factory worker, believes there is another way to create a piece of bubble gum 26 inches in length by using other machines. **Show or explain** how this could be accomplished.
2.	It appears some of the machines in the factory are unnecessary because combinations of other machines could be used instead. Figure out which machines are actually unnecessary. **List all** unnecessary numbers.
3.	The Kimble Bubble Gum Factory is going to offer gum in the following lengths: 15, 28, 36, 65, 84. The Kimbles are about to order machines for their company and since they are expensive, they want to order the fewest possible. What is the fewest number of necessary machines needed to create all of these gum lengths? What is the number of each machine? Show all work.
4.	For each of the lengths at the Kimble Bubble Gum Factory, what other machines could have been used that were unnecessary? Show all work.
5.	Back at the Potter Bubble Gum Factory, which lengths between 1 and 100 would come out if the bubble gum went through five machines and all five machines were necessary ones? It can travel through the same number machine more than once. Show all work.
6.	You know the gum can go through five machines and stay less than 100. Can it go through six and stay less than 100? Seven and less than 100? Which lengths between 1 and 100 require the greatest number of runs through necessary machines? How did you figure out your answer? It can travel through the same number machine more than once. Show all work.
7.	Suppose you now have lengths of gum up to 200. Are you going to need to buy more necessary machines? If so, do not list them all, but what do the machines have in common? Show all work.
8.	How many necessary machines are required for a 160-inch length? Which lengths between 100 and 200 inches require going through six necessary machines? Which lengths between 100 and 200 inches require going through seven necessary machines? Show all work.

SHOW ALL YOUR WORK AND
MAKE SURE I CAN UNDERSTAND WHERE ALL YOUR NUMBERS CAME FROM.

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