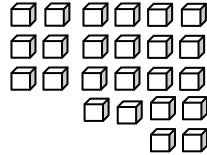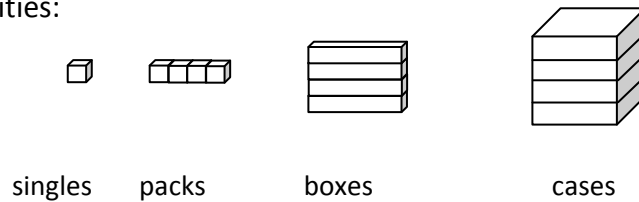# Caramel Factory

You are a lucky owner of a caramel factory, but you're having lots of trouble finding good help. In fact, people you have hired are able to count only up to four. When your machine spews out these caramels:

they can't tell you how many there are. They just say "Many"

So, you decide that the best thing to do is package caramel into fours. When your employee sees four caramels he puts them into a pack, when he sees four packs he puts them into a box, and when four boxes are full he puts them into a case. So your caramels are available in following quantities:

singles   packs   boxes   cases

To simplify ordering you supply your customers with the following order form

Cases	Boxes	Packs	singles

What digits could your customers use so that your workers can fill in the order? Why?

If your clerk Jon got the following order:

Cases	Boxes	Packs	singles
1	1	1	1

What would he ship? Draw a picture. What does each 1 represent?

Jon soon got pretty quick. He no longer needed to read the entire order. The following was good enough for him:

3	2	1	0

2	3	0	1

	1	0	3

What did Jon ship in each of those instances? Draw your answer next to the shipping order.

To be able to distinguish these numbers from our usual ones we will write these:
$3210_{(4)}$
$2301_{(4)}$
$103_{(4)}$

How many caramels were in each of these orders? Explain how you arrived at your answer.

In the following examples you may find it useful to still talk about singles, packs, cases and boxes and to draw them.
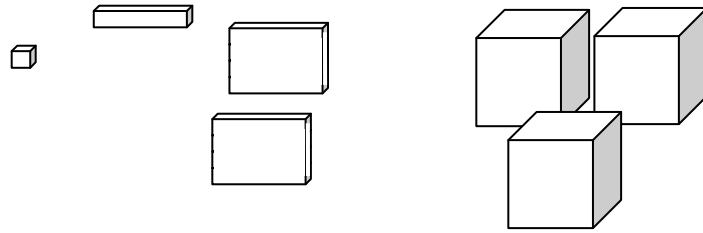
Mr. Candy has been ordering your caramels at a furious pace. In fact, two of his orders $2013_{(4)}$ and $231_{(4)}$ are still waiting to be shipped. Jon decided to combine them into one order. How many will he ship (remember he can count up to 4)?

Three of the workers have been working independently and they now have $112_{(4)}$, $131_{(4)}$ and $122_{(4)}$ caramels respectively. Jon needs to know how many caramels he has available, because Miss Sour has ordered $1232_{(4)}$ caramels. Can he fill her order?

Just as Jon was wrapping up Miss Sour's order, she calls him up to say that she ordered $303_{(4)}$ caramels too many. How many does she need now?

Jon got three identical orders in: $222_{(4)}$. How many caramels does he need to have in stock to fill all three of them?

You are feeling very generous to your three employees who have stayed overtime to help you fill in a few huge orders. You tell Jon to divide whatever is left in the warehouse between them. This is what Jon finds there:

How will he split this among the workers?