Homework 1

November 3, 2021

Welcome to pasta center! We are the premier pasta maker in the northeast. We make and deliver pasta, and are known for our having great suppliers. We work with three supply companies, providing

1. Sauce
2. Noodes (precooked)
3. Veggies

Our pasta is always fresh, and made in our local industrial kitchen. Our staff are great, although they are a little peculiar. They want *extremely* clear tasks each day. To faciliate communication, the kitchen has sent us a description of their operations.

1 The Kitchen

The kitchen has several areas for work, as well as staff that can perform several functions. The regions of the kitchen are

1.1 Regions

1.1.1 Incoming

A line of incoming ingredients from our suppliers. We only have one loading bay, so we can only interact with the front of the line. Saying

$$NEXT$$

will refer to the the front of that line.

1.1.2 Storage

A suite of fridges for storing components. Referring to

$$F1, F2, ...$$

will allow you to specify which fridge you mean. (Note that for this assignment, 10 fridges would be more than enough).

1.1.3 Kitchen

A kitchen with two counters for storing pasta components. We will use

$$K1, K2$$

to refer to these positions.

1.2 Functions

We also have great staff, who are extermely reliable. They are, however, rather specialzied. We an only ask them to perform the following:

1.2.1 MOVE

When we want to move an ingredient around, we say

$$MOVE\ place1\ place2$$

to ask the couriers to take whatever is in $place1$ and put it in $place2$. For example,

$$MOVE\ NEXT\ F3$$

will take whatevers in the front of the line, and move it to fridge 3.

$$MOVE\ F3\ K2$$

will take whatever's in fridge 3, and place it in on the second kitchen counter.

NOTE: $place1$ is empty, or $place2$ is already occupied, this instruction will fail.

1.2.2 COMBINE

The is the key instruction. Using

$$COMBINE$$

will ask the checkfs combine the items on K1 and K2. The resulting item will be placed on K1. This will allow you to combine pairs of sauce, noodles, and veggies to ultimately make pasta!

NOTE: If $K1$ or $K2$ are empty, this instruction will fail.

1.2.3 DELIVER

The instruction
$$DELIVER$$
will signal the delivery specialists that the item in $K1$ is ready, and they will take it to a hungry customer.

NOTE: If $K1$ is empty, this instruction fails.

2 Instructions

Our kitchen has bad cell reception, so they need their instructions delivered at the beginning of the day. Thankfully, we know all of the scheduled deliveries for that day.

If the deliveries for that day are

1. Veggies (Front of line)
2. Noodles
3. Sauce

then here is a valid set of instructions that delivers complete pasta

1. $MOVE\ NEXT\ F1$
2. $MOVE\ NEXT\ F2$
3. $MOVE\ NEXT\ F3$
4. $MOVE\ F1\ K1$
5. $MOVE\ F2\ K2$
6. $COMBINE$
7. $MOVE\ F3\ K2$
8. $COMBINE$
9. $DELIVER$

3 Exercies

Let's say we have
Day 1

1. Veggies (Front of line)
2. Noodles
3. Sauce

Day 2

1. Veggies (Front of line)
2. Veggies
3. Noodles
4. Sauce
5. Sauce
6. Noodles

Exercise 1

Can you find more efficient version of the example Day 1 instructions?

Exercise 2

Can you find instructions that will work for Day 2?

Exercise 3

Customers have started complaining that our pasta is not consistently delicious. Corporate has decided that we need to combine ingredients in the same order every time.

1. Noodes/Sauce
2. Noodes+Sauce/Veggies

In other words, the $COMBINE$ instruction now forbids combining Noodles/Veggies directly or Veggies/Sauce directly. Given these new constraints, can you find instructions that will work for day 1 and day 2?