

# DS0103EN-3-3-1-From-Understanding-to-Preparation-v2.0

August 11, 2019

From Understanding to Preparation

## 0.1 Introduction

In this lab, we will continue learning about the data science methodology, and focus on the **Data Understanding** and the **Data Preparation** stages.

## 0.2 Table of Contents

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## 1 Recap

In Lab **From Requirements to Collection**, we learned that the data we need to answer the question developed in the business understanding stage, namely *can we automate the process of determining the cuisine of a given recipe?*, is readily available. A researcher named Yong-Yeol Ahn scraped tens of thousands of food recipes (cuisines and ingredients) from three different websites, namely:

www.allrecipes.com

www.epicurious.com

www.menupan.com

For more information on Yong-Yeol Ahn and his research, you can read his paper on [Flavor Network and the Principles of Food Pairing](#).

We also collected the data and placed it on an IBM server for your convenience.

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## 2 Data Understanding

Important note: Please note that you are not expected to know how to program in Python. The following code is meant to illustrate the stages of data understanding and data preparation, so it is totally fine if you do not understand the individual lines of code. We have a full course on programming in Python, Python for Data Science, which is also offered on Coursera. So make sure to complete the Python course if you are interested in learning how to program in Python.

## 2.0.1 Using this notebook:

To run any of the following cells of code, you can type **Shift + Enter** to excute the code in a cell.  
Get the version of Python installed.

```
[ ]: # check Python version
!python -V
```

Download the library and dependencies that we will need to run this lab.

```
[2]: import pandas as pd # import library to read data into dataframe
pd.set_option('display.max_columns', None)
import numpy as np # import numpy library
import re # import library for regular expression
```

Download the data from the IBM server and read it into a *pandas* dataframe.

```
[3]: recipes = pd.read_csv("https://s3-api.us-geo.objectstorage.softlayer.net/cf-courses-data/
    ↪CognitiveClass/DS0103EN/labs/data/recipes.csv")

print("Data read into dataframe!") # takes about 30 seconds
```

Data read into dataframe!

Show the first few rows.

```
[4]: recipes.head()
```

```
[4]:    country almond angelica anise anise_seed apple apple_brandy apricot \
0  Vietnamese    No      No    No        No    No          No    No
1  Vietnamese    No      No    No        No    No          No    No
2  Vietnamese    No      No    No        No    No          No    No
3  Vietnamese    No      No    No        No    No          No    No
4  Vietnamese    No      No    No        No    No          No    No
```

```
    armagnac artemisia artichoke asparagus avocado bacon baked_potato balm \
0      No      No      No      No      No    No      No    No
1      No      No      No      No      No    No    No    No
2      No      No      No      No      No    No    No    No
3      No      No      No      No      No    No    No    No
4      No      No      No      No      No    No    No    No
```

```
    banana barley bartlett_pear basil bay bean beech beef beef_broth beef_liver \
0      No    No      No  Yes  No  No  No  No      No    No
1      No    No      No   No  No  No  No  No      No    No
2      No    No      No   No  No  No  No  No      No    No
3      No    No      No  Yes  No  Yes  No  No     Yes    No
4      No    No      No   No  No  No  No  No      No    No
```

```
    beer beet bell_pepper bergamot berry bitter_orange black_bean black_currant \
0    No  No      No      No  No      No    No      No
1    No  No      No      No  No      No    No      No
2    No  No      No      No  No      No    No      No
```

3	No	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No	No

	black_mustard_seed_oil	black_pepper	black_raspberry	black_sesame_seed
0	No	No	No	No
1	No	Yes	No	No
2	No	No	No	No
3	No	No	No	No
4	No	No	No	No

	black_tea	blackberry	blackberry_brandy	blue_cheese	blueberry	bone_oil
0	No	No	No	No	No	No
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	No	No	No	No
4	No	No	No	No	No	No

	bourbon_whiskey	brandy	brassica	bread	broccoli	brown_rice	brussels_sprout
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No

	buckwheat	butter	buttermilk	cabbage	cabernet_sauvignon_wine	cacao
0	No	No	No	No	No	No
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	No	No	No	No
4	No	No	No	No	No	No

	camembert_cheese	cane_molasses	caraway	cardamom	carnation	carob	carrot
0	No	No	No	No	No	No	Yes
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No

	cashew	cassava	catfish	cauliflower	caviar	cayenne	celery	celery_oil	cereal
0	No	No	No	No	No	Yes	No	No	No
1	No	No	No	No	No	Yes	No	No	No
2	No	No	No	No	No	No	No	No	No
3	No	No	No	No	No	Yes	No	No	No
4	No	No	No	No	No	Yes	No	No	No

	chamomile	champagne_wine	chayote	cheddar_cheese	cheese	cherry	cherry_brandy
0	No	No	No	No	No	No	No

1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No

chervil chicken chicken_broth chicken_liver chickpea chicory \							
0	No	No	No	No	No	No	
1	No	No	No	No	No	No	
2	No	No	No	No	No	No	
3	No	No	No	No	No	No	
4	No	No	No	No	No	No	

chinese_cabbage chive cider cilantro cinnamon citrus citrus_peel clam clove \									
0		No	No	No	Yes	No	No	No	No
1		No	No	No	No	No	No	No	No
2		No	No	No	No	No	No	No	No
3		No	No	No	Yes	No	No	No	No
4		No	No	No	No	No	No	No	No

cocoa coconut coconut_oil cod coffee cognac concord_grape condiment \								
0	No	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No	No

coriander corn corn_flake corn_grit cottage_cheese crab cranberry cream \									
0	No	No	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No	No	No
4	Yes	No	No	No	No	No	No	No	No

cream_cheese cucumber cumin cured_pork currant date dill durian eel egg \										
0		No	Yes	No	No	No	No	No	No	No
1		No	No	No	No	No	No	No	No	No
2		No	No	No	No	No	No	No	No	No
3		No	No	No	No	No	No	No	No	No
4		No	Yes	No	No	No	No	No	No	No

egg_noodle elderberry emmental_cheese endive enokidake fennel fenugreek \							
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No

	feta_cheese	fig	fish	flower	frankfurter	fruit	galanga	gardenia	garlic	\
0	No	No	Yes	No	No	No	No	No	Yes	
1	No	No	Yes	No	No	No	No	No	Yes	
2	No	No	No	No	No	No	No	No	Yes	
3	No	No	Yes	No	No	No	No	No	No	
4	No	No	Yes	No	No	No	No	No	Yes	

	gelatin	geranium	gin	ginger	goat_cheese	grape	grape_brandy	grape_juice	\
0	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	Yes	No	No	No	No	
4	No	No	No	No	No	No	No	No	

	grapefruit	green_bell_pepper	green_tea	gruyere_cheese	guava	haddock	ham	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	

	hazelnut	herring	holy_basil	honey	hop	horseradish	huckleberry	jamaican_rum	\
0	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	

	japanese_plum	jasmine	jasmine_tea	juniper_berry	kaffir_lime	kale	\
0	No	No	No	No	No	No	
1	No	No	No	No	No	No	
2	No	No	No	No	No	No	
3	No	No	No	No	No	No	
4	No	No	No	No	No	No	

	katsuobushi	kelp	kidney_bean	kiwi	kohlrabi	kumquat	lamb	lard	laurel	\
0	No	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	No	

	lavender	leaf	leek	lemon	lemon_juice	lemon_peel	lemongrass	lentil	lettuce	\
0	No	No	No	No	No	No	No	No	Yes	
1	No	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	No	

4	No	No	No	Yes	No	No	No	No	No
---	----	----	----	-----	----	----	----	----	----

	licorice	lilac_flower_oil	lima_bean	lime	lime_juice	lime_peel_oil	\
0	No	No	No	No	Yes	No	
1	No	No	No	No	No	No	
2	No	No	No	No	Yes	No	
3	No	No	No	Yes	Yes	No	
4	No	No	No	No	Yes	No	

	lingonberry	litchi	liver	lobster	long_pepper	lovage	macadamia_nut	macaroni	\
0	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	

	mace	mackerel	malt	mandarin	mandarin_peel	mango	maple_syrup	marjoram	mate	\
0	No	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	No	

	matsutake	meat	melon	milk	milk_fat	mint	mozzarella_cheese	mung_bean	\
0	No	No	No	No	No	Yes	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	Yes	No	No	
4	No	No	No	No	No	Yes	No	No	

	munster_cheese	muscat_grape	mushroom	mussel	mustard	mutton	nectarine	nira	\
0	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	

	nut	nutmeg	oat	oatmeal	octopus	okra	olive	olive_oil	onion	orange	\
0	No	No	No	No	No	No	Yes	No	No		
1	No	No	No	No	No	No	No	Yes	No		
2	No	No	No	No	No	No	No	No	No		
3	No	No	No	No	No	No	No	No	No		
4	No	No	No	No	No	No	No	No	No		

	orange_flower	orange_juice	orange_peel	oregano	ouzo	oyster	palm	papaya	\
0	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	

2	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No	No

	parmesan_cheese	parsley	parsnip	passion_fruit	pea	peach	peanut	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	No	Yes	No	No	
4	No	No	No	No	No	No	Yes	

	peanut_butter	peanut_oil	pear	pear_brandy	pecan	pelargonium	pepper	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	

	peppermint	peppermint_oil	pimenta	pimento	pineapple	pistachio	plum	popcorn	\
0	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	

	porcini	pork	pork_liver	pork_sausage	port_wine	potato	potato_chip	prawn	\
0	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	

	prickly_pear	provolone_cheese	pumpkin	quince	radish	raisin	rapeseed	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	

	raspberry	raw_beef	red_algae	red_bean	red_kidney_bean	red_wine	rhubarb	rice	\
0	No	No	No	No	No	No	No	Yes	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	Yes	
4	No	No	No	No	No	No	No	Yes	

	roasted_almond	roasted_beef	roasted_hazelnut	roasted_meat	roasted_nut	\
--	----------------	--------------	------------------	--------------	-------------	---

0	No	No	No	No	No
1	No	No	No	No	No
2	No	No	No	No	No
3	No	Yes	No	No	No
4	No	No	No	No	No

	roasted_peanut	roasted_pecan	roasted_pork	roasted_sesame_seed	romano_cheese \
0	No	No	No	No	No
1	No	No	No	No	No
2	No	No	No	No	No
3	No	No	No	No	No
4	No	No	No	No	No

	root	roquefort_cheese	rose	rosemary	rum	rutabaga	rye_bread	rye_flour \
0	No	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No	No

	saffron	sage	sake	salmon	salmon_roe	sassafras	sauerkraut	savory	scallion \
0	No	No	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No	No	Yes

	scallop	sea_algae	seaweed	seed	sesame_oil	sesame_seed	shallot	sheep_cheese \
0	No	No	No	Yes	No	No	No	No
1	No	No	No	Yes	No	No	No	No
2	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	Yes	No
4	No	No	No	No	No	No	No	No

	shellfish	sherry	shiitake	shrimp	smoke	smoked_fish	smoked_salmon \
0	No	No	Yes	Yes	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	Yes	No	No	No

	smoked_sausage	sour_cherry	sour_milk	soy_sauce	soybean	soybean_oil \
0	No	No	No	No	No	No
1	No	No	No	No	No	No
2	No	No	No	Yes	No	No
3	No	No	No	No	No	No
4	No	No	No	No	No	No



	spearmint	squash	squid	star_anise	starch	strawberry	strawberry_jam	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	

	strawberry_juice	sturgeon_caviar	sumac	sunflower_oil	sweet_potato	\
0	No	No	No	No	No	
1	No	No	No	No	No	
2	No	No	No	No	No	
3	No	No	No	No	No	
4	No	No	No	No	No	

	swiss_cheese	tabasco_pepper	tamarind	tangerine	tarragon	tea	tequila	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	

	thai_pepper	thyme	tomato	tomato_juice	truffle	tuna	turkey	turmeric	turnip	\
0	No	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	No	
2	Yes	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	No	

	vanilla	veal	vegetable	vegetable_oil	vinegar	violet	walnut	wasabi	\
0	No	No	No	No	Yes	No	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	Yes	No	No	No	No	
4	No	No	No	No	Yes	No	No	No	

	watercress	watermelon	wheat	wheat_bread	whiskey	white_bread	white_wine	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	

	whole_grain_wheat_flour	wine	wood	yam	yeast	yogurt	zucchini
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No

3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No

Get the dimensions of the dataframe.

```
[5]: recipes.shape
```

```
[5]: (57691, 384)
```

So our dataset consists of 57,691 recipes. Each row represents a recipe, and for each recipe, the corresponding cuisine is documented as well as whether 384 ingredients exist in the recipe or not, beginning with almond and ending with zucchini.

We know that a basic sushi recipe includes the ingredients: \* rice \* soy sauce \* wasabi \* some fish/vegetables

Let's check that these ingredients exist in our dataframe:

```
[8]: ingredients = list(recipes.columns.values)

print([match.group(0) for ingredient in ingredients for match in [(re.compile(".*(rice).*")).
    ↳search(ingredient)] if match])
print([match.group(0) for ingredient in ingredients for match in [(re.compile(".*(wasabi).*")).
    ↳search(ingredient)] if match])
print([match.group(0) for ingredient in ingredients for match in [(re.compile(".*(soy).*")).
    ↳search(ingredient)] if match])
```

```
['brown_rice', 'licorice', 'rice']
['wasabi']
['soy_sauce', 'soybean', 'soybean_oil']
```

Yes, they do!

- rice exists as rice.
- wasabi exists as wasabi.
- soy exists as soy\_sauce.

So maybe if a recipe contains all three ingredients: rice, wasabi, and soy\_sauce, then we can confidently say that the recipe is a **Japanese** cuisine! Let's keep this in mind!

### 3 Data Preparation

In this section, we will prepare data for the next stage in the data science methodology, which is modeling. This stage involves exploring the data further and making sure that it is in the right format for the machine learning algorithm that we selected in the analytic approach stage, which is decision trees.

First, look at the data to see if it needs cleaning.

```
[9]: recipes["country"].value_counts() # frequency table
```

```
[9]: American    40150
     Mexico      1754
```

Italian	1715
Italy	1461
Asian	1176

...	
Indonesia	12
Belgium	11
East-African	11
Israel	9
Bangladesh	4

Name: country, Length: 69, dtype: int64

By looking at the above table, we can make the following observations:

1. Cuisine column is labeled as Country, which is inaccurate.
2. Cuisine names are not consistent as not all of them start with an uppercase first letter.
3. Some cuisines are duplicated as variation of the country name, such as Vietnam and Vietnamese.
4. Some cuisines have very few recipes.

**Let's fix these problems.** Fix the name of the column showing the cuisine.

```
[12]: column_names = recipes.columns.values
      column_names[0] = "cuisine"
      #print(column_names)
      recipes.columns = column_names
      recipes
```

```
[12]:      cuisine almond angelica anise anise_seed apple apple_brandy apricot \
0      Vietnamese No No No No No No No
1      Vietnamese No No No No No No No
2      Vietnamese No No No No No No No
3      Vietnamese No No No No No No No
4      Vietnamese No No No No No No No
...      ...
57686      Japan No No No No No No No
57687      Japan No No No No No No No
57688      Japan No No No No No No No
57689      Japan No No No No No No No
57690      Japan No No No No No No No
...      ...
armagnac artemisia artichoke asparagus avocado bacon baked_potato balm \
0      No No No No No No No No
1      No No No No No No No No
2      No No No No No No No No
3      No No No No No No No No
4      No No No No No No No No
...      ...
57686      No No No No No No No No
57687      No No No No No No No No
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57688	No	No	No	No	No	No	No	No
57689	No	No	No	No	No	Yes	No	No
57690	No	No	No	No	No	No	No	No

	banana	barley	bartlett_pear	basil	bay	bean	beech	beef	beef_broth	\
0	No	No	No	Yes	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	No	
3	No	No	No	Yes	No	Yes	No	No	Yes	
4	No	No	No	No	No	No	No	No	No	
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57688	No	Yes	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	No	No	
57690	No	Yes	No	No	No	No	No	No	No	

	beef_liver	beer	beet	bell_pepper	bergamot	berry	bitter_orange	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
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3	No	No	No	No	No	No	No	
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57688	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	No	

	black_bean	black_currant	black_mustard_seed_oil	black_pepper	\
0	No	No	No	No	
1	No	No	No	Yes	
2	No	No	No	No	
3	No	No	No	No	
4	No	No	No	No	
...	...	...	...	...	
57686	No	No	No	No	
57687	No	No	No	No	
57688	No	No	No	No	
57689	No	No	No	No	
57690	No	No	No	No	

	black_raspberry	black_sesame_seed	black_tea	blackberry	\
0	No	No	No	No	
1	No	No	No	No	
2	No	No	No	No	

3	No	No	No	No
4	No	No	No	No
...	...	...	...	...
57686	No	No	No	No
57687	No	No	No	No
57688	No	No	No	No
57689	No	No	No	No
57690	No	No	No	No

	blackberry_brandy	blue_cheese	blueberry	bone_oil	bourbon_whiskey	brandy \
0	No	No	No	No	No	No
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	No	No	No	No
4	No	No	No	No	No	No
...	...	...	...	...	...	...
57686	No	No	No	No	No	No
57687	No	No	No	No	No	No
57688	No	No	No	No	No	No
57689	No	No	No	No	No	No
57690	No	No	No	No	No	No

	brassica	bread	broccoli	brown_rice	brussels_sprout	buckwheat	butter \
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
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57688	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No

	buttermilk	cabbage	cabernet_sauvignon_wine	cacao	camembert_cheese \
0	No	No	No	No	No
1	No	No	No	No	No
2	No	No	No	No	No
3	No	No	No	No	No
4	No	No	No	No	No
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57687	No	No	No	No	No
57688	No	No	No	No	No
57689	No	Yes	No	No	No
57690	No	No	No	No	No

	cane_molasses	caraway	cardamom	carnation	carob	carrot	cashew	cassava \
0	No	No	No	No	No	Yes	No	No
1	No	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No	No
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57688	No	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No	No

	catfish	cauliflower	caviar	cayenne	celery	celery_oil	cereal	chamomile \
0	No	No	No	Yes	No	No	No	No
1	No	No	No	Yes	No	No	No	No
2	No	No	No	No	No	No	No	No
3	No	No	No	Yes	No	No	No	No
4	No	No	No	Yes	No	No	No	No
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57688	No	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No	No

	champagne_wine	chayote	cheddar_cheese	cheese	cherry	cherry_brandy \
0	No	No	No	No	No	No
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	No	No	No	No
4	No	No	No	No	No	No
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57687	No	No	No	No	No	No
57688	No	No	No	No	No	No
57689	No	No	No	No	No	No
57690	No	No	No	No	No	No

	chervil	chicken	chicken_broth	chicken_liver	chickpea	chicory \
0	No	No	No	No	No	No
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	No	No	No	No
4	No	No	No	No	No	No
...	...	...	...	...	...	...

57686	No	No	No	No	No	No
57687	No	Yes	No	No	No	No
57688	No	No	No	No	No	No
57689	No	No	No	No	No	No
57690	No	No	No	No	No	No

	chinese_cabbage	chive	cider	cilantro	cinnamon	citrus	citrus_peel	clam	\
0	No	No	No	Yes	No	No	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	Yes	No	No	No	No	
4	No	No	No	No	No	No	No	No	
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57688	No	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	No	No	

	clove	cocoa	coconut	coconut_oil	cod	coffee	cognac	concord_grape	\
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2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	
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57687	No	No	No	No	No	No	No	No	
57688	No	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	No	No	

	condiment	coriander	corn	corn_flake	corn_grit	cottage_cheese	crab	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	
4	No	Yes	No	No	No	No	No	
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57687	No	No	No	No	No	No	No	
57688	No	No	Yes	No	No	No	No	
57689	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	No	

	cranberry	cream	cream_cheese	cucumber	cumin	cured_pork	currant	date	\
0	No	No	No	Yes	No	No	No	No	

1	No	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No	No
4	No	No	No	Yes	No	No	No	No
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57686	No	Yes	Yes	Yes	No	No	No	No
57687	No	No	No	No	No	No	No	No
57688	No	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No	No

dill durian eel egg egg_noodle elderberry emmental_cheese endive \								
0	No	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No	No
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57689	No	No	No	Yes	No	No	No	No
57690	No	No	No	Yes	No	No	No	No

enokidake fennel fenugreek feta_cheese fig fish flower frankfurter \								
0	No	No	No	No	No	Yes	No	No
1	No	No	No	No	No	Yes	No	No
2	No	No	No	No	No	No	No	No
3	No	No	No	No	No	Yes	No	No
4	No	No	No	No	No	Yes	No	No
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57688	No	No	No	No	No	Yes	No	No
57689	No	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No	No

fruit galanga gardenia garlic gelatin geranium gin ginger goat_cheese \									
0	No	No	No	Yes	No	No	No	No	No
1	No	No	No	Yes	No	No	No	No	No
2	No	No	No	Yes	No	No	No	No	No
3	No	No	No	No	No	No	No	Yes	No
4	No	No	No	Yes	No	No	No	No	No
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57687	No	No	No	No	No	No	No	No	No
57688	No	No	No	Yes	No	No	No	Yes	No



57689	No	No	No	No	No	No	No	Yes	No
57690	No	No	No	No	No	No	No	No	No

	grape	grape_brandy	grape_juice	grapefruit	green_bell_pepper	green_tea	\
0	No	No	No	No	No	No	
1	No	No	No	No	No	No	
2	No	No	No	No	No	No	
3	No	No	No	No	No	No	
4	No	No	No	No	No	No	
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57687	No	No	No	No	No	No	
57688	No	No	No	No	No	No	
57689	No	No	No	No	No	No	
57690	No	No	No	No	No	No	

	gruyere_cheese	guava	haddock	ham	hazelnut	herring	holy_basil	honey	hop	\
0	No	No	No	No	No	No	No	No	No	
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2	No	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	No	
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...	...	...	...	...	...	...	...	...	...	
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57687	No	No	No	No	No	No	No	No	No	
57688	No	No	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	No	No	No	

	horseradish	huckleberry	jamaican_rum	japanese_plum	jasmine	jasmine_tea	\
0	No	No	No	No	No	No	
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3	No	No	No	No	No	No	
4	No	No	No	No	No	No	
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57687	No	No	No	No	No	No	
57688	No	No	No	No	No	No	
57689	No	No	No	No	No	No	
57690	No	No	No	No	No	No	

	juniper_berry	kaffir_lime	kale	katsuobushi	kelp	kidney_bean	kiwi	\
0	No	No	No	No	No	No	No	
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2	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	

4	No	No	No	No	No	No	No
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57687	No	No	No	No	No	No	No
57688	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No

	kohlrabi	kumquat	lamb	lard	laurel	lavender	leaf	leek	lemon	lemon_juice	\
0	No	No	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	Yes	No	
...	...	...	...	...	...	...	...	...	...	...	
57686	No	No	No	No	No	No	No	No	No	No	
57687	No	No	No	No	No	No	No	No	No	No	
57688	No	No	No	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	No	No	No	No	

	lemon_peel	lemongrass	lentil	lettuce	licorice	lilac_flower_oil	\
0	No	No	No	Yes	No	No	
1	No	No	No	No	No	No	
2	No	No	No	No	No	No	
3	No	No	No	No	No	No	
4	No	No	No	No	No	No	
...	...	...	...	...	...	...	
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57687	No	No	No	No	No	No	
57688	No	No	No	No	No	No	
57689	No	No	No	No	No	No	
57690	No	No	No	No	No	No	

	lima_bean	lime	lime_juice	lime_peel_oil	lingonberry	litchi	liver	\
0	No	No	Yes	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	Yes	No	No	No	No	
3	No	Yes	Yes	No	No	No	No	
4	No	No	Yes	No	No	No	No	
...	...	...	...	...	...	...	...	
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57687	No	No	No	No	No	No	No	
57688	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	No	

	lobster	long_pepper	lovage	macadamia_nut	macaroni	mace	mackerel	malt	\
0	No	No	No	No	No	No	No	No	
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2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	
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57688	No	No	No	No	No	No	No	No	
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57690	No	No	No	No	No	No	No	No	

	mandarin	mandarin_peel	mango	maple_syrup	marjoram	mate	matsutake	meat	\
0	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	
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57687	No	No	No	No	No	No	No	No	
57688	No	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	No	No	

	melon	milk	milk_fat	mint	mozzarella_cheese	mung_bean	munster_cheese	\
0	No	No	No	Yes	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	Yes	No	No	No	
4	No	No	No	Yes	No	No	No	
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57687	No	No	No	No	No	No	No	
57688	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	
57690	No	Yes	No	No	No	No	No	

	muscat_grape	mushroom	mussel	mustard	mutton	nectarine	nira	nut	nutmeg	\
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2	No	No	No	No	No	No	No	No	No	
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4	No	No	No	No	No	No	No	No	No	
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57687	No	No	No	No	No	No	No	No	Yes	No
57688	No	No	No	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No	No	No	No

	oat	oatmeal	octopus	okra	olive	olive_oil	onion	orange	orange_flower	\
0	No	No	No	No	No	Yes	No	No	No	
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2	No	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	No	
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57689	No	No	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	Yes	No	No	

	orange_juice	orange_peel	oregano	ouzo	oyster	palm	papaya	\
0	No	No	No	No	No	No	No	
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2	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	
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57688	No	No	No	No	No	No	No	
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57690	No	No	No	No	No	No	No	

	parmesan_cheese	parsley	parsnip	passion_fruit	pea	peach	peanut	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	No	No	Yes	No	No	
4	No	No	No	No	No	No	Yes	
...	...	...	...	...	...	...	...	...
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57687	No	No	No	No	No	No	No	
57688	No	No	No	No	No	No	No	
57689	No	No	No	No	No	No	No	
57690	No	No	No	No	No	No	No	

	peanut_butter	peanut_oil	pear	pear_brandy	pecan	pelargonium	pepper	\
0	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	

2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No
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57686	No	No	No	No	No	No	No
57687	No	No	No	No	No	No	No
57688	No	No	No	No	No	No	Yes
57689	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	Yes

	peppermint	peppermint_oil	pimenta	pimento	pineapple	pistachio	plum \
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No
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57687	No	No	No	No	No	No	No
57688	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No

	popcorn	porcini	pork	pork_liver	pork_sausage	port_wine	potato \
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No
...	...	...	...	...	...	...	...
57686	No	No	No	No	No	No	No
57687	No	No	Yes	No	No	No	No
57688	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No

	potato_chip	prawn	prickly_pear	provolone_cheese	pumpkin	quince	radish \
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No
...	...	...	...	...	...	...	...
57686	No	No	No	No	No	No	No
57687	No	No	No	No	No	No	No
57688	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No

57690	No	No	No	No	No	No	No
-------	----	----	----	----	----	----	----

	raisin	rapeseed	raspberry	raw_beef	red_algae	red_bean	red_kidney_bean \
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No
...	...	...	...	...	...	...	...
57686	No	No	No	No	No	No	No
57687	No	No	No	No	No	No	No
57688	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No

	red_wine	rhubarb	rice	roasted_almond	roasted_beef	roasted_hazelnut \
0	No	No	Yes	No	No	No
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	Yes	No	Yes	No
4	No	No	Yes	No	No	No
...	...	...	...	...	...	...
57686	No	No	No	No	No	No
57687	No	No	No	No	No	No
57688	No	No	Yes	No	No	No
57689	No	No	No	No	No	No
57690	No	No	Yes	No	No	No

	roasted_meat	roasted_nut	roasted_peanut	roasted_pecan	roasted_pork \
0	No	No	No	No	No
1	No	No	No	No	No
2	No	No	No	No	No
3	No	No	No	No	No
4	No	No	No	No	No
...	...	...	...	...	...
57686	No	No	No	No	No
57687	No	No	No	No	No
57688	No	No	No	No	No
57689	No	No	No	No	No
57690	No	No	No	No	No

	roasted_sesame_seed	romano_cheese	root	roquefort_cheese	rose	rosemary \
0	No	No	No	No	No	No
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	No	No	No	No
4	No	No	No	No	No	No

...	...	...	...	...	...	...
57686	No	No	No	No	No	No
57687	No	No	No	No	No	No
57688	No	No	No	No	No	No
57689	No	No	No	No	No	No
57690	No	No	No	No	No	No

	rum	rutabaga	rye_bread	rye_flour	saffron	sage	sake	salmon	salmon_roe	\
0	No	No	No	No	No	No	No	No	No	
1	No	No	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	No	
4	No	No	No	No	No	No	No	No	No	

...	...	...	...	...	...	...	...	...	...
57686	No	No	No	No	No	No	No	No	No
57687	No	No	No	No	No	No	No	No	No
57688	No	No	No	No	No	No	Yes	No	No
57689	No	No	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No	No	No

	sassafras	sauerkraut	savory	scallion	scallop	sea_algae	seaweed	seed	\
0	No	No	No	No	No	No	No	Yes	
1	No	No	No	No	No	No	No	Yes	
2	No	No	No	No	No	No	No	No	
3	No	No	No	No	No	No	No	No	
4	No	No	No	Yes	No	No	No	No	

...	...	...	...	...	...	...	...	...
57686	No	No	No	No	No	No	No	No
57687	No	No	No	Yes	No	No	Yes	No
57688	No	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No	No

	sesame_oil	sesame_seed	shallot	sheep_cheese	shellfish	sherry	shiitake	\
0	No	No	No	No	No	No	Yes	
1	No	No	No	No	No	No	No	
2	No	No	No	No	No	No	No	
3	No	No	Yes	No	No	No	No	
4	No	No	No	No	No	No	No	

...	...	...	...	...	...	...	...
57686	No	No	No	No	No	No	No
57687	Yes	No	No	No	No	No	No
57688	No	No	Yes	No	No	No	No
57689	No	No	No	No	No	No	No
57690	No	Yes	No	No	No	No	No

	shrimp	smoke	smoked_fish	smoked_salmon	smoked_sausage	sour_cherry	\
--	--------	-------	-------------	---------------	----------------	-------------	---

0	Yes	No	No	No	No	No
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	No	No	No	No
4	Yes	No	No	No	No	No
...	...	...	...	...	...	...
57686	No	No	No	No	No	No
57687	No	No	No	No	No	No
57688	No	No	No	No	No	No
57689	No	No	No	No	No	No
57690	No	No	No	No	No	No

	sour_milk	soy_sauce	soybean	soybean_oil	spearmint	squash	squid \
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	Yes	No	No	No	No	No
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No
...	...	...	...	...	...	...	...
57686	No	No	No	No	No	No	No
57687	No	No	No	No	No	No	No
57688	No	Yes	Yes	No	No	No	No
57689	No	No	No	No	No	No	No
57690	No	Yes	Yes	No	No	No	No

	star_anise	starch	strawberry	strawberry_jam	strawberry_juice \
0	No	No	No	No	No
1	No	No	No	No	No
2	No	No	No	No	No
3	No	No	No	No	No
4	No	No	No	No	No
...	...	...	...	...	...
57686	No	Yes	No	No	No
57687	No	No	No	No	No
57688	No	No	No	No	No
57689	No	No	No	No	No
57690	No	No	No	No	No

	sturgeon_caviar	sumac	sunflower_oil	sweet_potato	swiss_cheese \
0	No	No	No	No	No
1	No	No	No	No	No
2	No	No	No	No	No
3	No	No	No	No	No
4	No	No	No	No	No
...	...	...	...	...	...
57686	No	No	No	No	No
57687	No	No	No	No	No



57688	No	No	No	No	No
57689	No	No	No	No	No
57690	No	No	No	No	No

	tabasco_pepper	tamarind	tangerine	tarragon	tea	tequila	thai_pepper \
0	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No
2	No	No	No	No	No	No	Yes
3	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No
...	...	...	...	...	...	...	...
57686	No	No	No	No	No	No	No
57687	No	No	No	No	No	No	No
57688	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No
57690	No	No	No	No	No	No	No

	thyme	tomato	tomato_juice	truffle	tuna	turkey	turmeric	turnip	vanilla \
0	No	No	No	No	No	No	No	No	No
1	No	No	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No	No	No
3	No	No	No	No	No	No	No	No	No
4	No	No	No	No	No	No	No	No	No
...	...	...	...	...	...	...	...	...	...
57686	No	No	No	No	No	No	No	No	No
57687	No	No	No	No	No	No	No	No	No
57688	No	No	No	No	No	No	No	No	No
57689	No	No	No	No	No	No	No	No	No
57690	No	No	No	No	Yes	No	No	No	No

	veal	vegetable	vegetable_oil	vinegar	violet	walnut	wasabi	watercress \
0	No	No	No	Yes	No	No	No	No
1	No	No	No	No	No	No	No	No
2	No	No	No	No	No	No	No	No
3	No	No	Yes	No	No	No	No	No
4	No	No	No	Yes	No	No	No	No
...	...	...	...	...	...	...	...	...
57686	No	No	Yes	No	No	No	No	No
57687	No	No	No	No	No	No	No	No
57688	No	No	Yes	Yes	No	No	No	No
57689	No	No	No	Yes	No	No	No	No
57690	No	No	Yes	No	No	No	Yes	No

	watermelon	wheat	wheat_bread	whiskey	white_bread	white_wine \
0	No	No	No	No	No	No
1	No	No	No	No	No	No
2	No	No	No	No	No	No

3	No	No	No	No	No	No
4	No	No	No	No	No	No
...	...	...	...	...	...	...
57686	No	Yes	No	No	No	No
57687	No	No	No	No	No	No
57688	No	No	No	No	No	No
57689	No	Yes	No	No	No	No
57690	No	Yes	No	No	No	No

	whole_grain_wheat	flour	wine	wood	yam	yeast	yogurt	zucchini
0		No	No	No	No	No	No	No
1		No	No	No	No	No	No	No
2		No	No	No	No	No	No	No
3		No	No	No	No	No	No	No
4		No	No	No	No	No	No	No
...	...	...	...	...	...	...	...	...
57686		No	No	No	No	No	No	No
57687		No	No	No	No	No	No	No
57688		No	No	No	No	No	No	No
57689		No	No	No	No	No	No	No
57690		No	No	No	No	No	No	No

[57691 rows x 384 columns]

Make all the cuisine names lowercase.

```
[13]: recipes["cuisine"] = recipes["cuisine"].str.lower()
```

Make the cuisine names consistent.

```
[ ]: recipes.loc[recipes["cuisine"] == "austria", "cuisine"] = "austrian"
recipes.loc[recipes["cuisine"] == "belgium", "cuisine"] = "belgian"
recipes.loc[recipes["cuisine"] == "china", "cuisine"] = "chinese"
recipes.loc[recipes["cuisine"] == "canada", "cuisine"] = "canadian"
recipes.loc[recipes["cuisine"] == "netherlands", "cuisine"] = "dutch"
recipes.loc[recipes["cuisine"] == "france", "cuisine"] = "french"
recipes.loc[recipes["cuisine"] == "germany", "cuisine"] = "german"
recipes.loc[recipes["cuisine"] == "india", "cuisine"] = "indian"
recipes.loc[recipes["cuisine"] == "indonesia", "cuisine"] = "indonesian"
recipes.loc[recipes["cuisine"] == "iran", "cuisine"] = "iranian"
recipes.loc[recipes["cuisine"] == "italy", "cuisine"] = "italian"
recipes.loc[recipes["cuisine"] == "japan", "cuisine"] = "japanese"
recipes.loc[recipes["cuisine"] == "israel", "cuisine"] = "jewish"
recipes.loc[recipes["cuisine"] == "korea", "cuisine"] = "korean"
recipes.loc[recipes["cuisine"] == "lebanon", "cuisine"] = "lebanese"
recipes.loc[recipes["cuisine"] == "malaysia", "cuisine"] = "malaysian"
recipes.loc[recipes["cuisine"] == "mexico", "cuisine"] = "mexican"
recipes.loc[recipes["cuisine"] == "pakistan", "cuisine"] = "pakistani"
recipes.loc[recipes["cuisine"] == "philippines", "cuisine"] = "philippine"
recipes.loc[recipes["cuisine"] == "scandinavia", "cuisine"] = "scandinavian"
```

```

recipes.loc[recipes["cuisine"] == "spain", "cuisine"] = "spanish_portuguese"
recipes.loc[recipes["cuisine"] == "portugal", "cuisine"] = "spanish_portuguese"
recipes.loc[recipes["cuisine"] == "switzerland", "cuisine"] = "swiss"
recipes.loc[recipes["cuisine"] == "thailand", "cuisine"] = "thai"
recipes.loc[recipes["cuisine"] == "turkey", "cuisine"] = "turkish"
recipes.loc[recipes["cuisine"] == "vietnam", "cuisine"] = "vietnamese"
recipes.loc[recipes["cuisine"] == "uk-and-ireland", "cuisine"] = "uk-and-irish"
recipes.loc[recipes["cuisine"] == "irish", "cuisine"] = "uk-and-irish"

recipes

```

Remove cuisines with < 50 recipes.

```

[:]: # get list of cuisines to keep
recipes_counts = recipes["cuisine"].value_counts()
cuisines_indices = recipes_counts > 50

cuisines_to_keep = list(np.array(recipes_counts.index.values)[np.array(cuisines_indices)])

[:]: rows_before = recipes.shape[0] # number of rows of original dataframe
print("Number of rows of original dataframe is {}".format(rows_before))

recipes = recipes.loc[recipes['cuisine'].isin(cuisines_to_keep)]

rows_after = recipes.shape[0] # number of rows of processed dataframe
print("Number of rows of processed dataframe is {}".format(rows_after))

print("{} rows removed!".format(rows_before - rows_after))

```

Convert all Yes's to 1's and the No's to 0's

```

[19]: recipes = recipes.replace(to_replace="Yes", value=1)
      recipes = recipes.replace(to_replace="No", value=0)

```

**Let's analyze the data a little more in order to learn the data better and note any interesting preliminary observations.** Run the following cell to get the recipes that contain **rice** and **soy** and **wasabi** and **seaweed**.

```

[20]: recipes.head()

```

```

[20]:
   cuisine almond angelica anise anise_seed apple apple_brandy \
0  vietnamese      0      0      0          0      0          0
1  vietnamese      0      0      0          0      0          0
2  vietnamese      0      0      0          0      0          0
3  vietnamese      0      0      0          0      0          0
4  vietnamese      0      0      0          0      0          0

   apricot armagnac artemisia artichoke asparagus avocado  bacon \
0         0         0         0          0          0          0
1         0         0         0          0          0          0
2         0         0         0          0          0          0

```

3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	baked_potato	balm	banana	barley	bartlett_pear	basil	bay	bean	beech	\
0	0	0	0	0	0	1	0	0	0	
1	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	1	0	1	0	
4	0	0	0	0	0	0	0	0	0	

	beef	beef_broth	beef_liver	beer	beet	bell_pepper	bergamot	berry	\
0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	1	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	

	bitter_orange	black_bean	black_currant	black_mustard_seed_oil	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	black_pepper	black_raspberry	black_sesame_seed	black_tea	blackberry	\
0	0	0	0	0	0	
1	1	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	blackberry_brandy	blue_cheese	blueberry	bone_oil	bourbon_whiskey	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	brandy	brassica	bread	broccoli	brown_rice	brussels_sprout	buckwheat	\
0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	

	butter	buttermilk	cabbage	cabernet_sauvignon_wine	cacao	\
0	0	0	0	0	0	

1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

	camembert_cheese	cane_molasses	caraway	cardamom	carnation	carob	\
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	0	0	0	0	0	

	carrot	cashew	cassava	catfish	cauliflower	caviar	cayenne	celery	\
0	1	0	0	0	0	0	1	0	
1	0	0	0	0	0	0	1	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	1	0	
4	0	0	0	0	0	0	1	0	

	celery_oil	cereal	chamomile	champagne_wine	chayote	cheddar_cheese	\
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	0	0	0	0	0	

	cheese	cherry	cherry_brandy	chervil	chicken	chicken_broth	\
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	0	0	0	0	0	

	chicken_liver	chickpea	chicory	chinese_cabbage	chive	cider	cilantro	\
0	0	0	0	0	0	0	1	
1	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	1	
4	0	0	0	0	0	0	0	

	cinnamon	citrus	citrus_peel	clam	clove	cocoa	coconut	coconut_oil	\
0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	

	cod	coffee	cognac	concord_grape	condiment	coriander	corn	corn_flake	\
0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	1	0	0	

	corn_grit	cottage_cheese	crab	cranberry	cream	cream_cheese	cucumber	\
0	0	0	0	0	0	0	1	
1	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	1	

	cumin	cured_pork	currant	date	dill	durian	eel	egg	egg_noodle	\
0	0	0	0	0	0	0	0	0		
1	0	0	0	0	0	0	0	0		
2	0	0	0	0	0	0	0	0		
3	0	0	0	0	0	0	0	0		
4	0	0	0	0	0	0	0	0		

	elderberry	emmental_cheese	endive	enokidake	fennel	fenugreek	\
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	0	0	0	0	0	

	feta_cheese	fig	fish	flower	frankfurter	fruit	galanga	gardenia	\
0	0	0	1	0	0	0	0	0	
1	0	0	1	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	
3	0	0	1	0	0	0	0	0	
4	0	0	1	0	0	0	0	0	

	garlic	gelatin	geranium	gin	ginger	goat_cheese	grape	grape_brandy	\
0	1	0	0	0	0	0	0	0	
1	1	0	0	0	0	0	0	0	
2	1	0	0	0	0	0	0	0	
3	0	0	0	0	1	0	0	0	
4	1	0	0	0	0	0	0	0	

	grape_juice	grapefruit	green_bell_pepper	green_tea	gruyere_cheese	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	

4	0	0	0	0	0
---	---	---	---	---	---

	guava	haddock	ham	hazelnut	herring	holy_basil	honey	hop \
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0

	horseradish	huckleberry	jamaican_rum	japanese_plum	jasmine \
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

	jasmine_tea	juniper_berry	kaffir_lime	kale	katsuobushi	kelp \
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0

	kidney_bean	kiwi	kohlrabi	kumquat	lamb	lard	laurel	lavender	leaf \
0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0

	leek	lemon	lemon_juice	lemon_peel	lemongrass	lentil	lettuce \
0	0	0	0	0	0	1	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	1	0	0	0	0	

	licorice	lilac_flower_oil	lima_bean	lime	lime_juice	lime_peel_oil \
0	0	0	0	0	1	0
1	0	0	0	0	0	0
2	0	0	0	0	1	0
3	0	0	0	1	1	0
4	0	0	0	0	1	0

	lingonberry	litchi	liver	lobster	long_pepper	lovage	macadamia_nut \
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	

2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	macaroni	mace	mackerel	malt	mandarin	mandarin_peel	mango	\
0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	

	maple_syrup	marjoram	mate	matsutake	meat	melon	milk	milk_fat	mint	\
0	0	0	0	0	0	0	0	0	1	
1	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	1	
4	0	0	0	0	0	0	0	0	1	

	mozzarella_cheese	mung_bean	munster_cheese	muscat_grape	mushroom	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	mussel	mustard	mutton	nectarine	nira	nut	nutmeg	oat	oatmeal	\
0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	0	

	octopus	okra	olive	olive_oil	onion	orange	orange_flower	\
0	0	0	0	1	0	0	0	
1	0	0	0	0	1	0	0	
2	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	

	orange_juice	orange_peel	oregano	ouzo	oyster	palm	papaya	\
0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	

	parmesan_cheese	parsley	parsnip	passion_fruit	pea	peach	peanut	\
--	-----------------	---------	---------	---------------	-----	-------	--------	---



0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	1	0	0
4	0	0	0	0	0	0	1

	peanut_butter	peanut_oil	pear	pear_brandy	pecan	pelargonium	pepper \
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	peppermint	peppermint_oil	pimenta	pimento	pineapple	pistachio	plum \
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	popcorn	porcini	pork	pork_liver	pork_sausage	port_wine	potato \
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	potato_chip	prawn	prickly_pear	provolone_cheese	pumpkin	quince \
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0

	radish	raisin	rapeseed	raspberry	raw_beef	red_algae	red_bean \
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	red_kidney_bean	red_wine	rhubarb	rice	roasted_almond	roasted_beef \
0	0	0	0	1	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	1	0	1
4	0	0	0	1	0	0

	roasted_hazelnut	roasted_meat	roasted_nut	roasted_peanut	roasted_pecan \
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

	roasted_pork	roasted_sesame_seed	romano_cheese	root	roquefort_cheese \
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

	rose	rosemary	rum	rutabaga	rye_bread	rye_flour	saffron	sage	sake \
0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0

	salmon	salmon_roe	sassafras	sauerkraut	savory	scallion	scallop \
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	1	0

	sea_algae	seaweed	seed	sesame_oil	sesame_seed	shallot	sheep_cheese \
0	0	0	1	0	0	0	0
1	0	0	1	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	1	0
4	0	0	0	0	0	0	0

	shellfish	sherry	shiitake	shrimp	smoke	smoked_fish	smoked_salmon \
0	0	0	1	1	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	1	0	0	0

	smoked_sausage	sour_cherry	sour_milk	soy_sauce	soybean	soybean_oil \
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	1	0	0

3	0	0	0	0	0	0
4	0	0	0	0	0	0

	spearmint	squash	squid	star_anise	starch	strawberry	strawberry_jam \
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	strawberry_juice	sturgeon_caviar	sumac	sunflower_oil	sweet_potato \
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

	swiss_cheese	tabasco_pepper	tamarind	tangerine	tarragon	tea	tequila \
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	thai_pepper	thyme	tomato	tomato_juice	truffle	tuna	turkey	turmeric \
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0

	turnip	vanilla	veal	vegetable	vegetable_oil	vinegar	violet	walnut \
0	0	0	0	0	0	1	0	0
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	1	0	0	0
4	0	0	0	0	0	1	0	0

	wasabi	watercress	watermelon	wheat	wheat_bread	whiskey	white_bread \
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	white_wine	whole_grain_wheat_flour	wine	wood	yam	yeast	yogurt \
0	0	0	0	0	0	0	0

1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

zucchini

0	0
1	0
2	0
3	0
4	0

```
[21]: check_recipes = recipes.loc[
      (recipes["rice"] == 1) &
      (recipes["soy_sauce"] == 1) &
      (recipes["wasabi"] == 1) &
      (recipes["seaweed"] == 1)
      ]
      check_recipes
```

```
[21]: cuisine almond angelica anise anise_seed apple apple_brandy \
11306  japanese      0      0      0      0      0      0
11321  japanese      0      0      0      0      0      0
11361  japanese      0      0      0      0      0      0
12171   asian       0      0      0      0      0      0
12385   asian       0      0      0      0      0      0
13010   asian       0      0      0      0      0      0
13159   asian       0      0      0      0      0      0
13513  japanese      0      0      0      0      0      0
13586  japanese      0      0      0      0      0      0
13625 east_asian     0      0      0      0      0      0
14495 east_asian     0      0      0      0      0      0
```

	apricot	armagnac	artemisia	artichoke	asparagus	avocado	bacon	\
11306	0	0	0	0	0	1	0	
11321	0	0	0	0	0	0	0	
11361	0	0	0	0	0	1	0	
12171	0	0	0	0	0	0	0	
12385	0	0	0	0	0	1	0	
13010	0	0	0	0	0	1	0	
13159	0	0	0	0	0	1	0	
13513	0	0	0	0	0	0	0	
13586	0	0	0	0	0	0	0	
13625	0	0	0	0	0	0	0	
14495	0	0	0	0	0	0	0	

baked\_potato balm banana barley bartlett\_pear basil bay bean \

11306	0	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0	0

	beech	beef	beef_broth	beef_liver	beer	beet	bell_pepper	bergamot	\
11306	0	0	0	0	0	0	0	0	
11321	0	0	0	0	0	0	0	0	
11361	0	0	0	0	0	0	0	0	
12171	0	0	0	0	0	0	0	0	
12385	0	0	0	0	0	0	0	0	
13010	0	0	0	0	0	0	0	0	
13159	0	0	0	0	0	0	0	0	
13513	0	0	0	0	0	0	0	0	
13586	0	0	0	0	0	0	0	0	
13625	0	0	0	0	0	0	0	0	
14495	0	0	0	0	0	0	0	0	

	berry	bitter_orange	black_bean	black_currant	\
11306	0	0	0	0	
11321	0	0	0	0	
11361	0	0	0	0	
12171	0	0	0	0	
12385	0	0	0	0	
13010	0	0	0	0	
13159	0	0	0	0	
13513	0	0	0	0	
13586	0	0	0	0	
13625	0	0	0	0	
14495	0	0	0	0	

	black_mustard_seed_oil	black_pepper	black_raspberry	\
11306	0	0	0	
11321	0	0	0	
11361	0	0	0	
12171	0	0	0	
12385	0	0	0	
13010	0	0	0	
13159	0	0	0	
13513	0	0	0	

13586	0	0	0
13625	0	0	0
14495	0	0	0

	black_sesame_seed	black_tea	blackberry	blackberry_brandy \
11306	0	0	0	0
11321	0	0	0	0
11361	0	0	0	0
12171	0	0	0	0
12385	0	0	0	0
13010	0	0	0	0
13159	0	0	0	0
13513	0	0	0	0
13586	0	0	0	0
13625	0	0	0	0
14495	0	0	0	0

	blue_cheese	blueberry	bone_oil	bourbon_whiskey	brandy	brassica \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	bread	broccoli	brown_rice	brussels_sprout	buckwheat	butter \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	1	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	buttermilk	cabbage	cabernet_sauvignon_wine	cacao	camembert_cheese \
11306	0	0	0	0	0
11321	0	0	0	0	0
11361	0	0	0	0	0

12171	0	0		0	0		0
12385	0	0		0	0		0
13010	0	0		0	0		0
13159	0	0		0	0		0
13513	0	0		0	0		0
13586	0	1		0	0		0
13625	0	0		0	0		0
14495	0	1		0	0		0

	cane_molasses	caraway	cardamom	carnation	carob	carrot	cashew \
11306	0	0	0	0	0	0	0
11321	0	0	0	0	0	1	0
11361	0	0	0	0	0	1	0
12171	0	0	0	0	0	1	0
12385	0	0	0	0	0	1	0
13010	0	0	0	0	0	0	0
13159	0	0	0	0	0	1	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	1	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	1	0

	cassava	catfish	cauliflower	caviar	cayenne	celery	celery_oil \
11306	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	cereal	chamomile	champagne_wine	chayote	cheddar_cheese	cheese \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	cherry	cherry_brandy	chervil	chicken	chicken_broth	chicken_liver	\
11306	0	0	0	0	0	0	
11321	0	0	0	0	0	0	
11361	0	0	0	0	0	0	
12171	0	0	0	0	0	0	
12385	0	0	0	0	0	0	
13010	0	0	0	0	0	0	
13159	0	0	0	0	0	0	
13513	0	0	0	0	0	0	
13586	0	0	0	0	0	0	
13625	0	0	0	0	0	0	
14495	0	0	0	0	0	0	

	chickpea	chicory	chinese_cabbage	chive	cider	cilantro	cinnamon	\
11306	0	0	0	0	0	0	0	
11321	0	0	0	0	0	0	0	
11361	0	0	0	0	0	0	0	
12171	0	0	0	0	0	0	0	
12385	0	0	0	0	0	0	0	
13010	0	0	0	0	0	0	0	
13159	0	0	0	0	0	0	0	
13513	0	0	0	0	0	0	0	
13586	0	0	0	0	0	0	0	
13625	0	0	0	0	0	0	0	
14495	0	0	0	0	0	0	0	

	citrus	citrus_peel	clam	clove	cocoa	coconut	coconut_oil	cod	\
11306	0	0	0	0	0	0	0	0	
11321	0	0	0	0	0	0	0	0	
11361	0	0	0	0	0	0	0	0	
12171	0	0	0	0	0	0	0	0	
12385	0	0	0	0	0	0	0	0	
13010	0	0	0	0	0	0	0	0	
13159	0	0	0	0	0	0	0	0	
13513	0	0	0	0	0	0	0	0	
13586	0	0	0	0	0	0	0	0	
13625	0	0	0	0	0	0	0	0	
14495	0	0	0	0	0	0	0	0	

	coffee	cognac	concord_grape	condiment	coriander	corn	corn_flake	\
11306	0	0	0	0	0	0	0	
11321	0	0	0	0	0	0	0	
11361	0	0	0	0	0	0	0	
12171	0	0	0	0	0	0	0	
12385	0	0	0	0	0	0	0	
13010	0	0	0	0	0	0	0	



13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	corn_grit	cottage_cheese	crab	cranberry	cream	cream_cheese	\
11306	0	0	1	0	0	0	
11321	0	0	0	0	0	0	
11361	0	0	1	0	0	0	
12171	0	0	0	0	0	0	
12385	0	0	1	0	0	0	
13010	0	0	1	0	0	0	
13159	0	0	0	0	0	0	
13513	0	0	0	0	0	0	
13586	0	0	0	0	0	0	
13625	0	0	0	0	0	0	
14495	0	0	0	0	0	0	

	cucumber	cumin	cured_pork	currant	date	dill	durian	eel	egg	\
11306	1	0	0	0	0	0	0	0	0	
11321	0	0	0	0	0	0	0	0	1	
11361	1	0	0	0	0	0	0	0	0	
12171	0	0	0	0	0	0	0	0	1	
12385	1	0	0	0	0	0	0	0	0	
13010	1	0	0	0	0	0	0	0	0	
13159	1	0	0	0	0	0	0	0	0	
13513	0	0	0	0	0	0	0	0	1	
13586	1	0	0	0	0	0	0	0	0	
13625	0	0	0	0	0	0	0	0	1	
14495	1	0	0	0	0	0	0	0	0	

	egg_noodle	elderberry	emmental_cheese	endive	enokidake	fennel	\
11306	0	0	0	0	0	0	
11321	0	0	0	0	0	0	
11361	0	0	0	0	0	0	
12171	0	0	0	0	0	0	
12385	0	0	0	0	0	0	
13010	0	0	0	0	0	0	
13159	0	0	0	0	0	0	
13513	0	0	0	0	0	0	
13586	0	0	0	0	0	0	
13625	0	0	0	0	0	0	
14495	0	0	0	0	0	0	

	fenugreek	feta_cheese	fig	fish	flower	frankfurter	fruit	galanga	\
11306	0	0	0	0	0	0	0	0	

11321	0	0	0	1	0	0	0	0
11361	0	0	0	0	0	0	0	0
12171	0	0	0	1	0	0	0	0
12385	0	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0	0
13513	0	0	0	1	0	0	0	0
13586	0	0	0	0	0	0	0	0
13625	0	0	0	1	0	0	0	0
14495	0	0	0	0	0	0	0	0

	gardenia	garlic	gelatin	geranium	gin	ginger	goat_cheese	grape \
11306	0	0	0	0	0	1	0	0
11321	0	0	0	0	0	0	0	0
11361	0	0	0	0	0	1	0	0
12171	0	0	0	0	0	0	0	0
12385	0	0	0	0	0	1	0	0
13010	0	0	0	0	0	1	0	0
13159	0	0	0	0	0	0	0	0
13513	0	0	0	0	0	1	0	0
13586	0	0	0	0	0	0	0	0
13625	0	0	0	0	0	1	0	0
14495	0	0	0	0	0	0	0	0

	grape_brandy	grape_juice	grapefruit	green_bell_pepper	green_tea \
11306	0	0	0	0	0
11321	0	0	0	0	0
11361	0	0	0	0	0
12171	0	0	0	0	0
12385	0	0	0	0	0
13010	0	0	0	0	0
13159	0	0	0	0	0
13513	0	0	0	0	0
13586	0	0	0	0	0
13625	0	0	0	0	0
14495	0	0	0	0	0

	gruyere_cheese	guava	haddock	ham	hazelnut	herring	holy_basil \
11306	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0

13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	honey	hop	horseradish	huckleberry	jamaican_rum	japanese_plum	\
11306	0	0	1	0	0	0	
11321	0	0	0	0	0	0	
11361	0	0	1	0	0	0	
12171	0	0	0	0	0	0	
12385	0	0	1	0	0	0	
13010	0	0	1	0	0	0	
13159	0	0	0	0	0	0	
13513	0	0	0	0	0	0	
13586	0	0	0	0	0	0	
13625	0	0	0	0	0	0	
14495	0	0	0	0	0	0	

	jasmine	jasmine_tea	juniper_berry	kaffir_lime	kale	katsuobushi	\
11306	0	0	0	0	0	0	
11321	0	0	0	0	0	1	
11361	0	0	0	0	0	0	
12171	0	0	0	0	0	1	
12385	0	0	0	0	0	0	
13010	0	0	0	0	0	0	
13159	0	0	0	0	0	0	
13513	0	0	0	0	0	0	
13586	0	0	0	0	0	0	
13625	0	0	0	0	0	0	
14495	0	0	0	0	0	0	

	kelp	kidney_bean	kiwi	kohlrabi	kumquat	lamb	lard	laurel	\
11306	0	0	0	0	0	0	0	0	
11321	0	0	0	0	0	0	0	0	
11361	0	0	0	0	0	0	0	0	
12171	0	0	0	0	0	0	0	0	
12385	0	0	0	0	0	0	0	0	
13010	0	0	0	0	0	0	0	0	
13159	0	0	0	0	0	0	0	0	
13513	0	0	0	0	0	0	0	0	
13586	0	0	0	0	0	0	0	0	
13625	0	0	0	0	0	0	0	0	
14495	0	0	0	0	0	0	0	0	

	lavender	leaf	leek	lemon	lemon_juice	lemon_peel	lemongrass	\
11306	0	0	0	0	1	0	0	
11321	0	0	0	0	0	0	0	
11361	0	0	0	0	0	0	0	
12171	0	0	0	0	0	0	0	

12385	0	0	0	0	0	0	0
13010	0	0	0	0	1	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	lentil	lettuce	licorice	lilac_flower_oil	lima_bean	lime \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	1	0	0	0	0
13625	0	0	0	0	0	0
14495	0	1	0	0	0	0

	lime_juice	lime_peel_oil	lingonberry	litchi	liver	lobster \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	long_pepper	lovage	macadamia_nut	macaroni	mace	mackerel	malt \
11306	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	mandarin	mandarin_peel	mango	maple_syrup	marjoram	mate	matsutake \
11306	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	meat	melon	milk	milk_fat	mint	mozzarella_cheese	mung_bean \
11306	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	munster_cheese	muscat_grape	mushroom	mussel	mustard	mutton \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	nectarine	nira	nut	nutmeg	oat	oatmeal	octopus	okra	olive \
11306	0	0	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0	0	0

13513	0	0	0	0	0	0	1	0	0
13586	0	0	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	1	0	0
14495	0	0	0	0	0	0	0	0	0

	olive_oil	onion	orange	orange_flower	orange_juice	orange_peel \
11306	0	0	0	0	0	0
11321	0	1	0	0	0	0
11361	0	0	0	0	0	0
12171	0	1	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	oregano	ouzo	oyster	palm	papaya	parmesan_cheese	parsley	parsnip \
11306	0	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0	0

	passion_fruit	pea	peach	peanut	peanut_butter	peanut_oil	pear \
11306	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	pear_brandy	pecan	pelargonium	pepper	peppermint	peppermint_oil \
11306	0	0	0	0	0	0
11321	0	0	0	1	0	0

11361	0	0	0	0	0	0
12171	0	0	0	1	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	pimenta	pimento	pineapple	pistachio	plum	popcorn	porcini	pork \
11306	0	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0	0

	pork_liver	pork_sausage	port_wine	potato	potato_chip	prawn \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	prickly_pear	provolone_cheese	pumpkin	quince	radish	raisin \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	1	0	0
13586	0	0	0	1	0	0
13625	0	0	0	1	0	0

14495	0	0	0	0	1	0
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	rapeseed	raspberry	raw_beef	red_algae	red_bean	red_kidney_bean \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	red_wine	rhubarb	rice	roasted_almond	roasted_beef \
11306	0	0	1	0	0
11321	0	0	1	0	0
11361	0	0	1	0	0
12171	0	0	1	0	0
12385	0	0	1	0	0
13010	0	0	1	0	0
13159	0	0	1	0	0
13513	0	0	1	0	0
13586	0	0	1	0	0
13625	0	0	1	0	0
14495	0	0	1	0	0

	roasted_hazelnut	roasted_meat	roasted_nut	roasted_peanut \
11306	0	0	0	0
11321	0	0	0	0
11361	0	0	0	0
12171	0	0	0	0
12385	0	0	0	0
13010	0	0	0	0
13159	0	0	0	0
13513	0	0	0	0
13586	0	0	0	0
13625	0	0	0	0
14495	0	0	0	0

	roasted_pecan	roasted_pork	roasted_sesame_seed	romano_cheese	root \
11306	0	0	0	0	0
11321	0	0	0	0	0
11361	0	0	0	0	0
12171	0	0	0	0	0
12385	0	0	0	0	0



13010	0	0	0	0	0
13159	0	0	0	0	1
13513	0	0	0	0	0
13586	0	0	0	0	0
13625	0	0	0	0	0
14495	0	0	0	0	0

	roquefort_cheese	rose	rosemary	rum	rutabaga	rye_bread	rye_flour \
11306	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	saffron	sage	sake	salmon	salmon_roe	sassafras	sauerkraut	savory \
11306	0	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0	0

	scallion	scallop	sea_algae	seaweed	seed	sesame_oil	sesame_seed \
11306	0	0	0	1	1	0	0
11321	0	0	0	1	0	0	0
11361	1	0	0	1	0	0	1
12171	0	0	0	1	0	0	0
12385	1	0	0	1	0	0	1
13010	0	0	0	1	1	0	0
13159	0	0	0	1	0	0	0
13513	0	0	0	1	0	0	0
13586	0	0	0	1	0	0	0
13625	0	0	0	1	0	0	0
14495	0	0	0	1	0	0	0

	shallot	sheep_cheese	shellfish	sherry	shiitake	shrimp	smoke \
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11306	0	0	0	1	0	0	0
11321	0	0	0	0	1	1	0
11361	0	0	0	0	0	0	0
12171	0	0	0	0	1	1	0
12385	0	0	0	0	0	0	0
13010	0	0	0	1	0	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	1	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	1	0
14495	0	0	0	0	0	0	0

	smoked_fish	smoked_salmon	smoked_sausage	sour_cherry	sour_milk	\
11306	0	0	0	0	0	
11321	0	0	0	0	0	
11361	0	0	0	0	0	
12171	0	0	0	0	0	
12385	0	0	0	0	0	
13010	0	0	0	0	0	
13159	0	0	0	0	0	
13513	0	0	0	0	0	
13586	0	1	0	0	0	
13625	0	0	0	0	0	
14495	0	1	0	0	0	

	soy_sauce	soybean	soybean_oil	spearmint	squash	squid	star_anise	\
11306	1	0	0	0	0	0	0	
11321	1	0	0	0	0	0	0	
11361	1	0	0	0	0	0	0	
12171	1	0	0	0	0	0	0	
12385	1	0	0	0	0	0	0	
13010	1	0	0	0	0	0	0	
13159	1	0	0	0	0	0	0	
13513	1	0	0	0	0	1	0	
13586	1	0	0	0	0	0	0	
13625	1	0	0	0	0	1	0	
14495	1	0	0	0	0	0	0	

	starch	strawberry	strawberry_jam	strawberry_juice	sturgeon_caviar	\
11306	0	0	0	0	0	
11321	1	0	0	0	0	
11361	0	0	0	0	0	
12171	1	0	0	0	0	
12385	0	0	0	0	0	
13010	0	0	0	0	0	
13159	0	0	0	0	0	
13513	0	0	0	0	0	

13586	0	0	0	0	0
13625	0	0	0	0	0
14495	0	0	0	0	0

	sumac	sunflower_oil	sweet_potato	swiss_cheese	tabasco_pepper \
11306	0	0	0	0	0
11321	0	0	0	0	0
11361	0	0	0	0	0
12171	0	0	0	0	0
12385	0	0	0	0	0
13010	0	0	0	0	0
13159	0	0	0	0	0
13513	0	0	0	0	0
13586	0	0	0	0	0
13625	0	0	0	0	0
14495	0	0	0	0	0

	tamarind	tangerine	tarragon	tea	tequila	thai_pepper	thyme \
11306	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0
13513	0	0	0	0	0	0	0
13586	0	0	0	0	0	0	0
13625	0	0	0	0	0	0	0
14495	0	0	0	0	0	0	0

	tomato	tomato_juice	truffle	tuna	turkey	turmeric	turnip	vanilla \
11306	0	0	0	0	0	0	0	0
11321	0	0	0	0	0	0	0	0
11361	0	0	0	0	0	0	0	0
12171	0	0	0	0	0	0	0	0
12385	0	0	0	0	0	0	0	0
13010	0	0	0	0	0	0	0	0
13159	0	0	0	0	0	0	0	0
13513	0	0	0	1	0	0	0	0
13586	0	0	0	0	0	0	0	0
13625	0	0	0	1	0	0	0	0
14495	0	0	0	0	0	0	0	0

	veal	vegetable	vegetable_oil	vinegar	violet	walnut	wasabi \
11306	0	0	0	1	0	0	1
11321	0	0	1	1	0	0	1
11361	0	0	1	1	0	0	1

12171	0	0	1	1	0	0	1
12385	0	0	1	1	0	0	1
13010	0	0	0	1	0	0	1
13159	0	0	0	1	0	0	1
13513	0	0	0	1	0	0	1
13586	0	0	0	1	0	0	1
13625	0	0	0	1	0	0	1
14495	0	0	0	1	0	0	1

	watercress	watermelon	wheat	wheat_bread	whiskey	white_bread \
11306	0	0	0	0	0	0
11321	0	0	0	0	0	0
11361	0	0	0	0	0	0
12171	0	0	0	0	0	0
12385	0	0	0	0	0	0
13010	0	0	0	0	0	0
13159	0	0	0	0	0	0
13513	0	0	0	0	0	0
13586	0	0	0	0	0	0
13625	0	0	0	0	0	0
14495	0	0	0	0	0	0

	white_wine	whole_grain_	wheat_flour	wine	wood	yam	yeast	yogurt \
11306	0		0	0	0	0	0	0
11321	0		0	1	0	0	0	0
11361	0		0	0	0	0	0	0
12171	0		0	1	0	0	0	0
12385	0		0	0	0	0	0	0
13010	0		0	0	0	0	0	0
13159	0		0	0	0	0	0	0
13513	0		0	0	0	0	0	0
13586	0		0	0	0	0	0	0
13625	0		0	0	0	0	0	0
14495	0		0	0	0	0	0	0

	zucchini
11306	0
11321	0
11361	0
12171	0
12385	0
13010	0
13159	0
13513	0
13586	0
13625	0
14495	0

Based on the results of the above code, can we classify all recipes that contain **rice and soy and wasabi and seaweed** as **Japanese** recipes? Why? Your Answer: Double-click [here](#) for the solution. Let's count the ingredients across all recipes.

```
[17]: # sum each column
ing = recipes.iloc[:, 1:].sum(axis=0)
print(ing)
```

```
almond      NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNo...
angelica    NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNo...
anise       NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNo...
anise_seed  NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNo...
apple       NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNo...
           ...
wood        NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNo...
yam         NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNo...
yeast       NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoYesNo...
yogurt      NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNo...
zucchini    NoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNoNo...
Length: 383, dtype: object
```

```
[ ]: # define each column as a pandas series
ingredient = pd.Series(ing.index.values, index = np.arange(len(ing)))
count = pd.Series(list(ing), index = np.arange(len(ing)))

# create the dataframe
ing_df = pd.DataFrame(dict(ingredient = ingredient, count = count))
ing_df = ing_df[["ingredient", "count"]]
print(ing_df.to_string())
```

Now we have a dataframe of ingredients and their total counts across all recipes. Let's sort this dataframe in descending order.

```
[ ]: ing_df.sort_values(["count"], ascending=False, inplace=True)
ing_df.reset_index(inplace=True, drop=True)

print(ing_df)
```

**What are the 3 most popular ingredients?** Your Answer: 1.

2.

3. Double-click [here](#) for the solution.

However, note that there is a problem with the above table. There are ~40,000 American recipes in our dataset, which means that the data is biased towards American ingredients.

**Therefore**, let's compute a more objective summary of the ingredients by looking at the ingredients per cuisine.

**Let's create a profile for each cuisine.** In other words, let's try to find out what ingredients Chinese people typically use, and what is **Canadian** food for example.

```
[22]: cuisines = recipes.groupby("cuisine").mean()
      cuisines.head()
```

```
[22]:      almond angelica  anise anise_seed  apple apple_brandy \
cuisine
african    0.156522  0.000000  0.000000    0.000000  0.034783    0.000000
american   0.040598  0.000025  0.003014    0.000573  0.052055    0.000623
asian      0.007544  0.000000  0.000838    0.002515  0.012573    0.000000
austria    0.238095  0.000000  0.000000    0.000000  0.047619    0.000000
bangladesh 0.000000  0.000000  0.000000    0.000000  0.000000    0.000000
```

```
      apricot armagnac artemisia artichoke asparagus avocado \
cuisine
african    0.069565    0.0000    0.0  0.000000  0.000000  0.008696
american   0.011308    0.0001    0.0  0.006351  0.007522  0.007323
asian      0.005029    0.0000    0.0  0.000000  0.019279  0.010897
austria    0.142857    0.0000    0.0  0.000000  0.000000  0.000000
bangladesh 0.000000    0.0000    0.0  0.000000  0.000000  0.000000
```

```
      bacon baked_potato  balm  banana  barley \
cuisine
african    0.008696    0.000000  0.000000  0.017391  0.017391
american   0.041220    0.000199  0.000075  0.021594  0.003885
asian      0.013412    0.000000  0.000000  0.006706  0.029338
austria    0.000000    0.000000  0.000000  0.000000  0.000000
bangladesh 0.000000    0.000000  0.000000  0.000000  0.000000
```

```
      bartlett_pear  basil  bay  bean beech  beef \
cuisine
african            0.000000  0.017391  0.034783  0.008696  0.0  0.052174
american          0.000423  0.058655  0.020697  0.028767  0.0  0.075118
asian             0.000000  0.055323  0.011735  0.083822  0.0  0.103940
austria           0.000000  0.000000  0.047619  0.000000  0.0  0.047619
bangladesh        0.000000  0.000000  0.500000  0.000000  0.0  0.500000
```

```
      beef_broth beef_liver  beer  beet bell_pepper bergamot \
cuisine
african    0.008696    0.000000  0.000000  0.008696  0.313043  0.000000
american   0.009988    0.000174  0.005430  0.003686  0.087846  0.000149
asian      0.012573    0.000000  0.004191  0.000838  0.133277  0.000000
austria    0.047619    0.000000  0.000000  0.000000  0.000000  0.000000
bangladesh 0.000000    0.000000  0.000000  0.000000  0.000000  0.000000
```

```
      berry bitter_orange black_bean black_currant \
cuisine
african    0.000000    0.000000  0.008696    0.000000
american   0.003836    0.001245  0.005131    0.000199
```

asian	0.000838	0.001676	0.017603	0.000000
austria	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000

	black_mustard_seed_oil	black_pepper	black_raspberry	\
cuisine				
african	0.000000	0.295652	0.000000	
american	0.000050	0.147621	0.000199	
asian	0.001676	0.118189	0.000000	
austria	0.000000	0.047619	0.000000	
bangladesh	0.000000	0.250000	0.000000	

	black_sesame_seed	black_tea	blackberry	blackberry_brandy	\
cuisine					
african	0.0	0.000000	0.000000	0.000000	
american	0.0	0.000573	0.003462	0.000075	
asian	0.0	0.005868	0.000838	0.000000	
austria	0.0	0.047619	0.000000	0.000000	
bangladesh	0.0	0.000000	0.000000	0.000000	

	blue_cheese	blueberry	bone_oil	bourbon_whiskey	brandy	\
cuisine						
african	0.000000	0.000000	0.000000	0.000000	0.017391	
american	0.007995	0.010710	0.000149	0.003362	0.006426	
asian	0.000838	0.001676	0.000838	0.000000	0.003353	
austria	0.000000	0.000000	0.000000	0.000000	0.047619	
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	

	brassica	bread	broccoli	brown_rice	brussels_sprout	\
cuisine						
african	0.008696	0.104348	0.008696	0.000000	0.000000	
american	0.001021	0.081519	0.018107	0.006999	0.001843	
asian	0.005868	0.036044	0.025147	0.008382	0.000838	
austria	0.000000	0.190476	0.000000	0.000000	0.000000	
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	

	buckwheat	butter	buttermilk	cabbage	\
cuisine					
african	0.000000	0.208696	0.000000	0.008696	
american	0.000448	0.411582	0.033151	0.014321	
asian	0.017603	0.058676	0.003353	0.081308	
austria	0.000000	0.714286	0.000000	0.000000	
bangladesh	0.000000	0.000000	0.000000	0.000000	

	cabernet_sauvignon_wine	cacao	camembert_cheese	\
cuisine				
african	0.000000	0.000000	0.0000	

american	0.000324	0.000772	0.0001
asian	0.000000	0.000000	0.0000
austria	0.000000	0.000000	0.0000
bangladesh	0.000000	0.000000	0.0000

	cane_molasses	caraway	cardamom	carnation	carob	carrot \
cuisine						
african	0.043478	0.078261	0.060870	0.000000	0.000000	0.104348
american	0.165280	0.002839	0.004010	0.000075	0.000149	0.056065
asian	0.096396	0.002515	0.005868	0.000000	0.000000	0.123219
austria	0.000000	0.000000	0.047619	0.000000	0.000000	0.095238
bangladesh	0.000000	0.000000	0.500000	0.000000	0.000000	0.000000

	cashew	cassava	catfish	cauliflower	caviar	cayenne \
cuisine						
african	0.000000	0.008696	0.000000	0.008696	0.000000	0.356522
american	0.003661	0.000050	0.001345	0.006152	0.000399	0.088643
asian	0.009220	0.000000	0.002515	0.006706	0.001676	0.295893
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000

	celery	celery_oil	cereal	chamomile	champagne_wine \
cuisine					
african	0.026087	0.000000	0.000000	0.000000	0.000000
american	0.071034	0.019726	0.004832	0.000005	0.001843
asian	0.025985	0.011735	0.000000	0.000000	0.000838
austria	0.047619	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	chayote	cheddar_cheese	cheese	cherry	cherry_brandy \
cuisine					
african	0.000000	0.000000	0.008696	0.000000	0.000000
american	0.000199	0.05741	0.045056	0.023537	0.000448
asian	0.000838	0.000000	0.003353	0.000838	0.000000
austria	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	chervil	chicken	chicken_broth	chicken_liver	chickpea \
cuisine					
african	0.000000	0.200000	0.182609	0.000000	0.060870
american	0.000523	0.089639	0.053225	0.000573	0.005504
asian	0.000000	0.158424	0.139145	0.000838	0.001676
austria	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	chicory	chinese_cabbage	chive	cider	cilantro	cinnamon \
cuisine						



african	0.000000	0.000000	0.000000	0.000000	0.243478	0.286957
american	0.001469	0.000025	0.025031	0.023263	0.020224	0.110884
asian	0.003353	0.004191	0.018441	0.013412	0.204526	0.030176
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.095238
bangladesh	0.000000	0.000000	0.000000	0.000000	0.500000	0.500000

		citrus	citrus_peel	clam	clove	cocoa	coconut \
cuisine							
african	0.008696	0.0	0.000000	0.000000	0.008696	0.008696	
american	0.002167	0.0	0.004932	0.000174	0.106052	0.033051	
asian	0.006706	0.0	0.012573	0.000000	0.005029	0.093881	
austria	0.000000	0.0	0.000000	0.000000	0.238095	0.000000	
bangladesh	0.000000	0.0	0.000000	0.000000	0.000000	0.000000	

		coconut_oil	cod	coffee	cognac	concord_grape \
cuisine						
african	0.000000	0.043478	0.000000	0.000000		0.000000
american	0.000299	0.002167	0.013674	0.000548		0.000299
asian	0.000000	0.005868	0.003353	0.000838		0.000000
austria	0.000000	0.000000	0.000000	0.000000		0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000		0.000000

		condiment	coriander	corn	corn_flake	corn_grit \
cuisine						
african	0.008696	0.278261	0.034783	0.000000	0.000000	
american	0.000125	0.016538	0.080174	0.005131	0.001743	
asian	0.000000	0.138307	0.049455	0.000000	0.000838	
austria	0.000000	0.000000	0.000000	0.000000	0.000000	
bangladesh	0.000000	0.500000	0.000000	0.000000	0.000000	

		cottage_cheese	crab	cranberry	cream	cream_cheese \
cuisine						
african	0.000000	0.000000	0.000000	0.034783	0.000000	
american	0.006227	0.010411	0.021320	0.196737	0.062740	
asian	0.000000	0.020117	0.003353	0.035205	0.003353	
austria	0.000000	0.000000	0.000000	0.238095	0.047619	
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	

		cucumber	cumin	cured_pork	currant	date	dill \
cuisine							
african	0.017391	0.426087	0.000000	0.017391	0.034783	0.000000	
american	0.029489	0.033524	0.004134	0.003512	0.007547	0.021220	
asian	0.082146	0.084661	0.000838	0.000838	0.002515	0.002515	
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	
bangladesh	0.000000	0.250000	0.000000	0.000000	0.000000	0.000000	

		durian	eel	egg	egg_noodle	elderberry	emmental_cheese \
--	--	--------	-----	-----	------------	------------	-------------------

cuisine						
african	0.0	0.0	0.200000	0.000000	0.0000	0.0
american	0.0	0.0	0.405131	0.005729	0.0001	0.0
asian	0.0	0.0	0.136630	0.009220	0.0000	0.0
austria	0.0	0.0	0.809524	0.000000	0.0000	0.0
bangladesh	0.0	0.0	0.000000	0.000000	0.0000	0.0

	endive	enokidake	fennel	fenugreek	feta_cheese	fig \
cuisine						
african	0.000000	0.0	0.052174	0.060870	0.008696	0.000000
american	0.001295	0.0	0.011283	0.012005	0.010062	0.001943
asian	0.000838	0.0	0.005029	0.057837	0.001676	0.000000
austria	0.000000	0.0	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.0	0.000000	0.000000	0.000000	0.000000

	fish	flower	frankfurter	fruit	galanga	gardenia \
cuisine						
african	0.078261	0.000000	0.000000	0.00000	0.000000	0.0
american	0.015816	0.000448	0.000648	0.00924	0.000125	0.0
asian	0.196144	0.001676	0.000000	0.00000	0.014250	0.0
austria	0.000000	0.000000	0.000000	0.00000	0.000000	0.0
bangladesh	0.000000	0.000000	0.000000	0.00000	0.000000	0.0

	garlic	gelatin	geranium	gin	ginger	goat_cheese \
cuisine						
african	0.495652	0.008696	0.000000	0.000000	0.260870	0.000000
american	0.240722	0.031308	0.000025	0.001469	0.054321	0.003910
asian	0.479464	0.006706	0.000000	0.000000	0.486169	0.000838
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.750000	0.000000	0.000000	0.000000	0.500000	0.000000

	grape	grape_brandy	grape_juice	grapefruit \
cuisine				
african	0.000000	0.0	0.008696	0.000000
american	0.006999	0.0	0.013848	0.002192
asian	0.000838	0.0	0.011735	0.003353
austria	0.000000	0.0	0.000000	0.000000
bangladesh	0.000000	0.0	0.000000	0.000000

	green_bell_pepper	green_tea	gruyere_cheese	guava	haddock \
cuisine					
african	0.017391	0.000000	0.000000	0.000000	0.008696
american	0.046575	0.000299	0.000448	0.000199	0.000374
asian	0.010059	0.002515	0.000838	0.000000	0.000000
austria	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	ham	hazelnut	herring	holy_basil	honey	hop \
cuisine						
african	0.000000	0.017391	0.000000	0.000000	0.147826	0.000000
american	0.022242	0.003910	0.000075	0.000000	0.047472	0.000005
asian	0.009220	0.000000	0.000000	0.000838	0.062867	0.000000
austria	0.000000	0.142857	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	horseradish	huckleberry	jamaican_rum	japanese_plum	jasmine \
cuisine					
african	0.000000	0.000000	0.0	0.0	0.000000
american	0.008095	0.000224	0.0	0.0	0.000050
asian	0.007544	0.000000	0.0	0.0	0.000838
austria	0.000000	0.000000	0.0	0.0	0.000000
bangladesh	0.000000	0.000000	0.0	0.0	0.000000

	jasmine_tea	juniper_berry	kaffir_lime	kale	katsuobushi \
cuisine					
african	0.000000	0.000000	0.000000	0.000000	0.000000
american	0.000025	0.000199	0.000000	0.001245	0.000025
asian	0.000838	0.000000	0.000838	0.003353	0.011735
austria	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	kelp	kidney_bean	kiwi	kohlrabi	kumquat	lamb \
cuisine						
african	0.000000	0.000000	0.000000	0.000000	0.008696	0.130435
american	0.000000	0.006849	0.001818	0.000075	0.000523	0.005031
asian	0.000838	0.000000	0.003353	0.000000	0.004191	0.013412
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	lard	laurel	lavender	leaf	leek	lemon \
cuisine						
african	0.008696	0.000000	0.000000	0.000000	0.008696	0.165217
american	0.061445	0.000005	0.000847	0.000005	0.005355	0.053948
asian	0.008382	0.000000	0.000000	0.000000	0.012573	0.016764
austria	0.047619	0.000000	0.000000	0.000000	0.047619	0.095238
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	lemon_juice	lemon_peel	lemongrass	lentil	lettuce	licorice \
cuisine						
african	0.260870	0.008696	0.008696	0.026087	0.017391	0.000000
american	0.090535	0.012379	0.000722	0.003611	0.017111	0.000399
asian	0.055323	0.011735	0.070411	0.000838	0.049455	0.000838
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	lilac_flower_oil	lima_bean	lime	lime_juice	lime_peel_oil \
cuisine					
african	0.000000	0.000000	0.008696	0.043478	0.017391
american	0.000025	0.002715	0.016837	0.017733	0.001619
asian	0.000000	0.000000	0.068734	0.163453	0.006706
austria	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	lingonberry	litchi	liver	lobster	long_pepper	lovage \
cuisine						
african	0.000000	0.000000	0.000000	0.017391	0.000000	0.000000
american	0.000075	0.000174	0.000523	0.002117	0.000000	0.003064
asian	0.000000	0.002515	0.000838	0.004191	0.001676	0.000000
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	macadamia_nut	macaroni	mace	mackerel	malt	mandarin \
cuisine						
african	0.000000	0.026087	0.008696	0.0	0.000000	0.000000
american	0.002466	0.046252	0.002192	0.0	0.000672	0.006575
asian	0.000838	0.036044	0.002515	0.0	0.000838	0.000838
austria	0.000000	0.000000	0.000000	0.0	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.0	0.000000	0.000000

	mandarin_peel	mango	maple_syrup	marjoram	mate \
cuisine					
african	0.000000	0.034783	0.000000	0.034783	0.000000
american	0.000050	0.006002	0.010760	0.010610	0.000025
asian	0.004191	0.026823	0.005868	0.000000	0.000000
austria	0.000000	0.000000	0.000000	0.047619	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	matsutake	meat	melon	milk	milk_fat	mint \
cuisine						
african	0.000000	0.017391	0.000000	0.086957	0.034783	0.060870
american	0.000000	0.015866	0.003238	0.266002	0.012603	0.011880
asian	0.000838	0.017603	0.005029	0.025147	0.012573	0.082146
austria	0.000000	0.000000	0.000000	0.476190	0.047619	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	mozzarella_cheese	mung_bean	munster_cheese	muscat_grape \
cuisine				
african	0.000000	0.000000	0.000000	0.000000
american	0.018431	0.000025	0.000598	0.000025
asian	0.000838	0.004191	0.000000	0.000000
austria	0.000000	0.000000	0.000000	0.000000

bangladesh	0.000000	0.000000	0.000000	0.000000
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	mushroom	mussel	mustard	mutton	nectarine	nira \
cuisine						
african	0.000000	0.000000	0.052174	0.000000	0.000000	0.000000
american	0.060747	0.001046	0.082889	0.000005	0.000996	0.000000
asian	0.051970	0.005029	0.024308	0.000000	0.000838	0.000838
austria	0.047619	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.250000	0.000000	0.000000	0.000000

	nut	nutmeg	oat	oatmeal	octopus	okra \
cuisine						
african	0.026087	0.034783	0.000000	0.000000	0.008696	0.017391
american	0.018705	0.051731	0.029639	0.001295	0.000000	0.001569
asian	0.033529	0.008382	0.000000	0.000838	0.000000	0.001676
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	olive	olive_oil	onion	orange	orange_flower \
cuisine					
african	0.104348	0.521739	0.530435	0.043478	0.0000
american	0.025056	0.132628	0.293325	0.031681	0.0001
asian	0.001676	0.066220	0.145851	0.015926	0.0000
austria	0.000000	0.000000	0.142857	0.047619	0.0000
bangladesh	0.000000	0.000000	1.000000	0.000000	0.0000

	orange_juice	orange_peel	oregano	ouzo	oyster	palm \
cuisine						
african	0.017391	0.008696	0.008696	0.000000	0.000000	0.000000
american	0.035019	0.010336	0.046077	0.000025	0.003736	0.000399
asian	0.023470	0.020117	0.002515	0.000000	0.045264	0.007544
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	papaya	parmesan_cheese	parsley	parsnip	passion_fruit \
cuisine					
african	0.008696	0.017391	0.191304	0.000000	0.008696
american	0.000648	0.048568	0.088568	0.002491	0.000374
asian	0.009220	0.005868	0.014250	0.000838	0.000000
austria	0.000000	0.000000	0.047619	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	pea	peach	peanut	peanut_butter	peanut_oil	pear \
cuisine						
african	0.043478	0.000000	0.026087	0.034783	0.034783	0.000000
american	0.017858	0.011507	0.008244	0.022441	0.002366	0.007323
asian	0.076278	0.002515	0.049455	0.028500	0.085499	0.013412

austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.250000	0.000000	0.000000	0.000000	0.000000	0.000000

	pear_brandy	pecan	pelargonium	pepper	peppermint	\
cuisine						
african	0.000000	0.008696	0.000000	0.165217	0.000000	
american	0.000199	0.050336	0.000025	0.168369	0.003362	
asian	0.000000	0.001676	0.000000	0.186085	0.000000	
austria	0.000000	0.047619	0.000000	0.190476	0.000000	
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	

	peppermint_oil	pimenta	pimento	pineapple	pistachio	plum	\
cuisine							
african	0.000000	0.0	0.008696	0.008696	0.008696	0.034783	
american	0.000199	0.0	0.005330	0.036538	0.003213	0.004284	
asian	0.000000	0.0	0.000000	0.018441	0.002515	0.010897	
austria	0.000000	0.0	0.000000	0.000000	0.000000	0.095238	
bangladesh	0.000000	0.0	0.000000	0.000000	0.000000	0.000000	

	popcorn	porcini	pork	pork_liver	pork_sausage	port_wine	\
cuisine							
african	0.000000	0.000000	0.008696	0.000000	0.008696	0.000000	
american	0.002267	0.001046	0.030884	0.000075	0.021719	0.000797	
asian	0.000000	0.000000	0.090528	0.000000	0.007544	0.000000	
austria	0.000000	0.000000	0.047619	0.000000	0.000000	0.000000	
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	

	potato	potato_chip	prawn	prickly_pear	provolone_cheese	\
cuisine						
african	0.026087	0.000000	0.008696	0.000000	0.000000	
american	0.061395	0.001494	0.000423	0.000075	0.002665	
asian	0.013412	0.000000	0.000000	0.000000	0.000838	
austria	0.095238	0.000000	0.000000	0.000000	0.000000	
bangladesh	0.500000	0.000000	0.000000	0.000000	0.000000	

	pumpkin	quince	radish	raisin	rapeseed	raspberry	\
cuisine							
african	0.000000	0.008696	0.000000	0.139130	0.0	0.000000	
american	0.014321	0.000324	0.002565	0.034994	0.0	0.016687	
asian	0.002515	0.000838	0.015926	0.001676	0.0	0.001676	
austria	0.000000	0.000000	0.000000	0.047619	0.0	0.047619	
bangladesh	0.000000	0.000000	0.000000	0.000000	0.0	0.000000	

	raw_beef	red_algae	red_bean	red_kidney_bean	red_wine	\
cuisine						
african	0.0	0.0	0.0	0.000000	0.034783	
american	0.0	0.0	0.0	0.001071	0.019925	

asian	0.0	0.0	0.0	0.000000	0.005029
austria	0.0	0.0	0.0	0.000000	0.000000
bangladesh	0.0	0.0	0.0	0.000000	0.000000

	rhubarb	rice	roasted_almond	roasted_beef	\
cuisine					
african	0.000000	0.104348	0.000000	0.000000	
american	0.003686	0.040473	0.000005	0.003885	
asian	0.000000	0.413244	0.000000	0.005029	
austria	0.000000	0.000000	0.000000	0.000000	
bangladesh	0.000000	0.250000	0.000000	0.000000	

	roasted_hazelnut	roasted_meat	roasted_nut	roasted_peanut	\
cuisine					
african	0.000000	0.000000	0.000000	0.008696	
american	0.000025	0.000324	0.000025	0.002516	
asian	0.000000	0.000000	0.000000	0.033529	
austria	0.000000	0.000000	0.000000	0.000000	
bangladesh	0.000000	0.000000	0.000000	0.000000	

	roasted_pecan	roasted_pork	roasted_sesame_seed	romano_cheese	\
cuisine					
african	0.000000	0.000000	0.000000	0.000000	
american	0.000025	0.002291	0.001395	0.002989	
asian	0.000000	0.000000	0.003353	0.000000	
austria	0.000000	0.000000	0.000000	0.000000	
bangladesh	0.000000	0.000000	0.000000	0.000000	

	root	roquefort_cheese	rose	rosemary	rum	\
cuisine						
african	0.000000	0.000000	0.008696	0.008696	0.008696	
american	0.000822	0.000399	0.000648	0.033474	0.011308	
asian	0.022632	0.000000	0.000000	0.002515	0.000838	
austria	0.000000	0.000000	0.000000	0.000000	0.142857	
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	

	rutabaga	rye_bread	rye_flour	saffron	sage	sake	\
cuisine							
african	0.000000	0.000000	0.000000	0.130435	0.008696	0.000000	
american	0.000473	0.001793	0.002242	0.001494	0.017335	0.003288	
asian	0.000000	0.000838	0.000838	0.000000	0.000838	0.047779	
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	

	salmon	salmon_roe	sassafras	sauerkraut	savory	scallion	\
cuisine							
african	0.008696	0.000000	0.000000	0.000000	0.000000	0.052174	

american	0.008269	0.000100	0.000423	0.003088	0.001868	0.053225
asian	0.015088	0.001676	0.000000	0.000838	0.000838	0.382230
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.250000	0.000000	0.000000	0.000000	0.000000	0.000000

	scallop	sea_algae	seaweed	seed	sesame_oil	sesame_seed \
cuisine						
african	0.000000	0.0	0.000000	0.095652	0.000000	0.043478
american	0.003761	0.0	0.000324	0.022217	0.007821	0.008792
asian	0.026823	0.0	0.022632	0.027661	0.298407	0.105616
austria	0.000000	0.0	0.000000	0.047619	0.000000	0.000000
bangladesh	0.000000	0.0	0.000000	0.000000	0.000000	0.000000

	shallot	sheep_cheese	shellfish	sherry	shiitake	shrimp \
cuisine						
african	0.043478	0.0	0.000000	0.008696	0.000000	0.034783
american	0.017310	0.0	0.000025	0.009489	0.002665	0.017958
asian	0.103101	0.0	0.000000	0.064543	0.070411	0.123219
austria	0.000000	0.0	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.0	0.000000	0.000000	0.000000	0.250000

	smoke	smoked_fish	smoked_salmon	smoked_sausage	sour_cherry \
cuisine					
african	0.026087	0.000000	0.000000	0.000000	0.000000
american	0.006600	0.000149	0.001519	0.005106	0.000797
asian	0.005868	0.000000	0.002515	0.000000	0.001676
austria	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	sour_milk	soy_sauce	soybean	soybean_oil	spearmint	squash \
cuisine						
african	0.000000	0.008696	0.000000	0.000000	0.000000	0.043478
american	0.001096	0.038705	0.007895	0.000005	0.000100	0.010461
asian	0.000000	0.496228	0.136630	0.000000	0.000838	0.012573
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	squid	star_anise	starch	strawberry	strawberry_jam \
cuisine					
african	0.008696	0.008696	0.008696	0.000000	0.0
american	0.000473	0.000922	0.046227	0.023213	0.0
asian	0.008382	0.035205	0.129925	0.002515	0.0
austria	0.000000	0.000000	0.000000	0.000000	0.0
bangladesh	0.000000	0.000000	0.000000	0.000000	0.0

	strawberry_juice	sturgeon_caviar	sumac	sunflower_oil \
cuisine				



african	0.0	0.000000	0.0000	0.008696
american	0.0	0.000025	0.0001	0.000025
asian	0.0	0.000000	0.0000	0.000000
austria	0.0	0.000000	0.0000	0.000000
bangladesh	0.0	0.000000	0.0000	0.000000

	sweet_potato	swiss_cheese	tabasco_pepper	tamarind	tangerine \
cuisine					
african	0.043478	0.000000	0.008696	0.000000	0.000000
american	0.010187	0.011233	0.018356	0.033773	0.000523
asian	0.010897	0.000838	0.010059	0.015926	0.006706
austria	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000

	tarragon	tea	tequila	thai_pepper	thyme	tomato \
cuisine						
african	0.000000	0.000000	0.000000	0.000000	0.069565	0.252174
american	0.008692	0.001793	0.001768	0.000648	0.052329	0.138680
asian	0.001676	0.006706	0.000000	0.041911	0.004191	0.057837
austria	0.000000	0.047619	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.250000

	tomato_juice	truffle	tuna	turkey	turmeric	turnip \
cuisine						
african	0.000000	0.000000	0.017391	0.008696	0.156522	0.043478
american	0.003213	0.000598	0.007796	0.017758	0.014670	0.002516
asian	0.000000	0.000000	0.016764	0.006706	0.080469	0.004191
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000

	vanilla	veal	vegetable	vegetable_oil	vinegar	violet \
cuisine						
african	0.026087	0.000000	0.034783	0.173913	0.052174	0.0000
american	0.197061	0.001694	0.019303	0.187397	0.135492	0.0001
asian	0.012573	0.000838	0.037720	0.360436	0.336966	0.0000
austria	0.428571	0.047619	0.000000	0.095238	0.047619	0.0000
bangladesh	0.000000	0.000000	0.000000	1.000000	0.000000	0.0000

	walnut	wasabi	watercress	watermelon	wheat	wheat_bread \
cuisine						
african	0.026087	0.000000	0.000000	0.000000	0.260870	0.000000
american	0.059950	0.001096	0.002092	0.002167	0.398406	0.001569
asian	0.004191	0.026823	0.015088	0.001676	0.095557	0.000838
austria	0.047619	0.000000	0.000000	0.000000	0.809524	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.250000	0.000000

	whiskey	white_bread	white_wine	whole_grain_wheat_flour \
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cuisine	wine	wood	yam	yeast	yogurt	zucchini
african	0.000000	0.008696	0.043478		0.008696	
american	0.002964	0.006874	0.030809		0.014819	
asian	0.000838	0.001676	0.038558		0.001676	
austria	0.000000	0.047619	0.000000		0.000000	
bangladesh	0.000000	0.000000	0.000000		0.000000	

  

cuisine	wine	wood	yam	yeast	yogurt	zucchini
african	0.017391	0.000000	0.008696	0.017391	0.000000	0.034783
american	0.011009	0.000672	0.001445	0.068219	0.016912	0.018630
asian	0.124895	0.000000	0.001676	0.004191	0.010897	0.011735
austria	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
bangladesh	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

As shown above, we have just created a dataframe where each row is a cuisine and each column (except for the first column) is an ingredient, and the row values represent the percentage of each ingredient in the corresponding cuisine.

**For example:**

- *almond* is present across 15.65% of all of the **African** recipes.
- *butter* is present across 38.11% of all of the **Canadian** recipes.

Let's print out the profile for each cuisine by displaying the top four ingredients in each cuisine.

```
[ ]: num_ingredients = 4 # define number of top ingredients to print

# define a function that prints the top ingredients for each cuisine
def print_top_ingredients(row):
    print(row.name.upper())
    row_sorted = row.sort_values(ascending=False)*100
    top_ingredients = list(row_sorted.index.values)[0:num_ingredients]
    row_sorted = list(row_sorted)[0:num_ingredients]

    for ind, ingredient in enumerate(top_ingredients):
        print("%s (%d%%)" % (ingredient, row_sorted[ind]), end=' ')
    print("\n")

# apply function to cuisines dataframe
create_cuisines_profiles = cuisines.apply(print_top_ingredients, axis=1)
```

At this point, we feel that we have understood the data well and the data is ready and is in the right format for modeling!

### 3.0.1 Thank you for completing this lab!

This notebook was created by [Alex Aklson](#). We hope you found this lab session interesting. Feel free to contact us if you have any questions!

This notebook is part of a course on **Coursera** called *Data Science Methodology*. If you accessed this notebook outside the course, you can take this course, online by clicking [here](#).

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