

Motivations of Data Structures and Algorithms

Hsuan-Tien Lin

Dept. of CSIE, NTU

February 23, 2021

Introduction of Algorithms

Sheet Music for Playing Instrument



first page of the manuscript of Bach's lute suite in G minor

figure licensed as public domain via

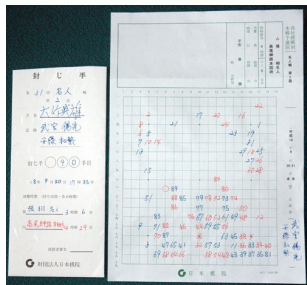
commons.wikimedia.org/wiki/File:Bachlut1.png

sheet music

Wikipedia: *handwritten or printed form of musical **notation** ... to indicate the pitches, rhythms or chords of a song*

sheet music: **instructions** to **play instrument** (**well**)

Kifu for Learning Go



a Japanese kifu

figure by Velobici,

licensed under CC BY-SA 4.0 via Wikimedia Commons

kifu

go game record of steps that describe how the game had been played

kifu: instructions to play a Go game (professionally)

Recipe for Cooking Dish

a recipe for hamburger on Wikibooks

figure by Gentgeen,

licensed under CC BY-SA 3.0 via Wikimedia Commons

Cookbook:Hamburger · Wikibooks
<http://en.wikibooks.org/wiki/Cookbook:Hamburger>

Cookbook:Hamburger

From Wikibooks

Cookbook (Help) Index | More recipes

A **hamburger** (or, less frequently, a **hamburg**, or in the United Kingdom, a **hamburger**) is a variant on a sandwich involving a patty of ground meat that is almost always beef.

Ingredients

- 1lb (1.1 kg) minced (ground) beef (beef and ground veal)
- cheese (optional)
- salad (tomato, sprouts, alfalfa sprouts, tomatoes, onion etc. - optional)
- 1 hamburger bun for each burger

Procedure

1. Add the beef to a food processor for approximately 10 seconds.
2. Heat oil and cook onion and onion in oil until browned. Depending on the quality of your meat (beef), you may want to add some hot sauce to improve the flavor.
3. Mix in the food processor for another 30 seconds or until fully mixed.
4. If you bought the beef already ground, make sure you cook in your own meat. If you buy meat from a grocery store, make sure it is fresh. If you buy meat from a grocery store, make sure it is fresh. If you buy meat from a grocery store, make sure it is fresh.
5. Form the beef into patties about 4 inches in diameter and 1/2 inch thick. If you are using a food processor, you can use a meat grinder to make the patties.
6. Brown the beef in the food processor and shape by hand into burgers. You should get between 4-6 burgers from 1lb (1.1 kg) of beef.
7. The burgers can be fried (about 5 minutes on each side for burgers which aren't too thick), grilled (about 5 minutes on each side for burgers which aren't too thick), or broiled.
8. Brown your burgers are fully cooked through before serving. If your burgers are quite thick or if you are using a food processor, you can use a meat thermometer to make sure they are cooked. If the burgers are not, then it is a danger that the meat is not fully cooked.
9. Serve each burger on a bun (common meat preferences) optionally with salad, sliced pickles, ketchup, mayonnaise, mustard, sauce (ketchup, mustard, tomato, onion, etc.).
10. For further serving suggestions, see the Wikipedia article on hamburgers.

Notes, tips and variations

- You can use almost any type of minced (ground) meat to make hamburgers, including pork, chicken, turkey, lamb, veal, salmon, etc., or a mix of different meats such as Spam.
- If you burgers fall apart, adding an egg yolk will help keep it together. Baking lean ground beef will also help.
- You may wish to experiment with including cheese in the center of your burger before cooking.
- Spices which can work well in hamburgers include black pepper, chili (either fresh or powder), Worcestershire Sauce and soy sauce. Experiment in food food combinations.
- Burgers can also be cooked in a grill. Smoked burgers will appear red and glazed on the outside, but browned on the inside. Smoking a burger before grilling is an excellent way to work on the flavor of your meat.
- **Variations:** Adding onion and spices together in a bowl and mixing by hand until the spices are distributed may produce better results. This will also keep your burgers from falling apart.

Links

Retrieved from "http://en.wikibooks.org/wiki/Cookbook:Hamburger"

Categories: Recipes | Sandwich recipes | Beef recipes | Fast food recipes

- This page was last modified 17:58, 17 November 2005.
- All text is available under the terms of the GNU Free Documentation License (see Copyright for details).

1 of 1
13:50:09 11/10/2005

recipe

Wikipedia: *a set of **instructions** that describes how to prepare or make something, especially a dish of prepared food*

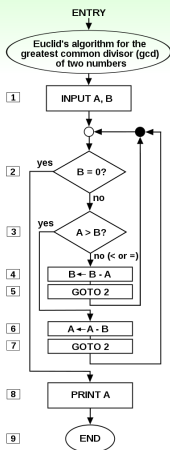
recipe: **instructions** to **cook** a (**delicious**) **dish**

Algorithm for Computing

flowchart of Euclid's algorithm for calculating the greatest common divisor (g.c.d.) of two numbers

figure by Somepics,

licensed under CC BY-SA 4.0 via Wikimedia Commons



algorithm

Wikipedia: *algorithm is a finite sequence of well-defined, computer-implementable **instructions**, typically to solve a class of problems or to perform a computation*

algorithm ~ computing recipe:

(computable) **instructions** to **solve a computing task**
correctly/efficiently

Five Criteria of Algorithm

Cocktail Recipe: Screwdriver

inputs: 5 cl vodka, 10 cl orange juice

- 1 mix inputs in a highball glass with ice
- 2 garnish with orange slice and serve

output: a glass of delicious cocktail

Knuth: input, output, definiteness, finiteness, effectiveness

getMinIndex with Sequential Search Algorithm

Buggy Version

```
/* return index to min. element
   in arr[0] ... arr[len-1] */
int getMinIndex
    (int arr[], int len){
    int i;
    int m;
    for(i=0;i<=len;i++){
        if (arr[m] > arr[i]){
            i = m;
        }
    }
    return i;
}
```

Corrected Version

```
/* return index to min. element
   in arr[0] ... arr[len-1] */
int getMinIndex
    (int arr[], int len){
    int i;
    int m=0;
    for(i=0;i<len;i++){
        if (arr[m] > arr[i]){
            m = i;
        }
    }
    return m;
}
```

input (problem/data), output (correctness), definiteness (instruction), finiteness (efficiency), effectiveness (computability)