Tutorial Sheet

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1 Lecture 1: Introduction

- **Question 1:** Why are computers called general-purpose machines?
- **Question 2**: Identify some advantages and disadvantages of a using a Biometric authentication system in a company (Hint: think about privacy)?
- **Question 3**: Is Computer Science an Engineering discipline? Explain why or why not?
- **Question 4**: Why do we need standardization in computer Science?
- **Question 5**: A recipe database stores the recipes in Table. Users can search for recipes by entering search terms, which the database matches to tags and cooking times. Consider the following search terms and decide which recipes will be returned:
  - A. cooking time less than 20 minutes and not vegetarian;
  - B. includes chicken or turkey but not garlic;
  - C. doesn't include nuts.

Name	Tags	Cooking time
Broiled chicken salad	Chicken, lettuce, gorgonzola cheese, lemon juice	15 mins
Holiday turkey	Turkey, rice, onion, walnuts, garlic	60 mins
Three-spice chicken	Chicken, ginger, cinnamon, garlic, green beans	30 mins
Lentil salad	Lentils, onion, peppers, walnuts, lettuce	20 mins

Name	Tags	Cooking time
Garlic dip	Garlic, lemon juice, chickpeas, chicken broth	5 mins

- **Question 6**: Here are some rules of thumb to apply when deciding which supermarket queue to join (assuming you want to spend as little time queuing as possible)
  - A. People in a queue who are carrying their items by hand take about one minute to be processed.
  - B. People carrying a basket take about two minutes to be processed.
  - C. People pushing a trolley take about five minutes to be processed for a half-empty trolley; ten minutes for a full trolley.
  - D. People in a self-service checkout are processed in about 80 per cent of the time of a normal checkout.

    Express these rules of thumb as logical statements. Each statement should make a conclusion about the estimated queuing time.
- **Question 7**: You're planning to hold a birthday picnic for a child and her friends. Break down the preparation into a tree structure of tasks. The facts are:
  - A. You need to send out the invitations to the parents of the other children.
  - B. Food you'll provide: sandwiches (ham, chicken, and cheese), homemade cake.
  - C. Fresh ingredients (meat and dairy) need to purchased on the day.
  - D. Other things you need to take: disposable cutlery, blankets, games.
  - E. The park where the picnic is held requires you to reserve a spot.
  - F. All guests will get a goody bag with sweets when they leave.
- **Question 8**: Order the following into layers of abstraction, starting with the most general and ending with the most specific:
  - A. penguin;
  - B. bird;
  - C. Tommy the Penguin;
  - D. animal;
  - E. Emperor penguin.

2 Lecture 2: Hardware

1. Applying Moore's Law, how much larger would you expect a computer from 30 years ago to be by comparison to the computer you currently use?
2. Using the Mayan numeral system, what are the decimal numbers 12, 123, 452, and 1256? Research online for your answer.
3. Each text message contains a date (8 bytes), time sent (4 bytes), up to 160 characters of text, and the sender's phone number (8-byte number). How many text messages can you store on a 128GB hard drive? [*Hint: Read the required reading for this lecture*]
4. What would happen if you ran out of RAM? What would happen if you ran out of permanent storage?
5. Complete the truth table for the logical statement A AND (B OR C) and draw the circuit diagram for this system.
6. Show how to convert the following binary numbers to decimal:

    a. 1101
    b. 1111101000
    c. 11.0011
    d. 11.110001

7. Design truth tables and ciruit diagrams for the following Boolean expressions:

    a. not (a and b)
    b. not (a or b)
    c. not a or not b
    d. not a and not b