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My Materials Supporting the Exploring Computer Science Curriculum

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Most of my materials are available in

- PDF format. (If you don't have it already, you can download the free Adobe PDF Reader for .pdf files.)
- LaTeX format. (If you are not already familiar with this format, you will probably want to skip over it, but here is a starting point for learning more about LaTeX.)

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My materials are organized under the standard ECS units, just the first three for now:

- Unit1: Human Computer Interaction
- Unit 2: Problem Solving
- Unit 3: Web Design

My Materials Supporting Exploring Computer Science Curriculum Unit 1

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- Supplement with some direct education about computing applications and careers in the form of questions with references that you could go through in class; includes robotics videos generally of high interest to students. HTML.
- Supplement with information about metric prefixes, bits, bytes, nibbles, pixels, and other hardware terms; some of this could be useful for computer buying project. PDF, LaTeX.
- Questions with references for website evaluation. Part assumes you have copied and distributed the website evaluation rubric from ECS. HTML.
- Communication Methods Chart with a few changes in the list of scenarios, for example planning a surprise party instead of gossiping. PDF, LaTeX.
- Privacy Activity with activities less sensitive for high school students: PDF, LaTeX.
- Handouts for 5 groups for Room Activity:
    1. Group 1: Directions for picture. PDF, LaTeX.
    2. Group 2: Directions for word cloud. (Need to cut and paste word cloud in empty space.) PDF, LaTeX.
    3. Group 3: First word list and directions. PDF, LaTeX.
    4. Group 4: Second word list and directions. PDF, LaTeX.
    5. Group 5: Third word list and directions. PDF, LaTeX.
    6. Second page common to all groups. PDF, LaTeX.

  (The word cloud here is a good leadin for an activity to use when students are to report/discuss on reading material; see what I have at the beginning of Unit 2 for the articles on privacy/data.
- Communication Methods and Data Chart with a few changes in the list of scenarios to correspond with Communication Methods Chart above. PDF, LaTeX.
- For convenience in conducting Computer Science Unplugged Activity 20 (Conversations with Computers --- The Turing Test), these handouts provide the questions for the class to look at and answer/reference sheets for the students playing computer and human:
    - Questions. PDF

    - Questions and answers for computer. PDF, LaTeX.
    - Questions/instructions for human. PDF, LaTeX.
- A chatterbot handout based on ECS page 73 Part I; the online version includes clickable links to the referenced websites. This handout references the 17 Turing Test questions from Computer Science Unplugged Activity 20. PDF, LaTeX.
- An additional activity I suggest is to have students play rock-paper-scissors at http://www.nytimes.com/interactive/science/rock-paper-scissors.html and reflect on the results. (This also foreshadows Instructional Day 18 in Unit 4.)

Other units: Next Unit: Unit 2, Unit 3.

My Materials Supporting Exploring Computer Science Curriculum Unit 2

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- Convenient 2-page (11pt type) version of New York Times article about search data referenced for instructional days 1--2. This version elides sexually-related and suicide-related material. PDF, LaTeX.
- Convenient 2-page (11pt type) version of New York Times article about online privacy referenced for instructional days 1--2. PDF, LaTeX.
- Suggestion based on an idea of Baker Franke: For each article, have students read and then submit through a Google form 10 keywords they think are most descriptive of what the article is about. Then collect all the submitted words and make a word cloud at http://wordle.net.
- A handout with a scenario and questions to get students thinking about a community problem. PDF, LaTeX.
- A general list of problem-solving strategies that could be useful to present to students; got this from Dan Wheadon at a professional development workshop. HTML
- A handout presenting the four problem solving steps and helping guide students to work on the candy bar problem. PDF, LaTeX.
- A handout to help guide students through the dictionary exercise for linear and binary search. PDF, LaTeX.

Other units: Previous Unit: Unit 1, Next Unit: Unit 3.

My Materials Supporting Exploring Computer Science Curriculum Unit 3

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- LaTeX format. (If you are not already familiar with this format, you will probably want to skip over it, but here is a starting point for learning more about LaTeX.)

Feel free to edit and repackage these materials for your own use. If you are not familiar with LaTeX, you will probably want to cut-and-paste from the PDF to whatever document preparation tool you prefer. (See also available materials for other units.) For this unit, I have created a set of handouts that can be used to complete the web design work with minimal access to the internet in case of connectivity that is not entirely reliable. The parts in my plan that use internet access are as follows; generally, one could even work around these items:

- Grabbing images and manipulating using Photoshop Express. (Could potentially avoid internet access if some version of Photoshop is installed locally.)
- Exploring available colors. (Could just provide a more limited set of colors to students.)
- Exploring more advanced styling than in the handouts, but this is an optional activity.

I have done a little bit of reordering of the ECS material relative to the ECS order, and developed the following set of instructions to students in four parts:

- Web Design Part 1: Creation of an initial web page including at least a title, headings, paragraphs, two links, and other specific requirements. PDF, LaTeX.
- Web Design Part 2: Preparing and inserting images. PDF, LaTeX.
- Web Design Part 3: Incorporating emphasized and strongly emphasized text, inline styling, and an internal style sheet. PDF, LaTeX.
- Web Design Part 4: Creating a site of three interrelated pages and using an external style sheet. Also tables and ordered and unordered lists. PDF, LaTeX.

Other units: Previous Unit: Unit 2, Unit 1.

Some questions with references for learning about computing applications and job prospects

1. List six to ten things that a robot can do. (References: bionic arms video, realistic robot woman video, robotic snake video, "Big Dog" video, Humanoid robot Nao.)
2. List three fields of study other than computer science where computers are very useful and explain how. (References: CMU Roadshow excerpt, Presentation by Jeanette Wing.)
3. According to the 10-year projections prepared by the Bureau of Labor Statistics in 2008, what are the four fastest growing occupations? (For this question and next two, see beginning of jobs sheet.)
4. According to the 2006 CNN analysis of the highest-paying, fastest-growing jobs, which two are the highest paying jobs among those listed in your answer to the previous question?
5. In the 2011 ratings of CareerCast.com, what is the best job in America based on based on work environment, stress, physical demands, and hiring outlook?

Here are some terminologies relating to computing hardware, etc.

1 Metric prefixes

Some of these prefix names may be familiar, but here we give more extensive listings than most people are familiar with and even more than are likely to appear in typical computer science usage. The range in which typical usages occur is from Peta down to nano or pico.

A further note is that the terminologies are classicly used for powers of 10, but most quantities in computer science are measured in terms of powers of 2. Since $2^10 = 1024$, which is close to 10^3, computer scientists typically use these prefixes to represent the nearby powers of 2, at least with reference to big things like bytes of memory.

For big things:

Power of 10	In CS, may be	Place-value name	Metric prefix	metric abbrev.
10^3	2^{10}	thousands	kilo	k
10^6	2^{20}	millions	mega	M
10^9	2^{30}	billions	giga	G
10^{12}	2^{40}	trillions	tera	T
10^{15}	2^{50}	quadrillions	peta	P
10^{18}	2^{60}	quintillions	exa	E
10^{21}	2^{70}	sextillions	zeta	Z
10^{24}	2^{80}	septillions	yotta	Y

For small things:

Power of 10	In CS, may be	Place-value name	Metric prefix	metric abbrev.
10^{-3}	2^{-10}	thousandths	milli	m
10^{-6}	2^{-20}	millionths	micro	μ
10^{-9}	2^{-30}	billionths	nano	n
10^{-12}	2^{-40}	trillionths	pico	p
10^{-15}	2^{-50}	quadrillionths	femto	f
10^{-18}	2^{-60}	quintillionths	atto	a
10^{-21}	2^{-70}	sextillionths	zepto	z
10^{-24}	2^{-80}	septillionths	yocto	y

2 Bits, bytes, nibbles, and pixels

Information in computers is essentially stored as sequences of 0's and 1's. For numbers, this is referred to as a *binary* or base two representation, whereas our usual number system is base ten. We will learn more about binary numbers later, but for now, we just want to be aware that numbers can be represented with the two digits 0 and 1 in base two rather than the digits 0 through 9 that we use in base ten.

The term *bit* refers to one binary digit, i.e., a 0 or a 1. Since a bit can have just two values, it is enough to represent one small piece of information, e.g., a "yes" or "no" to some question.

Typically, bits are organized into larger chunks that encode more information. For example, 8 bits are enough to represent the numbers from 0 to 255. A collection of 8 bits is referred to as a *byte*. Occasionally, computer scientists also like to refer to chunks of 4 bits; the term for this is a *nibble*.

Bits may be abbreviated as "b" and bytes as "B"; for example "6GB" would mean six gigabytes (see metric prefixes below).

The term "pixel" comes from "picture element". It is a single tiny dot on a computer monitor. Color displays, generally specify an amount of red, an amount of green, and an amount of blue for each pixel, with the amount of each color expressed as a number from 0 to 255. The range from 0 to 255 is exactly what can be represented with one byte. (Again, we will learn more later about representing numbers in binary, but the 256 values we want to represent can be done with one byte, because there are 8 bits in a bit, and $256 = 2^8$.)

Based on our discussion so far, we can see that 3 bytes of storage are required to represent one pixel. So if you have, for example, a 2 megapixel camera, the pictures it takes will require 6 megabytes if stored in a naive fashion. In reality, the storage requirement is generally several times less than this, because pictures are typically stored in a format such as JPEG that does image compression. Instead of just listing the three color values for every pixel in the image, more sophisticated coding techniques are used. For example, if a corner of the image containing 100 pixels is a background of a solid color, we could just note the boundaries of that region and that all the pixels are of the same color instead of listing that color 100 times. JPEG images are actually only an approximation of the original picture, but it is generally possible to reduce the storage requirement greatly without doing anything that the human eye will notice.

3 Other terms you may see in computer ads

A limited selection is included here.

- **OS:** Operating System
- **HD:** High definition (in reference to monitors)
- **RAM:** Random-access memory. Refers to the working memory in the computer that primarlily determines the speed with which you can run complex applications manipulating a lot of data. Often, you will see specific varieties mentionend such as SDRAM (xynchronous dyanamic), DDR (double data rate), etc.
- **MHz:** Megahertz (i.e., millions of cycles per second). You may see this as a rating of how fast the memory or the central processor can operate. Usually, a higher clock rate means being able to do things more quickly, but it is not an extremely reliable indicator; it just measures the frequency of executing elementary steps, but some processors utilize less powerful elementary operations than others.
- **RPM:** Revolutions per minute. Along with the number of bytes of storage, this is the other main measure for disk drives. The RPM gives some idea of how fast information can be read/written on the disk drive. (Some drives may also make reference to a RAID level, which refers to a method of using multiple disks for increased speed and/or redundancy (backup).)
- **USB:** Universal serial bus. The most common mechanism for connecting peripherals like cameras and phones to your computer. There are different versions, e.g., 2.0, 3.0, each allowing for faster data transfers if both the computer and peripheral support it.

Some Website Evaluation Materials

Martin Luther King

We will look a bit at the four sites that turn up in the top of a Google search for "Martin Luther King". Use the links here to look at these sites (the last with a bit of inappropriate language masked):

1. http://thekingcenter.org
2. http://en.wikipedia.org/wiki/Martin_Luther_King,_Jr.
3. http://www.nobelprize.org/nobel_prizes/peace/laureates/1964/king-bio.html
4. Front page from martinlutherking.org here at mlkorg.pdf

For each of these four sites, make a note in your journal of what sort of organization or people have authored the site and what sort of goals the presentation evidences.

World Trade Organization

Both of the pages here are titled "World Trade Organization" and bear its logo:

1. http://www.gatt.org
2. http://www.wto.org

Examine these two sites, and decide which is the real World Trade Organization site. Make a note in your journal of which URL is the correct site.

Evaluation of web sites for your own research

In your desk pairs, look at two web sites you would consider as sources of information for an upcoming required report in another class or a topic one of you has recently researched. For each of them, fill out a copy of the ECS rubric (from page 40 of ECS curriculum version 4.0). Include partner names and the full URL of the web site on the top of each rubric sheet.

A more extensive rubric

If you have time, you can look at the more extensive rubric at http://www-personal.umich.edu/~pfa/pro/courses/WebEvalNew.pdf for further ideas of possible considerations in evaluating web sites, but we will not get so detailed in our work in this course.

Name_____

Communication Methods Chart

Let's consider some different ways you can communicate with others. For each of the following scenarios, fill in the table below with the method you would choose for that scenario and why. The methods are:

- Texting
- Phone call
- Talking in person
- MySpace / Facebook
- Twitter
- Email

Scenario to communicate	**Method**	**Why you chose this method**
1. Canceling an activity when it will really disappoint a friend		
2. Asking parents' permission to do something when you think they'll likely say "no"		
3. Figure out where and when to meet a friend for pizza.		
4. Plan a surprise birthday party for someone who could hear you if you spoke.		
5. Plan a surprise birthday party for someone not around you.		
6. Get help on homework.		
7. Feedback on a big decision (like what color dress for a big event, what game to buy, what phone to get)		
8. Announce you met someone famous.		
9. Mourn someone you lost.		
10. Buy something from someone you don't know well.		

Additional questions:

1. How would life be different if you could only communicate 1-on-1 instead of with multiple people at once?

2. How would life be different if you could only communicate in person?

Privacy Activity

Data are everywhere. You are 'giving off data' and providing data to others all the time. Sometimes this data can be directly linked to you as an individual; sometimes not.

Read the scenario assigned to you (some based on real stories):

A. A boss sees an employee who called in "sick" in a picture that someone posted on Facebook. In this picture, the employee is at a ball game on the day of the "sickness". The boss fires the employee.

B. A company that has contracts with the Federal Government doesn't want to hire you because a Facebook friend leaves lots of anti-government postings on your wall.

C. A teacher at a public school is fired because there's a picture of this teacher holding alcoholic drinks on her MySpace page.

D. Someone's Netflix rental history is being used as evidence in a murder case because this person rented a lot of horror movies.

E. A student is called in to the principal's office for disciplinary action, because her Facebook page shows postings in which she makes fun of another student because of the way she dresses.

Prepare a 3–5 minute presentation for the class that includes answers to the following:

1. Names of everyone in your group.
2. The scenario you were assigned.
3. In your scenario, did the people have the right to use the information they did, or should it have been private? Why?
4. Are the people who were affected by the use of this information at fault? Why?
5. Give another example of something unexpected happening because of information shared at sites such as Facebook, Twitter, MySpace, blogs.
6. Think about what data you've made available in different places/spaces such as Facebook, Twitter, texting, Netflix, email, at the grocery store, etc. What might other people think about who you are based on these data? Is it an accurate impression of who you are?
7. Consider each of the following broad categories of societal change:

   - Privacy
   - Safety
   - Globalization
   - Connectivity (keeping in touch with people)
   - Permanence of historical information

   Discuss whether availability of data has had a positive or negative impact on each aspect of society and, if negative, how these consequences can be minimized.

Group 1

Look at the picture in your handout or at
`http://rig.cs.luc.edu/~rig/ecs/hci/RoomPicture.doc` (landscape mode).

1. As a group, make a list of the objects in the picture.

Then each student should answer the following questions in your journal:

2. What does the data tell you about the person who lives in this room? What does it not tell you?

3. What are most of the items in this room related to?

4. How many toy soldiers are there?

Group 2

Consider the following items found in someone's room as per this word cloud:

1. As a group, draw a picture of the room including each of the items from the list above.

Then each student should answer the following questions in your journal:

2. What does the data tell you about the person who lives in this room? What does it not tell you?
3. What are most of the items in this room related to?
4. How many radios are there?

Group 3

Consider the following items found in someone's room:

- Lava lamp
- Books(10)
- Burger
- Cell phone
- Pringles can
- Television
- Calendar
- Glasses
- Sandwich
- Pizza
- Paintings(2)
- Person
- Sprite can

1. As a group, draw a picture of the room including each of the items from the list above.

Then each student should answer the following questions in your journal:

2. What does the data tell you about the person who lives in this room? What does it not tell you?
3. What are most of the items in this room related to?
4. How many radios are there?

Group 4

Consider the following items found in someone's room:

- Trophy
- Pizza
- Guitar
- Sandwich
- IPod with ear buds
- Radio(2)
- Toy soldiers(3)
- Person
- Shoe
- Cell phone
- Violin
- Harry Potter poster
- Ribbons(3)
- Sandwich
- Laptop
- Goldfish

1. As a group, draw a picture of the room including each of the items from the list above.

Then each student should answer the following questions in your journal:

2. What does the data tell you about the person who lives in this room? What does it not tell you?
3. What are most of the items in this room related to?
4. How many radios are there?

Group 5

Consider the following items found in someone's room:

- Books(75)
- Burger
- Globe
- Gold medal
- Goldfish
- Harry Potter poster
- Phone
- Paintings (2)
- Person
- Plaques(3)
- Posters(8)
- Ribbons(3)
- Toy soldiers(3)
- Trophy
- Violin

1. As a group, draw a picture of the room including each of the items from the list above.

Then each student should answer the following questions in your journal:

2. What does the data tell you about the person who lives in this room? What does it not tell you?
3. What are most of the items in this room related to?
4. How many radios are there?

Now compare your results with the other groups, and answer the following questions:

5. Are there any advantages to one representation or another?
6. Do you think different representations can tell different stories?
7. What do you think came first, the drawing of the room or the list?

Name_____

Communication Methods and Data Chart

Let's look at what kinds of data you 'give off' when using the different forms of communication. For each of the following examples, fill in the table below with which method you chose for the given scenario and why (you should already have completed that part) and the other information indicated. Keep in mind that "data" here is not just the content you communicate (what you say or write) but could also refer to details like the time of a telephone call and the number. The methods are: **Texting, Phone call, Talking in person, MySpace / Facebook, Twitter, Email**.

Scenario to communicate	**Method**	**What data is available?**	**Who has access to the data?**	**What can be learned from the data in aggregate?**	**Why you chose this method**
1. Canceling an activity when it will really disappoint a friend					
2. Asking parents' permission to do something when you think they'll likely say "no"					
3. Figure out where and when to meet a friend for pizza.					
4. Plan a surprise birthday party for someone who could hear you if you spoke.					
5. Plan a surprise birthday party for someone not around you.					
6. Get help on homework.					
7. Feedback on a big decision (like what color dress for a big event, what game to buy, what phone to get)					
8. Announce you met someone famous.					
9. Mourn someone you lost.					
10. Buy something from someone you don't know well.					

Additional question:

How does the type of data being exchanged affect which method you choose?

1. What is the name of Bart Simpson's baby sister?
2. What do you think of Roald Dahl?
3. Are you a computer?
4. What is the next number in the sequence 3, 6, 9, 12, 15?
5. What do you think of nuclear weapons?
6. What is 2×78?
7. What is the square root of two?
8. Add 34957 to 70764.
9. Do you like school?
10. Do you like dancing?
11. What day is it today?
12. What time is it?
13. How many days are there in February in a leap year?
14. How many days are there in a week?
15. For which country is the flag a red circle on a white background?
16. Do you like to read books?
17. What food do you like to eat?

Instructions: *Choose questions from this list to ask the hidden human and "computer".*

Turing Test answers for person pretending to be the computer

1. What is the name of Bart Simpson's baby sister?
   I can't remember.
2. What do you think of Roald Dahl?
   He writes funny books.
3. Are you a computer?
   Are *you* a computer?
4. What is the next number in the sequence 3, 6, 9, 12, 15?
   18
5. What do you think of nuclear weapons?
   Nuclear Weapons are very dangerous and should not be used.
6. What is 2×78?
   166 ***(deliberately incorrect)***
7. What is the square root of two?
   1.41421356237309504878
8. Add 34957 to 70764.
   Wait for about 20 seconds before giving the answer: **105621**
9. Do you like school?
   Yes, I like school.
10. Do you like dancing?
    Yes, I like dancing.
11. What day is today?
    Give correct day of the week.
12. What time is it?
    Give correct time.
13. How many days are there in February in a leap year?
    2000 and 2004 are leap years.
14. How many days are there in a week?
    Seven.
15. For which country is the flag a red circle on a white background?
    I don't know.
16. Do you like to read books?
    Yes, I like to read books.
17. What food do you like to eat?
    I'm not hungry, thanks.

Turing Test answers for human

1. What is the name of Bart Simpson's baby sister?
   Give your own answer.
2. What do you think of Roald Dahl?
   Give your own answer.
3. Are you a computer?
   Give your own answer.
4. What is the next number in the sequence 3, 6, 9, 12, 15?
   Give your own answer.
5. What do you think of nuclear weapons?
   Give your own answer.
6. What is 2×78?
   Give your own answer.
7. What is the square root of two?
   Give your own answer.
8. Add 34957 to 70764.
   Give your own answer.
9. Do you like school?
   Give your own answer.
10. Do you like dancing?
    Give your own answer.
11. What day is today?
    Give your own answer.
12. What time is it?
    Give your own answer.
13. How many days are there in February in a leap year?
    Give your own answer.
14. How many days are there in a week?
    Give your own answer.
15. For which country is the flag a red circle on a white background?
    Give your own answer.
16. Do you like to read books?
    Give your own answer.
17. What food do you like to eat?
    Give your own answer.

A program passes the "Turing Test" if a person can have a conversation with both it and a person and not be able to tell which one is the computer.

Working in desk pairs, try each of the following chatterbots with your three questions, chosen as follows. Use the questions from `TTQuestions.pdf` corresponding to your seat numbers (if applicable) and then supplement with whatever else you would like from the list or elsewhere.

Complete the following in your journal.

1. Try chatting with Eliza (`http://nlp-addiction.com/eliza`). Record the questions and answers in your journal. How realistic is this chatterbot? Would it pass the Turing Test?

2. Try chatting with Dr. Romulon (`http://nlp-addiction.com/chatbot/dr.romulon`). Record the questions and answers in your journal. How realistic is this chatterbot? Would it pass the Turing Test?

3. Try chatting with Athena (`athena.blueinfos.com`). Record the questions and answers in your journal. How realistic is this chatterbot? Would it pass the Turing Test?

4. Try chatting with InteliAvatar (`inteliwise.com`). Record the questions and answers in your journal. How realistic is this chatterbot? Would it pass the Turing Test?

5. Which of the above chatterbots was the most like a real person?

6. What is the Chatterbox Challenge (`chatterboxchallenge.com`)?

Following is most of an article from the New York Times of August 9, 2006. Elisions are indicated an ellipsis.

A Face Is Exposed for AOL Searcher No. 4417749

By MICHAEL BARBARO and TOM ZELLER Jr. (reporting also contributed by Saul Hansell)

Buried in a list of 20 million Web search queries collected by AOL and recently released on the Internet is user No. 4417749. The number was assigned by the company to protect the searcher's anonymity, but it was not much of a shield.

No. 4417749 conducted hundreds of searches over a three-month period on topics ranging from "numb fingers" to "60 single men" to "dog that urinates on everything".

And search by search, click by click, the identity of AOL user No. 4417749 became easier to discern. There are queries for "landscapers in Lilburn, Ga", several people with the last name Arnold and "homes sold in shadow lake subdivision gwinnett county georgia".

It did not take much investigating to follow that data trail to Thelma Arnold, a 62-year-old widow who lives in Lilburn, Ga., frequently researches her friends. medical ailments and loves her three dogs. "Those are my searches", she said, after a reporter read part of the list to her.

AOL removed the search data from its site over the weekend and apologized for its release, saying it was an unauthorized move by a team that had hoped it would benefit academic researchers.

But the detailed records of searches conducted by Ms. Arnold and 657,000 other Americans, copies of which continue to circulate online, underscore how much people unintentionally reveal about themselves when they use search engines — and how risky it can be for companies like AOL, Google and Yahoo to compile such data.

Those risks have long pitted privacy advocates against online marketers and other Internet companies seeking to profit from the Internet's unique ability to track the comings and goings of users, allowing for more focused and therefore more lucrative advertising.

But the unintended consequences of all that data being compiled, stored and cross-linked are what Marc Rotenberg, the executive director of the Electronic Privacy Information Center, a privacy rights group in Washington, called "a ticking privacy time bomb".

Mr. Rotenberg pointed to Google's own joust earlier this year with the Justice Department over a subpoena for some of its search data. The company successfully fended off the agency's demand in court, but several other search companies, including AOL, complied. The Justice Department sought the information to help it defend a challenge to a law that is meant to shield children from sexually explicit material.

"We supported Google at the time," Mr. Rotenberg said, "but we also said that it was a mistake for Google to be saving so much information because it creates a risk".

Ms. Arnold, who agreed to discuss her searches with a reporter, said she was shocked to hear that AOL had saved and published three months' worth of them. "My goodness, it's my whole personal life," she said. "I had no idea somebody was looking over my shoulder".

In the privacy of her four-bedroom home, Ms. Arnold searched for the answers to scores of lifes questions, big and small. How could she buy school supplies for Iraq children? What is the safest place to live? What is the best season to visit Italy?

Her searches are a catalog of intentions, curiosity, anxieties and quotidian questions. There was the day in May, for example, when she typed in termites, then tea for good health then mature living, all within a few hours.

Her queries mirror millions of those captured in AOLs database, which reveal the concerns of expectant mothers, cancer patients, college students and music lovers. User No. 2178 searches for foods to avoid when breast feeding. No. 3482401 seeks guidance on calorie counting. No. 3483689 searches for the songs Time After Time and Wind Beneath My Wings.

. . .

But while these searches can tell the casual observer — or the sociologist or the marketer — much about the person who typed them, they can also prove highly misleading.

At first glace [sic], it might appear that Ms. Arnold fears she is suffering from a wide range of ailments. Her search history includes "hand tremors", "nicotine effects on the body", "dry mouth" and "bipolar". But in an interview, Ms. Arnold said she routinely researched medical conditions for her friends to assuage their anxieties. Explaining her queries about nicotine, for example, she said: "I have a friend who needs to quit smoking and I want to help her do it".

Asked about Ms. Arnold, an AOL spokesman, Andrew Weinstein, reiterated the company's position that the data release was a mistake. "We apologize specifically to her", he said. "There is not a whole lot we can do".

Mr. Weinstein said he knew of no other cases thus far where users had been identified as a result of the search data, but he was not surprised. We acknowledged that there was information that could potentially lead to people being identified, which is why we were so angry.

AOL keeps a record of each users search queries for one month, Mr. Weinstein said. This allows users to refer back to previous searches and is also used by AOL to improve the quality of its search technology. The three-month data that was released came from a special system meant for AOLs internal researchers that does not record the users AOL screen names, he said.

Several bloggers claimed yesterday to have identified other AOL users by examining data, while others hunted for particularly entertaining or shocking search histories. Some programmers made this easier by setting up Web sites that let people search the database of searches.

John Battelle, the author of the 2005 book The Search: How Google and Its Rivals Rewrote the Rules of Business and Transformed Our Culture, said AOLs misstep, while unfortunate, could have a silver lining if people began to understand just what was at stake. In his book, he says search engines are mining the priceless database of intentions formed by the worlds search requests.

Its only by these kinds of screw-ups and unintended behind-the-curtain views that we can push this dialogue along, Mr. Battelle said. As unhappy as I am to see this data on people leaked, Im heartened that we will have this conversation as a culture, which is long overdue.

Ms. Arnold says she loves online research, but the disclosure of her searches has left her disillusioned. In response, she plans to drop her AOL subscription. We all have a right to privacy, she said. Nobody should have found this all out.

Following is an article from the New York Times of March 16, 2010.

How Privacy Vanishes Online

By STEVE LOHR

If a stranger came up to you on the street, would you give him your name, Social Security number and e-mail address?

Probably not.

Yet people often dole out all kinds of personal information on the Internet that allows such identifying data to be deduced. Services like Facebook, Twitter and Flickr are oceans of personal minutiae — birthday greetings sent and received, school and work gossip, photos of family vacations, and movies watched.

Computer scientists and policy experts say that such seemingly innocuous bits of self-revelation can increasingly be collected and reassembled by computers to help create a picture of a person's identity, sometimes down to the Social Security number.

"Technology has rendered the conventional definition of personally identifiable information obsolete", said Maneesha Mithal, associate director of the Federal Trade Commission's privacy division. "You can find out who an individual is without it".

In a class project at the Massachusetts Institute of Technology that received some attention last year, Carter Jernigan and Behram Mistree analyzed more than 4,000 Facebook profiles of students, including links to friends who said they were gay. The pair was able to predict, with 78 percent accuracy, whether a profile belonged to a gay male.

So far, this type of powerful data mining, which relies on sophisticated statistical correlations, is mostly in the realm of university researchers, not identity thieves and marketers.

But the F.T.C. is worried that rules to protect privacy have not kept up with technology. The agency is convening on Wednesday the third of three workshops on the issue.

Its concerns are hardly far-fetched. Last fall, Netflix awarded $1 million to a team of statisticians and computer scientists who won a three-year contest to analyze the movie rental history of 500,000 subscribers and improve the predictive accuracy of Netflix's recommendation software by at least 10 percent.

On Friday, Netflix said that it was shelving plans for a second contest — bowing to privacy concerns raised by the F.T.C. and a private litigant. In 2008, a pair of researchers at the University of Texas showed that the customer data released for that first contest, despite being stripped of names and other direct identifying information, could often be "de-anonymized" by statistically analyzing an individual's distinctive pattern of movie ratings and recommendations.

In social networks, people can increase their defenses against identification by adopting tight privacy controls on information in personal profiles. Yet an individual's actions, researchers say, are rarely enough to protect privacy in the interconnected world of the Internet.

You may not disclose personal information, but your online friends and colleagues may do it for you, referring to your school or employer, gender, location and interests. Patterns of social communication, researchers say, are revealing.

"Personal privacy is no longer an individual thing", said Harold Abelson, the computer science professor at M.I.T. "In today's online world, what your mother told you is true, only more so: people really can judge you by your friends".

Collected together, the pool of information about each individual can form a distinctive "social signature", researchers say.

The power of computers to identify people from social patterns alone was demonstrated last year in a study by the same pair of researchers that cracked Netflix's anonymous database: Vitaly Shmatikov, an associate professor of computer science at the University of Texas, and Arvind Narayanan, now a researcher at Stanford University.

By examining correlations between various online accounts, the scientists showed that they could identify more than 30 percent of the users of both Twitter, the microblogging service, and Flickr, an online photo-sharing service, even though the accounts had been stripped of identifying information like account names and e-mail addresses.

"When you link these large data sets together, a small slice of our behavior and the structure of our social networks can be identifying", Mr. Shmatikov said.

Even more unnerving to privacy advocates is the work of two researchers from Carnegie Mellon University. In a paper published last year, Alessandro Acquisti and Ralph Gross reported that they could accurately predict the full, nine-digit Social Security numbers for 8.5 percent of the people born in the United States between 1989 and 2003 — nearly five million individuals.

Social Security numbers are prized by identity thieves because they are used both as identifiers and to authenticate banking, credit card and other transactions.

The Carnegie Mellon researchers used publicly available information from many sources, including profiles on social networks, to narrow their search for two pieces of data crucial to identifying people – birthdates and city or state of birth.

That helped them figure out the first three digits of each Social Security number, which the government had assigned by location. The remaining six digits had been assigned through methods the government didn't disclose, although they were related to when the person applied for the number. The researchers used projections about those applications as well as other public data, like the Social Security numbers of dead people, and then ran repeated cycles of statistical correlation and inference to partly re-engineer the government's number-assignment system.

To be sure, the work by Mr. Acquisti and Mr. Gross suggests a potential, not actual, risk. But unpublished research by them explores how criminals could use similar techniques for large-scale identity-theft schemes.

More generally, privacy advocates worry that the new frontiers of data collection, brokering and mining, are largely unregulated. They fear "online redlining", where products and services are offered to some consumers and not others based on statistical inferences and predictions about individuals and their behavior.

The F.T.C. and Congress are weighing steps like tighter industry requirements and the creation of a "do not track" list, similar to the federal "do not call" list, to stop online monitoring.

But Jon Kleinberg, a professor of computer science at Cornell University who studies social networks, is skeptical that rules will have much impact. His advice: "When you're doing stuff online, you should behave as if you're doing it in public — because increasingly, it is".

Problem Solving — a community problem

The city of Chicago would like to get more recycling done and keep down costs of recycling and trash collection. Discuss this problem in your groups. In your journal, note your answers to the following types of questions:

1. How would you approach the problem?
2. What kind of data might you need to collect?
3. How would you collect and analyze the data?
4. What research question do you want to focus on? (You might be engaging in advocacy (making a case, for example, telling the principal about something that needs to be done at the school) or discovery (documenting a situation and using the data to learn something, for example, determining if your food choices could be improved or whether you always take an efficient route to activities).
5. Why did you choose to collect the data you've suggested for this question?
6. What can you confidently say based on this data?
7. What perspectives will be left out based on your data?

Some Problem Solving Strategies

- Draw a picture or graph.
- Solve a simpler problem.
- Make a table.
- Make an organized list.
- Look at extreme cases.
- Find a pattern.
- Work backwards.
- Write a number sentence.
- Guess and check.

Candy Bar Activity

Decide how many breaks it will take to divide a candy bar into 12 equal pieces, and put the answer in your journal.

Then discuss with your group members and write your possible revised solution plan in your journal.

We can think about the main phases of problem solving as defined by G. Polya in How to Solve It:

1. **Understand the problem:** Read or listen to the problem statement, and clarify ambiguities.
2. **Make a plan to solve the problem:** Use pictures, charts, graphs, systematic lists, objects, or act out the solution to help you devise a plan to solve the problem. In computer science, we call this plan an **algorithm**.
3. **Carry out the plan:** Once the plan is conceived and understood, follow the plan. If you have planned well, this is the easy part.
4. **Review and reflect on how the problem was solved:** Once the problem is solved, reflect on the plan that was used, the significance of the problem and solution, etc.

We will implement your plans in class and discuss. Then jot in your journals any further reflections on the solution and any real-life situations you can think of where this type of problem arises.

For extra credit, consider also a variation on the problem in which you can stack pieces of your candy bar, break them together, and count that as one break. Then how many breaks does it take to get 12 equal pieces? There may be a theoretical answer and a different answer as to what you can do in practice.

Linear and Binary Search

1. Pick a word you would like to find in the dictionary, and record what it is in your journal.

2. Go through the pages of the dictionary in order from the beginning until you find the page containing your word. After a while, you may get tired of this process, so, instead, you can just look at the page numbers and figure out how many steps it would take. Record the number of steps (pages) in your journal.

3. Now find the word using the binary search technique that will be explained in class. How many pages did you need to look at? Record the answer in your journal.

4. Repeat steps 1–3 using three other words, and record the results for each in your journal.

5. (A) Record in your journal a summary of how linear and binary search work and which one is typically better when searching in a dictionary. (B) Can you draw any connection to your experience with the Tower Building activity?

6. For binary search to work, what condition must be satisfied by the list of things in which we are searching? Note the answer in your journal.

Web Design

You will create a single web page and later a multi-page web site on a flash drive. You can also store your materials on one or more computers and perhaps eventually on a web server where it will be publicly visible. But keep track of the flash drive, which you'll eventually turn in to your teacher.

The basic steps we will go through will be on a series of handouts and will extend over several classes. The checklist of items to turn in for the 2nd term also gives a brief overview of what will need to be done, but starting with this handout, you will get more detail.

Web Design Part 1

1. Make a storyboard (a basic layout plan) for a web page including a title, headings, paragraphs, and at least two lists (for example, favorite books or favorite hobbies.

2. Make an initial web page including the content from your storyboard. If you envisioned some complicated layout features, simplify it for now. Create your web page by using Notepad (generally available in the "Accessories" folder from "All Programs" on the Start Menu of Windows computers. Make your web page look exactly like this but with your own document title and your own document content:

```
<!DOCTYPE html>
<html>
<head>
<title>Title of the document</title>
</head>

<body>
The content of the document......
</body>

</html>
```

   That is, type exactly what you see above, but change the part between `<title>` and `</title>`, and change the part between `<body>` and `</body>`. Note that the title is something that will appear in the upper bar of the browser window, not in the main part of the page; you might want to repeat this title or some version of it as the first thing in the body of your page.

   (The style used above for the DOCTYPE declaration (first line) is to fit the new HTML standard referred to as "HTML 5". Some browsers may not yet support all features of HTML 5, but this is probably the best framework for you to be thinking about, and everything else we put in our pages in this class should be basic enough to work in any browser.)

   You may notice that different "elements" in the page are enclosed by matching tags at the beginning and the end, the first *without* a slash and the second *with*. Do not use < or > except for tags. Also, sections may be contained inside one another (such as the head and the body being contained within the html, and the title within the head), but a section won't overlap another except when it is completely contained or containing.

3. Save your web page in an a file on your flash drive using the "File" pulldown menu in Notepad. **Use an appropriate name ending in ".html" and containing *no* spaces.** (I always recommend on Windows machines to uncheck the box for "Hide extensions for known file types" that you will

find in Windows Explorer by starting from "My Computer" and going to "Tools" and then "Folder Options" and then "View". This will make it easier for you to be sure of the full name of each of your files.) You may have to hit a button to "browse folders" and then go to "My Computer" and then to an entry with a label like "USB Disk (E:)".

You can now view this page in a browser. It's ok if you leave Notepad open, but you'll want to minimize it to get it out of the way while you find the file you just saved to (e.g., going from "My Computer" on the Start menu to "USB Disk (E:)). When you find the `.html` file you have saved, you can right-click on it and use "Open With" to open with a browser such as Internet Explorer, Mozilla Firefox, or Google Chrome. You should find all your content in a big mush (except the title in the upper bar of the browser), so we'll proceed to improve that.

4. Go back into your page in Notepad and add additional HTML tags that will improve the formatting. Specifically, each heading should be surrounded by tags that look like `<h1>` and `</h1>` (or `<h2>`, and `</h2>`, etc. for smaller and smaller subordinate headings). Notice how there is a tag at the beginning that does not contain a slash and then a corresponding tag at the end that does contain a slash. Next, do the same thing for each paragraph in your page but with the tags `<p>` and `</p>`. (Browsers will generally let you get away without the closing tag on paragraphs, but it is better to be in the habit of always pairing these tags.) Note that there are no numbers in the `<p>` and `</p>` tags, and you can use the same tag as many times as you want. Meanwhile, the headers get smaller and smaller as you go from `h1`, to `h2`, ..., to `h6`. But you can have as many headers as you wish that are of type `h1`, as many as you want of type `h2`, etc.

   Now open the file with your web browser again, or if your web browser is still running, just go there and refresh the page. Hopefully the page will look nicer now, but your lists will probably still look pretty ugly.

5. Experiment with adding the tags `<br />`, which creates a line break, and `<hr />`, which creates a horizontal rule (line). These tags do not come in pairs; browsers will generally allow you to omit the space and slash, but it is best form to include them. Use these tags to neaten up your lists. (There are also other tags that can be used for lists; we'll see that later.)

6. Include at least two hyperlinks in your web page. (This is the name for things that you click on in the web browser to go to another page.) Since you only have one web page of your own right now, you will need to make these hyperlinks go to other existing pages on the web. The form for a hyperlink is basically to surround the text that appears in the link with the tags `<a>` and `</a>` ("a" for "anchor"). But the opening tag will need to also include what is referred to as an atribute; specifically you must specify a value for the `href` attribute that indicates what web page to go to when the link is clicked. Thus the opening tag will look like this: `<a href="URL">` where you will need to replace "URL" with the appropriate web address (uniform resource locator). The URL is what you would type in the top of your browser to visit a chosen web page, for example something like `http://google.com`. Open your web page in your browser, and make sure the links work as desired. A full example of something you might type for a hyperlink and sourrounding text is this:

```
I love <a href="http://www.cityofchicago.org">the city of Chicago</a>, even its winters.
```

   When you do this, the text displayed in your page will be "I love the city of Chicago, even its winters.", but the words "city of Chicago" will be displayed in a special way (e.g., different color and underlined), and clicking on it will take you to the page at `http://www.cityofchicago.org`.

Web Design continued

Web Design Part 2

1. The next thing we'll include in our web pages is images (pictures). First, you'll have to find and perhaps manipulate images that you want to include; we'll use a free Adobe Photoshop Express tool for manipulations. You can grab pictures from the web (or of your own from your email for example), but there also are several sample images available in Photoshop Express, and you are encouraged to expedite your work by using those for now. If you do want to use your own image, get an image in JPEG format (file name ending in `.jpg`) onto your computer. (Another good format for images in web pages is `.gif`, but you won't be directly able to edit these in Photoshop Express.)

   To get started with photoshop express, use your web browser to go to `http://www.photoshop.com/express`, and use the "Online Tools" pulldown to go to "Photoshop Express Editor". Then upload a photo from your computer, or click on one of the samples. You can experiment with any of the Photoshop features, but don't get too carried away, and get a couple images ready for your web page, and put them on your flash drive.

   You may particularly want to use a couple things in the "Basic" palette at the left of the editor: "Crop & Rotate" and "Resize". You can crop down to a particular section of the image by clicking and dragging on the corners of the cropping selector. (Sometimes, you may also need to zoom out to see everything.) You may want to use "Resize" and then hit "Website" just above the picture to get something with an appropriate number of pixels for general website usage, or you may want to use "Custom" and change the "Height" or "Width" number to get a smaller picture, but it can be a good idea to leave the larger "Website" version, and then **you will still be able to scale to a different display size when you insert an image in your webpage**. (If the initial image is small, resizing for "Website" will do nothing.)

2. Once you have two images ready, you can insert them into your web page. Do this with content like the following, where you will have to change FILENAME, and you can put in whatever number of pixels you want for the width of the displayed image:

   ```
   <img src="FILENAME.jpg" width="300" />
   ```

   You also could use height instead of width (or you could use both, but then you may be stretching/distorting the picture).

   You can place the image at whatever location in the page where you want it to appear; you might want it inside a paragraph but probably not inside a header.

Web Design Part 3

A summary of the things we will continue with is as follows:

1. Learn about commonly used tags that generate bold and italicized text.
2. Learn about the use of styles, which can provide for things like coloring text and backgrounds, changing type styles and sizes, and adjusting positioning and alignment of parts of a page.
3. Learn about tags for tables and lists.
4. Create a multi-page web site.

In this handout, we will get through beginning styling to the point of incorporating an internal style page in your initial web page. We elaborate this via the following sequence of detailed steps:

1. Experiment with inserting the tags `<em>` and `<strong>` for "emphasis" and "strong emphasis", respectively. Each of these tags gets paired with a corresponding closing tag (`</em>` and `</strong>`). Text surrounded by `<em>` and `</em>` will appear in italics; text surrounded by `<strong>` and `</strong>` will appear bold. Remember that elements (surrounded by an opening tag without a slash and a closing tag with a slash) can be nested one inside another, but don't otherwise make them overlap. So you might have something like:
   `Here is <strong>bold, <em>italics inside</em> and back to just bold</strong>.`
   but don't do something like:
   `Don't overlap <strong>bold and <em>italics</strong> like this</em>.`
2. The technology we will use for further styling is referred to as "css", which stands for "cascading style sheets". We will not cover this in full generality, but we will use all of the three possible methods of inserting styles:
   - Inline styles
   - Internal style sheet
   - External style sheet

   We will work with the first two methods before working with tables and lists and the third afterwards.
3. Experiment with adding inline styles to a few of your elements. This is done by adding a `style` attribute to the opening tag of any element (heading, paragraph, link, etc.) that you would like, similar to the way that we included an `href` attribute in our links (tagged with `a` for "anchor"). For example, if you have a top-level heading you would like to appear in green and underlined, you can do something like

   ```
   <h1 style="color: green; text-decoration: underline;">My heading</h1>
   ```

   - Notice how the value of the `style` attribute is given with an equal-sign and quotes. Within that value, each setting ends with a semicolon, and each setting contains a specific property followed by a colon followed by a value.

  - `color` is used to change text color, and you can find available color names at `http://www.w3schools.com/tags/ref_colornames.asp` or use the color picker at `http://www.w3schools.com/tags/ref_colorpicker.asp` to get a color code comprised of a sharp-sign and six more characters.
  - `text-decoration` can provide some other properties: `blink` (doesn't work in Explorer, Chrome, or Safari browsers), `underline`, `line-through`, and `overline`.
- You could put such a style attribute in the opening tag of one of your paragraphs instead or even in the opening `body` tag to apply to the entire body of your page. You can also make a new grouping of a bunch of stuff in your page by putting a `<div>` tag at the beginning and `</div>` at the end. Then you could apply a style to this chunk of your page by inserting it in the opening `<div>` tag.
- You can set many other things in a `style` attribute. A good reference for all the choices is `http://www.w3schools.com/css` ; the things we've seen so far are under "Styling Text" in the set of links at the left. Another example there is that you could put `text-align: center;` to horizontally center the text in your lines. You might also be interested in things like "Styling Backgrounds", "Styling Fonts", and "Styling Links". Later, we will also look at things that come under "Styling Lists" and "Styling Tables".
- You could look at many more things under "CSS Box Model" and even "CSS Advanced" at `http://www.w3schools.com/css` , but don't get carried away at this point. Just come up with two or three inline styling things that you would like to incorporate into your page.

4. Once you are comfortable with the use of styles, create an internal style sheet. You do this by adding it in the `head` section of your page (between `<head>` and `</head>`); it can appear before or after the `title` part. It will begin with `<style type="text/css">` and end with `</style>`. An example is as follows:

```
<style type=''text/css''>
    body {
        background-color:  #ffcc00;
    }
    p {
        background-color: #003366;
        color:  white;
        padding:  25px;
        font: large arial;
    }
    img {
        border: 5px dotted red;
        padding:  10px;
        background-color: white;
    }
</style>
```

This example will change the background color of the entire body of the page but use a different background color for all paragraphs (since they are marked with the `p` tag). It will also make the text in paragraphs white, put 25 pixels of space on all sides around the text of each paragraph, and put the text of all paragraphs in a large arial font. Finally, it puts each image (marked with the `img` tag) on a white background and surrounds it with 10 pixels of space on each side and a dotted red border that is 5 pixels wide. Make your own internal style sheet for your web page.

Web Design Part 4

We will complete our web design unit by:

1. Creating a second web page that uses tags for tables and lists.
2. Creating an external style sheet for the second web page.
3. Creating at least a third web page and making some links between the pages so they function together as multi-page web site.

The detailed steps are as follows:

1. Create a second web page that can be related to your first web page (without losing the original page) and eventually be part of a web site of at least three pages. To create your new web page, use Notepad as before, and save the page in a new filename (again ending in `.html` and containing no spaces). Your page will have the same structure as before but with different content between the opening and closing tags for `title` and `body`. (I don't care if what you communicate is very similar to your first page as long as you use the new layout features described below.) As before, remember that the title appears in the upper bar of the browser window, and you may want to repeat it in the body if you want it to display in the main part of the page.
2. In your second web page, include at least one table. Like everything in HTML (the language of web pages), a table begins with an opening and closing tag (`<table>` and `</table>` in the most basic form). Within a table, one can place one or more rows of content; each row begins with `<tr>` (for "table row") and ends with `</tr>`. Within a row, one can place several cells of table data, each beginning with `<td>` and ending with `</td>`. One also can choose to instead surround a cell with `<th>` and `</th>`, which generally makes it appear bold and centered so as to constitute a heading for a column or row. Below is a full example of a table, which also incorporates an optional attribute into the opening `<table>` tag to display a border of one pixel around the table:

```
<table border="1">
<tr>
<th>Header 1</th>
<th>Header 2</th>
</tr>
<tr>
<td>row 1, cell 1</td>
<td>row 1, cell 2</td>
</tr>
<tr>
<td>row 2, cell 1</td>
<td>row 2, cell 2</td>
</tr>
</table>
```

   Make your own table. If you want to see more examples and variations, you can look at `http://www.w3schools.com/html/html_tables.asp` .

3. Now you should include at least two lists, but unlike the approach used in your first web page, you will use HTML markup specifically designed for lists instead of just inserting line breaks. There are two kinds of lists: unordered and orderd. An unordered list could look like this:

```
<ul>
    <li>cat food</li>
    <li>bread</li>
    <li>milk</li>
    <li>veggies</li>
    <li>paper towels</li>
</ul>
```

and would generally display with a "bullet" in front of each list item. An ordered list would be created the same way but with `<ol> </ol>` instead of `<ul> </ul>`. Note that the ordered list will display with numbers (or you can choose a different enumeration style) in front of each list item. Include at least one unordered list and at least one ordered list in your page. For extra credit, nest one list inside of another.

4. For this web page, you are to provide styling with an external style sheet (like the internal style sheet you did before, but in a separate file). Instead of using a section beginning `<style>` and ending `</style>`, you will include a line just like this in the head of the page (again before or after the entire title element):

```
<link href="style.css" rel="stylesheet" type="text/css">
```

The only thing you might change in the line above is the name of the external style sheet, `style.css`. Whatever name you use, create a file of that name in the same folder as everything else you have been working on; then put your style sheet into that file.

5. One last feature you might want in your style sheet is to use `id` and `class` attributes. Actually, it is both the `.html` file and the style sheet that you will need to modify to work with `id` and `class`. The idea of both of these things is that you can mark certain elements in your `.html` file as having a particular `id` or `class`; then the style sheet can provide styling specifications that apply just to elements that have the indicated `id` or `class`. An `id` is usually used for a single unique element, while a `class` may be applied to a number of different elements. An example of HTML using each is as follows:

```
<p id="special-par">This is a special paragraph that is going to have
a styling specification that applies just to this particular
paragraph.</p>
<p>And here is a table:
  <table>
    <tr class="odd"><td>first row</td>
    <tr class="even"><td>second row</td>
    <tr class="odd"><td>third row</td>
    <tr class="even"><td>fourth row</td>
    <tr class="odd"><td>fifth row</td>
  </table>
</p>
```

Now we can apply a special text color to the paragraph above and apply different background colors to the odd and even rows of the table by putting the following styling directives in the style sheet:

```
#special-par { color: red; }
.odd { background-color: yellow; }
.even { background-color: aqua; }
```

Note that in the style sheet, we use `#` before an `id` and `.` before a `class`.

6. The last step in the web design unit is to make at least a third web page that uses the same external style sheet as the second web page. Make some links between your pages so that they function together as a multi-page web site. You can continue to work on your web pages to make the coolest possible site; time permitting, we will look at each other's sites.

7. Totally optional is to put your web site in a publicly accessible place. If you want to do this, ask your parents for permission and search for "free web host" in a search engine or try one of the top-rated choices at `http://www.free-webhosts.com/webhosting-01.php` . Then following the instructions there to register for an account and upload to the web host.