

*CMPSCI 120 – Spring 2010 – Review for Midterm  
Professor William T. Verts*

## ***Introduction***

The midterm exam is open-book-open-notes. Anything and everything on paper is allowed, including this document. No electronics allowed, except for simple four-function calculators (no graphing calculators, no base-conversion calculators, and no cell phone calculators). Please turn off cell phone, iPods, and other electronics when you sit for the exam.

This exam is NOT multiple-choice. It is very important that you gather all relevant notes and information together before taking the exam, and index that information in a way that will allow you to find specific topics quickly. Use of Post-It tabs to index a book or a lot of papers in a notebook is highly recommended.

Here is a list of topics that we have covered so far in the course. While this represents a lot of information, I expect to have the exam concentrate on the practical aspects of Web page design. This includes use of colors and images in Web pages, tables, client-side image maps, design of sculptured buttons, frames, etc. Also, think about the issues you encountered in setting up the first Web page assignment with respect to UNIX. I will briefly cover JavaScript, Python, and CGI programming, but only in a limited fashion (expect these topics to be covered in more depth on the final exam).

Obviously, the exam won't be able to cover all of these topics, as we only have 50 minutes. The exam will contain no more than 10 questions (probably fewer). You should read through all the questions quickly before answering any of them, and then answer the easy questions first (wherever they may be found). Afterwards, go back and work on those that take longer to solve. This gives you the maximum number of points in case you run short on time.

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**Spring 2010 By Day**

- Wed, Jan 20 Introduction to class, history of Internet vs. Web  
Fri, Jan 22 Observation and search (USSR shuttle Buran & Lincoln Conspirators)
- Mon, Jan 25 Bias (observational, pareidolia, confirmation, hindsight, correlation vs causality).  
Example: Google "xxx(religion) is"
- Wed, Jan 27 URLs, IPv4, IP address exhaustion, classful/CIDR addresses  
Fri, Jan 29 Types of networks (point-to-point, star, token-ring, Ethernet)
- Mon, Feb 1 Web introduction, DNS, URLs, etc.  
Wed, Feb 3 Basic HTML (PC), tags, links, character entities, etc.  
Fri, Feb 5 Basic HTML (Mac), introduction to HTML color
- Mon, Feb 8 Color conversion algorithms, <IMG> tag  
Wed, Feb 10 CANCELLED (SNOW DAY)  
Fri, Feb 12 TWINCOLOR and MAKEBUTTONS, client-side image maps
- Tue, Feb 16 FAVICON, Icon Generator and CamWatcher demos, <OL>, <UL>, nested lists  
Wed, Feb 17 <http://www.w3schools.com>, <SUP>, <SUB>, <FONT>, &frasl;, typesetting equations, <TABLE>, deprecated tags & attributes, why CSS?  
Fri, Feb 19 Frames introduction
- Mon, Feb 22 More Frames with rollover buttons, introduction to JavaScript, with examples  
Wed, Feb 24 CANCELLED (SNOW DAY)  
Fri, Feb 26 JavaScript - in-line code (variables, computations, on-the-fly HTML generation)
- Mon, Mar 1 JavaScript - functions in header (factorial with hard-coded variables)  
Wed, Mar 3 Web forms interacting with JavaScript (factorial with input boxes)  
Fri, Mar 5 Web forms interacting with CGI server code (in Python, generating HTML response on-the-fly)
- Mon, Mar 8 Intro to servers - PuTTY/ssh to elsrv3, intro to UNIX and permissions  
Wed, Mar 10 Review of telnet, permissions, intro to emacs to create documents in-place, FTP  
Fri, Mar 12 Demo of FTP (WinSCP on the PC, ExpressPCB with embedded FTP)
- Mon, Mar 15 SPRING BREAK  
Wed, Mar 17 SPRING BREAK  
Fri, Mar 19 SPRING BREAK
- Mon, Mar 22 Intro to CSS - embedded styles, why use styles?  
Wed, Mar 24 CSS (handout) Inline vs. Embedded vs. Linked styles  
Fri, Mar 26 CSS finish - mention of pseudoclasses and boxes. Big Picture: HTML, CSS, JavaScript, CGI, Perl, Python, forms

## **Topics**

**Searching the Internet:** How do you find the appropriate source of information? What changes do controversial topics make to our information found online?

- Biased Information
  - o Confirmation Bias
  - o Hindsight Bias
  - o Pareidolia
- Psychics
- Correlation vs. Causality
- Searching
  - o How do you set up a search?
  - o How do you set up a search to reduce/increase bias?
  - o How do you decide if a Web site is biased?

**Networking:** How do networks actually work? How would you draw a graph of a network?

- Network types
  - o Simplest network – Peer-to-peer direct-connection (2 or 3 machines at most)
  - o Star network (central server, all “dumb” machines connect to center)
  - o Token Ring network (each machine has exactly two neighbors)
  - o Ethernet network
    - Hub
    - Switch
    - Router
    - Wireless Access Point
- Internet Protocol
  - o IPv4 and IPv6
  - o Why are we running out of IPv4 addresses?
  - o How can routers reduce the rate at which addresses run out?
- Classful network
  - o Class A, B, C, etc.
- Classless Inter-Domain Routing (CIDR)
- Domain Name Server (DNS)
  - o Top-level domains
  - o Country codes
- Packet Sniffer

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**Colors:** RGB (Red Green Blue)

- What is the importance of RGB?
- How are colors represented digitally?
- 8-bits for each color (256 values between 0...255)
- Difference between bit and byte, importance and relevancy to colors
- 0-9, A-F characters used for generation of each RGB color
  - #                   to develop a final color
  - Red Grn Blue
- Six characters specify the final color, two for each primary color
- Generation of a RGB cube: x-axis(red), y-axis(green) and z-axis(blue)
- How do you convert between Decimal 0...255 and Hexadecimal **00...FF**?
- What are browser safe colors and how are they important?
- What are short hex colors (CSS only)? **#FA2 = #FFAA22**

**Images:** What role do images have on the internet? What are the different formats of images and what is the benefit and disadvantage of each type?

- Image file types
  - o **.BMP** – Bitmap (Windows native, millions of colors)
  - o **.GIF** – Graphical Interchange Format (up to 256 colors)
  - o **.JPG/ .JPEG** – Joint Photographic Experts Group (millions of colors)
  - o **.PNG** – Portable Network Graphics (zillions of colors)
  - o **.TIF** – Tagged Image File Format
- Image compression
  - o No compression (. **BMP**)
  - o Lossless compression (. **GIF**, . **PNG**)
  - o Lossy compression (. **JPG**, . **PNG**)
- Options
  - o Transparency (. **GIF**, . **PNG**)
  - o Animation (. **GIF**)
- Thumbnails and Buttons
  - o How do you create thumbnails?
  - o Why are thumbnails used?
  - o How do you use thumbnails in HTML?
  - o How do you draw a 3D sculptured button?
- Copyright Infringement
- Bandwidth Theft
- Client-side image maps

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**Webpages & HTML:** What does a (properly formed) webpage look like?

- Basics
  - How are URLs formed?
    - Protocol           **http://**
    - Host               **www.cs.umass.edu/**
    - Username          **~verts/**
    - Path               **cmpsci120/**
    - Filename          **mypage.html**
  - What is http? (hypertext transport protocol)
  - What is HTML? (hypertext markup language)
  - What is hypertext?
  - Is there a difference between **.htm** and **.html** files?
  - If a filename is absent from a URL, what is the default page?
  - How should HTML be properly indented?
  - What does a “deprecated” tag mean?
  - What are the “classic” TLD (top-level-domains)?
    - **.edu**
    - **.com**
    - **.gov**
    - **.mil**
    - **.net**
    - **.org**
  - What are country codes?
    - **.us**       United States
    - **.uk**       United Kingdom (Great Britain)
    - **.jp**       Japan
    - **.fi**       Finland
    - **.de**       Germany (Deutschland!)
    - **.dk**       Denmark
    - **.ru**       Russia
    - etc.
- HTML Tags
  - Comment tag **<!-- ... -->**
  - Document tag **<HTML>...</HTML>**
  - Header tag **<HEAD>...</HEAD>**
    - Title tag **<TITLE>...</TITLE>**
    - Script tag **<SCRIPT Language="JavaScript">...</SCRIPT>**
    - Style tag **<STYLE TYPE="text/css">...</STYLE>**
  - Body tag **<BODY>...</BODY>**
    - How do you change the background color? **BGCOLOR=" \_\_\_\_ "**
    - How do you change the text color? **TEXT=" \_\_\_\_ "**
    - How do you change the link color? **LINK=" \_\_\_\_ "**
    - How do you change the visited link color? **VLINK=" \_\_\_\_ "**
    - How do you add a background image? **BACKGROUND=" \_\_\_\_ "**

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- Character Entities
  - **&lt;**; Less than <
  - **&gt;**; Greater than >
  - **&amp;**; Ampersand &
  - **&nbsp;**; Non-breaking Space
  - **&copy;** vs. **&#169;**; Copyright ©
  - etc.
- Basic Markup Tags
  - What happens with white space in the HTML document?
  - How do you make text boldface? **<B>...</B>**
  - How do you make text italic? **<I>...</I>**
  - How do you make a heading? **<H1>...</H1>** through **<H6>...</H6>**
  - How do you break a line? **<BR>**
  - How do you break a line with a horizontal line? **<HR>**
  - How do you indicate a paragraph? **<P>...</P>**
  - How do you center something? **<CENTER>...</CENTER>**
  - How do you create an ordered list? **<OL><LI><LI>...<LI></OL>**
  - How do you create an unordered list? **<UL><LI><LI>...<LI></UL>**
  - How do you create superscripts? **<SUP>...</SUP>**
  - How do you create subscripts? **<SUB>...</SUB>**
- Image tag **<IMG SRC=" \_\_\_\_ ">**
  - How do you change the width to fit appropriately? **WIDTH=" \_\_\_\_ "**
  - How do you change the height to fit appropriately? **HEIGHT=" \_\_\_\_ "**
  - How do you show text if the image can't be shown? **ALT=" \_\_\_\_ "**
  - How do you apply a mouse-over title to the image? **TITLE=" \_\_\_\_ "**
  - What is the purpose of the title?
  - What is necessary in order to create an image map?
- Anchor tags **<A HREF=" \_\_\_\_ ">...</A>**
  - How do you create a link to another web page on a different site?
  - How do you create a link to another web page on the same site?
  - How do you create a link to an image or other media file?
  - How do you make an intra-page link?
  - How can an image be used as a link?
- Font tags **<FONT>...</FONT>** (deprecated)
  - How do you change the text color? **COLOR=" \_\_\_\_ "**
  - How do you change the typeface? **FACE=" \_\_\_\_ "**
  - How do you change the point size? **SIZE=" \_\_\_\_ "**
  - Why is the **<FONT>** tag deprecated? What is wrong with it?
- Table tags **<TABLE>...</TABLE>**
  - How do you add borders to tables? **<TABLE BORDER=" \_\_\_\_ ">**
  - How do you add rows to tables? **<TR>...</TR>**
  - How do you add columns to rows? **<TD>...</TD>**
  - How do you have a cell span columns? **<TD COLSPAN=" \_\_\_\_ ">**
  - How do you have a cell span rows? **<TD ROWSPAN=" \_\_\_\_ ">**

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- Forms
  - Basic Format

```
<FORM NAME="MyForm">
  <INPUT TYPE="reset" VALUE="Reset All">
  <INPUT TYPE="submit" VALUE="Submit all Data">
  <BR><BR>
  <INPUT TYPE="text" NAME="Input1"><BR><BR>
  <INPUT TYPE="checkbox" NAME="C1" CHECKED>Check #1
  <INPUT TYPE="checkbox" NAME="C2">Check #2
  <INPUT TYPE="button" VALUE="MyLabel" OnClick="...">
  <SELECT NAME="L1">
    <OPTION>I don't know!
    <OPTION>Yes
    <OPTION>No
  </SELECT>
</FORM>
```

- Submission to a server

```
<FORM NAME="MyForm"
  METHOD="post"
  ACTION="http://.../cgi-bin/echohtml.cgi">
```

- Frames
  - What are frames and how are they used?
  - Why would we use frames?
  - What do you need to build a set of frames?
  - What is the purpose of the `COLS="200, *"` below?
  - What is the purpose of the `<NOFRAMES>...</NOFRAMES>` tag?

```
<HTML>
  <HEAD>
    <TITLE>Test of Frames</TITLE>
  </HEAD>

  <FRAMESET COLS="200, *">
    <FRAME SRC="Contents.html" NAME="TOC">
    <FRAME SRC="MainBody.html" NAME="MAIN">
  </FRAMESET>

  <NOFRAMES>
    Code for browsers which don't support frames
  </NOFRAMES>
</HTML>
```

- Styles
  - Why are styles better than “raw” HTML?
  - Types of style usage
    - Inline Styles
    - Embedded Styles
    - Linked Style Sheets

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**JavaScript:** How is JavaScript used in a website? What are its capabilities?

- What are the two uses of JavaScript in Web pages?
  - o Embedded JavaScript – generate HTML as page is rendered
  - o Interactive JavaScript – interact with buttons and forms

**CGI - Common Gateway Interface:** What are the general methods to use CGI?

- What is a CGI file? (a program, written in Perl, Python, etc.)
- Where is a CGI file stored? (on a UNIX server, often in a **cgi-bin** folder)
- What does a CGI file use as input? (data from an HTML **FORM**)
- What does a CGI file generate as output? (an HTML document, on-the-fly)

**UNIX**

- Basic Commands
  - o **ls -al**
  - o **mkdir** *folder*
  - o **chmod** *permissions filename*
  - o **cd** *folder*
  - o **cd ..**
  - o **logout**
  - o **emacs** *filename*
  - o **ftp** / **sftp**
  - o **telnet** / **ssh**
- Communicating with a UNIX system
  - o Telnet (PuTTY on a PC, ssh on a Mac)
  - o FTP (WinSCP on a PC, Fugu on a Mac)
    - Text/ASCII mode
    - Binary mode
  - o Why is encryption needed?
- Website structure
  - o Where do we put Web pages? (**public\_html**)
  - o What are the necessary folder permissions? (**rxwxr-xr-x** or **755**)
  - o What are the necessary file permissions? (**rw-r--r--** or **644**)

## **Embedded JavaScript Example**

```
<HTML>
  <HEAD>
    <TITLE>JavaScript Test</TITLE>

    <SCRIPT Language="JavaScript">
      <!--
        function Factorial (N)
        {
          var I = 1
          var F = 1

          while (I <= N)
            {
              F = F * I ;
              I = I + 1 ;
            }

          return (F) ;
        }
      -->
    </SCRIPT>
  </HEAD>

  <BODY BGCOLOR="#00FFFF">
    <SCRIPT Language="JavaScript">
      <!--
        document.writeln (Factorial(20)) ;
        document.writeln (Factorial(16)) ;
      //-->
    </SCRIPT>
  </BODY>
</HTML>
```

## **Interactive JavaScript Example**

```
<HTML>
  <HEAD>
    <TITLE>JavaScript Test</TITLE>

    <SCRIPT Language="JavaScript">
      <!--
        function Factorial (N)
        {
          var I = 1
          var F = 1

          while (I <= N)
            {
              F = F * I ;
              I = I + 1 ;
            }

          return (F) ;
        }

        function Compute ()
        {
          var N = parseFloat(document.MyForm.Input3.value)
          var F = Factorial(N)
          document.MyForm.Answer2.value = String(F)
        }
      -->
    </SCRIPT>
  </HEAD>

  <BODY BGCOLOR="#00FFFF">
    <FORM NAME="MyForm">
      <INPUT TYPE="text" NAME="Input1">
      <INPUT TYPE="text" NAME="Input2">
      <INPUT TYPE="button" VALUE="Add"
        onClick="Answer.value=String(parseFloat(Input1.value) +
          parseFloat(Input2.value))">

      <INPUT TYPE="text" NAME="Answer">
      <BR><BR>
      <INPUT TYPE="text" NAME="Input3">
      <INPUT TYPE="button" Value="!" onClick="Compute()">
      <INPUT TYPE="text" NAME="Answer2">
    </FORM>
  </BODY>
</HTML>
```

Note: the **OnClick** event for the **Add** button should all be on one line, not with the string broken across lines.

## **Form with Data Posted to Server**

```
<HTML>
  <HEAD>
    <TITLE>Test of Server Script</TITLE>
  </HEAD>

  <BODY BGCOLOR="#00FFFF">
    <FORM NAME="MyForm"
      METHOD="post"
      ACTION="http://www.cs.umass.edu/~verts/cgi-bin/echohtml.cgi">
      <INPUT TYPE="reset" VALUE="Reset All">
      <INPUT TYPE="submit" VALUE="Submit all Data">
      <BR><BR>
      <INPUT TYPE="text" NAME="Input1"><BR><BR>
      <INPUT TYPE="text" NAME="Input2"><BR><BR>
      <INPUT TYPE="text" NAME="Input3"><BR><BR>
      <INPUT TYPE="text" NAME="Input4"><BR><BR>
      <INPUT TYPE="checkbox" NAME="Check1" CHECKED>Check #1<BR><BR>
      <INPUT TYPE="checkbox" NAME="Check2">Check #2<BR><BR>
      <INPUT TYPE="checkbox" NAME="Check3">Check #3<BR><BR>

      <SELECT NAME="List1">
        <OPTION>I don't know!
        <OPTION>Yes
        <OPTION>No
      </SELECT>
    </FORM>
  </BODY>
</HTML>
```

## **Python Program *echohtml.cgi* to Respond to Submitted Form**

```
#!/usr/bin/python

import cgi
form = cgi.FieldStorage()
print "Content-type: text/html\n"
print ""
print "<HTML>"
print "  <HEAD>"
print "    <TITLE>Received Data</TITLE>"
print "  </HEAD>"
print ""
print "  <BODY>"
print "    <OL>"

for key in form.keys():
    val = form[key].value
    print "      <LI>", key, " = ", val

print "    </OL>"
print "  </BODY>"
print "</HTML>"
```

## **Example of Embedded and Inline Styles**

```
<HTML>
  <HEAD>
    <TITLE>My Spiffy Web Page</TITLE>

    <STYLE TYPE="text/css">
      H2 {color:yellow ;
        text-align:center ;
        font-family:'Arial',sans-serif}

      HR {width:18pc}

      P {color:blue ;
        font-family:'Arial Narrow',sans-serif ;
        text-align:justify
      }
    </STYLE>
  </HEAD>

  <BODY>
    <H1>Welcome!</H1>
    <HR>

    <H2>Section #1</H2>
    <P>
    This is my new Web page. I hope you like
    it a lot and come visit frequently. We
    will be changing the content over the
    next few weeks.
    </P>
    <HR>

    <H2 STYLE="{color:green}">Section #2</H2>
    <P>
    This is my new Web page. I hope you like
    it a lot and come visit frequently. We
    will be changing the content over the
    next few weeks.
    </P>
    <HR>

    <H2>Section #3</H2>
    <P>
    This is my new Web page. I hope you like
    it a lot and come visit frequently. We
    will be changing the content over the
    next few weeks.
    </P>
    <HR>

    Copyright &copy; 2010 Dr. William T. Verts
  </BODY>
</HTML>
```

## Styles

### Styles from Style Sheet (in <HEAD> section)

```
<LINK REL="stylesheet"  
      TYPE="text/css"  
      HREF="filename">
```

### Styles from Style Sheet Example

```
<LINK REL="stylesheet"  
      TYPE="text/css"  
      HREF="my_sheet.css">
```

### Embedded Styles (in <HEAD> section)

```
<STYLE TYPE="text/css">  
  selector,  
  selector,  
  selector {  
    property:value;  
    property:value;  
    property:value  
  }  
</STYLE>
```

### Embedded Styles Example

```
<STYLE TYPE="text/css">  
  H1,H2 {color:red ;  
         text-align:center}  
  HR    {width:50%}  
  P     {text-align:justify ;  
         font-family:'Arial' ;  
         font-size:16pt ;  
         color:blue}
```

### Inline Styles (in individual tags)

```
<tag STYLE="{property:value}">
```

### Inline Style Example

```
<H1 STYLE="{color:red}">
```

### Length Units

<b>em</b>	Ems, for a 16-point font: <b>1em = 16pt</b>
<b>%</b>	Percent, example: <b>100%</b>
<b>px</b>	Pixels, example: <b>500px</b>
<b>cm</b>	Centimeters, example: <b>1cm</b>
<b>in</b>	Inches, example: <b>2in</b>
<b>mm</b>	Millimeters, example: <b>25mm</b>
<b>pc</b>	Picas, <b>1pc = 0.166in</b> ( $\frac{1}{6}$ inch)
<b>pt</b>	Points, <b>72pt = 1in</b>

### Colors (Short Hex & RGB are CSS only)

<b>White</b>	Name
<b>#FFFFFF</b>	Hexadecimal
<b>#FFF</b>	Short Hex
<b>rgb (255, 255, 255)</b>	RGB Decimal
<b>rgb (100%, 100%, 100%)</b>	RGB Percent

### Color Names Guaranteed on all Browsers

<b>BLACK</b>	<b>SILVER</b>	<b>GRAY</b>	<b>WHITE</b>
<b>MAROON</b>	<b>RED</b>	<b>PURPLE</b>	<b>FUCHSIA</b>
<b>GREEN</b>	<b>LIME</b>	<b>OLIVE</b>	<b>YELLOW</b>
<b>NAVY</b>	<b>BLUE</b>	<b>TEAL</b>	<b>AQUA</b>

### Browser-Safe Color Values

Hex	Short	Percent	Decimal
00	0	0%	0
33	3	20%	51
66	6	40%	102
99	9	60%	153
CC	C	80%	205
FF	F	100%	255

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<u>Text Properties</u>	<u>Possible Values</u>
color	[color value]
text-align	left   right   center   justify
text-decoration	none   underline   overline   line-through   blink
text-indent	[length]   [percentage]
text-transform	capitalize   uppercase   lowercase   none
text-shadow	none   [color]   [length]
letter-spacing	normal   [length]
word-spacing	normal   [length]   [percentage]
vertical-align	baseline   sub   super   top   text-top   middle   bottom   text-bottom   [length]   [percentage]

<u>Font Properties</u>	<u>Possible Values</u>
font-family	[font name]   cursive   fantasy   monospace   sans-serif   serif
font-size	xx-small   x-small   small   medium   large   x-large   xx-large   larger   smaller   [length]   [percentage]
font-style	normal   italic   oblique
font-variant	normal   small-caps
font-weight	normal   bold   lighter   bolder   100   200   300   400   500   600   700   800   900
font-stretch	normal   ultra-condensed   extra-condensed   condensed   semi-condensed   semi-expanded   expanded   extra-expanded   ultra-expanded
font-size-adjust	none   [number]
line-height	normal   [number]   [length]   [percentage]

<u>Background Properties</u>	<u>Possible Values</u>
background-color	transparent   [color]
background-image	none   [url]
background-repeat	repeat   repeat-x   repeat-y   no-repeat
background-attachment	scroll   fixed
background-position	[percentage]   [length{1,2}]   [top   center   bottom]   [left   center   right]