

## CS110 Review Questions and *Solutions*

This is *not* a “practice test.” It is much longer than the test will be and covers more material. Some of the questions may be harder or more time-consuming than the test questions. Furthermore, this is not exhaustive: there may be kinds of questions on the test that are not exhibited here. Therefore, you should not study *only* by doing these questions. These questions are here for you to think about and to trigger your own thoughtful inquiry into the material.

Review your own notes, the lecture and lab notes, and the textbook reading in an inquisitive way: not only “do I understand this,” but “can I explain it,” and “can I use it,” and even “what little bits of syntax are tricky here.” Consider compiling your own summary of reference material, concepts and so forth.

Work through problems on your own without reference to the course material to test whether you actually understand it. While the test is open book and open notes, there will not be time to learn a technique or look up things on every problem and finish in 70 minutes.

### Vocabulary

1. One advantage of the GIF image format is that it allows transparency.
2. Two examples of a JavaScript function are `alert()` and `prompt()`.
3. You can access information from an object (such as the Date object) by using a method (such as `getMonth()`).
4. A hyperlink like `<a href="fred.gif">` is an example of a(n) relative URL.
5. A hyperlink like `<a href="http://www.yahoo.com/home.html">` is an example of a(n) absolute URL.

### True/False

1. false JavaScript is case-sensitive except for the names of variables
2. false HTML is case-sensitive

### Short Answer

For questions with numerical answers, show how you arrived at your answer and mark the answer clearly. For other questions, write 2–3 clear, concise, complete English sentences. Your answer will be graded 50% for correctness and 50% for quality of explanation.

1. What graphic format would be best for photographs of real-world stuff?

**answer:**

The JPEG format would probably compress best, giving a good balance of quality and small file size.

2. What decimal number does binary number 10101 represent?

**answer:** The place values are 16, 8, 4, 2, 1, so the number is 16+4+1 or 21.

3. What decimal number does hexadecimal number A9 represent?

**answer:** The digit “A” stands for 10, so this number is a 10 in the 16s place and a 9 in the one’s place, for a total value of  $10 \times 16 + 9 = 169$ .

4. Convert 75 to binary and to hexadecimal.

**answer:** In binary, we can see what places we need: the place values are 64, 32, 16, 8, 4, 2, and 1. We’ll need 64, leaving us with  $75 - 64 = 11$  to represent. So we don’t need 32 or 16, but we do need 8, leaving us with  $11 - 8 = 3$  to represent. To get 3, we need the 2 and 1. Final answer is 1001011.

In hexadecimal, we just have to ask ourselves how many 16s there are in 75. Divide 16 into 75 and we get a quotient of 4 and a remainder of 11. We can represent 11 with the digit “B.” Therefore, the answer is 4B.

5. Consider  $11_{10}$  and  $11_2$  (both decimal and binary). Which of the two is larger?

**answer:** If we convert them both to decimal, we can compare. Convert  $11_2$  to decimal and we get 3, and clearly  $11 > 3$ , so the first is larger.

6. Every computer repeats several steps continuously. What are they?

**answer:** Fetch an instruction, decode it, execute it.

7. Cars with bigger engines are faster than those with smaller engines. But smaller computers are often faster than larger computers. Why?

**answer:**

Computers generally get faster when they are *smaller*, because computers run faster if the components are closer together (this makes the wires shorter).

8. John W. Eirido has just created a computer with a keyboard that can only use capital letters. His computer can represent the 26 letters of the English language, but he has no clue on how to represent numbers. Can you help him? What base is your arithmetic system?

**answer:** The crucial observation is that we have a way to represent 26 distinct values, or, in other words, we have a set of 26 distinct symbols. Therefore, we could work in base 26, using the letters of the alphabet to stand for numbers. Alternatively, we could work in base 10, using the first ten letters of the alphabet to stand for our familiar digits. In fact, we could work in any base between 2 and 26 (inclusive).

9. You’re picking colors for a web site. Your client likes dark violet (#9400D3) and plum (#DDA0DD), and asks you to find a color that is “right in between.” What color would you offer? Show your computations.

**answer:** You can do the computations in hex or decimal. Here’s how they would go:

- Red: halfway between 94 and DD isn’t easy to do in hex, so let’s convert to decimal.  $94_{16} = 9 \times 16 + 4 = 148_{10}$  and  $DD_{16} = 13 \times 16 + 13 = 221_{10}$ . Halfway between 148 and 221 is  $(221 + 148) / 2 = 369 / 2 = 185$ . Converting  $185_{10} = 11 \times 16 + 9 = B9_{16}$ .
- Green: halfway between 0 and  $A0_{16} = 160_{10}$  is clearly 80. Converting  $80_{10} = 5 \times 16 + 0 = 50_{16}$ .
- Blue: halfway between D3 and DD is D8; there’s no need to convert to decimal.

So, the intermediate color is #B950D8

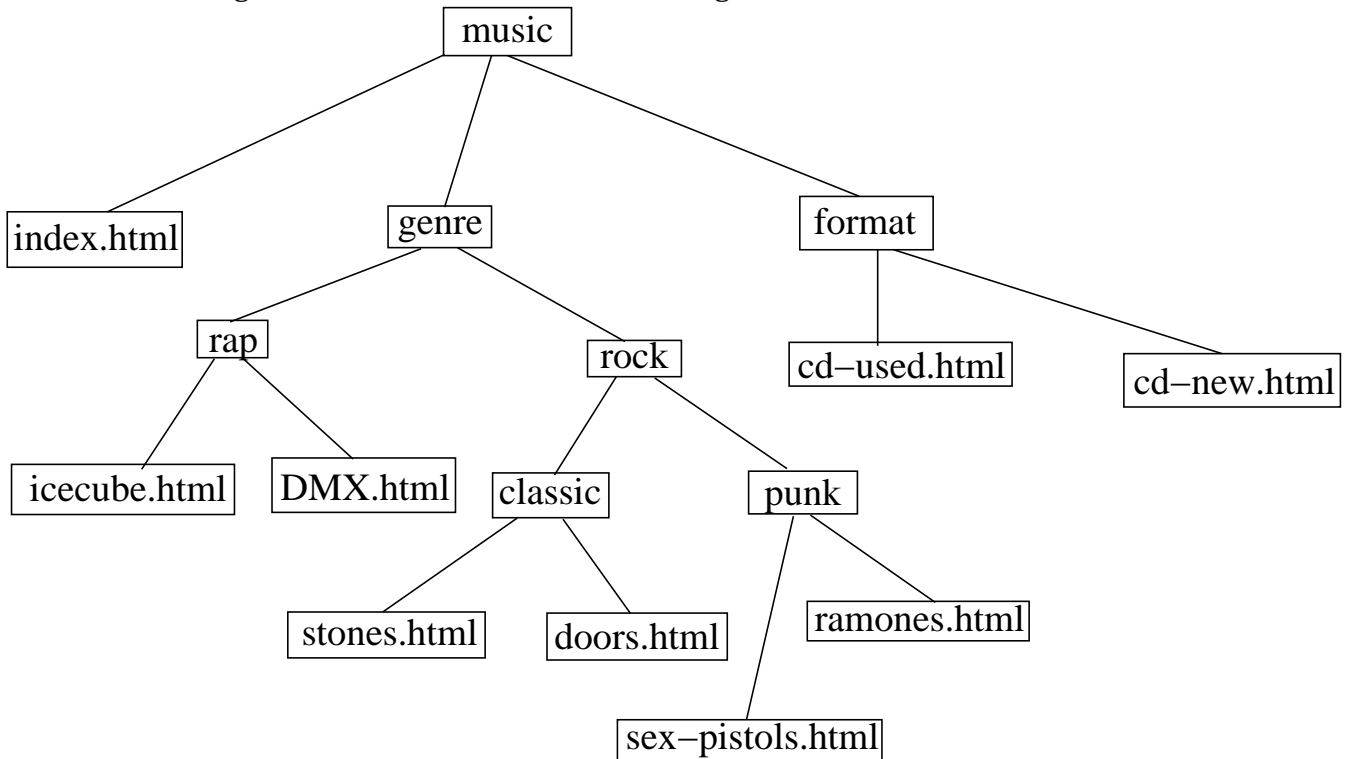
10. Which of these two colors is *lighter*: aliceblue (#F0F8FF) or cornflowerblue (#6495ED)?

**answer:** AliceBlue is lighter, since all three of its components are larger numbers.

## Relative URLs

This section tests your understanding of the syntax of relative URLs, which are incredibly useful when designing all but the smallest of web sites.

You're creating a music web site with the following folder and file structure:

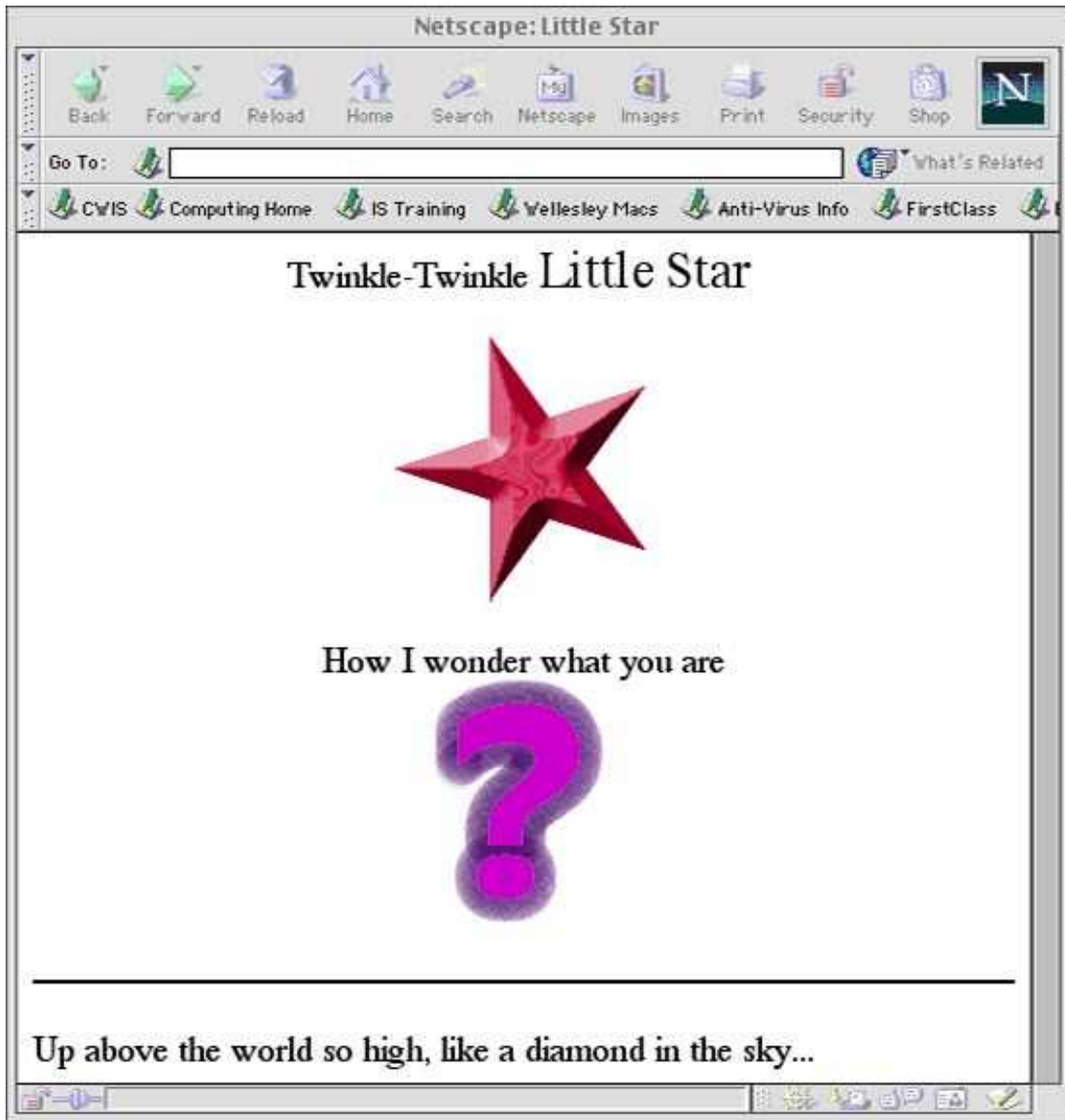


Give the relative URL for each of the following connections:

- From `cd-used.html` to `stones.html`  
`../genre/rock/classic/stones.html`
- From `icecube.html` to `ramones.html`  
`../rock/punk/ramones.html`
- From `doors.html` to `stones.html`  
`stones.html`
- From `index.html` to `DMX.html`  
`genre/rap/DMX.html`

## HTML

Write the complete HTML to produce this web page:



The image of this star comes from the following URL:

<http://puma.wellesley.edu/~cs110/lectures/M02-fireworks/star1.gif>

The image of the question mark comes from a local file, named `questionMark.gif`.

**answer:** Note that your code needn't match exactly. Capturing the ideas is what's important.

```
<html>
<head>
<title>Little Star</title>
</head>

<body style="text-align:center">
Twinkle-Twinkle <span style="font-size: xx-large">Little Star</span>
<p>

<p>How I wonder what you are<br>

<p style="border-top: medium solid #000000"> </p>
```

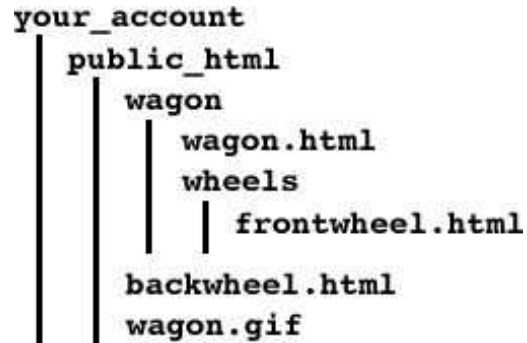
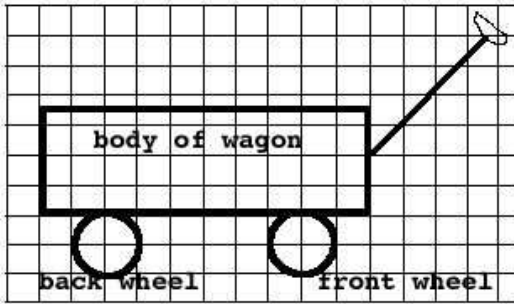
```

    <p>Up above the world so high, like a diamond in the sky...</p>
</body>
</html>

```

## Image maps

You're working on a web site that sells wagons. The image on the left below will appear in the web site:



The grid lines are not part of the image; they are only there to help you estimate coordinates. Each grid block is 10 pixels wide and 10 pixels high. For each wagon part, there is a corresponding URL with more information. Sadly, the files are not very organized, as you can see from the diagram on the right, above. The diagram gives the names of files and folders, with folder contents indented (you've seen this on many computer displays).

Assume that your code is in `wagon.html` and the image above is in `wagon.gif`. Write the HTML code that uses this image as an image map with the following properties:

1. front wheel links to `frontwheel.html`
2. backwheel links to `backwheel.html`
3. body of wagon links to `www.radioflyer.com`

You only need to write code for the image and `imagemap` — you do *not* need to write code for whole page. Hyperlinks should use relative and absolute URLs, as appropriate.

**answer:**

```

<IMG SRC="../../wagon.gif" USEMAP="#redwagon">

<map name="redwagon">
  <area alt="body of wagon"
        shape="rect" coords="10,35,110,70" href="http://www.radioflyer.com">
  <area alt="back wheel of wagon"
        shape="circle" coords="30,80,10" href="../../backwheel.html">
  <area alt="front wheel of wagon"
        shape="circle" coords="90,80,10" href="wheels/frontwheel.html">
</map>

```

## CSS

1. Suppose that you're writing a web site for an online store. In addition to its thousands of regular offerings, it occasionally has sale items, often dozens at a time. To make the sale items stand out, your boss says that they should be written in a bold font in lime green. How do you solve this problem? Briefly explain your design decisions.

**answer:** Your first decision is whether sale items are separate paragraphs (implying the use of P or DIV) or in-line text (implying the use probably of SPAN). Suppose you decide to use DIV for each item. There are clearly two classes of items, the regular items and the sale items. So, you should probably define a class of DIV. What will you name it? You should probably name it based on its *purpose*, not its look, so you might call it "sale." Thus, in the external style sheet, you code:

```
DIV.sale {
  font-weight: bold;
  color: lime;
}
```

In the web pages, you code, for example:

```
<div class="sale">
all-wool bikinis, now just \$5.99!
</div>
```

Note that this also makes it to change the look of all the sale items, when your boss decides that this looks ugly.

There are several key ideas here. One is how to code it at all (using DIV, P or SPAN) and another is the use of classes and the naming of them.

2. For a website for a newspaper, you decide to mimic the look of a newspaper and have the content of the site in columns, but just three columns each 2 inches wide. How would you do this?

**answer:**

```
DIV#left {
  position: absolute;
  left: 0in;
  width: 2in;
}
```

```
DIV#middle {
  position: absolute;
  left: 2in;
  width: 2in;
}
```

```
DIV#right {
  position: absolute;
  left: 4in;
  width: 2in;
}
```

And, in the page, do

```
<div id="left">
<p>Here is the contents of the left column, etc.
</div>
```

```
<div id="middle">
<p>This is the contents of the middle column, etc.
</div>
<div id="right">
<p>And here is the contents of the right column, etc.
</div>
```

3. It turns out that HTML has a special code to produce a bullet, namely `&bull;`. So, one could do a bullet list as follows:

```
<p>Here is a list of items:
<p style="margin-left: 3em">&bull; apples
<p style="margin-left: 3em">&bull; bananas
<p style="margin-left: 3em">&bull; dates
```

The result can be indistinguishable from conventional bullet lists. Indeed, many GUI programs for creating web sites do exactly this. What advantages or disadvantages does this have compared to conventional bullet lists?

**answer:** The given code concentrates on what the result *looks like* rather than its *structure*. This means that programs that rely on structure, such as screen readers for the blind, will not be able to convey that structure accurately. It will read this list as if it were an ordinary sequence of paragraphs, which may be less useful to the visitor. Secondly, each paragraph gets its own style, so if we decide to indent all bullet lists a little more or a little less, each bullet item must be individually updated. These are two big disadvantages. About the only advantage is that you don't have to think about abstractions like this.

## JavaScript

1. What is the result of the following code?

```
<script type="text/JavaScript">
  x = 7;
  y = 5;
  z = 14;
  x = y;
  z = z % x;
  alert(y + z);
</script>
```

**answer:**

The fourth line sets  $x$  to be 5, so the “remainder” operator on line 5 computes  $(14\%5)$ , which is 4. So, the alert is of  $(5 + 4)$ , which is 9.

2. What is the result of the following code?

```
<script type="text/JavaScript">
  a = 1;
  a = a + 1;
  b = "a is " + a;
  a = 5;
  alert(b);
</script>
```

**answer:** The third line makes `b` have the value `"a is 2"`. This is unaffected by the fourth line, so the alert says `"a is 2"`.

3. Write some JavaScript code that would ask a user for their name, and then greet them by name in the first sentence of the web page. You don't have to write the whole web page, of course, just give the beginning, so that we can see how you would solve this problem.

**answer:**

```
<html>
<body bgcolor=white>
<script type="text/JavaScript">
    name=prompt("What is your name?");
    document.write("Greetings, " + name);
</script>
and thanks for visiting our web site ...
</body>
```

4. Write some JavaScript code that asks the user for their age and then computes and displays how old they will be in the year 2058. An acceptable answer works for this year; a perfect answer works for any year before 2058.

```
<html>
  <head>

  </head>
  <body>
```

```
    </body>
</html>
```

**answer:**

At this writing, the year is 2006, so, since the year 2058 is 52 years from now, all we have to do is add 52 to their age. Well, first we have to ask their age.

```
<html>
  <head>

  </head>
  <body>
```

```

    <script type="text/JavaScript">
        age = prompt("How old are you?");
        age = parseFloat(age);
        alert("In the year 2058, you'll be " + (age + 52));
    </script>

</body>
</html>

```

That answer won't work for any year but 2006. The following code works for any year. It even works for years after 2058, though the use of the future tense is wrong.

```

<html>
  <head>

  </head>
  <body>
    <script type="text/JavaScript">
      age = prompt("How old are you?");
      age = parseFloat(age);
      today = new Date();
      this_year = today.getFullYear();
      diff = 2058 - this_year;
      alert("In the year 2058, you'll be " + (age + diff));
    </script>

  </body>
</html>

```

5. Newspaper offices and similar places often have clocks that show the time in other cities (London, Paris, Tokyo, etc.). Write a web page for use here at Wellesley that shows the time in London and San Francisco. FYI, London is 5 hours ahead of us, so if it's 7am here, it's noon there. Similarly, San Francisco is 3 hours behind us, so when it's 9pm here, it's only 6pm there.

**answer:** The key here is finding out the time from the Date object, and then adding 5 hours or subtracting 3 hours. Then you have to deal with "wrapping around," so that  $20 + 5 \Rightarrow 1$ . We can do that with the remainder operator.

For super extra credit, you might need to know that the remainder operator on a negative number doesn't make it positive. Therefore, instead of subtracting 3, we'll add 21 (since  $3 + 21 = 24$ ).

```

now_here = new Date();
hours_here = now_here.getHours();
mins = now_here.getMinutes();

document.write('The local time is '
    + mins + ' past ' + hours_here + ' <br>');
document.write('In London, it is '
    + mins + ' past ' + (hours_here + 5) % 24 + ' <br>');
document.write('In San Fran, it is '
    + mins + ' past ' + (hours_here + 21) % 24 + ' <br>');

```

6. What would your solution to the previous problem show if the page is on `puma.wellesley.edu` but is displayed on a browser running on a computer at Oxford University in England?

**answer:** The point of this question is that even though the page is hosted at Wellesley, the JavaScript code runs in the browser, so the `Date` object will reflect the time in England, not the time at Wellesley. Therefore, the page will show the local time in England, the time 5 time zones east of there (Pakistan), and 3 time zones west of there (Greenland).