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### 15-110 Spring 2019 Quiz 1

\* 25 minutes

\* No calculators, no notes, no books, no computers, no phones.

\* Show your work!

\* 100 pts total: 20 problems, 5 pts each

\* Be sure to include your andrew id and your section (-2 pts each if these are incorrect or missing).

1. Compute  $27 - 12$  using 10's Complement.
2. Compute  $27 * 12$  using Egyptian multiplication.
3. Convert the unsigned binary (base 2) value 100010 to decimal.
4. Convert the (sign-magnitude) signed binary (base 2) value 100010 to decimal.
5. What is the smallest positive decimal (base 10) integer value that will overflow when converted to 3-bit (sign-magnitude) signed binary (base 2)?

6. Decode 0000 0010 0100 0010 0011 0011 using length-prefixed ASCII and 8-bit words.  
Hint: Recall that the ASCII value of 'A' in decimal is 65, 'a' is 97, and '0' is 48.
7. In regards to the Parity Card Trick, using steps 7-10, what bits would we produce as the final result if we received these (erroneous) bits:  
1001 1110 1001 1010
8. Using the method described in the notes, which person from among 6 people (numbered 0 through 5) would win with the following coin flips:  
H-H-H-H-H-T-T-T-H-T-H-H-T-H-T  
Note that once an answer is found, all future coin flips are ignored.
9. Say we are playing K-Nim, a slightly modified version of Nim where K is a positive integer, and you can pick up 1, 2, 3, ..., up to K straws (inclusive) on your turn. If it is your turn, and N straws remain, which ONE of the following must be true to guarantee that you will eventually win (by picking up the last straw)?
- |                           |                               |
|---------------------------|-------------------------------|
| A) N is a multiple of K   | B) N is not a multiple of K   |
| C) N is a multiple of K-1 | D) N is not a multiple of K-1 |
| E) N is a multiple of K+1 | F) N is not a multiple of K+1 |
| G) N+1 is a multiple of K | H) N+1 is not a multiple of K |
10. Which of these are good reasons not to hardcode values in your Tkinter drawings?
- A) It's easier to let Python do computations for you.
  - B) It's easier to change your code.
  - C) It's easier to understand the logic in your code.
  - D) All of the above.
11. Android has a maximum file size of 4GB. Based only on this, how many bytes do you think Android uses to store the size (in bytes) of each file?

12. Fill in the blank with an unsigned binary (base 2) number to complete the joke: "I ordered a book entitled '\_\_\_\_\_ Binary Tips', but it was missing 96 of them!"
13. What is a "Grace Hopper nanosecond"?
- A) The time it takes to compile a typical computer program.
  - B) About a foot of wire, showing the distance light travels in one-billionth of a second.
  - C) The theoretically fastest possible time to perform a digital computation of any kind.
  - D) Nothing. It is a made-up term.
14. Circle ALL of the following that are real quotes from the 3 videos in the course notes about Coding and Computer Science:
- A) "As one measure of the pervasiveness of computing, the five most valuable companies in the world are Apple, Amazon, Google, Microsoft, and Facebook."
  - B) "You're good with computers, right? [ummmm] I was wondering if you could fix my printer..."
  - C) "During World War II, most of our human computers were women, and some became our first computer programmers."
  - D) "Fully nine current and former CMU faculty have won the Turing Award, which is the highest honor in Computer Science."
  - E) "If you can become a developer in 14 weeks, either companies overpay for what's really a simple job, or there is actually much more to it. And of course, there is. It's the difference between programming and Computer Science."
15. How do you find the autograder's feedback (and not just your numeric score) after you make a submission to autolab?
- A) Email your TA.
  - B) Ask on piazza.
  - C) Eat a pizza.
  - D) Click on your score.

Note: For each of the following, you can assume all the drawing code is already provided for you, including the `rgbString` function, and that the canvas is 800 wide x 600 high.

16. Fill in the blanks so this code draws a line from the lower-left corner to the upper-right corner of the canvas.

```
canvas.create_line( _____, _____, _____, _____)
```

17. In just one word, what common shape will the following code draw?

```
canvas.create_polygon(10, 10, 90, 10, 50, 50, 10, 10)
```

18. Fill in the blanks so this code draws a circle of radius 100, centered in the right half of the canvas.

```
canvas.create_oval( _____, _____, _____, _____)
```

19. Fill in the blanks so this code draws a yellow Pac Man that looks like this:



```
canvas.create_arc(100, 100, 200, 200,  
                 fill=_____, start=_____, extent=_____)
```

20. The following code includes a small bug, and so it fails with this error:

```
unknown color name "pistachio"
```

Directly edit the code to fix the bug so the code successfully draws a pistachio rectangle.

```
pistachio = rgbString(147, 197, 114)  
canvas.create_rectangle(0, 0, 20, 20, fill='pistachio')
```

21. Bonus/Optional [2 pts]: What does this print?

```
# hint: int(s, b) converts the string s into an integer in base b  
print(int('32', int('12', int('11', 2))))
```

22. Bonus/Optional [2 pts]: What 3-letter word does this appear to draw in a 400x200 canvas?

```
# hints:  
# str(n) converts the integer n into a string, so str(42) is '42'  
# Neither 'B' nor 'P' are in the answer  
# // does integer division, ignoring fractional parts, so 29//10 is 2  
n = 658173783191231123 * 891238123988991823  
n = n // (n+1)  
canvas.create_text(392, 100, text='B', font='Arial 160 bold')  
canvas.create_text(250, 125, text='P', font='Arial 250 bold')  
canvas.create_text(120, 90, text=str(n), font='Arial 160 bold')  
canvas.create_rectangle(180, 146, 300, 250, fill='white', outline='')
```