

Computer Science 2530
Spring 2020
Practice Exam 3

All questions concern the C++ programming language. **Check your answers.**

For the multiple choice questions (marked [MC]) circle the letter of the best answer, even if no answer is ideal. For the other questions, write the answer after the question in a clear and readable way.

1. [MC] If variable p has type `Widget*`, then expression $*p$ has type
 - (a) `Widget`
 - (b) `Widget*`
 - (c) `Widget**`
 - (d) `*Widget`
 - (e) `**Widget`

2. [MC] If variable x has type `Widget`, then expression $\&x$ has type
 - (a) `Widget`
 - (b) `Widget*`
 - (c) `Widget**`
 - (d) `**Widget`
 - (e) `*Widget`

3. [MC] Suppose that variable p has been created, with type `int*`. Which of the following statements makes p point to newly allocated memory in the heap?
 - (a) `int* p;`
 - (b) `new int* p;`
 - (c) `p = new int*;`
 - (d) `*p = new int;`
 - (e) `p = new int;`

4. [MC] Suppose that variable p has been made to point to newly allocated memory as in the preceding question. Which of the following statements stores 100 into that newly allocated memory?
- (a) `p = 100;`
 - (b) `new int* p = 100;`
 - (c) `*p = 100;`
 - (d) `p* = 100;`
 - (e) `p = new int*(100);`
5. Write a definition of function `allSame(A, n)`, which returns true if the first n values in array A are all the same, and returns false if they are not. If $n \leq 1$, `allSame(A, n)` must return true.

Use recursion for this problem. Do not use any kind of loop. A heading is given.

Work from a small example. Make sure that your code is correct for that example, but also generalize it to work for any array A and size $n \geq 0$.

```
bool allSame(int* A, int n)
```

6. Suppose that function `quark` is defined as follows. What is the value of `quark(8)`? (Hint: You will need to know `quark(1)`, `quark(2)`, `quark(4)` and `quark(8)`. Work those out, in that order. Show your work neatly.)

```
int quark(int n)
{
    if(n == 1)
    {
        return 2;
    }
    else
    {
        return 2*quark(n/2) + 1;
    }
}
```

`quark(8) = _____`

7. What are the values of variables a , b , c , x and y after performing the following sequence of statements? Work out the answer carefully, and show your work. Draw pointer diagrams.

In order to receive any credit for this problem, you must get at least 3 of the 5 answers correct.

```
int a,b,c;
int x = 50;
int y = 62;
int* q = &y;
int* p = &x;
int* s = p;

*p = 14;
*q = 95;
*s = 18;
p = q;
*p = 6;
q = p;
c = *q;
b = *s;
a = *p;
```

a = _____
b = _____
c = _____
x = _____
y = _____

8. Write a C++ definition of function `twice(s)` that takes a null-terminated string `s` and yields a null-terminated string that holds string `s` twice in a row. For example, `twice("fig")` must return "figfig" and `twice("rabbit")` must return "rabbitrabbit". You may use functions from the `cstring` library. A heading is given.

```
char* twice(const char* s)
```