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1 const

1. In your own words, describe what the const keyword does.
   A. const makes a variable immutable.

2. Where are two places that you should use the const keyword?
   A. When used in getters/setters. Methods that are not making any changes to variables. Pointers with static points in memory. Parameters passed to a function that don't need to be changed.

3. Which lines of code in the following code snippet will cause compiler errors.
   11 modifying attribute of a class, 23 because passed as constant, 27 passed as constant reference, and 38 because again trying to change a constant.

```
1  class Point {
2  public:
3    Point(const int x, const int y)  {
4      x_ = x;
5      y_ = y;
6    }
7
8    int get_x() const { return x_; }
9
10   int get_y() const {
11     y_++;
12     return y_;
13   }
14
15 private:
16   int x_;
17   int y_;
18 };
19
20
21
22 void CreateSquare(const int y) {
23   y = y * y;
24 }
25
26 void CreateCube(const int &y) {
27   y = y * y * y;
28 }
29
30 void CreateQuadruple(int &y) {
31   y = y * y * y * y;
32 }
33
34 int main() {
35     int a = 10;
36     const int b = 7;
37     a++;
38     b++;
39 }
```

2 Constructors

1. What is a constructor?
   A. a constructor initializes an object when created.

2. What is a destructor?
   A. A destructor cleans up the resources used in an object and removes the object.

3. Can you have multiple destructors in a class? Can a destructor be declared private?
A. A class can only have one destructor and it can't be private as the main program would not be able to be called and destruct the class.

4. Write the equivalents of the following constructors using initialization lists.

```
class Point {
public:
  // 0 parameter constructor initializes Point at the origin
  // constructor 1
  Point() {
    x_ = 0;
    y_ = 0;
  }

  // constructor 2
  Point(const int x, const int y)  {
    x_ = x;
    y_ = y;
  }

private:
  int x_;
  int y_;
};

class Library {
public:
  // constructor 3
  Library(const std::string name)  {
    name_ = name;
    std::vector<Book> tmp;
    shelf_ = tmp;
  }

private:
  std::string name_;
  std::vector<Book> shelf_;  // Book is defined elsewhere in the code for us
};
```

   A. Constructor 1 : Point() x_=0; y_ = 0 {};
   B. Constructor 2: Point(const int x, const int y) : x_(x), y_(y) {};
   C. Constructor 3: Library(const std::string name) : name_(name), shelf_() {};

5. Which of the constructors in the problem above are use in each of the following lines of code? How many instances of the class in question are created in each of these lines of code? (Or does the line of code cause an error?)

	Which constructor is called?	How many instances are created?
Point p;	Constructor 1	1
Point p2 (1, 3);	Constructor 2	1
Point p3[500];	Constructor 1	500
Point p4 (1, 2, 3);	Error	None
Point *p5 = new Point();	Constructor 1	1
Library lib;	Error	None
Library *lib2 = new Library();	Error	None
Library *lib2 = new Library(“Norlin”);	Constructor 3	1