

1 Packages Have Arrived

In the following classes, cross out the lines that will result in an error (either during compilation or execution). Next to each crossed-out line write a replacement for the line that correctly carries out the evident intent of the erroneous line.

Each replacement must be a single statement. Change as few lines as possible.

After your corrections, what is printed from running `java P2.C5?`

```
1 package P1;
2 class C1 {
3     private int a = 1;
4     protected int b = 2;
5     int c = 3;
6
7     public static int d() {
8         return 13;
9     }
10    public void setA(int v) { a = v; }
11    public void setB(int v) { b = v; }
12    public void setC(int v) { c = v; }
13    public int getA() { return a; }
14    public int getB() { return b; }
15    public int getC() { return c; }
16
17    public String toString() {
18        return a + " " + getB() + " " + getC() + " " + d();
19    }
20 }
21 -----
22
23 package P1;
24 class C2 extends C1 {
25     public C2() {}
26     public C2(int a, int b, int c) {
27         this.a = a;
28         this.b = b;
29         this.c = c;
30     }
31     public static int d() {
32         return 14;
33     }
```

Write output here:

```
34     public C1 gen() {
35         return new C3();
36     }
37 }
38 -----
39
40 package P1;
41 class C3 extends C2 {
42     private int a = 15;
43     public String toString() {
44         return a + " " + getB() + " " + getC() + " " + d();
45     }
46 }
47 -----
48
49 package P2;
50 class C4 extends C2 {
51     public int getB() {
52         return 2 * b;
53     }
54     public C4(int a, int b, int c) {
55         this.a = a;
56         this.b = b;
57         this.c = c;
58     }
59     public C4(int v) {
60         this.a = this.b = this.c = v;
61     }
62 }
63 -----
64
65 package P2;
66 class C5 {
67     public static void main(String... args) {
68         C1 x = new C1();
69         C2 y = new C4(20, 30, 40);
70         C3 z = y.gen();
71
72         System.out.println(x);
73         System.out.println((P1.C2) y);
74         System.out.println(z);
75     }
76 }
```

2 Bit Operations

In the following questions, use bit manipulation operations to achieve the intended functionality and fill out the function details -

- (a) Implement a function `isPalindrome` which checks if the binary representation of a given number is palindrome. The function returns true if and only if the binary representation of `num` is a palindrome. Assume `num` is 32 bits.

For example, the function should return true for `isPalindrome(0xDEADDAED)` since binary representation of 9 is `1001` which is a palindrome.

```

1  /**
2  * Returns true if binary representation of num is a palindrome
3  */
4  public static boolean isPalindrome(int num) {
5
6      -----
7
8      -----
9
10     -----
11
12     -----
13
14     -----
15
16     -----
17
18     -----
19 }

```

- (b) Implement a function `swap` which for a given integer, swaps two bits at given positions. The function returns the resulting integer after bit swap operation.

For example, when the function is called with inputs `swap(31, 3, 7)`, it should reverse the 3rd and 7th bits from the right and return 91 since 31 (00011111) would become 91 (01011011).

```

1  /**
2  * Function to swap bits at position a and b (from right) in integer num
3  */
4  public static int swap(int num, int a, int b) {
5      -----
6
7      -----
8
9      -----
10
11     -----
12
13     -----
14
15     -----
16
17     -----
18
19     return num;
20 }

```

3 Bits Runtime

Determine the best and worst case runtime of `tricky`.

```

1  public void tricky(int n) {
2      if (n > 0) {
3          tricky(n & (n - 1));
4      }
5  }

```

Best Case: $\Theta(\quad)$, Worst Case: $\Theta(\quad)$