CS124 Java Programming
Multiple Choice Test
April 15, 2003

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Please write your solutions on this page, by *circling* your answer. If you change your mind several times, and make it illegible, then use the box at the right to just enter the correct letter.

1	a	b	c	d	e	
2	a	b	c	d	e	
3	a	b	c	d	e	
4	a	b	c	d	e	
5	a	b	c	d	e	
6	a	b	c	d	e	
7	a	b	c	d	e	
8	a	b	c	d	e	
9	a	b	c	d	e	
10	a	b	c	d	e	
11	a	b	c	d	e	
12	a	b	c	d	e	
13	a	b	c	d	e	
14	a	b	c	d	e	
15	a	b	c	d	e	
16	a	b	c	d	e	
17	a	b	c	d	e	
18	a	b	c	d	e	
19	a	b	c	d	e	
20	a	b	c	d	e	

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1. What will the method call `mystery(1328)` return, if the method is defined as follows:

```
public int mystery(int n) {

  int m = 0;

  while (n > 0) {
    m = n%10 - m;
    n = n/10;
  }

  return m;

}
```

   (a) **(*)** -8
   (b) 14
   (c) 8
   (d) 0
   (e) -14

2. What are the values of `a` and `b` *after* the following loop?

```
int a = 0;
int b = 0;

for (a = 0; a < 10 || b < 20; a = b + 1) {
  a = a + b;
  b = b + a + 1;
}
```

   (a) `a` is 35, and `b` is 53
   (b) `a` is 18, and `b` is 17
   (c) `a` is 10, and `b` is 20
   (d) `a` is 11, and `b` is 5
   (e) **(*)** `a` is 54, and `b` is 53

3. Consider the following piece of code

```
BankAccount b1 = new BankAccount(1234,"Bill Gates");
BankAccount b2 = new BankAccount(1234,"Bill Gates");
```

What is the value of the expression `b1 == b2`, and why?

(a) `true` because the two accounts have the same account number, account name and balance.

(b) `true` because both variables are `null` until the objects are created.

(c) `false` because numerical round-off error means that the balances of the two accounts may not be exactly equal.

(d) (*) `false` because the two objects are different, even though they have identical values for their instance variables.

(e) Nothing, because it is illegal to use `==` with reference types, and this code will not compile.

4. Suppose that `a`, `b` and `c` are `boolean` variables. Which of the following expressions is `true` when *exactly two* out of the three variables are `true`, and is `false` otherwise?

(a) `(a && b) || (a && c) || (b && c)`

(b) `(a || b || c) && !(a && b && c)`

(c) `(a || !b) && (b || !c) && (c || !a)`

(d) `(!a || !b || !c) && (a || b || c)`

(e) (*) `(!a && b && c) || (a && !b && c) || (a && b && !c)`

5. Consider the following two expressions, where `x` is an `int`.

```
(3 / x > 10) && (x != 0)
(x != 0) && (3 / x > 10)
```

Which of the following is most correct about evaluating these expressions for different values of `x`?

(a) Both expressions can always be evaluated successfully.

(b) **(*)** The second expression can always be evaluated, but for some values of `x`, the first expression cannot be evaluated without causing a runtime error.

(c) The first expression can always be evaluated, but for some values of `x`, the second expression cannot be evaluated without causing a runtime error.

(d) Neither expression can *ever* be evaluated without causing a runtime error.

(e) For a given value of `x`, either both expressions can successfully be evaluated, or both will cause a runtime error.

6. What type of variable should be used to store data that is important throughout an object's lifespan?

(a) A method variable

(b) **(*)** An instance variable

(c) A primitive variable

(d) A parameter variable

(e) A reference variable

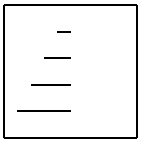
7. Suppose the following method is incorporated into a class that draws on a `Canvas` (may assume that the variable `c` refers to a blank, visible, newly-created 400×400 `Canvas`).

```
public void mystery() {
  for (int i=0; i<400; i=i+20)
    c.drawLine(0,i,i,399);
}
```

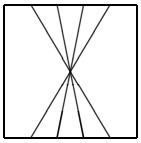
Which of the following diagrams most closely resembles the picture that this method will draw?

(a)

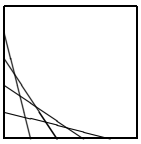
(b)



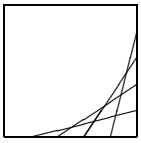
(c)



(d) **(*)**



(e)



8. What is the value of the variable `counter` after the following statements?

```
int counter = 0;

for (int x = 3; x <= 9; x = x + 2)
  counter = counter + x * x;
```

   (a) (*) 164
   (b) 280
   (c) 83
   (d) 165
   (e) 84

9. What are the values of the following three expressions respectively?

```
3.0 + 17 / 5
3 + 17.0 / 5
3 + 17 / 5.0
```

   (a) 6.4, 6.4 and 6.4
   (b) 6, 6.4 and 6.4
   (c) 6, 6 and 6
   (d) 6.0, 6.0 and 6.0
   (e) (*) 6.0, 6.4 and 6.4

10. What is the value of `method(10)`, where `method` is defined as follows?

```
public int method(int n) {

  if (n == 1 || n == 2)
    return 1;

  int last = 1;
  int current = 1;
  int next;

  for (int i=3; i<=n; i++) {
    next = current + last;
    last = current;
    current = next;
  }

  return current;

}
```

(a) 2

(b) 34

(c) (*) 55

(d) 13

(e) 89

11. Suppose that `String[] classList` is a variable referring to an array of the names of the students taking a particular unit. Which of the following expressions gives the number of students in the unit?

(a) `classList.length+1;`

(b) (*) `classList.length;`

(c) `String.length(classList);`

(d) `classList.length()+1;`

(e) `classList.length();`

12. Suppose that `c` is a 400×400 `Canvas`. What does the following method draw on the `Canvas`?

```
public void drawIt() {

  java.awt.Color col1 = new java.awt.Color(255,0,255);
  java.awt.Color col2 = new java.awt.Color(0,255,0);

  c.setForegroundColour(col1);

  for (int i=0; i<400; i++) {

    c.drawLine(i,0,i,399);

    if (i == 100)
      c.setForegroundColour(col2);

    if (i == 300)
      c.setForegroundColour(col1);

  }

}
```

(a) A thick vertical purple stripe centred on a green background.

(b) A thick horizontal yellow stripe centred on a blue background.

(c) A mostly white square with two thin vertical lines, one purple and one green.

(d) **(*)** A thick vertical green stripe centred on a purple background.

(e) A purple square with a green vertical stripe on the right-hand side.

13. Which of the following is *not* a true statement about the object-oriented style of programming and computation?

    (a) Each class provides a well-defined narrow range of services to other classes
    (b) **(*)** Objects act as a client or a server, but not both, during the running of a program
    (c) Complex behaviour is achieved through the co-operation of a number of simple objects
    (d) The classes and objects in an OO program should usually be modelled on the real-life classes and objects in the problem domain
    (e) Limiting access (for example, by use of `private`) to the data stored in an object makes it less likely for one part of the program to accidentally corrupt other parts.

14. Which of the following is a *true statement* about constructors?

    (a) A class can have only one constructor.
    (b) A constructor cannot have any parameters.
    (c) **(*)** None of the other statements about constructors are true.
    (d) A constructor can return a primitive type.
    (e) A constructor cannot call an instance method.

15. How many asterisks will be printed to the terminal window by the following piece of code?

```
for (int i=0; i<10; i++) {

  for (int j=i; j<10; j++) {
    System.out.print("*");
  }

  System.out.println("*");
}
```

    (a) **(*)** 65
    (b) 45
    (c) 66
    (d) 55
    (e) 100

The next five questions refer to the following source code, which deals with rectangles with integer co-ordinates (the co-ordinate system is that used by Java's graphics.)

```
public class Rectangle {

  // x and y store the location of the
  // top-left corner of the Rectangle.
  // width and height store the width
  // and height of the Rectangle.

  private int x;
  private int y;
  private int width;
  private int height;

  public Rectangle(int xpos, int ypos, int w, int h) {
    x = xpos;
    y = ypos;
    width = w;
    height = h;
  }

  public int area() {
    return width*height;
  }

  public Rectangle translate(int distance) {
    Rectangle r;
    r = new Rectangle(x+distance,y,width,height);
    return r;
  }

  public boolean mystery(Rectangle r) {
    boolean b;
    b = (x <= r.x) && (r.x+r.width <= x+width);
    return b && (y <= r.y) && (r.y+r.height <= y+height);
  }

}
```

16. What are the *instance variables* of the objects of this class?

    (a) **(*)** `x`, `y`, `width` and `height`
    (b) `xpos`, `ypos`, `w` and `h`
    (c) `xpos`, `ypos`, `width`, `height`, `x`, `y`, `w` and `h`
    (d) `area`, `translate` and `mystery`
    (e) `area`, `translate`, `mystery` and `Rectangle`

17. Which of the following are legal ways to construct a `Rectangle` object?

```
1. Rectangle r = new Rectangle();
2. Rectangle r = new Rectangle(50,50,100,200);
3. Rectangle r = Rectangle().new(50,50,100,200);
4. Rectangle r = new(50,50,100,200);
```

    (a) **(*)** 2 only
    (b) 1 and 2 only
    (c) 2 and 4 only
    (d) 4 only
    (e) 3 and 4 only

18. How many `Rectangle` objects have been created, in total, after the following sequence of commands?

```
Rectangle r1;
Rectangle r2;
Rectangle r3;

r1 = new Rectangle(0,0,100,100);
r2 = r1.translate(50);
r3 = r1;
```

    (a) 0
    (b) 1
    (c) **(*)** 2
    (d) 3
    (e) 4

19. If `r1` and `r2` are objects of the class `Rectangle`, then what does the method call `r1.mystery(r2)` return?

    (a) It returns `true` if and only if `r1` and `r2` overlap

    (b) It returns `true` if and only if `r1` is to the left of `r2`

    (c) **(*)** It returns `true` if and only if `r1` contains `r2`

    (d) It returns `true` if and only if `r1` is to the right of `r2`

    (e) It returns `true` if and only if `r2` contains `r1`

20. What is the value of `x` after the following lines of code?

```
Rectangle r1 = new Rectangle(100,30,100,80);
Rectangle r2 = new Rectangle(50,100,20,50);
int x = r1.area();
if (r2.area() > r1.area())
  x = r2.area();
```

    (a) 1000

    (b) 2000

    (c) 3000

    (d) 5000

    (e) **(*)** 8000