

## Final Exam – Winter 2013

1. Which modification to the following program makes it so that the display shows just a single circle at the location of the mouse. The circle should move to follow the mouse but leave no trail – just the one circle should be visible.

```
void draw() {
  // Insertion position 1
  ellipse(mouseX, mouseY, 5, 5);
  // Insertion position 2
}
```

- A. Insert `background(255);` at position 1  
 B. Insert `background(255);` at position 2  
 C. Either A or B will work  
 D. Don't insert anything. The code is fine as is
2. Which answer best describes the behavior of this Processing sketch?

```
int xPos, yPos;

void setup() {
  size(400,400);
  yPos = 0;
  xPos = 0;
}

void draw() {
  background(255);
  ellipse(xPos, yPos, 5, 5);

  yPos = yPos + 1;
  xPos = xPos + (1-yPos/(height/2));
}
```

- A. A ball moves from the upper left corner, diagonally to the lower right corner.  
 B. A ball moves from the upper left corner, diagonally to the center, then stops and stays in the center.  
 C. A ball moves from the upper left corner, diagonally to the center, then straight down to the bottom.  
 D. A ball moves from the upper left corner, diagonally to the center, then diagonally to the lower left.  
 E. A ball moves from the upper left corner, straight down the left side until half-way down then diagonally to the middle of the bottom.

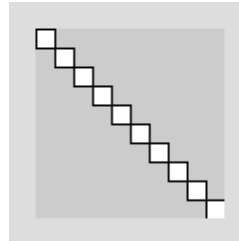
3. What is the value in Java of the expression `17%5`?  
 A. 0      B. 1      C. 2      D. 3      E. 7

4. What is the value in Java of the expression `17/5`?  
 A. 3      B. 3.4      C. 4

5. Add the missing line to the code below so it produces the image shown.

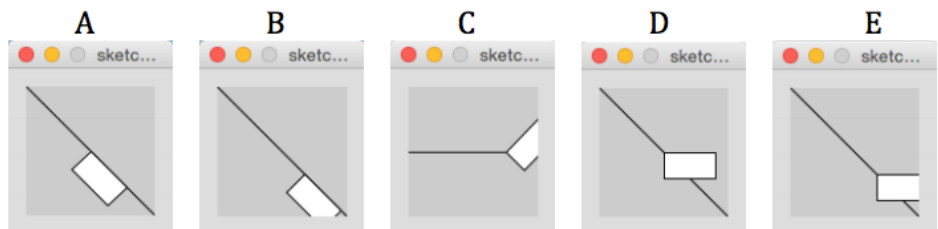
```
int pos = 0;
void draw() {
  rect(pos, pos, 10, 10);
```

- \_\_\_\_\_
- A. `translate(10,10);`  
 B. `pos = pos + 10;`  
 C. `either A or B`  
 D. `neither A nor B`



6. Which image is drawn by the following program?

```
translate(50, 50);
rotate(radians(45));
line(-100, 0, 100, 0);
translate(25, 0);
rect(0, 0, 40, 20);
```



7. What is printed during the drawing of the second frame of this program?

```
int box1Size = 200;
int box2Size = box1Size/2;
int box3Size = box1Size/4;
void draw() {
    println(box1Size);
    println(box2Size);
    println(box3Size);
    // some code might go here to do the actual drawing
    box1Size = box1Size - 1;
}
```

A.	B.	C.	D.
200	199	199	199
100	100	99.5	99
50	50	49.75	49

8. Which answer applies to this program?

```
int counter = 0;
void draw() {
    background(255);
    int xPos = width - counter*width;
    fill(255,0,0);
    ellipse(xPos, 25, 5, 5);
    fill(0,255,0);
    ellipse((2*counter)%width, 75, 5, 5);
    counter = counter + 1;
}
```

- A. The red circle is moving faster than the green circle.
- B. The red one is moving right to left and the green one left to right.
- C. Both A and B.
- D. Neither of A nor B

9. What goes in the blank so the display is black when the mouse is left of the center and white when it is to the right of the center?

```
void draw() {
    background(255);
    if ( _____ ) {
        background(0);
    }
}
```

- A. mouseX < 50
- B. mouseX > 50
- C. mouseX != 50

10. How many rectangles are drawn?

```
int yPos = 0;
while (yPos != 50) {
    rect(yPos, yPos, 20, 40);
    yPos = yPos + 10;
}
```

- A. 0
- B. 4
- C. 5
- D. 50
- E. more than 50

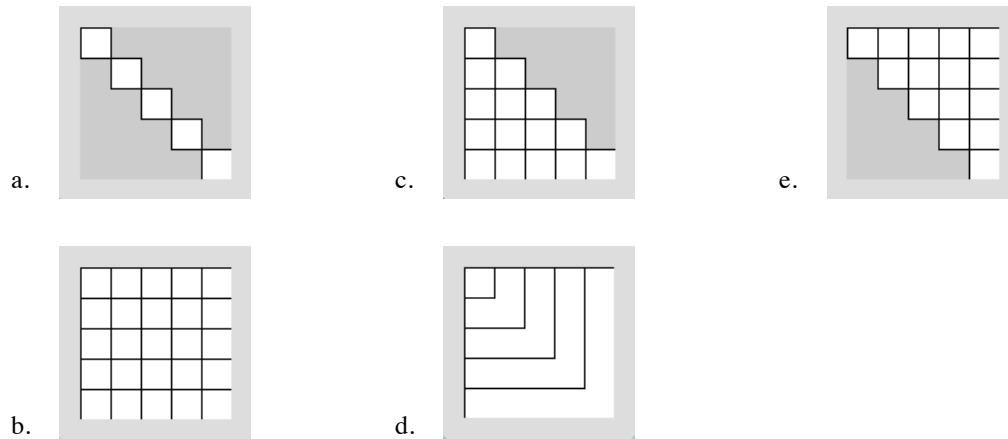
11. How many points are drawn by the following program?      A. 0    B. 2    C. 15    D. 40    E. more than 40

```
for (int i = 1; i <= 40; i = i + 1) {
    if (i % 15 == 0)
        point(i, i);
}
```

12. Which of the following is NOT specified for the formal parameters in a function (or method) **definition**?

- A. type
- B. name
- C. value
- D. position in the parameter list

The next set of four problems is an extended “matching” problem. Each problem shows a Processing sketch. Enter the letter that corresponds to the output. The possible choices are not all used and some *may* be used more than once.



13. Select the best choice from the list of choices A-E above for what this program displays.
 

```
for (int row = 0; row < height; row = row + 20) {
  rect(row, row, 20, 20);
}
```
14. Select the best choice from the list of choices A-E above for what this program displays.
 

```
for (int y = 0; y < height; y = y + 20) {
  for(int x = y; x < width; x = x + 20) {
    rect(x, y, 20, 20);
  }
}
```
15. Select the best choice from the list of choices A-E above for what this program displays.
 

```
for (int x = 0; x < height; x = x + 20) {
  for(int y = 0; y <= x; y = y + 20) {
    rect(x, y, 20, 20);
  }
}
```
16. Select the best choice from the list of choices A-E above for what this program displays.
 

```
for (int row = 0; row < height; row = row + 20) {
  rect(0, 0, width-row, height-row);
}
```
17. What expression can you put in the blank so this program shows a circle falling from the top center to the middle and then stopping when it reaches the center of the display staying there for 50 frames and then moving back up and off of the screen?

```
int bally = 0;
void draw() {
  background(120);
  bally = bally + _____;
  ellipse(width/2, bally, 20, 20);
}
```

- A. `frameCount/(height/2)`
- B. `frameCount%(height/2)`
- C. `(1-(frameCount/(height/2)))`
- D. `(1-(bally/(height/2)))`
- E. `bally/(height/2)`

18. Which choice below will cause all of the values stored in the array data to be printed out in reverse order?

```
int[] data = {22, 17, 95, 16, 103, -14, 95};
```

```
// Choice A
for (int i = data.length-1; i >= 0; i--) {
    print(data[i] + " ");
}
```

```
// Choice B
for (int i = 0; i < data.length; i++) {
    print(data[data.length-1-i] + " ");
}
```

- C. Both A and B will print all of the elements in reverse order.
- D. Neither A nor B will print all of the elements in reverse order

19. How many rectangles are drawn by the following Processing sketch?

```
int i = 0;
if (i < 100) {
    rect(i, i, 10, 10);
    i = i + 10;
}
```

- A. 0
- B. 1
- C. 10
- D. 100
- E. more than 100

20. How many times does this program print "test"?

```
int constrainIt(int val, int min, int max) {
    if (val < min)
        return min;
    else if (val > max)
        return max;
    println("test");
    return val;
}

void setup() {
    println(constrainIt(10, 20, 30));
    println(constrainIt(40, 20, 30));
}
```

- A. 0
- B. 1
- C. 2

21. Given the array declaration `int[] scores = new int[70];` fill in the blank so the print statement prints what is stored in the last element of the array: `println(_____);`?

- A. scores[69]
- B. scores[70]
- C. scores.length
- D. scores.last
- E. last(scores)

22. What is the second line printed by this program?

- A. a is now 123
- B. a is now 456
- C. a here is 456
- D. It doesn't print anything. There is a syntax error involving the variable a.

```
int a = 123;
void draw() {
    println("a is now " + a);
}
void setup() {
    int a = 456;
    println("a here is " + a);
}
```

23. What does the following program print?

```
void setup() {
  int x = 10;
  timesTwo(x);
  println(x);
}
```

```
void timesTwo(int x) {
  x = x * 2;
  println(x);
}
```

- A. 10,20
- B. 20,10
- C. 20,20

24. What does the following program print?

```
int x = 10;
void setup() {
  timesTwo();
  println(x);
}
```

```
void timesTwo() {
  x = x * 2;
  println(x);
}
```

- A. 10,20
- B. 20,10
- C. 20,20

25. Fill in the blank so that this function returns true if the circle at  $x_1, y_1$  with radius  $r_1$ , has collided with the circle at  $x_2, y_2$ , with radius  $r_2$ .

```
boolean collided(int x1, int y1, int r1, int x2, int y2, int r2) {
```

```
  return _____;
```

```
}
```

- A. `dist(x1, y1, x2, y2) <= r1+r2`
- B. `abs(x1-x2) >= r1+r2 && abs(y1-y2) <= r1+r2`
- C. A and B will both work
- D. Neither A nor B work but one would be correct if the `<=` was `>=`
- E. Neither A nor B work but both would be correct if the `<=` was `>=`

26. What is the last number printed by the program to the right?

- A. 4
- B. 12
- C. 14
- D. 16
- E. 18

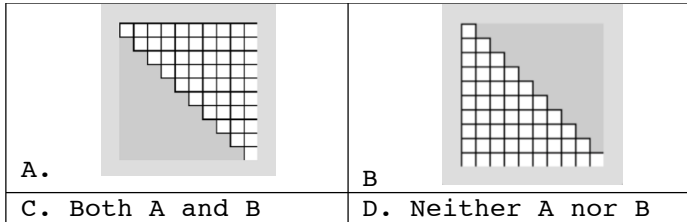
```
void setup() {
  f2(f3(4));
}
void f1(int x){
  println("f1 " + x);
}
void f2(int x){
  println("x is " + x);
  f1(x+2);
}
int f3(int x){
  println("f3 " + x);
  return x+10;
}
```

27. What expression can you put in the blank so this program shows a circle falling from the top center to the middle and then moving diagonally towards the lower right corner?

```
int ballX=50, ballY=0;
void draw() {
  background(120);
  ballX = ballX + _____;
  ballY++;
  ellipse(ballX, ballY, 20, 20);
}
```

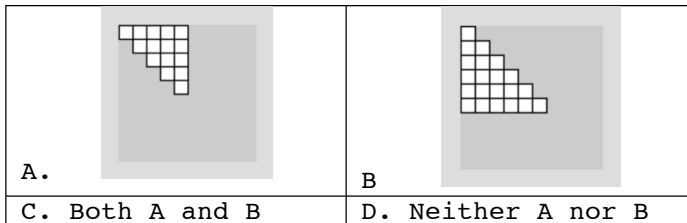
- A. frameCount%50
- B. (1-(ballY/50))
- C. (1-(frameCount/100))
- D. ballY/50
- E. ballX/50

28. Which of the images below could be produced by the code at the right?



```
void setup() {
  frameRate(10);
}
int maxXY=0;
void draw() {
  background(255);
  if (maxXY > width) maxXY = 0;
  for(int y=0; y<maxXY; y=y+10) {
    for(int x=0; x<=y; x=x+10) {
      rect(x, y, 10, 10);
    }
  }
  maxXY = maxXY + 10;
}
```

29. Which of the images below could be produced by the code at the right?



30. What expression goes in the blank so this program draws a red ball when the mouse is pressed and a black ball otherwise?

- A. mousePressed == true
- B. mousePressed
- C. both A and B work
- D. !mousePressed
- E. mousePressed == false

```
void draw() {
  background(255);
  drawBall(mouseX, mouseY, _____);
}

void drawBall(int x, int y, boolean red) {
  if (red) {
    fill(255,0,0);
  }
  else {
    fill(0);
  }
  ellipse(x, y, 40, 40);
}
```

31. What does the following program print?

```
int count = 0;
int[] data = {10,0,-15,0,12,-7,0,14};
for (int i = 0; i < data.length; i++) {
  if (data[i] <= 0) count++;
}
println(count);
```

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

32. What is the first value printed by the program to the right?

- A. -1 B. 1 C. 2 D. 8 E. 10

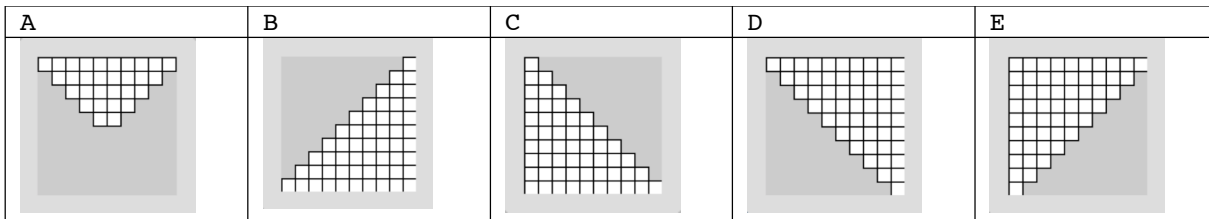
33. What is the second value printed by the program to the right?

- A. -1 B. 0 C. 5 D. 7 E. 10

```
void setup() {
  int[] data = {
    7, 10, 3, 10, 6, 7, 15, 10, 10
  };
  System.out.println(func1(10, data));
  System.out.println(func1(7, data));
}
// look close – this is not quite the
// same function as before
int func1(int x, int[] data) {
  for(int i = data.length-1; i >= 0; i--)
    if (data[i] == x)
      return i;
  return -1;
}
```

34. Which image is the result of the following program?

```
void setup() {
  for(int y=0; y<100; y=y+10) {
    for(int x=width-y-10; x<100; x=x+10){
      rect(x, y, 10, 10);
    }
  }
}
```



35. What does the following program print?

```
int[] data = {10,20,30,40,50};

for (int i = data.length-2; i >= 0; i--) {
  data[i+1] = data[i];
}
for (int i = 0; i < data.length; i++) {
  print(data[i] + " ");
}
```

- A. 10 20 30 40 50  
 B. 50 40 30 20 10  
 C. 10 10 20 30 40  
 D. 20 30 40 50 50  
 E. 10 20 20 30 40

36. True or false, the output of these two code fragments is always the same? That is, for a given pair of values for x and y, these fragments will both print A or both print nothing.

```
if (x < 20 && y < 30) {
  println("A");
}
```

```
if (x < 20) {
  if (y < 30) {
    println("A");
  }
}
```

37. True or false, the output of these two code fragments is always the same? That is, for a given pair of values for x and y, these fragments will both print 100 or both print 0.

```
int z = 0;
if (x < 20 || y < 30) {
    z = 100;
}
println(z);
```

```
int z = 0;
if (x < 20) {
    z = 100;
}
if (y < 30) {
    z = 100;
}
println(z);
```

The remaining questions are all about the following program

```
// Create a class to represent a light bulb that can be
// positioned, sized, given a color, and turned on and off as indicated
// by the following usage of that class.
Light light1, light2, light3, light4;

void setup() {
    size(400,400);
    light1 = new Light(25, 25);
    light2 = new Light(width-30, height-60, false); // set initially off
    light3 = new Light(width/2, height/2, 50); // specify the size
    light4 = new Light(30, height/2, 75, color(255, 0, 0)); //set size and color
    light4.turnOff();
}

void draw() {
    light1.show();
    light2.show();
    light3.show();
    light4.show();
}

void mousePressed() {
    if (light1.clicked()) {
        light1.toggle();
    }
    if (light2.clicked()) {
        light2.toggle();
    }
    if (light3.clicked()) {
        light3.toggle();
    }
    if (light4.clicked()) {
        light4.toggle();
    }
}
```

38. How many methods NOT counting constructors must the Light class have for the program above?  
A. 1      B. 3      C. 4      D. 5      E. 6
39. How many constructors must the Light class have for the program above?  
A. 0      B. 1      C. 2      D. 3      E. 4
40. How many instance variables must the light class have?  
A. 2      B. 3      C. 4      D. 5      E. 6