

Name Key A

Mark your answers on a red scantron. Make sure to bubble in your name and student id # on the scantron. Turn in both this sheet with your name filled in, and the completed scantron. CAUTION: Many problems are very similar to problems you have seen before but have been changed in small but significant ways.

1. Which of these draws a line from the center to the lower right corner of the 100x100 default display?

- A. line(0, 0, 50, 50);
- B. line(0, 0, 50, -50);
- C. line(50, 50, 100, 100);
- D. line(50, 50, 100, 0);

2. Which of these draws a rectangle with its upper left corner at (10,50) and its lower right corner at (90,90) using the default settings?

- A. rect(10, 90, 90, 50);
- B. rect(10, 90, 50, 90);
- C. rect(50, 70, 80, 40);
- D. rect(10, 50, 90, 90);
- E. rect(10, 50, 80, 40);

3. Which of the following draws a small black circle in the middle of a large white square?

<p>A</p> <pre>rectMode(CENTER); ellipseMode(CENTER); fill(0); rect(50, 50, 50, 50); fill(255); ellipse(50, 50, 9, 9);</pre>	<p>B</p> <pre>rectMode(CENTER); ellipseMode(CENTER); fill(255); ellipse(50, 50, 9, 9); fill(0); rect(50, 50, 50, 50);</pre>	<p><input checked="" type="radio"/> C</p> <pre>rectMode(CENTER); ellipseMode(CENTER); fill(255); rect(50, 50, 50, 50); fill(0); ellipse(50, 50, 9, 9);</pre>	<p>D</p> <pre>rectMode(CENTER); ellipseMode(CENTER); fill(0); ellipse(50, 50, 9, 9); fill(255); rect(50, 50, 50, 50);</pre>
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4. True or false, names in Processing are case sensitive, so ellipse(1, 2, 3, 4) is not the same as Ellipse(1, 2, 3, 4).

5. 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.

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

- A. a is now 123
- B. a is now 456
- C. a here is 123
- D. a here is 456
- E. 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() {
  a = 456;
  println("a here is " + a);
}
```

7. 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");
  }
}
```

8. 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. Assume x and y have been declared and assigned values earlier.

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

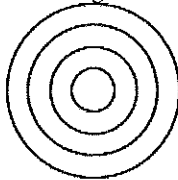
```
int z = 0;
if (x < 20) {
    z = 100;
}
if (y < 30) {
    z = 100;
}
println(z);
```

9. True or false, these two programs produce the same image?

```
size(250,250);
noFill();
translate(50, 50);
ellipse(0, 0, 10, 10);
translate(50, 50);
ellipse(0, 0, 20, 20);
translate(50, 50);
ellipse(0, 0, 30, 30);
translate(50, 50);
ellipse(0, 0, 40, 40);
```

```
size(250,250);
noFill();
ellipse(50, 50, 10, 10);
ellipse(100, 100, 20, 20);
ellipse(150, 150, 30, 30);
ellipse(200, 200, 40, 40);
```

10. Which of these programs would produce this image? Mark ALL that apply.



<p>A</p> <pre>background(255); noFill(); ellipse(50, 50, 25, 25); ellipse(50, 50, 50, 50); ellipse(50, 50, 75, 75); ellipse(50, 50, 100, 100);</pre>	<p>B</p> <pre>background(255); fill(255); ellipse(50, 50, 25, 25); ellipse(50, 50, 50, 50); ellipse(50, 50, 75, 75); ellipse(50, 50, 100, 100);</pre>
<p>C</p> <pre>background(255); noFill(); ellipse(50, 50, 100, 100); ellipse(50, 50, 75, 75); ellipse(50, 50, 50, 50); ellipse(50, 50, 25, 25);</pre>	<p>D</p> <pre>background(255); fill(255); ellipse(50, 50, 100, 100); ellipse(50, 50, 75, 75); ellipse(50, 50, 50, 50); ellipse(50, 50, 25, 25);</pre>

E. None of the above.

11. True or false, all translations and rotations are reset back to the original position and orientation at the start of each pass through the draw() method?

12. Which answer best describes the behavior of this Processing sketch?

```
int xPos, yPos;

void setup() {
  size(400,400);
  yPos = height/2;
  xPos = 0;
}

void draw() {
  background(255);
  ellipse(xPos, yPos, 5, 5);
  yPos = yPos - frameCount/200;
  xPos = xPos + 1;
}
```

- A. A ball moves from the middle left to the center of the display and then moves diagonally to the upper right corner.
- B. A ball moves from the middle left to the center of the display and then moves diagonally to the lower right corner.
- C. A ball moves from the middle left horizontally all of the way across the screen.
- D. A ball moves from the middle left in a straight line to the center then stops briefly before moving back to the left and off of the screen.
- E. A ball moves from the middle left in a straight line to the lower right corner.

13. Which answer best describes the behavior of this Processing sketch?

```
int dia = 100;
void draw() {
  frameRate(1);
  noFill();
  ellipse(width/2, height/2, dia, dia);
  dia = dia - 10;
}
```

- A. A set of concentric circles appears, from the outside (large to small), eventually filling in to form a target like picture.
- B. A set of concentric circles appears, like a target, that grows until it fills the display.
- C. A single small circle appears in the center and just stays.
- D. A single small circle appears and then grows, always showing just a single circle until it is too large and then you see nothing.

14. What is the value in Java of the expression 37%4?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 9

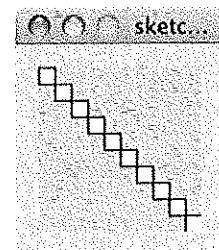
15. What is the value in Java of the expression 37/4?

- A. 9
- B. 9.25
- C. 10

16. Which of the programs below would produce the image to the right? Mark ALL that apply.

<pre>// A int pos = 0; void draw() { translate(10,10); rect(pos, pos, 10, 10); } }</pre>	<pre>// B int pos = 0; void draw() { rect(pos, pos, 10, 10); translate(10,10); } }</pre>
<pre>// C int pos = 0; void draw() { translate(pos, pos); rect(0, 0, 10, 10); pos = pos + 10; } }</pre>	<pre>// D int pos = 0; void draw() { rect(pos, pos, 10, 10); pos = pos + 10; } }</pre>

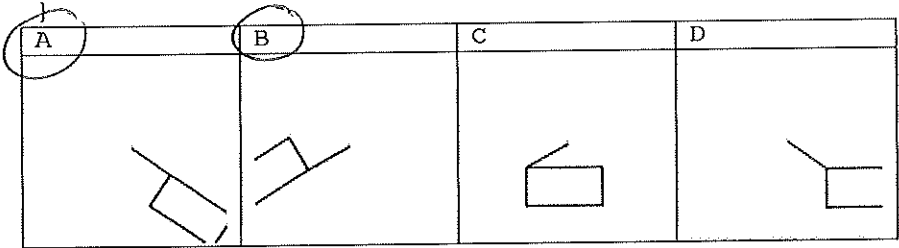
E. None of A-D



17. Which of these images could be produced by this program? Check ALL that apply.

```
float angle=0;
void draw() {
  background(255);
  translate(50, 50);
  rotate(angle);
  line(0,0,25,0);
  translate(25, 0);
  rect(0,0,40,20);
  angle = angle + .1;
```

Hint: All images shown were drawn with programs that include calls to `line(0,0,25,0);` and `rect(0,0,40,20);`.



E. None of A-D

18. What is printed at the start of the second frame of this program?

```
int lengthOfCar = 200;
int carBodyHeight = lengthOfCar/4;
int wheelDiameter = lengthOfCar/4;
void draw() {
  println(lengthOfCar);
  println(carBodyHeight);
  println(wheelDiameter);
  // some code might go here to do the actual drawing
  lengthOfCar = lengthOfCar - 1; // make the car shrink
}
```

A.	B.	C.	D.
200	199	199	199
50	50	49.75	49
50	50	49.75	49

19. Which of the descriptions is true for this program? Check ALL that apply.

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

- A. The green circle is moving faster than the red circle.
- B. The green one is moving on the diagonal, upper left to lower right.
- C. The green one is moving on the diagonal lower right to upper left.
- D. The red one is moving on the diagonal, upper right to lower left.
- E. The red one is moving on the diagonal, lower right to upper left.

20. What goes in the blank so the display is black when the mouse is left of 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`

21. Which static Processing sketch/program below reproduces the image to the right. It is the default 100x100 and does not change. The small square in the upper left corner is 10x10. Check ALL that apply.

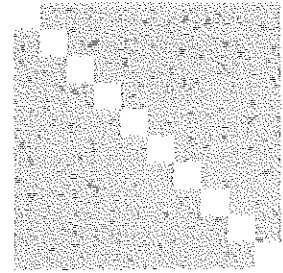
```
noStroke(); // choice A
for(int i = 0; i < 10; i++) {
  rect(i,i,10,10);
}

noStroke(); // choice B
for(int i = 0; i < width; i=i+10) {
  rect(i,i,10,10);
}

noStroke(); // choice C
int i = 0;
while(i < width) {
  rect(i,i,10,10);
  i = i + 10;
}

noStroke(); // choice D
for(int i = 0; i < 10; i++) {
  rect(i*10,i*10,10,10);
}

noStroke(); // choice E
for(int i = 9; i >=0; i--) {
  rect(i*10,i*10,10,10);
}
```



22. How many points are drawn by the following program? A. 0 B. 1 C. 5 D. 25 E. 50 or more
- ```
for (int i = 1; i <= 50; i = i + 1) {
 if (i % 10 == 0)
 point(i, i);
}
```

23. What does this program print? The function print() is like println() except that it does not print a new line character after printing the value so if more than one of the print() statements execute all output will be on one line. WARNING! The indenting MAY be misleading.

```
int x = 10, y = 20, z = 30;
if (x == y)
 print("A");
 if (x < z)
 print("B");
else
 print("C");
```

A. A  
B. B  
C. C  
D. AB  
E. AC

24. How many rectangles are drawn?
- ```
int yPos = 1;
while (yPos != 50) {
  rect(yPos, yPos, 20, 40);
  yPos = yPos + 10;
}
```

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

25. What expression can you put in the blank so this program shows a circle moving from the left edge (halfway down) to the center of the display and then diagonally to the lower right corner? Check ALL that apply.

```
int ballX,ballY=50;
void draw() {
  background(120);
  ballX = ballX + 1;
  ballY = ballY + _____;
  ellipse(ballX, ballY, 20, 20);
}
```

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

26. What does the following print?

```
for (int i = 1; i <= 4; i++) {
  print(i);
}
```

- A. 123
- B. 234
- C. 1234
- D. 2345

27. How many rectangles are drawn by the following processing sketch?

```
// Trick question?
int i = 0;
while (i > 0) {
  rect(i, i, 10, 10);
  i = i + 10;
}
```

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

28. Which answer applies to this program?

```
int x=50, xVel = 1;
void draw() {
  background(255);
  if (x <= 30 || x >=70) {
    xVel = -xVel;
  }
  x = x + xVel;
  ellipse(x, 50, 10, 10);
}
```

- A. A circle that just stays in the center.
- B. A circle that moves back and forth, appearing to bounce of the edges of the display.
- C. A circle that moves back and forth, moving at most 30 pixels in either direction.
- D. A circle that moves back and forth, moving at most 40 pixels in either direction.
- E. A circle that moves back and forth, moving at most 70 pixels in either direction.

29. What is displayed by this program?

```
int x = 0, y = x;
void draw() {
  background(255);
  x = 0;
  while ( x < width) {
    rect(x,y,10,10);
    x = x + 10;
  }
}
```

- | | |
|--|--|
| A. An empty white display. | B. A diagonal line of 10x10 squares. |
| C. One 10x10 square in the lower right corner. | <input checked="" type="radio"/> D. A row of 10x10 squares along the top edge. |

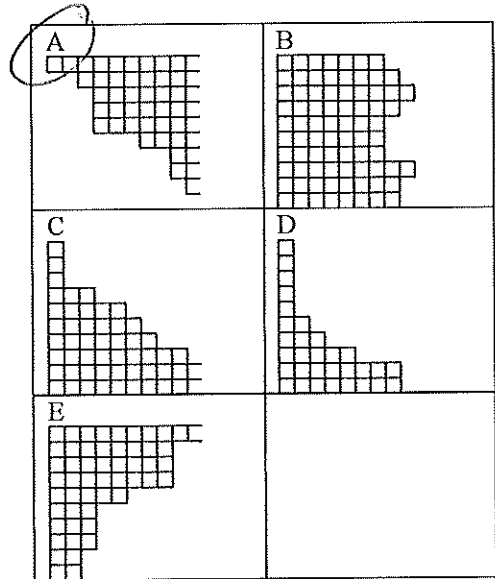
30. Pick the answer that **best** describes what is displayed by the following Processing sketch.

```
void setup() {
  size(400, 400);
}
void draw() {
  background(255);
  for(int col = 0; col < mouseX; col = col + 10) {
    for (int row = 0; row < mouseY; row = row + 10) {
      rect(col, row, 10, 10);
    }
  }
}
```

- A. A *rectangular* area filled with small squares with the lower right corner of the filled area near the current mouse position.
- B. A *square* area filled with small squares with the lower right corner of the filled area near (min(mouseX,mouseY), min(mouseX,mouseY)).
- C. A *square* area filled with small squares with the lower right corner of the filled area near (max(mouseX,mouseY), max(mouseX,mouseY)).
- D. A *square* area filled with small squares. The filled area starts with zero squares then increases in size each frame until it fills an area with the lower right corner of the filled area near (min(mouseX,mouseY), min(mouseX,mouseY)), then it starts over again with zero squares.
- E. A *square* area filled with small squares. The filled area starts with zero squares then increases in size each frame until it fills an area with the lower right corner of the filled area near (max(mouseX,mouseY), max(mouseX,mouseY)), then it starts over again with zero squares.

31. Which of the images to the right could be the result of running this program? Check ALL that apply. The apparently incomplete squares are an artifact of being on the edge and not some subtle trick.

```
int boxW = 10, boxH = 10;
void setup() {
  background(255);
  drawGrid();
}
void drawGrid() {
  int rowSize = width/boxW;
  for (int y = 0; y < height/boxH; y++) {
    rowSize = drawRow(rowSize, y);
  }
}
int drawRow(int maxX, int y) {
  int rowSize = max(1, maxX - (int)random(4));
  for (int x = 1; x <= rowSize; x++) {
    rect(width-x*boxW, y*boxH, boxW, boxH);
  }
  return rowSize;
}
```



32. What does the following program print?

```
int x=5;
void setup() {
  int z = timesTwo(x);
  println(x);
  println(z);
}
int timesTwo(int y) {
  int x = y * 2;
  println(x);
  return x;
}
```

- A. 10, 10, 10
 B. 10, 5, 10
 C. 10, 5, 5
 D. 5, 5, 5

33. Fill in the blank so this program shows a red rectangle when the mouse is within the box and a green one otherwise. Check ALL that apply.

```
boolean inBox(int x, int y, int centerX, int centerY, int bw, int bh) {
  return _____;
}
int boxX = 50, boxY = 50, boxW = 40, boxH = 15;
void draw() {
  background(255);
  rectMode(CENTER);
  if (inBox(mouseX, mouseY, boxX, boxY, boxW, boxH))
    fill(255,0,0);
  else fill(0,255,0);
  rect(boxX, boxY, boxW, boxH);
}
```

- A. $\text{dist}(x, y, \text{centerX}, \text{centerY}) \geq \text{bw} + \text{bh}$
 B. $\text{dist}(x, y, \text{centerX}, \text{centerY}) \geq (\text{bw} + \text{bh}) / 2$
 C. $\text{abs}(x - \text{centerX}) \leq \text{bw} \ \&\& \ \text{abs}(y - \text{centerY}) \leq \text{bh}$
 D. $\text{abs}(x - \text{centerX}) \leq \text{bw} / 2 \ \&\& \ \text{abs}(y - \text{centerY}) \leq \text{bh} / 2$

34. What goes in the blank?

- A. void
 B. int
 C. float
 D. boolean

```
_____ inOrder(int x, int y, int z) {
  return x <= y && y <= z;
}
```

35. What is the first word printed by the program to the right?

- A. func1
- B. func2
- C. func3

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

- A. 5
- B. 10
- C. 20
- D. 40
- E. 80

```
void setup() {
  func1(func2(func3(5)));
}
void func1(int x) {
  println("func1 " + x);
}
int func2(int x) {
  println("func2 " + x);
  return 2*x;
}
int func3(int x) {
  int y = func2(x);
  println("func3 " + x);
  return y;
}
```

37. What best describes what this program shows?

```
int ballX=100, ballY=0;
void draw() {
  background(120);
  if (ballX != ballY) {
    ballX = ballX - 1;
    ballY = ballY + 1;
  }
  ellipse(ballX, ballY, 20, 20);
}
```

- A. A circle moving diagonally all of the way across the display upper left to lower right.
- B. A circle moving diagonally all of the way across the display upper right to lower left.
- C. A circle moving diagonally across the display upper left to lower right but stopping in the center.
- D. A circle moving diagonally across the display upper right to lower left but stopping in the center.
- E. A circle in a corner that never moves.

38. What best describes what this program shows? Use the same set of answer choices as for the previous problem.

```
 D
int ballX=100, ballY=0;
void draw() {
  background(120);
  ballX = ballX - (1-ballY/50);
  ballY = ballY + (1-ballY/50);
  ellipse(ballX, ballY, 20, 20);
}
```

39. True These two functions always return the same value as each other given the same arguments.

```
int try1(int x, int y, int z) {
  return min(x, min(y, z));
}
```

```
int try2(int x, int y, int z) {
  if (x <= y && x <= z)
    return x;
  else if (y <= x && y <= z)
    return y;
  else return z;
}
```

40. What is the first thing printed by this program?

- A. 20
- B. 25
- C. 30
- D. 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(25, 20, 30));
}
```


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

- A. -1 B. 3 C. 7 D. 10 E. 13

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

- A. -1 B. 3 C. 7 D. 10 E. 13

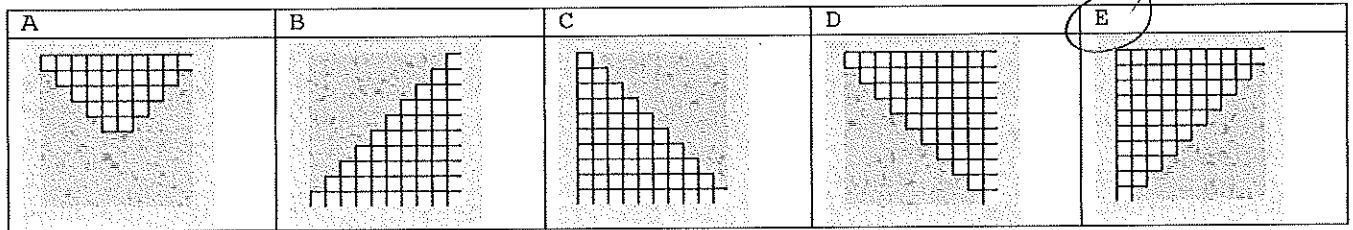
43. Which image is the result of the following program?

```
void setup() {
  for(int x=0; x<100; x=x+10) {
    for (int y=0; y<=90-x; y = y+10) {
      rect(x, y, 10, 10);
    }
  }
}
```

```
void setup() {
  int[] data1 = {
    7, 10, 13, 15, 26, 37, 45
  };
  int[] data2 = {
    7, 10, 13, 10, 6, 7, 15, 10, 10
  };

  println(func1(data1));
  println(func1(data2));
}

int func1(int[] data) {
  for (int i = 0; i < data.length-1; i++)
    if (data[i] == data[i+1])
      return i;
  return -1;
}
```



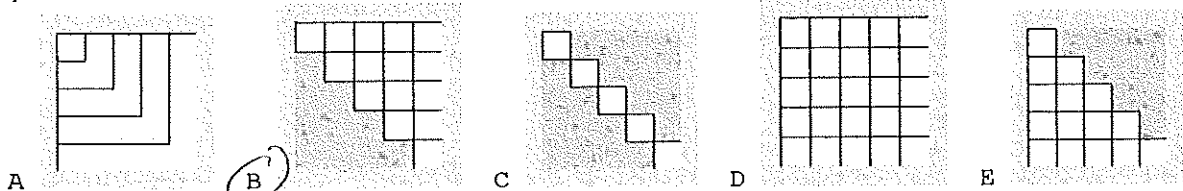
44. How many rectangles are drawn by the following processing sketch?

```
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

45. Which image below corresponds to the image produced by the program below?

```
for (int x = width; x >= 0; x = x - 20) {
  for (int y = height; y >= 0; y = y - 20) {
    if (y <= x) {
      rect(x, y, 20, 20);
    }
  }
}
```



46. 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[71] D. scores.last E. last(scores)

47. What expression goes in the blank so this program draws a red ball when the mouse is pressed and a black ball otherwise?
Check ALL that apply.

- A. mousePressed == true
- B. mousePressed
- C. !mousePressed
- D. 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);
}
```

The remaining questions are all about the following program.
// Create a class to represent a light bulb that can be
// positioned, and turned on and off.

```
Light light1, light2, light3;
void setup() {
    size(400, 400);
    light1 = new Light(25, 25); // put a light at (25,25)
    light2 = new Light(width-30, height-60);
    light3 = new Light(width/2, height/2);
    light1.on();
    light2.on();
    light3.off();
}
void draw() {
    light1.show();
    light2.show();
    light3.show();
}
void mousePressed() {
    if (light1.clicked()) {
        light1.toggle();
    }
    if (light2.clicked()) {
        light2.toggle();
    }
    if (light3.clicked()) {
        light3.toggle();
    }
}
```

- 48. How many methods NOT counting constructors must the Light class have for the program above?
A. 1 B. 3 C. 5 D. 8 E. 9
- 49. How many constructors must the Light class have for the program above?
A. 0 B. 1 C. 2 D. 3 E. 4
- 50. How many instance variables must the light class have?
A. 0 B. 1 C. 2 D. 3 E. 4

Name Key B

Mark your answers on a red scantron. Make sure to bubble in your name and student id # on the scantron. Turn in both this sheet with your name filled in, and the completed scantron. CAUTION: Many problems are very similar to problems you have seen before but have been changed in small but significant ways.

1. Which of these draws a line from the center to the lower right corner of the 100x100 default display?

- A. line(50, 50, 100, 100);
- B. line(50, 50, 100, 0);
- C. line(0, 0, 50, 50);
- D. line(0, 0, 50, -50);

2. Which of these draws a rectangle with its upper left corner at (10,50) and its lower right corner at (90,90) using the default settings?

- A. rect(10, 50, 90, 90);
- B. rect(10, 50, 80, 40);
- C. rect(10, 90, 90, 50);
- D. rect(10, 90, 50, 90);
- E. rect(50, 70, 80, 40);

3. Which of the following draws a small black circle in the middle of a large white square?

- | | | | |
|------------------------------------|-------------------------|-------------------------|-------------------------|
| <input checked="" type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| rectMode(CENTER); | rectMode(CENTER); | rectMode(CENTER); | rectMode(CENTER); |
| ellipseMode(CENTER); | ellipseMode(CENTER); | ellipseMode(CENTER); | ellipseMode(CENTER); |
| fill(255); | fill(255); | fill(0); | fill(0); |
| rect(50, 50, 50, 50); | ellipse(50, 50, 9, 9); | rect(50, 50, 50, 50); | ellipse(50, 50, 9, 9); |
| fill(0); | fill(0); | fill(255); | fill(255); |
| ellipse(50, 50, 9, 9); | rect(50, 50, 50, 50); | ellipse(50, 50, 9, 9); | rect(50, 50, 50, 50); |

4. True or false, names in Processing are case sensitive, so ellipse(1, 2, 3, 4) is not the same as Ellipse(1, 2, 3, 4).

5. 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. Don't insert anything. The code is fine as is.
- B. Insert background(255); at position 1.
- C. Insert background(255); at position 2.
- D. B and C both work.

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

- A. a here is 123
- B. a here is 456
- C. a is now 123
- D. a is now 456
- E. 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() {  
  a = 456;  
  println("a here is " + a);  
}
```

7. 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");  
  }  
}
```

8. 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. Assume x and y have been declared and assigned values earlier.

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

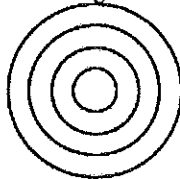
```
int z = 0;
if (x < 20) {
    z = 100;
}
if (y < 30) {
    z = 100;
}
println(z);
```

9. True or false, these two programs produce the same image?

```
size(250,250);
noFill();
translate(50, 50);
ellipse(0, 0, 10, 10);
translate(50, 50);
ellipse(0, 0, 20, 20);
translate(50, 50);
ellipse(0, 0, 30, 30);
translate(50, 50);
ellipse(0, 0, 40, 40);
```

```
size(250,250);
noFill();
ellipse(50, 50, 10, 10);
ellipse(100, 100, 20, 20);
ellipse(150, 150, 30, 30);
ellipse(200, 200, 40, 40);
```

10. Which of these programs would produce this image? Mark ALL that apply.



<p>A</p> <pre>background(255); fill(255); ellipse(50,50,25,25); ellipse(50,50,50,50); ellipse(50,50,75,75); ellipse(50,50,100,100);</pre>	<p>B</p> <pre>background(255); noFill(); ellipse(50,50,25,25); ellipse(50,50,50,50); ellipse(50,50,75,75); ellipse(50,50,100,100);</pre>
<p>C</p> <pre>background(255); fill(255); ellipse(50,50,100,100); ellipse(50,50,75,75); ellipse(50,50,50,50); ellipse(50,50,25,25);</pre>	<p>D</p> <pre>background(255); noFill(); ellipse(50,50,100,100); ellipse(50,50,75,75); ellipse(50,50,50,50); ellipse(50,50,25,25);</pre>

E. None of the above.

11. True or false, all translations and rotations are reset back to the original position and orientation at the start of each pass through the draw() method?

12. Which answer best describes the behavior of this Processing sketch?

```
int xPos, yPos;

void setup() {
  size(400,400);
  yPos = height/2;
  xPos = 0;
}

void draw() {
  background(255);
  ellipse(xPos, yPos, 5, 5);
  yPos = yPos - frameCount/200;
  xPos = xPos + 1;
}
```

- A. A ball moves from the middle left to the center of the display and then moves diagonally to the lower right corner.
- B. A ball moves from the middle left horizontally all of the way across the screen.
- C. A ball moves from the middle left in a straight line to the center then stops briefly before moving back to the left and off of the screen.
- D. A ball moves from the middle left to the center of the display and then moves diagonally to the upper right corner.
- E. A ball moves from the middle left in a straight line to the lower right corner.

13. Which answer best describes the behavior of this Processing sketch?

```
int dia = 100;
void draw() {
  frameRate(1);
  noFill();
  ellipse(width/2, height/2, dia, dia);
  dia = dia - 10;
}
```

- A. A single small circle appears in the center and just stays.
- B. A single small circle appears and then grows, always showing just a single circle until it is too large and then you see nothing.
- C. A set of concentric circles appears, from the outside (large to small), eventually filling in to form a target like picture.
- D. A set of concentric circles appears, like a target, that grows until it fills the display.

14. What is the value in Java of the expression 37/4?

- A. 9
- B. 9.25
- C. 10

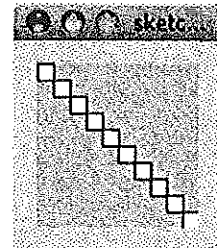
15. What is the value in Java of the expression 37%4?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 9

16. Which of the programs below would produce the image to the right? Mark ALL that apply.

<pre>// A int pos = 0; void draw() { translate(pos, pos); rect(0, 0, 10, 10); pos = pos + 10; }</pre>	<pre>// B int pos = 0; void draw() { rect(pos, pos, 10, 10); pos = pos + 10; }</pre>
<pre>// C int pos = 0; void draw() { translate(10,10); rect(pos, pos, 10, 10); }</pre>	<pre>// D int pos = 0; void draw() { rect(pos, pos, 10, 10); translate(10,10); }</pre>

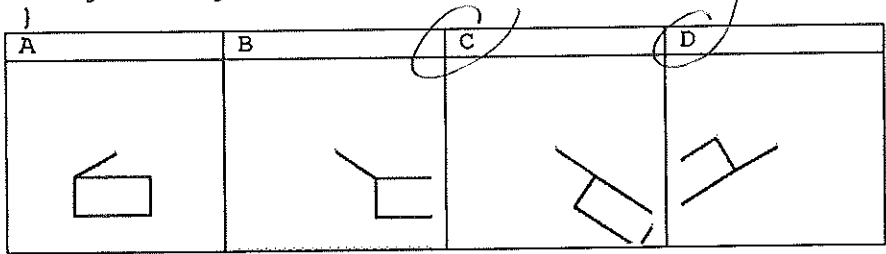
E. None of A-D



17. Which of these images could be produced by this program? Check ALL that apply.

```
float angle=0;
void draw() {
  background(255);
  translate(50, 50);
  rotate(angle);
  line(0,0,25,0);
  translate(25, 0);
  rect(0,0,40,20);
  angle = angle + .1;
}
```

Hint: All images shown were drawn with programs that include calls to `line(0, 0, 25, 0);` and `rect(0, 0, 40, 20);`.



E. None of A-D

18. What is printed at the start of the second frame of this program?

```
int lengthOfCar = 200;
int carBodyHeight = lengthOfCar/4;
int wheelDiameter = lengthOfCar/4;
void draw() {
  println(lengthOfCar);
  println(carBodyHeight);
  println(wheelDiameter);
  // some code might go here to do the actual drawing
  lengthOfCar = lengthOfCar - 1; // make the car shrink
}
```

A. 200 50 50	B. 199 49 49	C. 199 49.75 49.75	D. 199 50 50
-----------------------	-----------------------	-----------------------------	-----------------------

19. Which of the descriptions is true for this program? Check ALL that apply.

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

- A. The green one is moving on the diagonal, upper left to lower right.
- B. The green one is moving on the diagonal lower right to upper left.
- C. The red one is moving on the diagonal, upper right to lower left.
- D. The red one is moving on the diagonal, lower right to upper left.
- E. The green circle is moving faster than the red circle.

20. What goes in the blank so the display is black when the mouse is left of 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

21. How many points are drawn by the following program? A. 0 B. 1 **C. 5** D. 25 E. 50 or more

```
for (int i = 1; i <= 50; i = i + 1) {
  if (i % 10 == 0)
    point(i, i);
}
```

22. What does this program print? The function print() is like println() except that it does not print a new line character after printing the value so if more than one of the print() statements execute all output will be on one line. WARNING! The indenting MAY be misleading.

```
int x = 10, y = 20, z = 30;
if (x == y)
  print("A");
  if (x < z)
    print("B");
else
  print("C");
```

- A. A
- B. B**
- C. C
- D. AB
- E. AC

23. How many rectangles are drawn?

```
int yPos = 1;
while (yPos != 50) {
  rect(yPos, yPos, 20, 40);
  yPos = yPos + 10;
}
```

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

24. Which static Processing sketch/program below reproduces the image to the right. It is the default 100x100 and does not change. The small square in the upper left corner is 10x10. Check ALL that apply.

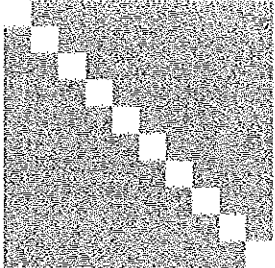
```
noStroke(); // choice A
for(int i = 9; i >=0; i--) {
  rect(i*10,i*10,10,10);
}

noStroke(); // choice B
for(int i = 0; i < 10; i++) {
  rect(i,i,10,10);
}

noStroke(); // choice C
for(int i = 0; i < width; i=i+10) {
  rect(i,i,10,10);
}

noStroke(); // choice D
int i = 0;
while(i < width) {
  rect(i,i,10,10);
  i = i + 10;
}

noStroke(); // choice E
for(int i = 0; i < 10; i++) {
  rect(i*10,i*10,10,10);
}
```



25. What expression can you put in the blank so this program shows a circle moving from the left edge (halfway down) to the center of the display and then diagonally to the lower right corner? Check ALL that apply.

```
int ballX,ballY=50;
void draw() {
  background(120);
  ballX = ballX + 1;
  ballY = ballY + _____;
  ellipse(ballX, ballY, 20, 20);
}
```

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

26. Pick the answer that best describes what is displayed by the following Processing sketch.

```
void setup() {
  size(400,400);
}
void draw() {
  background(255);
  for(int col = 0; col < mouseX; col = col + 10) {
    for (int row = 0; row < mouseY; row = row + 10) {
      rect(col, row, 10, 10);
    }
  }
}
```

- A. A square area filled with small squares with the lower right corner of the filled area near (min(mouseX,mouseY), min(mouseX,mouseY)).
- B. A square area filled with small squares with the lower right corner of the filled area near (max(mouseX,mouseY), max(mouseX,mouseY)).
- C. A square area filled with small squares. The filled area starts with zero squares then increases in size each frame until it fills an area with the lower right corner of the filled area near (min(mouseX,mouseY), min(mouseX,mouseY)), then it starts over again with zero squares.
- D. A square area filled with small squares. The filled area starts with zero squares then increases in size each frame until it fills an area with the lower right corner of the filled area near (max(mouseX,mouseY), max(mouseX,mouseY)), then it starts over again with zero squares.
- E. A rectangular area filled with small squares with the lower right corner of the filled area near the current mouse position.

27. What does the following print?

```
for (int i = 1; i <= 4; i++) {
  print(i);
}
```

- A. 123
- B. 234
- C. 1234
- D. 2345

28. How many rectangles are drawn by the following processing sketch?

```
// Trick question?
int i = 0;
while (i > 0) {
  rect(i, i, 10, 10);
  i = i + 10;
}
```

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

29. Which answer applies to this program?

```
int x=50, xVel = 1;
void draw() {
  background(255);
  if (x <= 30 || x >=70) {
    xVel = -xVel;
  }
  x = x + xVel;
  ellipse(x, 50, 10, 10);
}
```

- A. A circle that moves back and forth, appearing to bounce off the edges of the display.
- B. A circle that moves back and forth, moving at most 30 pixels in either direction.
- C. A circle that moves back and forth, moving at most 40 pixels in either direction.
- D. A circle that moves back and forth, moving at most 70 pixels in either direction.
- E. A circle that just stays in the center.

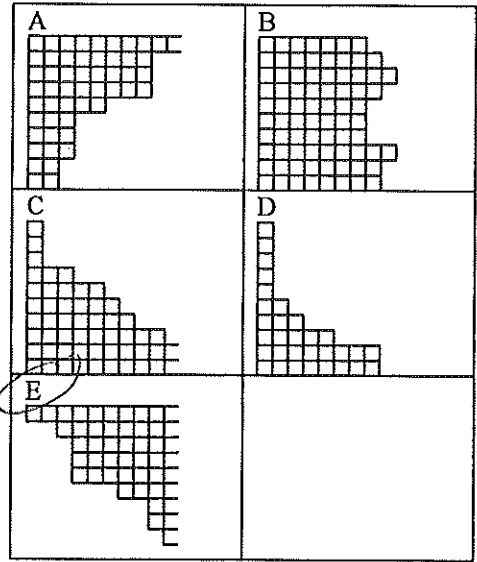
30. What is displayed by this program?

```
int x = 0, y = x;
void draw() {
  background(255);
  x = 0;
  while ( x < width) {
    rect(x,y,10,10);
    x = x + 10;
  }
}
```

- | | |
|--|--|
| A. An empty white display. | B. A diagonal line of 10x10 squares. |
| <input checked="" type="radio"/> C. A row of 10x10 squares along the top edge. | D. One 10x10 square in the lower right corner. |

31. Which of the images to the right could be the result of running this program? Check ALL that apply. The apparently incomplete squares are an artifact of being on the edge and not some subtle trick.

```
int boxW = 10, boxH = 10;
void setup() {
  background(255);
  drawGrid();
}
void drawGrid() {
  int rowSize = width/boxW;
  for (int y = 0; y < height/boxH; y++) {
    rowSize = drawRow(rowSize, y);
  }
}
int drawRow(int maxX, int y) {
  int rowSize = max(1,maxX - (int)random(4));
  for (int x = 1; x <= rowSize; x++) {
    rect(width-x*boxW, y*boxH, boxW, boxH);
  }
  return rowSize;
}
```



32. What does the following program print?

```
int x=5;
void setup() {
  int z = timesTwo(x);
  println(x);
  println(z);
}
int timesTwo(int y) {
  int x = y * 2;
  println(x);
  return x;
}
```

- A. 10, 10, 10
 B. 5, 5, 5
 C. 10, 5, 10
 D. 10, 5, 5

33. Fill in the blank so this program shows a red rectangle when the mouse is within the box and a green one otherwise. Check ALL that apply.

```
boolean inBox(int x, int y, int centerX, int centerY, int bw, int bh) {
  return _____;
}
int boxX = 50, boxY = 50, boxW = 40, boxH = 15;
void draw() {
  background(255);
  rectMode(CENTER);
  if (inBox(mouseX, mouseY, boxX, boxY, boxW, boxH))
    fill(255,0,0);
  else fill(0,255,0);
  rect(boxX, boxY, boxW, boxH);
}
```

- A. $\text{dist}(x, y, \text{centerX}, \text{centerY}) \geq (\text{bw} + \text{bh}) / 2$
 B. $\text{dist}(x, y, \text{centerX}, \text{centerY}) \geq \text{bw} + \text{bh}$
 C. $\text{abs}(x - \text{centerX}) \leq \text{bw} / 2 \ \&\& \ \text{abs}(y - \text{centerY}) \leq \text{bh} / 2$
 D. $\text{abs}(x - \text{centerX}) \leq \text{bw} \ \&\& \ \text{abs}(y - \text{centerY}) \leq \text{bh}$

34. What goes in the blank?

- A. void
 B. int
 C. boolean
 D. float

```
_____ inOrder(int x, int y, int z) {
  return x <= y && y <= z;
}
```

35. What is the first word printed by the program to the right?

- A. func1
- B. func2
- C. func3

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

- A. 5
- B. 10
- C. 20
- D. 40
- E. 80

```
void setup() {
  func1(func2(func3(10)));
}
void func1(int x) {
  println("func1 " + x);
}
int func2(int x) {
  println("func2 " + x);
  return 2*x;
}
int func3(int x) {
  int y = func2(x);
  println("func3 " + x);
  return y;
}
```

37. What best describes what this program shows?

```
int ballX=100, ballY=0;
void draw() {
  background(120);
  if (ballX != ballY) {
    ballX = ballX - 1;
    ballY = ballY + 1;
  }
  ellipse(ballX, ballY, 20, 20);
}
```

- A. A circle in a corner that never moves.
- B. A circle moving diagonally all of the way across the display upper left to lower right.
- C. A circle moving diagonally all of the way across the display upper right to lower left.
- D. A circle moving diagonally across the display upper left to lower right but stopping in the center.
- E. A circle moving diagonally across the display upper right to lower left but stopping in the center.

38. What best describes what this program shows? Use the same set of answer choices as for the previous problem.

```
int ballX=100, ballY=0;
void draw() {
  background(120);
  ballX = ballX - (1-ballY/50);
  ballY = ballY + (1-ballY/50);
  ellipse(ballX, ballY, 20, 20);
}
```

39. T/F These two functions always return the same value as each other given the same arguments.

```
int try1(int x, int y, int z) {
  return min(x, min(y, z));
}
```

```
int try2(int x, int y, int z) {
  if (x <= y && x <= z)
    return x;
  else if (y <= x && y <= z)
    return y;
  else return z;
}
```

40. What is the first thing printed by this program?

- A. test
- B. 20
- C. 25
- D. 30

```
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(25, 20, 30));
}
```

41. What is the first value printed by the program to the right?
 A. -1 B. 3 C. 7 D. 10 E. 13

42. What is the second value printed by the program to the right?
 A. -1 B. 3 C. 7 D. 10 E. 13

```

void setup() {
  int[] data1 = {
    7, 10, 13, 10, 6, 7, 15, 10, 10
  };
  int[] data2 = {
    7, 10, 13, 15, 26, 37, 45
  };

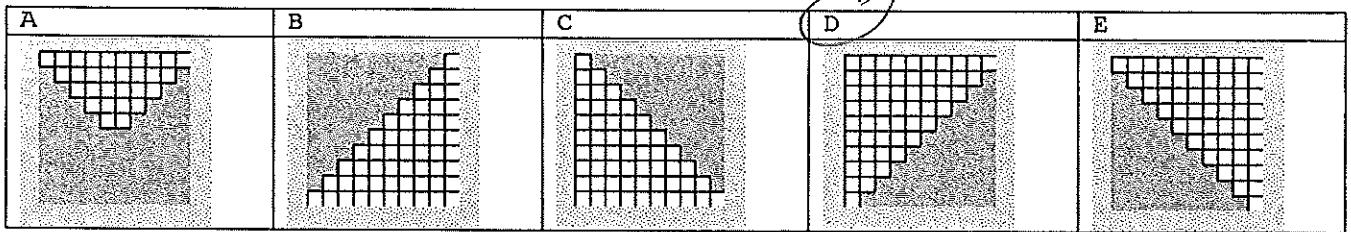
  println(func1(data1));
  println(func1(data2));
}

int func1(int[] data) {
  for (int i = 0; i < data.length-1; i++)
    if (data[i] == data[i+1])
      return i;
  return -1;
}
  
```

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

```

void setup() {
  for(int x=0; x<100; x=x+10) {
    for (int y=0; y<=90-x; y = y+10) {
      rect(x, y, 10, 10);
    }
  }
}
  
```



44. How many rectangles are drawn by the following processing sketch?

```

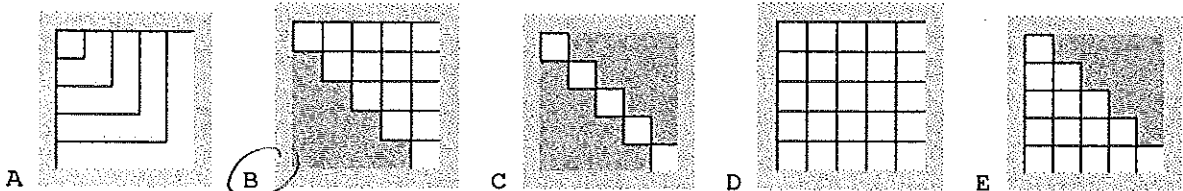
int i = 0;
if (i < 100) {
  rect(i, i, 10, 10);
  i = i + 10;
}
  
```

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

45. Which image below corresponds to the image produced by the program below?

```

for (int x = width; x >= 0; x = x - 20) {
  for (int y = height; y >= 0; y = y - 20) {
    if (y <= x) {
      rect(x, y, 20, 20);
    }
  }
}
  
```



46. 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[71]
- D. scores.last
- E. last(scores)

47. What expression goes in the blank so this program draws a red ball when the mouse is pressed and a black ball otherwise?
Check ALL that apply.

- A. mousePressed == false
- B. !mousePressed
- C. mousePressed
- D. mousePressed == true

```
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);
}
```

The remaining questions are all about the following program.

```
// Create a class to represent a light bulb that can be
// positioned, and turned on and off.
Light light1, light2, light3;
void setup() {
    size(400, 400);
    light1 = new Light(25, 25); // put a light at (25,25)
    light2 = new Light(width-30, height-60);
    light3 = new Light(width/2, height/2);
    light1.on();
    light2.on();
    light3.off();
}
void draw() {
    light1.show();
    light2.show();
    light3.show();
}
void mousePressed() {
    if (light1.clicked()) {
        light1.toggle();
    }
    if (light2.clicked()) {
        light2.toggle();
    }
    if (light3.clicked()) {
        light3.toggle();
    }
}
```

- 48. How many instance variables must the light class have?
A. 0 B. 1 C. 2 D. 3 E. 4
- 49. How many methods NOT counting constructors must the Light class have for the program above?
A. 1 B. 3 C. 5 D. 8 E. 9
- 50. How many constructors must the Light class have for the program above?
A. 0 B. 1 C. 2 D. 3 E. 4