

There are 21 problems and 50 points total. The last 5 problems ask you to write short programs or code fragments. There are multiple versions of this exam. Don't be tempted to try and copy.

1. (1 points) What best describes what is displayed by the following Processing sketch?

```
line(0, 90, 100, 90);
rect(19, 50, 3, 40);
rect(79, 50, 3, 40);
rect(15, 40, 10, 10);
ellipse(80, 50, 20, 20);
```

- Two posts in the ground, one topped by a square sign, the other by a round sign.
  - Two posts, a box, and a sphere, all on the ground.
  - A box and a sphere on a table.
  - Aerial view of a swimming pool with two diving boards.
  - A square and a round sign hanging from two horizontal posts sticking out of a wall.
2. (1 point) What is printed by the following Java program?

```
class Finalq2 {
    public static void main(String[] args) {

        int x = 25;
        int y = 20;
        int z = 30;
        if (x > y) {
            if (x > z)
                System.out.println("x is biggest");
        }
        else
            System.out.println("x is not biggest");
    }
}
```

- x is biggest
  - x is not biggest
  - 25 is biggest
  - 25 is not biggest
  - x is biggest  
x is not biggest
  - nothing is printed
3. (1 point) What is printed by the following Java program? \_\_\_\_\_ (insert answer here) Caution: this might be considered a trick question.

```
class Finalq3 {
    public static void main(String[] args) {

        int score = 92;
        String grade = "Not passing";

        if (score >= 90) {
            grade = "A";
        }
        if (score >= 80) {
            grade = "B";
        }
        if (score >= 70) {
            grade = "C";
        }
        System.out.println(grade);
    }
}
```

4. (1 point) What does the following Processing sketch display?

```
int ballPos = 0;
int ballDirection = 1;

void draw() {
  background(255);
  int ballSize = 10;
  fill(0);
  ellipse(width/2, ballPos, ballSize, ballSize);
  ballPos = ballPos + ballDirection;
  if (ballPos < 0 || ballPos > 100) {
    ballDirection = ballDirection*(-1);
  }
}
```

- A black circle moves from right to left across the display.
  - A black circle moves from left to right across the display.
  - A black circle moves from top to bottom across the display.
  - A black circle moves from bottom to top across the display.
  - A black circle moves repeatedly back and forth (side-to-side) across the display.
  - A black circle move repeatedly up and down (top-to-bottom) across the display.
5. (2 points) Are the following Boolean expressions true or false? Assume  $x = 5$  and  $y = 6$ . Circle the correct answer.

```
True or false    !(x > 6)
True or false    (x==6 && x==5)
True or false    (x==6 || x==5)
True or false    (x>-1 && y<10)
```

6. (1 point) Complete the Processing sketch below by adding the missing line.

```
// draw an electric stove top
void setup() {
  noFill();
  translate(25,25);
  drawBurner();
  translate(50,0);
  drawBurner();
  translate(0, 50);
  drawBurner();
  translate(-50,0);
  drawBurner();
}

_____ // insert missing line here
  ellipse(0, 0, 5, 5);
  ellipse(0, 0, 10, 10);
  ellipse(0, 0, 15, 15);
  ellipse(0, 0, 20, 20);
}
```

7. (2 points) Rewrite the following code fragment using just one if-statement instead of two.

```
if (x > y) {
  if (x > z)
    System.out.println("x is biggest");
}
```

8. (2 points) What is printed by the following code fragment?

```
for (int i = 1; i <= 40; i = i + 1) {
    if (i % 11 == 0)
        print(i + " ");
}
```

9. (2 points) What is printed by the following Processing sketch?

```
void setup() {
    println(computerMove(8));
    println(computerMove(9));
    println(computerMove(10));
}

int computerMove(int stonesRemaining) {
    if (stonesRemaining % 4 == 0) {
        return 1;
    }
    else {
        return stonesRemaining % 4;
    }
}
```

10. (2 points) Indicate where the three lines with statements, A, B, and C, should be placed by writing the corresponding letter on one of the blanks. Each letter should be placed on exactly one line. One line may contain more than one letter or no letters. Keep in mind proper use of globals versus locals.

- A. float velocity = 0;
- B. float yPos = 0;
- C. int ballRadius = 10;

```

_____
// bouncing ball
void setup() {
    _____
    size(400,400);
    fill(0); // ball will be black
}

void draw() {
    _____
    background(255);
    drawBouncingBall();
}

void drawBouncingBall() {
    _____
    // check if hit the ground so need to reverse the velocity
    if (yPos > height-ballRadius) {
        velocity = -velocity;
    }
    // adjust position based on velocity
    yPos = yPos + velocity;

    // adjust the velocity - increasing due to gravity
    velocity = velocity + 0.3; // always accelerate down

    // add some drag
    velocity = velocity*0.99;

    // draw the ball
    ellipse(width/2, yPos, ballRadius*2, ballRadius*2);
}

```

11. (3 points) What does the following program print?

```
void setup() {
  noFill();
  int size = 40;
  int pos = 0;
  ellipseMode(CORNER);
  for(int i = 1; i <= 4; i=i+1) {
    myRect(pos, height-size, size, size);
    pos = pos + size;
    size = size / 2;
  }
}
```

```
void myRect(int x, int y, int width, int height) {
  // don't actually draw a rect, just print it's position and size
  println("rect:" + x + ", " + y + ", " + width + ", " + height);
}
```



12. (1 point) What does the following program display?

```
color[] lites = {color(255,0,0), color(0,255,0), color(0,0,255)};
int dia = 20;
```

```
void draw() {
  frameRate(1);
  for (int i = 0; i < lites.length; i++) {
    fill(lites[i]);
    ellipse(width/2, dia/2 + i*dia, dia, dia);
  }
}
```

- alternating red, green, blue circles, once per second, all in the same place
- red, green, and blue circles stacked vertically, it is a static image so using setup() instead of draw() would have been better
- a red circle, then 1 second later a blue circle below that, then 1 second later a green circle below the blue one, with all three showing after that
- alternating red, green, blue circles, once per second, only one color shows at a time, and the three circles do not show up in the same place

13. (3 points) What does the following program print?

```
int[] xPos = {45, 40, 30};
int[] yPos = {30, 40, 60};
int[] size = {10, 20, 40};
```

```
void setup() {
  noFill();
  drawThing(xPos, yPos, size);
}
```

```
void drawThing(int[] x, int[] y, int[] w) {
  for (int i = 0; i < x.length; i++) {
    myRect(x[i], y[i], w[i], w[i]);
  }
}
```

```
void myRect(int x, int y, int width, int height) {
  // don't actually draw a rect, just print it's position and size
  println("rect:" + x + ", " + y + ", " + width + ", " + height);
}
```



14. (1 point) What does the following program print? (Careful this may be a trick.) \_\_\_\_\_ (put answer here)

```
void setup() {
  int someNumber = 1;
  timesTwo(someNumber);
  println(someNumber);
}
void timesTwo(int someNumber) {
  someNumber = someNumber*2;
}
```

15. (1 point) What does the following program print? \_\_\_\_\_ (put your answer here)

```
class PracticeProblem {
  public static void main (String[] args) {
    int x = 10, y = 5;

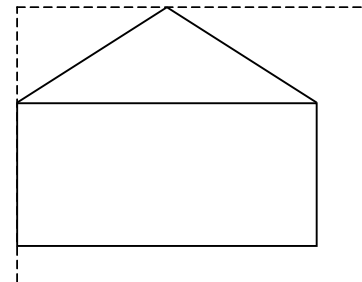
    printProduct(x, y);
    x = 2;
    System.out.print(" ");
    printProduct(x + y, x);
  }

  static void printProduct(int x, int y) {
    System.out.print(x * y);
  }
}
```

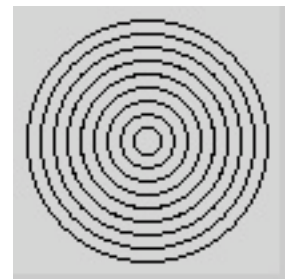
16. (1 point) How many times does the following print “testing”? \_\_\_\_\_ ( put answer here)

```
int i = 1;
if (i < 20 ) {
  while (i <= 40) {
    System.out.println("testing");
    i = i + 1;
  }
}
```

17. (5 points) Write a Processing program that draws the following sketch. This “house” is 50 pixels wide, 25 pixels to the ceiling (not to the peak of the roof). From the ground to the peak of the roof is 45 pixels. It should be positioned in the upper left corner – the bounds of the display are shown by the dashed lines. (The drawing is not precisely to scale.)



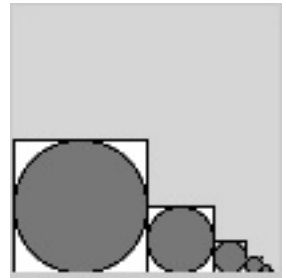
18. (5 points) Write a Processing sketch/program that reproduces the image to the right. It is the default 100x100 and does not change. The center circle has diameter 10 and the outer one has diameter 90. You must use a loop.



19. (5 points) Write a Processing sketch that blinks black then white, by filling the entire display first with black then with white, changing once per second.

20. (5 points) Add the missing method, `whiteSquare()`, to the program below. The method always draws squares and takes three parameters, the x, y coordinates of the upper left corner of the square and the length of one side of the square. The squares are filled with white and have a black outline.

```
// draw series of grey circles in white boxes
void setup() {
  int xpos = 0;
  ellipseMode(CORNER);
  for (int i = height/2; i > 0; i = i / 2) {
    whiteSquare(xpos, height - i, i);
    fill(100); // blue
    ellipse(xpos, height - i, i, i);
    xpos = xpos + i;
  }
}
```



21. (5 points) Write the missing method, `interleave()`, that prints out the Strings from two arrays of Strings, interleaving them all on ONE line. Each String is separated by a space from the next, as shown in the sample output. You may assume both arrays passed to `interleave()` will be the same length. The output for the completed program should be:

```
This has been a lot of hard work.  
Testing one two three.
```

```
String[] list1 = {"This", "been", "lot", "hard"};  
String[] list2 = {"has", "a", "of", "work."};  
String[] list3 = {"Testing", "two"};  
String[] list4 = {"one", "three."};
```

```
void setup() {  
    interleave(list1, list2);  
    interleave(list3, list4);  
}
```