Question 1 (10 points) Write the correct answer in each of the following:

a) Write a Processing command to create a canvas of 400x300 pixels:

```
size(400, 300);
```

b) After the above command is carried out, what will be the value of the variable, **`width`**:

_400 pixels__

c) Write the command to translate the origin to the coordinates <225, 50>:

```
translate(225, 50);
```

d) What will be printed by the following code segment:

```
int i = 1;
while (i <= 8)
{
  i++;
}
println(i);
```

9 will be printed.

e) Consider the commands below:

```
int i=1;
while (i < 12) {
   if (i%3 == 0) {
      println("Aloha");
   }
   i = i + 1;
}
```

How many times would this code print the text "`Aloha`"? ______3______

Question 1 (*cont'd)*

Suppose the function defined as:

```
void spongeBob(float x, float y, float s) {
     …details deleted…
} // spongeBob()
```

draws the Sponge Bob cartoon character with its top-left corner at <`x`, `y`> and of size `s` (i.e., its width and height are both `s`). Write the commands to do the following:

In the function definition above:

f) What is the name of the function defined above? ______**sponge Bob()**________

g) How many parameters does `spongeBob()` take? __________**3**__________

h) Use the function to draw a Sponge Bob of size 125x125 pixels with its top-left corner at <100, 50>:

```
spongeBob(100, 50, 125);
```

i) Use the function to draw a Sponge Bob of size 175x175 pixels with its top-left corner at <100, 150>:

```
spongeBob(100, 150, 175);
```

j) Use the function to draw an *upside-down* Sponge Bob of size 100x100 pixels with its *bottom-right* corner at <200, 240>.

```
translate(200, 240);
rotate(PI);
spongeBob(0, 0, 100);
```

Question 2 (5 points)

Write a conditional expression that would print "`Just Right`" whenever an integer variable `temperature` has a value between 67 and 74, inclusive.

```
int temperature = …;
// write your conditional here:
if (temperature >= 67 && temperature <= 74) {
   println("Just Right");
}
```

Question 3 (5 points)
Rewrite the following using a while-loop:

```
for (int i=1; i <= 15; i++) {
   if (i%3 == 0) {
      println("Hello");
   }
}
```

```
int i=1;
while (i <= 15) {
   if (i%3 == 0) {
      println("Hello");
   }
   i = i + 1;
}
```

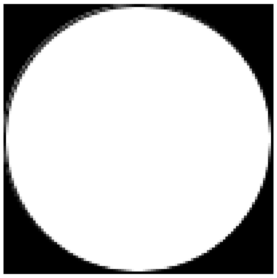
Question 4 (10 points)
Write Processing code segment to draw a line from the center of a sketch to its border. It should be drawn tilted by a given angle, `theta`, specified in radians. You may assume that the variable `theta` is already defined. Your code should work for any size sketch window, and it is acceptable for the line to pass the border, but it must reach at least to the sketch border.

```
float x = width * cos(theta);       // end point coordinates
float y = width * sin(theta);       // could use height

translate(width/2, height/2);       // Move to center of
screen
line(0, 0, x, y);
```

Alternate:

```
float x1 = width/2;            // start point coordinates –
sketch center
float y1 = height/2;
float x2 = x1 + width * cos(theta);     // end point
coordinates
float y2 = y1 + width * sin(theta);    // could use height

line(x1, y1, x2, y2);
```

Question 5 (15 points)
The Processing program below is supposed to draw the following figure centered at every mouse click:

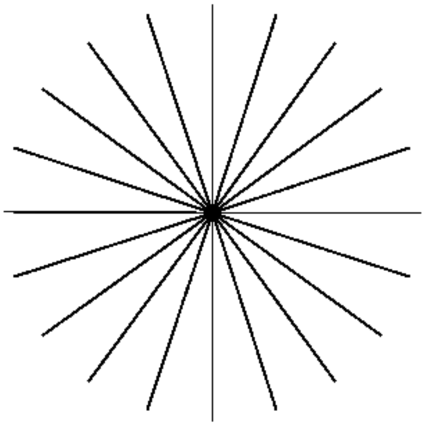


The width and height of the figure should always equal each other, and it should be a random number chosen between `50` and `150`.

<u>Complete the program</u> below by writing the appropriate commands needed to accomplish the task. Continue on the back of page if more space is needed.

```
void setup() {
   size(400, 400);
   background(255);
} // setup()

void draw() { }

void mousePressed() {
   float w = random(50, 150); // select a random size

// Draw the black square
   fill(0);
   rectMode(CENTER);
   rect(mouseX, mouseY, w, w);

   // Draw the white circle
   fill(255);
   ellipse(mouseX, mouseY, w, w);
} // mousePressed()
```

Question 6 (15 points)
Write a complete Processing function that draws the following figure:



The function should be defined as shown below. The sketch shown was generated using the call:

```
drawSpokes(250, 250, 200, 20);

void drawSpokes(int x, int y, int s, int n) {
   // draws n spokes centered at <x, y> of length s/2
  float r = s/2.0;
  float delta = TWO_PI/n;
  float theta = 0;

  pushMatrix();
  translate(x, y);
  for (int i=0; i < n; i++) {
    float x1 = r * cos(theta);
    float y1 = r * sin(theta);
    line(0, 0, x1, y1);
    theta += delta;
  }
  popMatrix();
} // drawSpokes()
```

Alternate version, using rotation…

```
void drawSpokes(int x, int y, int s, int n) {
  float r = s/2.0;
  float delta = TWO_PI/n;

  pushMatrix();
  translate(x, y);
  for (int i=0; i < n; i++) {
    line(0, 0, r, 0);
    rotate(delta);
  }
  popMatrix();
} // drawSpokes()
```

Question 7 (10 points)
Consider the following code segment. Using the table below, trace the code segment to determine what will be printed by the call to `mystery(3,8)`:

```
void mystery(int a, int b)
{
     int x = a;
     for(int i = 0; i < b - a; i++)
     {
          println(x);
          if(i % 2 == 0)
          {
               x = b - i;
          }
          else
          {
               x = a + i;
          }
     }
     println(x);
} // mystery()
```

Write what is printed here:

3
8
4
6
6
4

Question 8 (15 points)
Write a Processing function `sum(int n)` that computes and returns the summation:

$$1^2 + 3^2 + 5^2 + \cdots + n^2$$

```
int sum(int n) {
   int result = 0;

   for (int i = 1; i <= n; i = i + 2) {
      result = result + i;
   }

   return result;
} // sum()
```

Question 9 (15 points)
Write a Processing function `isPrime(int n)` that detects whether a number `n` is prime. A prime number has no even divisors except for 1 and the number itself (see algorithm below). The function returns **true** if the number, `n` is prime, **false** otherwise. Do not worry about what happens if the parameter is less than 2.

```
To see if a number N is prime do the following
  for each number (call it i) starting at 2 and counting up to (N-1)
        if i divides N evenly then N is not a prime number
  otherwise, N is prime
```

```
boolean isPrime(int n) {

   for (int i = 2; i < n; i++) {
      if (n % i == 0) {
         return false;
      }
   }
   return true;
} // isPrime()
```