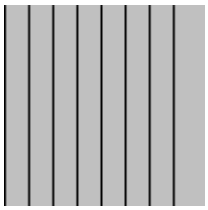
1. (1.5 point) Explain in your own words the following concepts
   a) `boolean`
   b) `void`
   c) variable scope

2. (1 point) What is the output of the following piece of code? Show me how you reached your answer; just giving the correct value(s) gives you no points.

```
int a = 5;
while( ( 7 >= a ) && !( false || 2*a != a ) ) {
      println(a);
      a++;
}
```

3. (1 point) Fill in the gaps so that the following piece of code draws 8 vertical lines equally distributed across your screen (cf. figure).



```
//please write your answers on your answer sheet only
int n = 8;

for (______ i = 0; ______ ; i++) {
  int x = i ______ (width/_______);
  line(x, ______, x, ______);
}
```

4. (a) (0.5 points) Array `a` is `{1, 0, 1, 0, 1}` and array `b` is `{20, 30, 70}`. What is the value of

```
b [ a [b.length] - 1 + 2*a[0]]
```

   Show me how you reached your answer; just giving the correct value(s) gives you no points.

   (b) (1 point) What is the output of the following piece of code? Show me how you reached your answer; just giving the correct value(s) gives you no points.

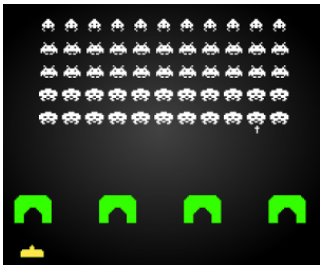
```
int j = 1;
int[] a = {3, 4, 1, 5, 6};

for (int i = 24*j; i > 4; i /= j) {
  j = a[j];
  println(i);
}
```

5. (1 point) Write a function `int rollNDice(int n)` that simulates the throwing of `n` dice. Your function should simulate the throwing of `n` standard (six-sided) dice and return the sum of all throws. You do not need to store the individual throws, only to calculate their sum.

   Note: `random(int a, int b)` is a Processing function that produces a random float number between a and b (starting at a, and up to, but not including, b)

6. (1 point) Write a function `void swapElements(int a, int b)` that swaps two elements in an array of integers `arr`. You can assume that `arr` is a global array; your function just changes the values in `arr`. Your function should receive two parameters, `a` and `b`, and swap the element at position `a` with the element at position `b`. 4. Make sure your solution prevents any issues with the values of `a` and `b`.



7. (1 point) (a) Suppose you are implementing the game of Space Invaders (cf. figure). How many classes will you need to implement the defence bunkers (i.e. big green things at the bottom)? How many objects? How many constructors? Briefly explain your answers.

   (b) The following class declaration contains 3 errors. Find them and correct them. Briefly explain your answers.

```
class Bird {
   String name;
   int age = 0;

   Constructor(String cuteName) {
   age = (int) random(1,3);
   cuteName = name;
   }
   void grow() {
   bird.age++;
   }
}
```

8. (1 point) (a) Explain the difference between a LIFO and a FILO data structure.
   (b) The following piece of code does not work. Why? Propose a solution.

```
int j=8;
for (int i=0; i<5 && j>0 ; i++) {
   if (i+j>8) {
   i = j; j--;
   }
}
println(i);
```

9. (1 point) Fill in the missing code so that the following function multiplies two positive integers *recursively*.

```
int multiply(int a, int times) { //positive integers only
   if (times == 0) {
      return _____________;
   }
   else {
      return _____________;
   }
}
```