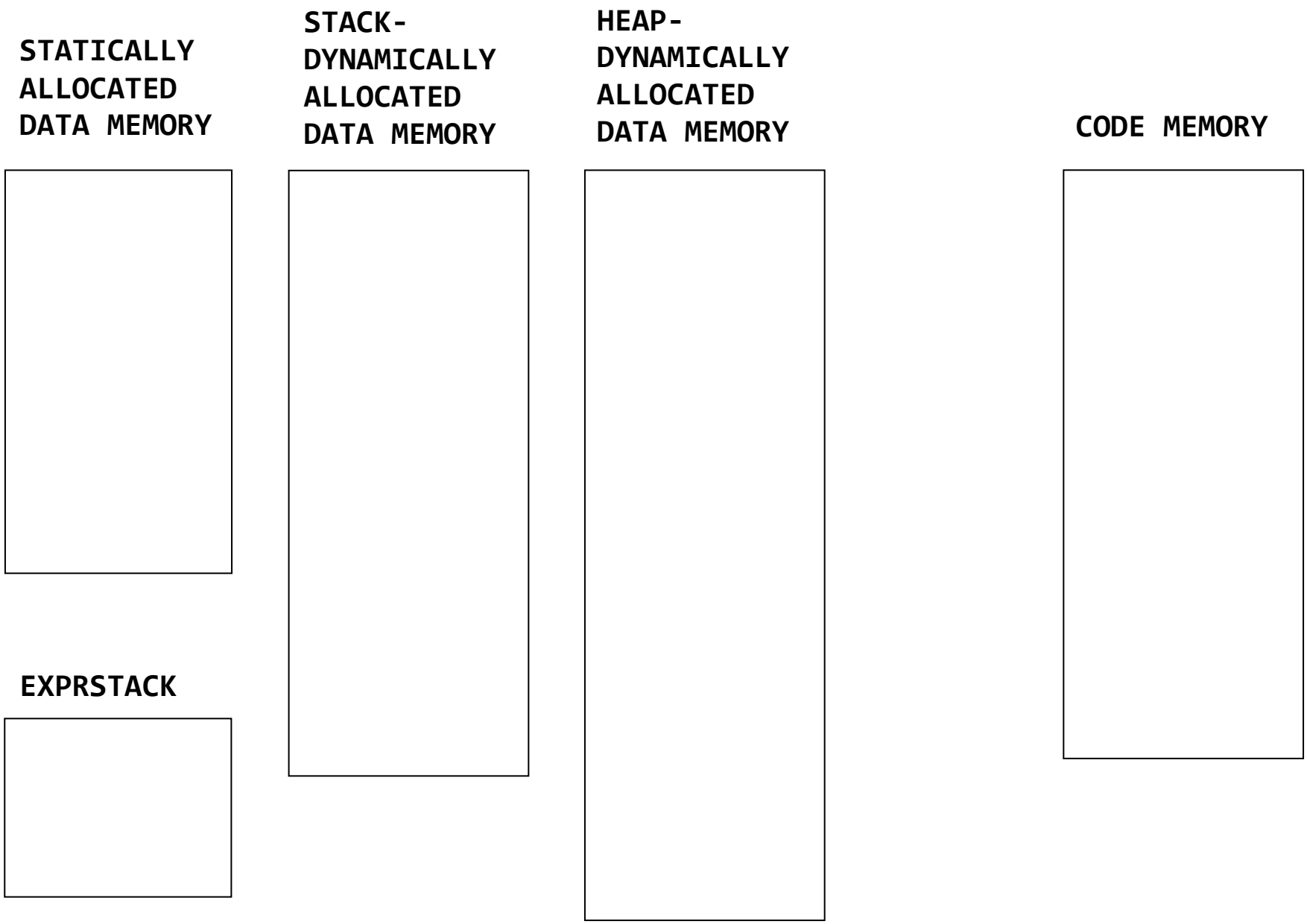
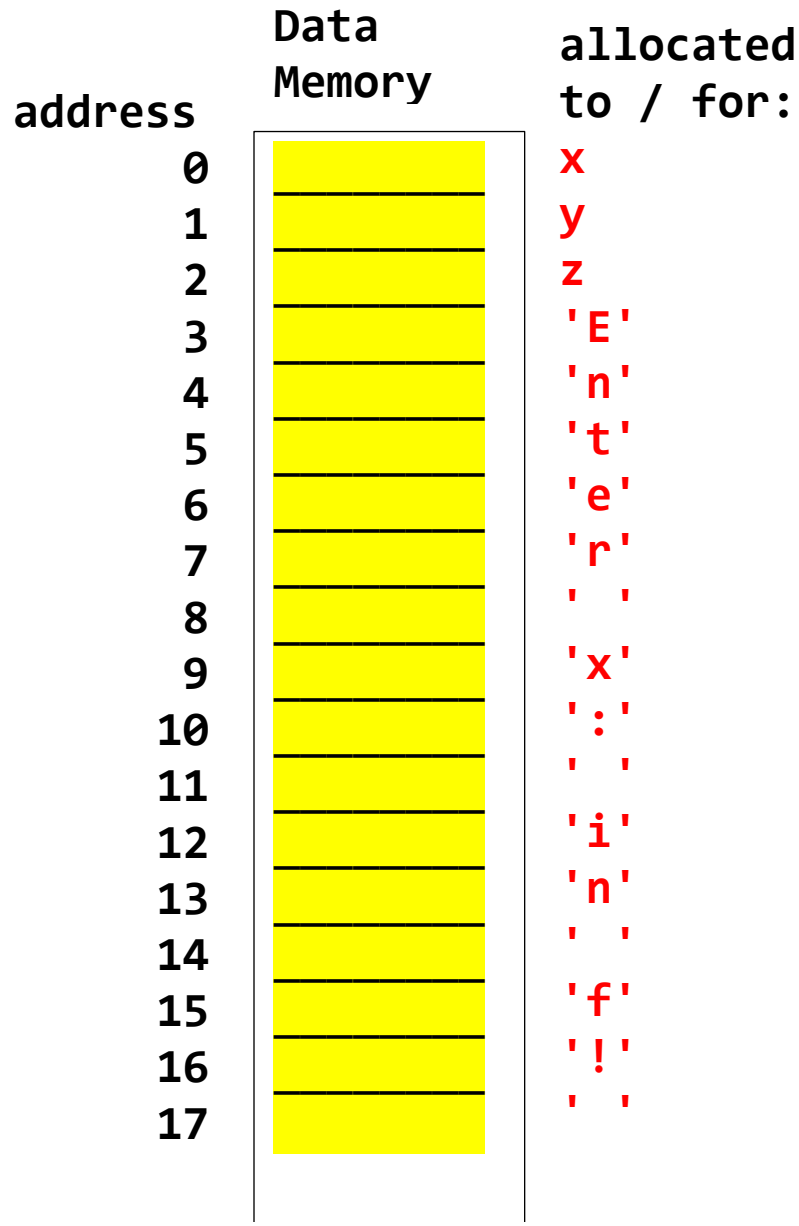
The TinyJ Virtual Machine's Memory (VM Registers are Not Shown)



An Example: Which memory locations are statically allocated for the following TinyJ program? What variables / data are they allocated to / for?

```
import java.util.Scanner;

class Simple {

 static Scanner input
           = new Scanner(System.in);

 static int x, y = 10, z;

 public static void main(String args[])
 {
   System.out.print("Enter x: ");
   x = input.nextInt();
   f(17, y, x-y);
   System.out.println(y + f(21,22,23));
 }

 static int f (int a, int b, int c)
 {
   int v[], w, u = x;
   System.out.print("in f! ");
   return y - a % u;
 }   Answer: 18 locations are statically
}            allocated as shown above.
```

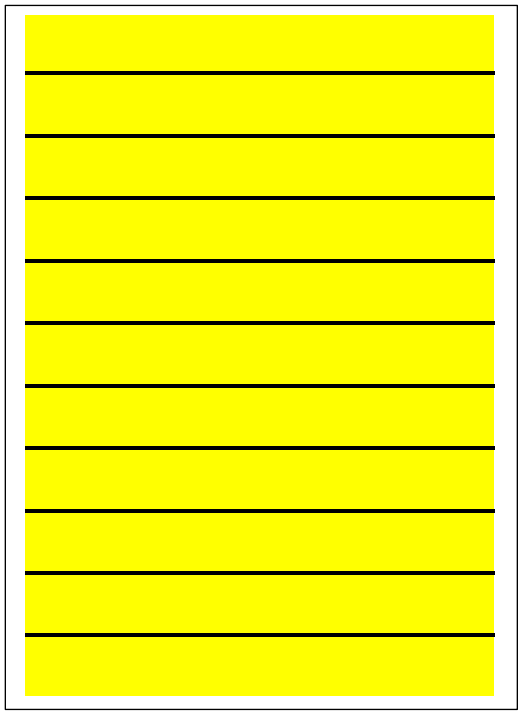


An Example: How many locations are allocated for each stackframe of the following function, and what stackframe offset is given to each formal parameter and each local variable declared in the body?

```
int my_func(int x, int[] y, int z)
{
  int a, b[];
  if ( ... ) {
    int c, d[];
       ...
  }
  else {
    int e, f;
       ...
    int g;
       ...
  }
   ...
  int h, i, j, k;
   ...
}
```

ANSWER: 11

Stackframe of any call of my_func



offset	allocated to
-4	x
-3	y
-2	z
-1	return addr
0	dynamic link
+1	a
+2	b
+3	c, e, h
+4	d, f, i
+5	g, j
+6	k

Example of Stack-Dynamic Allocation

See p. 4 of: https://euclid.cs.qc.cuny.edu/316/Memory-allocation-VM-instruction-set-and-hints-for-asn-2.pdf

```
(1) main() is called
(2)  main() calls f()
(3)   f() calls g()
(4)    g() calls h()
(5)     h() calls f()
(6)      f() returns control to h()
(7)     h() returns control to g()
(8)    g() calls f()
```

Stack-Dynamically Allocated Data Memory