CSCI 2271 Computer Systems

Assignment 2: Solution to Problem 2

a) For each of the functions *main*, *f*, and *g* of *HW2test.c* :

i. Give the offsets of the local variables and parameters.

ii. Specify if extra space is needed for padding, and how much.

iii. Calculate the total size of the stack frame.

Function *main*:

Name	Offset
d	-8
x	-12
y	-16
c	-17

7 extra bytes of padding are needed below the local variables.

```
The size of the stack frame = 32 bytes.
      4 bytes (for the next instruction pointer) +
      4 bytes (for the previous BR pointer) +
     17 bytes (for the local variables) +
      7 bytes (padding)
```

Function *f*:

Name	Offset
return location	+20
x	+16
y	+12
z	+8
result	-8
w	-12

4 extra bytes of padding are needed below the local variables.

```
The size of the stack frame = 40 bytes.
      4 bytes (for the return location pointer) +
     12 bytes (for the parameters) +
      4 bytes (for the next instruction pointer) +
      4 bytes (for the previous BR pointer) +
     12 bytes (for the local variables) +
      4 bytes (padding)
```

```
Function g:
```

Name	Offset
return location	+12
x	+8
result	-4

```
    4 extra bytes of padding are needed below the local
    variables.

    The size of the stack frame = 24 bytes.
          4 bytes (for the return location pointer) +
          4 bytes (for the parameter) +
          4 bytes (for the next instruction pointer) +
          4 bytes (for the previous BR pointer) +
          4 bytes (for the local variable) +
          4 bytes (padding)
```

b) Assume that the bottom of the stack is at location 256, and that the stack grows downward, towards 0. Give a table that describes each value in the stack when the stack is at its largest point – that is, when *main* calls *f* and *f* calls *g* – immediately after *g* executes the statement

```
          return result;
```

Your table should show the address, size, contents, and purpose of each value. For values you don't know (such as the location of an instruction), you should describe the value (such as "line 2 of the file hw2test.c"). For example, the first two entries in my solution look like this:

Stack Frame	Address	Size	Contents	Purpose
main	252	4	pointer to somewhere in the OS	pointer to next instruction
main	248	4	0	pointer to previous BR
main	240	8	garbage	d
main	236	4	1	x
main	232	4	2	y
main	231	1	garbage	c
main	224	7	garbage	padding
f	220	4	240	pointer to return location
f	216	4	1	param x
f	212	4	2	param y
f	208	4	-1	param z
f	204	4	line 13 of hw2test.c	pointer to next instruction
f	200	4	248	pointer to previous BR

f	192	8	4.0	result
f	188	4	4	w
f	184	4	garbage	padding
g	180	4	188	pointer to return location
g	176	4	2	param x
g	172	4	line 25 of hw2test.c	pointer to next instruction
g	168	4	200	pointer to previous BR
g	164	4	4	result
g	160	4	garbage	padding