ECS 140A Homework 2

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1. Give the output using (a) static scoping and (b) dynamic scoping.

   (a) With static scoping, the program outputs

   ```
   Q 1 1
   P 1 3
   Q 1 5
   P 1 3
   ```

   (b) With dynamic scoping, the program outputs

   ```
   Q 1 1
   P 1 3
   Q 5 5
   P 5 3
   ```

2. Consider the following program.

   (a) Show the runtime stack, including static pointers, each time a block or procedure is entered or exited.

action	stack	static pointers
start:	(empty)	
+A:	A	
+P/D:	A P	P→A
+S:	A P S	P→A S→P
+Q/C:	A P S Q	P→A S→P Q→P
+T:	A P S Q T	P→A S→P Q→P T→Q
+R/B:	A P S Q T R	P→A S→P Q→P T→Q R→A
+U:	A P S Q T R U	P→A S→P Q→P T→Q R→A U→R
-U:	A P S Q T R	P→A S→P Q→P T→Q R→A
-R/B:	A P S Q T	P→A S→P Q→P T→Q
-T:	A P S Q	P→A S→P Q→P
-Q/C:	A P S	P→A S→P
-S:	A P	P→A
-P/D:	A	
+E:	A E	E→A
+R/F:	A E R	E→A R→A
+U:	A E R U	E→A R→A U→R
-U:	A E R	E→A R→A
-R/F:	A E	E→A
-E:	A	
-A:	(empty)	

(b) Show the runtime stack and the display each time a block or procedure is entered or exited.

action	stack	display (@ = pointer to or address of)
start:	(empty)	(empty)
+A:	A	@A
+P/D:	A P	@A @P
+S:	A P S	@A @P @S
+Q/C:	A P S Q	@A @P @Q
+T:	A P S Q T	@A @P @Q @T
+R/B:	A P S Q T R	@A @R
+U:	A P S Q T R U	@A @R @U
-U:	A P S Q T R	@A @R
-R/B:	A P S Q T	@A @P @Q @T
-T:	A P S Q	@A @P @Q
-Q/C:	A P S	@A @P @S
-S:	A P	@A @P
-P/D:	A	@A
+E:	A E	@A @E
+R/F:	A E R	@A @R
+U:	A E R U	@A @R @U
-U:	A E R	@A @R
-R/F:	A E	@A @E
-E:	A	@A
-A:	(empty)	(empty)

3. Give the output from the following program for each of the following parameter passing combinations:

   (a) x, y, z by value.

   ```
   1 2 3
   1 2 3
   2 1 1
   1 2 3
   ```

   (b) x, y, z by reference.

   ```
   1 2 3
   2 1 1
   1 2 2
   1 1 1
   ```

   (c) x, y, z by name.

   ```
   1 2 3
   2 2 1
   1 2 2
   1 2 1
   ```

   (d) x by reference, y by name, z by value.

```
1 2 3
2 2 1
1 2 2
1 2 1
```

(e) x, y by name, z by reference.

```
1 2 3
2 2 1
1 2 2
1 1 1
```