

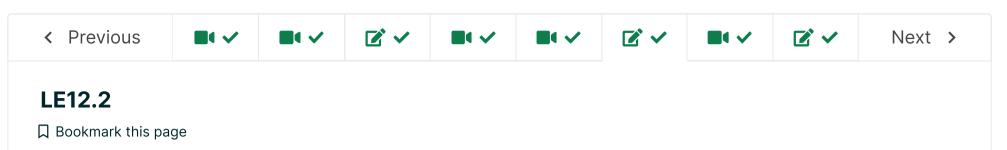
<u>Help</u>

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★ Course / 12. Procedures and Stacks / Lecture Videos (35:16)





■ Calculator

LE12.2.1 Compiling a Procedure

4/4 points (ungraded)

You are given the following listing of a C program and its translation to Beta assembly code:

```
int ones(int x) {
                         // low bit of x
  int lowbit = x & 1;
  int rest = x \gg 1;
                         // shift other bits right
 if (x == 0) return 0;
  else return ones(rest)+lowbit
}
```

```
[01] ones: PUSH(LP)
[02]
             PUSH(BP)
[03]
             MOVE(SP, BP)
[04]
             ALLOCATE(2)
[05]
             PUSH(R1)
[06]
             LD(BP, -12, R0)
[07]
             ANDC(R0, 1, R1)
[80]
             ST(R1, 0, BP)
[09]
             SHRC(R0, 1, R1)
             ST(R1, 4, BP)
[10]
             BEQ(R0, labl)
[11]
[12]
             LD(BP, 4, R1)
[13]
             PUSH(R1)
             BR(ones, LP)
[14]
[15]
             DEALLOCATE (1)
[16]
             LD(BP, 0, R1)
[17]
             ADD(R0, R1, R0)
[18] labl: POP(R1)
[19]
             MOVE(BP, SP)
[20]
             POP(BP)
[21]
             POP(LP)
[22]
             JMP(LP)
```

(A) Which line(s) of assembly language form the entry sequence? Include code responsible for allocating local variables and saving the values of registers used in the body of the procedure. Check all the applicable lines

variables and saving the values of registers used in the body of the procedure. Check ar	Title applicable liftes.
[01] ones:PUSH(LP)	
[02] PUSH(BP)	
[03] MOVE(SP, BP)	
[04] ALLOCATE(2)	
[05] PUSH(R1)	
[06] LD(BP, -12, R0)	
[07] ANDC(R0, 1, R1)	
[08] ST(R1, 0, BP)	
[09] SHRC(R0, 1, R1)	
[10] ST(R1, 4, BP)	
[11] BEQ(R0, lab1)	
[12] LD(BP, 4, R1)	
[13] PUSH(R1)	☐ Calculato

[13] PUSH(R1)

[14] BR(ones, LP)	
[15] DEALLOCATE(1)	
[16] LD(BP, 0, R1)	
[17] ADD(R0, R1, R0)	
[18] labl:POP(R1)	
[19] MOVE(BP, SP)	
[20] POP(BP)	
[21] POP(LP)	
[22] JMP(LP)	
ich line(s) of assembly language form the exit sequence? Include code responsible restoring values saved entry sequence. Check all the applicable lines.	d
[01] ones:PUSH(LP)	
[02] PUSH(BP)	
[03] MOVE(SP, BP)	
[04] ALLOCATE(2)	
[05] PUSH(R1)	
[06] LD(BP, -12, R0)	
[07] ANDC(R0, 1, R1)	
[08] ST(R1, 0, BP)	
[09] SHRC(R0, 1, R1)	
[10] ST(R1, 4, BP)	
[11] BEQ(R0, lab1)	
[12] LD(BP, 4, R1)	
[13] PUSH(R1)	
[14] BR(ones, LP)	
[15] DEALLOCATE(1)	
[16] LD(BP, 0, R1)	
[17] ADD(R0, R1, R0)	a c

[18] labl:POP(R1)	
[19] MOVE(BP, SP)	
[20] POP(BP)	
[21] POP(LP)	
✓ [22] JMP(LP)	
Which line(s) of assembly language were generated when compiling the applicable lines.	ne recursive call ones(rest). Check all
[01] ones:PUSH(LP)	
[02] PUSH(BP)	
[03] MOVE(SP, BP)	
[04] ALLOCATE(2)	
[05] PUSH(R1)	
[06] LD(BP, -12, R0)	
[07] ANDC(R0, 1, R1)	
[08] ST(R1, 0, BP)	
[09] SHRC(R0, 1, R1)	
[10] ST(R1, 4, BP)	
[11] BEQ(R0, lab1)	
[12] LD(BP, 4, R1)	
[13] PUSH(R1)	
[14] BR(ones, LP)	
[15] DEALLOCATE(1)	
[16] LD(BP, 0, R1)	
[17] ADD(R0, R1, R0)	
[18] labl:POP(R1)	
[19] MOVE(BP, SP)	
[20] POP(BP)	
[21] POP(LP)	
[22] JMP(LP)	⊞ Ca

[01]	ones:PUSH(LP)
[02]	PUSH(BP)
[03]	MOVE(SP, BP)
[04]	ALLOCATE(2)
[05]	PUSH(R1)
/ [06]	LD(BP, -12, R0)
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[11]	BEQ(R0, lab1)
[12]	LD(BP, 4, R1)
[13]	PUSH(R1)
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[16]	LD(BP, 0, R1)
[17]	ADD(R0, R1, R0)
[18]	labl:POP(R1)
[19]	MOVE(BP, SP)
[20]	POP(BP)
[21]	POP(LP)
[22]	JMP(LP)
/	

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