

Quiz #6
Monday, May 22nd

1. [5 pts ea] Each of the following multiplies the integer in R0 by a constant.
Identify the constant.
 - a. RSB R0,R0,R0,LSL 3 7
 - b. ADD R0,R0,R0,LSL 3 9

 2. [5 pts ea] Give a single instruction that multiplies the integer in R0 by the indicated constant:
 - a. $R0 \leftarrow 5 \times R0$: ADD R0,R0,R0,LSL 2
 - b. $R0 \leftarrow 15 \times R0$: RSB R0,R0,R0,LSL 4

 3. [5 pts] Suppose R0 contains a signed integer that you want to divide by 8 using ASR. What must you do so that the result is identical to that of integer division?
 - a. Add 7 and then use ASR to shift right by 3 bits.
 - b. Add 7 if the integer is negative and then use ASR to shift right by 3 bits.
 - c. Use ASR to shift right by 3 bits and then add 7 to the result.
 - d. Use ASR to shift right by 3 bits and then add 7 to the result if it is negative.

 4. [5 pts] Suppose "dividend" is an 8-bit signed integer that you want to divide by 3 using reciprocal multiplication. Which of the following sequences (all of which divide by 3) should you use?
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| <code>// 64 bits ← 32x32
 LDRB R0,dividend
 LDR R1,=1431655765
 SMULL R0,R1,R0,R1
 STRB R1,quotient</code> | <code>// 32 bits ← 16x16
 LDRB R0,dividend
 LDR R1,=21845
 MUL R0,R0,R1
 LSR R0,R0,16
 STRB R0,quotient</code> | <code>// 16 bits ← 8x8
 LDRB R0,dividend
 LDR R1,=85
 MUL R0,R0,R1
 LSR R0,R0,8
 STRB R0,quotient</code> |
|--|--|--|
5. [3 pts ea] Suppose $r = x \% 8$ and $m = x \& 7$. Circle all statements that are correct.
 - a. $m = r$ for all values of x .
 - b. $m = r$ for non-negative values of x .
 - c. $m = r + 8$ for all values of x .
 - d. $m = r + 8$ for negative values of x .

All 3 solutions work. However, the leftmost solution is the appropriate choice because (1) once the dividend is loaded into a 32-bit register it's no longer an 8-bit problem, and (2) it takes one less instruction.