

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?

// 64 bits $\leftarrow 32 \times 32$	// 32 bits $\leftarrow 16 \times 16$	// 16 bits $\leftarrow 8 \times 8$
<code>LDRB R0,dividend</code>	<code>LDRB R0,dividend</code>	<code>LDRB R0,dividend</code>
<code>LDR R1,=1431655765</code>	<code>LDR R1,=21845</code>	<code>LDR R1,=85</code>
<code>SMULL R0,R1,R0,R1</code>	<code>MUL R0,R0,R1</code>	<code>MUL R0,R0,R1</code>
<code>STRB R1,quotient</code>	<code>LSR R0,R0,16</code>	<code>LSR R0,R0,8</code>
	<code>STRB R0,quotient</code>	<code>STRB R0,quotient</code>

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.

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 .**