Spoerri Raphael

I will neither give nor receive unauthorized assistance on this exam. I will use only one computing device to perform this test. Raphael Spoerri

1.

	Unsigned	Signed	Unsigned Fixed Point	Signed Fixed Point
10000000	128	-128	32+0/4=32	-32+0/4 = -32
10000011	131	-125	32 + ¾ = (128+3)/4= 131/4	-31 -¼=(-124-1)/4= -125/4
10000001	129	-127	32 + ¼ = (128+1)/4= 129/4	-31-3/4 = -127/4
01000001	65	+65	16+¼=(64+1)/4 = 65/4	16+¼=+65/4
01111111	127	+127	31+¾=(124+3)/4= 127/4	31+¾=+127/4
11111111	255	-1	63+¾ = (252 + 3)/4 = 255/4	-1+¾=-1/4
11111100	252	-4	63+0/4 = 63	-1 + 0/4 = -1
00000000	0	+0	0 + 0 = 0	+0 + 0 = +0
01111110	126	+126	31 + ½ = (62 +1)/2 = 63/2	+31 + ½ = +63/2
10001110	142	-114	35 + ½ = (70+1)/2 = 71/2	-28 - ½ = (-56-1)/2=-57/2
00010011	19	+19	4+¾=(16+3)/4 = 19/4	4+¾=+19/4

1. NONE. Given 16 bits of representation, minus 6 bits for the fractional part, leaves us with 10 bits for the integer part, but since it's signed, the integer range is -2^9 to $+2^9 - 1$. $-2^9 = -512$, but since all of the answers are less than -512, none are correct.

2.

	0x0.E	0000.1110	14/16
	-		
	0x0.F	0000.1111	-15/16
	~(0x0.F) + .1 = 0xF.0 + .1 = 0xF.1 0x0.E + 0xF.1 = 0xF.F	-00001111= ~(00001111) + 1= 11110000 + 1= 11110001 0000.1110 + 1111.0001= 1111.1111	
Result	0xF.F	0b1111 1111	-1/16

3.

-127.75 requires two bits to represent the fractional part, and 8 to represent the integer part. To prove this, if we take 127.75 represented in binary:
0111 1111.11 and negate it by inverting and adding 1: ~(01111111.11) + 1 we get 1000,0000.01, which has 8 + 2 = 10 bits, so it takes 10 bits:

1) 1000000001
2) 10 bits

4. 1000 0000.01 << 4 = 100000000100.

4.1. ~100000000100 + 1 = 01111111011 + 1 = 01111111100 = -1020