16a) 52_{10} → 8 bit two's complement

$0011\ 0100_2 = 52_{10}$

$0011\ 0100_2 = 34_{16}$

$52_{10} \rightarrow 34_{16}$

b) -5_{10} → 8 bit two's complement

number is negative so first bit is 1

$1000\ 0101_2$ negated → 1111 1010 +1 = 1111 1011

-5_{10} = 1111 1011 (two's complement)

$-5_{10} \rightarrow FB_{16}$

c) -12_{10} → 8 bit two's complement

number is negative so first bit is 1

$1000\ 1100_2$ negated → 1111 0011 + 1 = 1111 0100

-12_{10} = 1111 0100 (two's complement)

$-12_{10} \rightarrow F4_{16}$

d) 120_{10} → 8 bit two's complement

$0111\ 1000_2 = 120_{10}$

$0111\ 1000_2 = 78_{16}$

$120_{10} \rightarrow 78_{16}$

e) -120_{10} → 8 bit two's complement

number is negative so first bit is 1

$1111\ 1000_2$ negated → 1000 0111+1 = 1000 1000

-120_{10} = 1000 1000 (two's complement)

$-120_{10} \rightarrow 88_{16}$

22)
a) 6 + 3 = 0110 + 0011 (two's complement) = **1001**

Signed overflow

b) 3 + (-2) = 0011 + 1110 = **0001**

Unsigned overflow

c) -5 + (-6) = 1011 + 1010 = **0101**

Signed overflow and unsigned overflow

d) -1 + (-6) = 1111 + 1010 = **1001**

Unsigned overflow

e) 1 + (-5) = 0001 + 1011 = **1100**

No overflow

24 a) 10010101 = -1.0101 * 2^(-2) = -0.010101_2 = **-21/64**

b) 00110011 = 1.0011 * 2^(0) = 1.0011_2 = **1 3/16**

c) 10101101 = -1.1101 * 2^(-1) = -0.11101_2 = **-29/32**

25 a) 1 ¼ = 1.01_2 = 1.0100_2 * 2^0

00110100

b) -1 ¾ = -1.11_2 = 1.1100_2 * 2^0

10111100

c) 2 3/8 = 10.011_2 = 1.0011_2 * 2^1

01000011

d) 5 ½ = 101.1_2 = 1.0110_2 * 2^2

01010110

I think computer scientists in the previous generations of computing were trying to make computers solely to preform human tasks at high speeds. We originally thought computers were going to just do computation, as the first human computers did. Once we created computers that could preform tasks at high speeds, the goals were to make computers as user friendly as possible. This was done by creating mouses and trackpads and GUI's, and introducing the PC, to bring computation into the everyday household. However, the recent boom in technology and big data I believe has pushed us into a new generation of computing.

With the rise of artificial intelligence and machine learning, we have gone from computers doing human tasks at high speeds, to doing tasks that humans might not be able to complete. IBM Watson is a clear example of data analytics and pattern matching that would be almost impossible for a human, or team of humans to complete. The focus is now pushing the boundaries of what technology can do, instead of making technology fit the boundaries of what humans can do.