(1) Because it is too low level.
complex to write code.
time consuming.
(Any thing reasonable should be fine)
As Answer.

$$
\begin{array}{lcll}
 & & 111\ 1 & \leftarrow \text{carry} \\
(2)\quad A & = & 11110100 & \\
B & = & 10110111 & (+) \\
\hline
A+B & = & 1\ \boxed{10101011} &
\end{array}
$$

1 ↓ carry (discarded).

---

(3) 3 ⇒ 0011 (4-bit)

-3 is 2's complement of 3:

1) Step1: Flip the bits = 1100
2) Step2: Add 1 = 1100+1 = 1101 ⇒ -3

1 is in 4-bit binary: 0001

-1 is 2's complement of 1:

1) flip the bits = 1110
2) Add 1 = 1110+1 = 1111 ⇒ -1

Now, $-3-1 \Rightarrow (-3)+(-1)$:

$$
\begin{array}{lr}
 & 111 \\
-3: & 1101 \\
-1: & 1111 \quad (+) \\
\hline
 & 1\,\boxed{1100}
\end{array}
$$

Discard.

Now $(-3-1)-1 = (-3-1)+(-1)$

$$
\begin{array}{lr}
 & 1 \\
-3-1: & 1100 \\
-1: & 1111 \quad (+) \\
\hline
 & 1\,\boxed{1011}
\end{array}
$$

Discard

Ans is negative : 1011

To get the absolute value, do a 2's complement

1) Flip the bits = 0100

2) Add 1 = 0100 + 1 = 0101

0101 is 5

Answer is $\boxed{-5}$

④ 1000 10 100 1010 1011 11 0000 11 00110 111

1	1000	10100	1010	1011	1100	0011	0011	0111
1	1	4	A	B	C	3	3	7

---

⑤ − 58

it can be done in many ways:

Approach 1: (1) convert the number to Hex.

(2) perform a compliment.

Approach 2: (1) Convert the number to binary

(2) Perform 2's complement

(3) Convert back to Hexadecimal.

See Next page

5

Approach-1

58 to Hexadecimal:

Division	Result	Remainder
58/16	3	10 → (A)
3/16	0	3

58 is 3A.

58 in 16 bit = 003A.

complement of 003A.

(1) FFFF − 003A = FFC5

(2) Add 1 : FFC5 + 1 = $\boxed{\text{FFC6.}}$

give full points if Answer is C6

Ans: $\boxed{\text{FFC6}}$

Approach-2

58 in binary ⇒ 111010

58 in 16-bit = 0000 0000 0011 1010

2's complement :

1) Flip : 1111 1111 1100 0101

2) Add 1 : +1

1111 1111 1100 0110

In Hexadecimal: F F C 6

Answer C6 also gets full points

Ans: FFC6

6 (a) 01110111

MSB is 0 here. So, the number is positive.

0 111 0 11 1

$0*2^6 + 1*2^6 + 1*2^5 + 1*2^4 + 0*2^3 + 1*2^2 + 1*2^1 + 1*2^0$

$= 0 + 64 + 32 + 16 + 0 + 4 + 2 + 1$

$= 119$

6 b

1111 0001

MSB is 1, so number is negative.

Do a 2's complement:

1) Flip the bits = 0000 1110

2) Add 1 = 00001110+1 = 00001111

Convert to binary:

0000 1111

$0*2^7 + 0*2^6 + 0*2^5 + 0*2^4 + 1*2^3 + 1*2^2 + 1*2^1 + 1*2^0$

$= 0 + 0 + 0 + 0 + 8 + 4 + 2 + 1$

$= 15$

Answer is $\boxed{-15}$

⑦

$$\begin{array}{r} A1C \\ +\ CCF \\ \hline 16EB \end{array}$$

$$\begin{array}{r} 16EB \\ -\ FFE \\ \hline 6ED \end{array}$$

---

⑧ The signed range of 4-bit storage is

$$-2^{n-1} \text{ to } +2^{n-1}-1$$

$$\Rightarrow -2^{4-1} \text{ to } +2^{4-1}-1$$

$$\Rightarrow -2^{3} \text{ to } +2^{3}-1$$

$$\Rightarrow -8 \text{ to } +7$$

So, -10 is out of range for 4-bit.

No possible to store -10

⑨ The smallest 120-bit signed integer $= -2^{n-1}$

$$= -2^{120-1}$$

$$= -2^{119}$$

⑩

$$P = (\neg x \wedge \neg y \wedge \neg z) \vee (\neg x \wedge y \wedge z) \vee (x \wedge y \wedge \neg z)$$