```
           11   11      ← Carry
Answer:  A = 10100111
         B = 11110110     +
         ------------------
            (1) 10011101
             ↓  --------
      Discarded  8-bit.
```

rubric : if the process is rigth, math has minor mistakes

↳ give 80%

give partial credit if math is half done.

Answer: 70 - 10 - 42

70 in binary:

Division	quotient	Remainder
70/2	35	0
35/2	17	1
17/2	8	1
8/2	4	0
4/2	2	0
2/2	1	0
1/2	0	1

So, 70 in binary = 1000110

70 in 8-bit binary = 01000110

10 in binary = 1010

10 in 8-bit binary = 0000 1010

-10 in binary:

2's complement of 10:

1) Flip the bits : 1111 0101

2) Add 1 : 00000001 +

11110110

(1)

42 in binary:

Division	Quotient	Remainder
42/2	21	0
21/2	10	1
10/2	5	0
5/2	2	1
2/2	1	0
1/2	0	1

42 in binary = 101010

42 in 8-bit binary = 00101010

- 42 in binary :

2's complement of 42: 00101010

1) flip the bits: 11010101

2) Add 1: 00000001 +

11010110

Now, 70 - 10 := 70 + (-10) :

1 1 1 ← carry

70 : 01000110

-10 : 11110110 (+)

1 00111100

8-bit

Discard

Now: (70 - 10) - 42 = (70 - 10) + (-42)

1 1 1 1 1

(70-10) : 00111100

-42 : 11010110 (+)

1 00010010

8-bit.

Discard

Note Answer is = 00010010

convert it to decimal :

10010

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

= 16 + 0 + 0 + 2 + 0

= 18. (Answer)

Q4:

Answer:

1101	0011	0111	1101	1100	1111	0001
↓	↓	↓	↓	↓	↓	↓
D	3	7	D	C	F	1

A = 1010
B = 1011
C = 1100
D = 1101
E = 1110
F = 1111

Answer: D37DCF1

Q5: Approach-1

-90

Convert 90 to binary:

Division	Quotient	Remainder
90/2	45	0
45/2	22	1
22/2	11	0
11/2	5	1
5/2	2	1
2/2	1	0
1/2	0	1

90 in binary: 1011010

90 in 16-bit binary = 0000 0000 0101 1010

2's complement of 90:

1) Flip the bits: 1111 1111 1010 0101

2) Add 1 : 0000 0000 0000 0001 (+)

1111 1111 1010 0110

Convert to Hex:

1111 → F, 1111 → F, 1010 → A, 0110 → 6

Answer: FFA6

Q5: Approach -2

Convert 90 to Hexadecimal:

Division	quotient	Remainder
90/16	5	10 (A)
5/16	0	5

90 is in Hexadecimal = 5A

16-bit Hex of 90 = 005A

Hexadecimal 2's complement:

1) Subtract all digits from 15 (F)

```
F F F F
0 0 5 A  (-)
---------
F F A 5
```

2) Add 1 : FFA5 + 1 = FFA6 (Answer).

Q:6

Answer:

(a) The signed binary number is negative. because most significant bit is 1.

First, perform a 2's complement on 11110101

1) Flip the bits - 00001010
2) Add 1 - 00000001 (+)

00001011

Now, Convert to decimal

1011

$1*2^3 + 0*2^2 + 1*2^1 + 1*2^0$

$8 + 0 + 2 + 1$

$= 11$

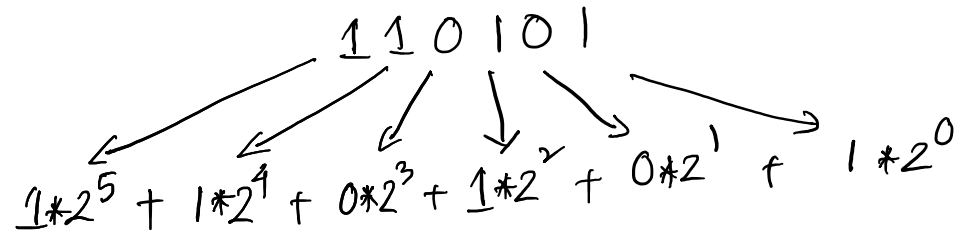
Answer is (-11)

Q 6

(b) 00110101

The signed number is positive, because most significant bit is 0.

convert the number into decimal.

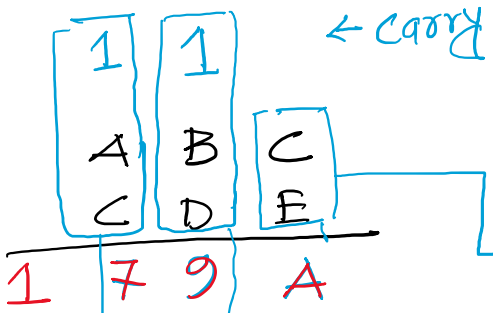


32 + 16 + 0 + 4 + 0 + 1

= 53 (Answer)

A = 10
B = 11
C = 12
D = 13
E = 14
F = 15

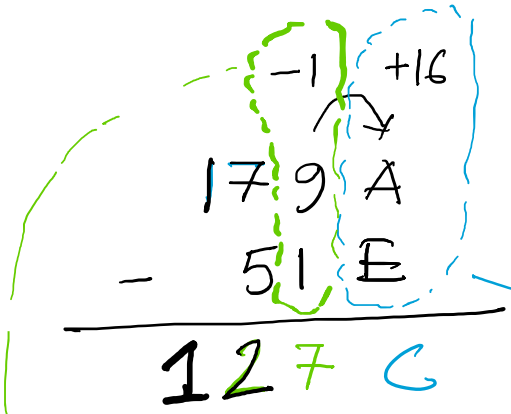
Q-7



C = 12, E = 14,
C + E = 12 + 14 = 26
Now, 26/16 = 1 → carry,
remainder = 10
= A
↓ result

B = 11, D = 13, 1 + B + D = 1 + 11 + 13 = 25
Now, 25/16 = 1 (↓ carry), remainder = 9 (↓ result)

A = 10, C = 12, 1 + A + C = 1 + 10 + 12 = 23
Now, 23/16 = 1 (↓ carry), remainder = 7



(16 + 10 − 14) = 12 = C

(−1 + 9 − 1) = 7

Answer = 127C

Q-8:

the range of signed integers is -2^{n-1} to $+2^{n-1}-1$

where n is the number of bits.

so, for 5-bit storage range = -2^{5-1} to $+2^{5-1}-1$

or -2^4 to 2^4-1

or (-16 to 15)

so, -19 cannot be stored correctly in 5-bit storage.

Q-9: smallest value can be stored in a n bit storage $= -2^{n-1}$

for 145-bit, it is $-2^{145-1} = -2^{144}$

Q-10:

X	Y	Z	P
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

$(\neg x \wedge \neg y \wedge z)$ OR $(\neg x \wedge y \wedge \neg z)$ OR $(\neg x \wedge y \wedge z)$

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