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'The GOOD' — Easy Problems

1. Binary 10111101 in hex is:

1011 1101 → B D → **0xBD**

2. Binary 1011110100000001 as an unsigned decimal is:

1011 1101 0000 0001 → **0xBD01**

3. Binary 1011110100000001 as a signed decimal is:

Decimal:
$11 \cdot 4096+13 \cdot 256+0 \cdot 16+1=45056+3328+1=4838511 \cdot 4096+13 \cdot 256+0 \cdot 16+1=45056+3328+1=$ **48385**

4. Decimal 8000 encoded in 16-bits (unsigned) is in hex:

8000_{10} **= 0x1F40**

5. Decimal 8000 encoded in 16-bits (signed) is in hex:

Positive & in range ⇒ same **0x1F40**

6. Decimal -11 encoded in 16-bits (signed) is in hex:

Two’s complement: $2^{16}-11=65536-11=65525=$ **0xFFF5**

7. Decimal -32717 encoded in 16-bits (signed) is in hex:

Two’s complement: $65536-32717=32819=$ **0x8033**

8. Hex FAC3 in binary is:

F A C 3 → 1111 1010 1100 0011 → **1111 1010 1100 0011**

9. Hex FAC3 as an unsigned decimal is:

$15 \cdot 4096+10 \cdot 256+12 \cdot 16+3=61440+2560+192+3=$**64195**

10. Hex FAC3 as a signed decimal is:

MSB=1 ⇒ negative: $64195-65536=$ **−1341**

11. Hex 0064 in binary is:

0 0 6 4 → 0000 0000 0110 0100 → **0000 0000 0110 0100**

12. Hex 0064 as an unsigned decimal is:

$0x64=6 \cdot 16+4=96+4=$ **100**

13. Hex 0064 as a signed decimal is:

MSB=0 ⇒ positive → **100**

14. Hex 8000 in binary is:

8 0 0 0 → **1000 0000 0000 0000**

15. Hex 8000 as an unsigned decimal is:

0x8000=$8 \cdot 4096$= **32768**

16. Hex 8000 as a signed decimal is:

MSB=1 ⇒ negative: 32768−65536= **−32768**

17. If we had 20-bit registers, the smallest signed decimal integer value would be:

-2^{19}= **−524,288**

18. If we had 20-bit registers, the largest signed decimal integer value would be:

$2^{19}-1$=**524,287**

19. The modular sum of 16-bit hex values 3511 + 4FFC is:

0x3511(13585)+0x4FFC(20476)=34061=**0x850D**

20. The saturated sum of 16-bit hex values 3511 + 4FFC is:

13585+20476=34061 which exceeds 32767.

Saturate to max: **0x7FFF**

21. The 16-bit operation 0x3511 + 0x4FFC has a carry (Y or N):

Sum 0x850D<0x100000⇒ **No carry (N)**.

22. The 16-bit operation 0x3511 + 0x4FFC has a overflows (Y or N):

Pos + Pos = Negative (MSB of 0x850D is 1) ⇒ **Overflow (Y)**.

'The BAD' — Medium Problems

23. The modular sum of 16-bit hex values 6159 + F702 is:

1)0x6159=$6 \cdot 4096+1 \cdot 256+5 \cdot 16+9$=24576+256+80+9=24,921

0xF702=$15 \cdot 4096+7 \cdot 256+0 \cdot 16+2$=61,440+1792+2=63,234

2) 24,921+63,234=88,155

3) 88,155−65,536=22,619

4) Divide: 22,619÷16=141322,619÷16=1413 remainder 11 → last digit = **B**

1413÷16=881413÷16=88 remainder 5 → next digit = **5**

88÷16=588÷16=5 remainder 8 → next digit = **8**

5÷16=05÷16=0 remainder 5 → next digit = **5**

So hex = 0x585B

24. The saturated sum of 16-bit hex values 6159 + F702 is:

1) 24,921+(−2,302)=22,619
2) Signed 16-bit range = [−32,768,32,767][−32,768,32,767].

   Result 22,61922,619 is **inside the range**.

3) 22,619=**0x585B**

25. The 16-bit operation 0x6159 + 0xF702 has a carry (Y or N): **Y**

26. The 16-bit operation 0x6159 + 0xF702 has a overflows (Y or N): **N**

27. The modular sum of 16-bit hex values EEEE + C00C is:

EEEE + C00C = 1AEFA → **mod sum = AEFA**

28. The saturated sum of 16-bit hex values EEEE + C00C is:

Since sum is more than 16-bits → **saturated sum = FFFF**

29. The 16-bit operation 9EEE + AB0C has a carry (Y or N): **Y**

30. The 16-bit operation 9EEE + AB0C has a overflows (Y or N): **Y**

31. The negation of 16-bit word 0xB00F is:

0xB00F = 1011 0000 0000 1111 → negation: 0100 1111 1111 0000 → hex: **0x4FF0**

32. The negation of 16-bit word 0x2232 is:

0x2232 = 0010 0010 0011 0010 → negation: 1101 1101 1100 1101 → hex: **0xDDCD**

33. The negation of 16-bit word 0x8000 is: **0x8000**

34. The negation of 32-bit word 0xFFF329BA is: **0x000CD646**

35. Hex 43700000, when interpreted as an IEEE-754 pattern, is in decimal:

s=0, e=1000 0110=(128+4+2)-127=7 f=1110 0000 0000 … → 1.111000000…* 10^7 = 11110000.0=128+64+32+16=**240**

36. Hex C0FF0000, when interpreted as an IEEE-754 pattern, is in decimal: **−7.96875**