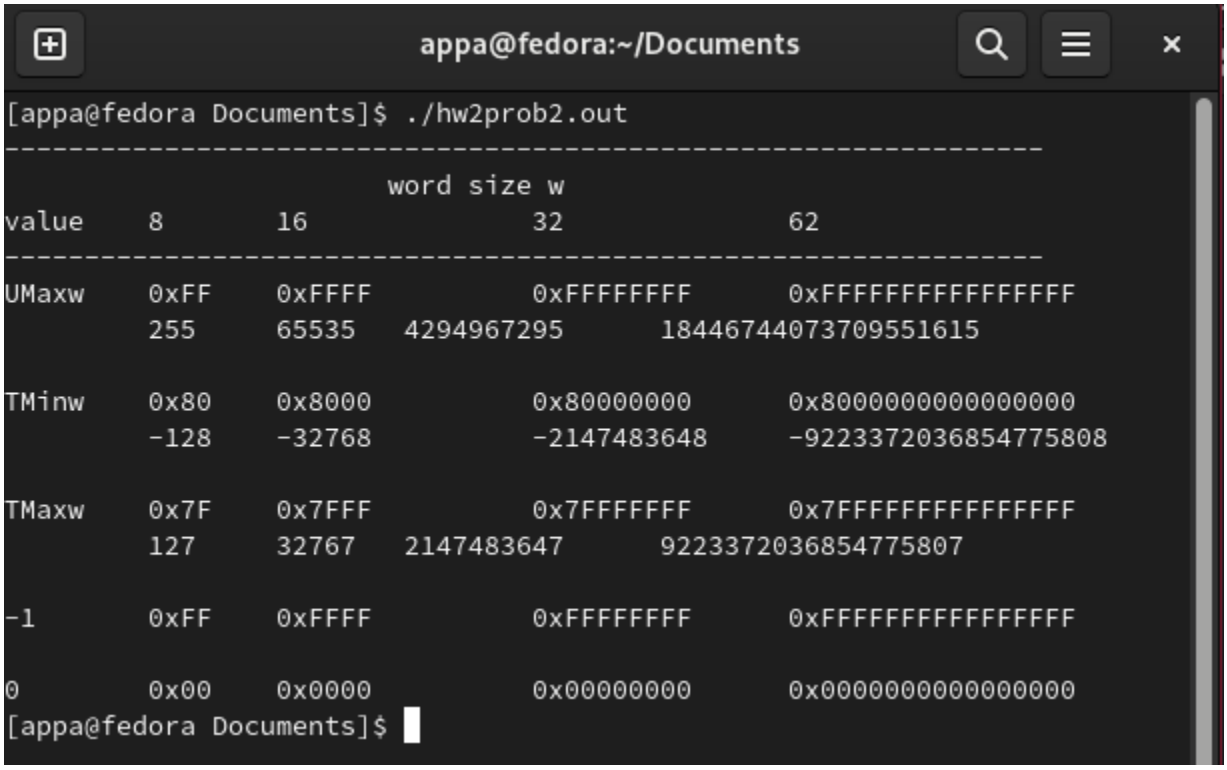
1.

Hexa Decimal	Binary	B2U8(x)	B2T8(x)
0x0A	00001010	10	10
0x06	00000110	6	6
0x14	00010100	20	20
0x6B	01101011	107	107
0x8A	10001010	138	-118
0x86	10000110	134	-122
0x94	10010100	148	-108
0xEB	11101011	235	-21

2.

```
#include <stdio.h>

#include <limits.h>

int main(){

printf("--------------------------------------------------------------------\n");

printf("\t\t\tword size w\n");

printf("value \t 8 \t 16 \t\t 32 \t\t 62\n");

printf("--------------------------------------------------------------------\n");

printf("UMaxw \t 0x%X \t 0x%X \t 0x%X \t 0x%lX \n", UCHAR_MAX, USHRT_MAX, UINT_MAX, ULONG_MAX);

printf(" \t %d \t %d \t %zu \t %zu \n\n", UCHAR_MAX,USHRT_MAX, UINT_MAX,ULONG_MAX);

printf("TMinw \t 0x%hhX \t 0x%X \t 0x%X \t 0x%lX \n",-CHAR_MIN,-SHRT_MIN, -INT_MIN, -LONG_MIN);

printf(" \t %d \t %d \t %d \t %ld \n\n", CHAR_MIN,SHRT_MIN, INT_MIN,LONG_MIN);

printf("TMaxw \t 0x%X \t 0x%X \t 0x%X \t 0x%lX \n", SCHAR_MAX, SHRT_MAX, INT_MAX, LONG_MAX);

printf(" \t %d \t %d \t %d \t %ld \n\n", SCHAR_MAX,SHRT_MAX, INT_MAX,LONG_MAX);

printf("-1 \t 0x%X \t 0x%04X \t 0x%X \t 0x%lX \n\n", (unsigned char)-1, (unsigned short)-1, (unsigned int)-1, (unsigned long)-1);

printf("0 \t 0x%02X \t 0x%04X \t 0x%08X \t 0x%016lX \n", (unsigned char)0, (unsigned short)0, (unsigned int)0, (unsigned long)0);

return 0;
```

}



3.

Bits	Signed	Unsigned
00000	0	0
00001	1	1
00010	2	2
00011	3	3
00100	4	4
00101	5	5
00110	6	6
00111	7	7
01000	8	8
01001	9	9
01010	10	10
01011	11	11
01100	12	12
01101	13	13
01110	14	14

01111	15	15
10000	-16	16
10001	-15	17
10010	-14	18
10011	-13	19
10100	-12	20
10101	-11	21
10110	-10	22
10111	-9	23
11000	-8	24
11001	-7	25
11010	-6	26
11011	-5	27
11100	-4	28
11101	-3	29
11110	-2	30
11111	-1	31

4.

```
#include <stdbool.h>

#include <stdio.h>

#include <limits.h>

int main(){

        printf("constant1 \t constant2 \t\t relation\t Evaluation\n\n");


        bool surprise = 0 == (unsigned int)0;

        if (surprise)

        printf("0 \t\t 0U \t\t\t == \t\t unsigned\n");

        else

        printf("0 \t\t 0U \t\t\t == \t\t signed\n");
```

```
surprise = -1 < 0;
if (surprise)
printf("-1 \t\t 0 \t\t\t < \t\t signed\n");
else
printf("-1 \t\t 0 \t\t\t < \t\t unsigned\n");

surprise = -1 > (unsigned int)0;
if (surprise)
printf("-1 \t\t 0U \t\t\t > \t\t unsigned\n");
else
printf("-1 \t\t 0U \t\t\t > \t\t signed\n");

surprise = INT_MAX > INT_MIN;
if (surprise)
printf("%d \t -%d-1 \t\t > \t\t signed\n", INT_MAX, INT_MAX);
else
printf("%d \t -%d-1 \t\t > \t\t unsigned\n", INT_MAX, INT_MAX);

surprise = (unsigned int)INT_MAX < INT_MIN;
if (surprise)
printf("%d \t -%d-1 \t\t < \t\t unsigned\n", INT_MAX, INT_MAX);
else
printf("%d \t -%d-1 \t\t < \t\t signed\n", INT_MAX, INT_MAX);

surprise = -1 > -2;
```

```
        if (surprise)
        printf(" -1 \t\t -2 \t\t\t > \t\t signed\n");
        else
        printf("-1 \t\t -2 \t\t\t > \t\t unsigned\n");

        surprise = (unsigned int)-1 > -2;
        if (surprise)
        printf("(unsigned)-1 \t -2 \t\t\t > \t\t unsigned\n");
        else
        printf("(unsigned)-1 \t -2 \t\t\t > \t\t signed\n");

        surprise = INT_MAX < (unsigned int)(INT_MAX+1);
        if (surprise)
        printf("%d \t %dU \t\t < \t\t unsigned\n", INT_MAX, INT_MAX+1);
        else
        printf("%d \t %dU \t\t < \t\t unsigned\n", INT_MAX, INT_MAX+1);

        surprise = (signed int)INT_MAX < (unsigned int)(INT_MAX+1);
        if (surprise)
        printf("%d \t (int)%dU \t > \t\t signed\n", INT_MAX, INT_MAX+1);
        else
        printf("%d \t (int)%dU \t > \t\t unsigned\n", INT_MAX, INT_MAX+1);

        return 0;
}
```

```
[appa@fedora Documents]$ ./hw2prob4.out
constant1        constant2                relation        Evaluation

0                0U                       ==              unsigned
-1               0                        <               signed
-1               0U                       >               unsigned
2147483647       -2147483647-1            >               signed
2147483647       -2147483647-1            <               unsigned
 -1              -2                       >               signed
(unsigned)-1     -2                       >               unsigned
2147483647       -2147483648U             <               unsigned
2147483647       (int)-2147483648U        >               signed
[appa@fedora Documents]$
```

5.

Type	X	Y	X+Y	X+(t5)Y	Case
Int	13	5	18	-14	1
Binary	01101	00101	10010	10010	BLANK
Int	3	4	7	7	2
Binary	00011	00100	00111	00111	BLANK
Int	-8	7	-1	-1	3
Binary	11000	00111	11111	11111	BLANK
Int	-9	-7	-16	-15	4
Binary	10111	11001	10000	10001	BLANK
Int	-11	-14	-25	7	5
Binary	10101	10010	100111	00111	BLANK

6.

```
#define TMAX 2147483647

#define TMIN (-TMAX -1)

#include <stdio.h>

int main(){

        int total = saturating_add(5, 10);

        printf("Total number of Is : %d\n",total);
```

```
}

int saturating_add(int x, int y) {
        int w = sizeof(x) << 3;
        int sum = x + y;
        int mask = 1 << (w - 1);
        int x_msb = x & mask;
        int y_msb = y & mask;
        int sum_msb = sum & mask;
        int pos_ovf = ~x_msb & ~y_msb & sum_msb;
        int neg_ovf = x_msb & y_msb & !sum_msb;
        (pos_ovf) && (sum = TMAX);
        (neg_ovf) && (sum = TMIN);
        return sum;
}
```