CPE 64 PAL Worksheet ECS, CSUS

r's and (r-1)'s complement worksheet

1) For binary number arithmetic, what is the advantage of using 2's complement?

2) For binary number arithmetic, what is the disadvantage of using 2's complement?

Example1) Find the 9's complement of N = 546700.
Solution: The formula for 9's complement is $(r^n - 1) - N$
(where n is the numbers of digits in the number N, r is the base of the number system. Here r = 10, because it is a base 10 number, n = 6, because there are 6 digits in the given N.)

999999 – 546700 = 453299 (9's complement)
9's complement of 546700 is 453299

3) Find the 9's complement of 27785936.

4) Find the 9's complement of 00000000.

Example 2) Find the 10's complement of 72532
$r^n - N = [(r^n - 1) - N] + 1$
99999 - 72532 = 27467 (9's complement)
27467 + 1 = 27468 (10's complement)
10's complement of 72532 is 27468

5) Find the 10's complement of 576325800.

6) Find the 10's complement of 948571236.

Example 3) Using 10's complement, subtract 72532 - 3250.

3,250 → 96,749 (9s comp) → 96,750 (10s comp)
72532 – 3250 = 72532 + 96750 = 169282(Negative)
169282 - 100000(Discard end carry 10^5) = 69282
Result: 72532 – 3250 = 69282.

7) Perform subtraction on the given unsigned numbers 647813 – 519297 using the 10's complement of the subtrahend.

8) Perform subtraction on the given unsigned numbers 197076 – 375217 using the 10's complement of the subtrahend.

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9) Perform subtraction on the given unsigned numbers 878631 – 745873 using the 10's complement of the subtrahend.

Example 4) Find the 1's complement of 010010

111111 - 010010 = 101101

1's complement of 010010 is 101101

10) What is the 1's complement of 1001_0110?

11) What is the 1's complement of 1101_1011

Example 4) Find the 2's complement of 1010_0101

1111_1111 – 1010_0101 = 0101_1010 (1's complement)

0101_1010 + 0000_0001 = 0101_1011 (2's complement)

2's complement of 1010_0101 is 0101_1011

12) Two's complement of the binary number 1010_0101.

13) Two's complement representation of value 1101_1110 is.

14) What is the largest positive value that can be represented by an 8 bit 2's complement number?

15) The range of numbers represented by an 8-bit two's complement representation is.

16) Perform subtraction on the unsigned binary numbers 10011 – 10010 using the 2's complement of the subtrahend.

17) Perform subtraction on the unsigned binary numbers 1001 – 110101 using the 2's complement of the subtrahend.