

## 1.2 Base 7

0, 1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 16, 20  
Base 9  
0, 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15

## 1.3 (1) one's complement

(a) 10010 ----> 01101  
(b) 110010 ----> 001101  
(c) 0010101 ----> 1101010  
(d) 10110.0101 ----> 01001.1010  
(e) 1101.1100 ----> 0010.0011  
(f) 111010.0011 ----> 000101.1100  
(g) 1001.0001 ----> 0110.1110  
(h) 110100.0100 ----> 001011.1011  
(i) 1010110.111 ----> 0101001.000

## (2) two's complement

(a) 10010 ----> 01101 <--- complement each bit  
+ 1 <--- add 1 to the LSR  
01110

(b) 110010 ----> 001101 + 1 = 001110  
(c) 0010101 ----> 1101010 + 1 = 1101011  
(d) 10110.0101 ----> 01001.1010 + 1 = 01001.1011  
(e) 1101.1100 ----> 0010.0011 + 1 = 0010.0100  
(f) 111010.0011 ----> 000101.1100 + 1 = 000101.1101  
(g) 1001.0001 ----> 0110.1110 + 1 = 0110.1111  
(h) 110100.0100 ----> 001011.1011 + 1 = 001011.1100  
(i) 1010110.111 ----> 0101001.000 + 1 = 0101001.001

## 1.4 nine's complement

(a) 465  
(465)<sub>9</sub> = 10<sup>3</sup> - (465)<sub>10</sub> - 1 = 534  
(b) 09867  
(09867)<sub>9</sub> = 10<sup>5</sup> - (09867)<sub>10</sub> - 1 = 90132  
(c) 42678  
(42678)<sub>9</sub> = 10<sup>5</sup> - (42678)<sub>10</sub> - 1 = 57321  
(d) 8976  
(8976)<sub>9</sub> = 10<sup>4</sup> - (8976)<sub>10</sub> - 1 = 1023  
(e) 423.76  
(423.76)<sub>9</sub> = 10<sup>3</sup> - (423.76)<sub>10</sub> - 0.01 = 576.23  
(f) 561.876  
(561.876)<sub>9</sub> = 10<sup>3</sup> - (561.876)<sub>10</sub> - 0.001 = 438.123  
(g) 463.90  
(463.90)<sub>9</sub> = 10<sup>3</sup> - (463.90)<sub>10</sub> - 0.01 = 536.09  
(h) 1786.967  
(1786.967)<sub>9</sub> = 10<sup>4</sup> - (1786.967)<sub>10</sub> - 0.001 = 8213.032  
(i) 12356.078  
(12356.078)<sub>9</sub> = 10<sup>5</sup> - (12356.078)<sub>10</sub> - 0.001 = 87643.921

## Ten's complement

(a) (465)<sub>10</sub> = 10<sup>3</sup> - (465)<sub>10</sub> = 535  
(b) (09867)<sub>10</sub> = 10<sup>5</sup> - (09867)<sub>10</sub> = 90133  
(c) (42678)<sub>10</sub> = 10<sup>5</sup> - (42678)<sub>10</sub> = 57322  
(d) (8976)<sub>10</sub> = 10<sup>4</sup> - (8976)<sub>10</sub> = 1024  
(e) (423.76)<sub>10</sub> = 10<sup>3</sup> - (423.76)<sub>10</sub> = 576.24  
(f) (561.876)<sub>10</sub> = 10<sup>3</sup> - (561.876)<sub>10</sub> = 438.124  
(g) (463.90)<sub>10</sub> = 10<sup>3</sup> - (463.90)<sub>10</sub> = 536.10  
(h) (1786.967)<sub>10</sub> = 10<sup>4</sup> - (1786.967)<sub>10</sub> = 8213.033  
(i) (12356.078)<sub>10</sub> = 10<sup>5</sup> - (12356.078)<sub>10</sub> = 87643.922

1.5 (a) x+y      1101010      x-y      1101010  
                 + 10111      - 10111  
                 10000001      1010011

xy      1101010  
         x      10111  
         1101010  
         1101010  
         1101010  
         0000000  
         1101010  
         100110000110

x/y      1101010      11010 > 10111      q<sub>1</sub> = 1 ; subtract  
         -10111  
         00111  
         - 10111  
         01110  
         - 10111  
         1110      ← remainder  
         100      ← quotient      x-y      101101  
                 + 1111      - 1111  
                 111100      11110

xy      101101  
         x      1111  
         101101  
         101101  
         101101  
         101101  
         101101  
         1010100011

x/y      101101      1011 < 1111      q<sub>1</sub> = 0; do not subtract  
         -1111  
         10110  
         -1111  
         1111  
         - 1111  
         0      ← remainder  
         011      ← quotient