

Homework 1

b) a) 1110
 $2^3 2^2 2^1$
 $8 + 4 + 2 = 14$

d) 1000
 $2^4 = 16$

g) 10111
 $2^4 2^3 2^2 2^1 2^0$
 $16 + 4 + 2 + 1 = 23$

b) 1010
 $2^3 2^1$
 $8 + 2 = 10$

e) 10101
 $2^4 2^2 2^0$
 $16 + 4 + 1 = 21$

h) 11111
 $2^4 2^3 2^2 2^1 2^0$
 $16 + 8 + 4 + 2 + 1 = 31$

c) 11100
 $2^4 2^3 2^2$
 $16 + 8 + 4 = 28$

f) 11101
 $2^4 2^3 2^2 2^0$
 $16 + 8 + 4 + 1 = 29$

8) a) $2^2 - 1 = 3$

e) $2^6 - 1 = 63$

i) $2^{10} - 1 = 1023$

b) $2^3 - 1 = 7$

f) $2^7 - 1 = 127$

j) $2^{11} - 1 = 2047$

c) $2^4 - 1 = 15$

g) $2^8 - 1 = 255$

d) $2^5 - 1 = 31$

h) $2^9 - 1 = 511$

10) a) 0 = 000
 1 = 001
 2 = 010
 3 = 011
 4 = 100
 5 = 101
 6 = 110
 7 = 111

b) 8 = 1000
 9 = 1001
 10 = 1010
 11 = 1011
 12 = 1100
 13 = 1101
 14 = 1110
 15 = 1111

c) 16 = 10000
 17 = 10001
 18 = 10010
 19 = 10011
 20 = 10100
 21 = 10101
 22 = 10110
 23 = 10111

24 = 11000
 25 = 11001
 26 = 11010
 27 = 11011
 28 = 11100
 29 = 11101
 30 = 11110
 31 = 11111

d) 32 = 100000
 33 = 100001
 34 = 100010
 35 = 100011
 36 = 100100
 37 = 100101
 38 = 100110
 39 = 100111

40 = 101000
 41 = 101001
 42 = 101010
 43 = 101011
 44 = 101100
 45 = 101101
 46 = 101110
 47 = 101111

48 = 110000
 49 = 110001
 50 = 110010
 51 = 110011
 52 = 110100
 53 = 110101
 54 = 110110
 55 = 110111

56 = 111000
 57 = 111001
 58 = 111010
 59 = 111011
 60 = 111100
 61 = 111101
 62 = 111110
 63 = 111111

e) 64 = 1000000
 65 = 1000001
 66 = 1000010
 67 = 1000011
 68 = 1000100
 69 = 1000101
 70 = 1000110

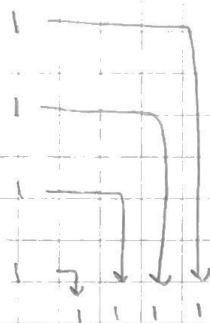
71 = 1000111
 72 = 1001000
 73 = 1001001
 74 = 1001010
 75 = 1001011

$$13) a) \frac{15}{2} = 7$$

$$\frac{7}{2} = 3$$

$$\frac{3}{2} = 1$$

$$\frac{1}{2} = 0$$



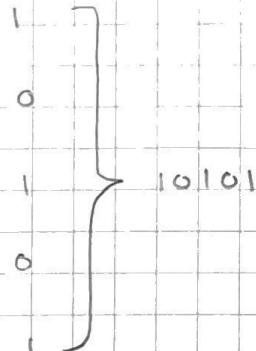
$$b) \frac{21}{2} = 10$$

$$\frac{10}{2} = 5$$

$$\frac{5}{2} = 2$$

$$\frac{2}{2} = 1$$

$$\frac{1}{2} = 0$$



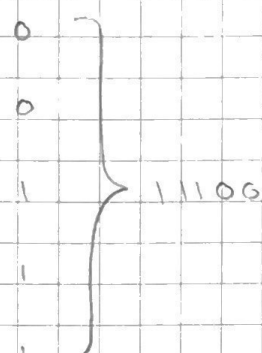
$$c) \frac{28}{2} = 14$$

$$\frac{14}{2} = 7$$

$$\frac{7}{2} = 3$$

$$\frac{3}{2} = 1$$

$$\frac{1}{2} = 0$$



$$d) \frac{34}{2} = 17$$

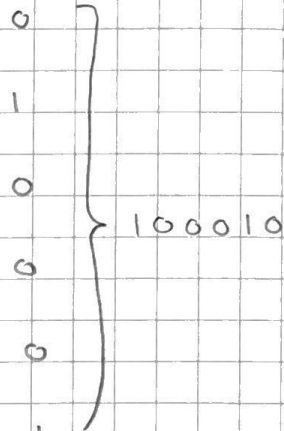
$$\frac{17}{2} = 8$$

$$\frac{8}{2} = 4$$

$$\frac{4}{2} = 2$$

$$\frac{2}{2} = 1$$

$$\frac{1}{2} = 0$$



$$e) \frac{40}{2} = 20$$

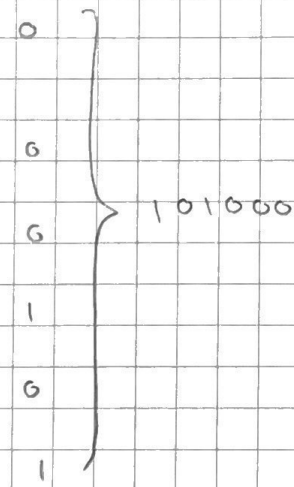
$$\frac{20}{2} = 10$$

$$\frac{10}{2} = 5$$

$$\frac{5}{2} = 2$$

$$\frac{2}{2} = 1$$

$$\frac{1}{2} = 0$$



$$f) \frac{59}{2} = 29$$

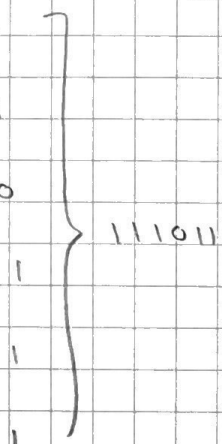
$$\frac{29}{2} = 14$$

$$\frac{14}{2} = 7$$

$$\frac{7}{2} = 3$$

$$\frac{3}{2} = 1$$

$$\frac{1}{2} = 0$$



$$g) \frac{65}{2} = 32$$

$$\frac{32}{2} = 16$$

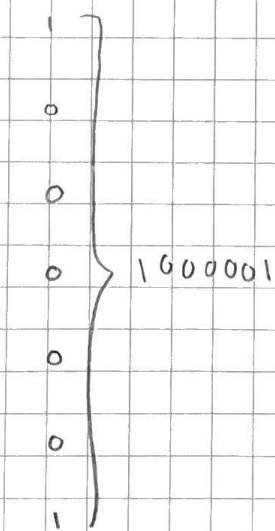
$$\frac{16}{2} = 8$$

$$\frac{8}{2} = 4$$

$$\frac{4}{2} = 2$$

$$\frac{2}{2} = 1$$

$$\frac{1}{2} = 0$$



$$h) \frac{73}{2} = 36$$

$$\frac{36}{2} = 18$$

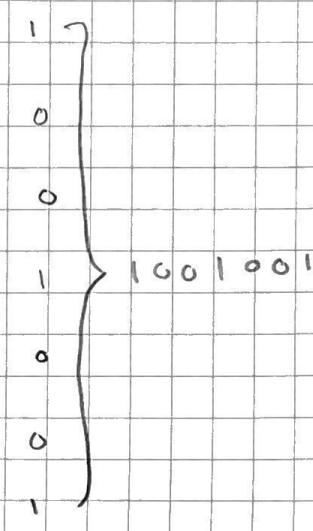
$$\frac{18}{2} = 9$$

$$\frac{9}{2} = 4$$

$$\frac{4}{2} = 2$$

$$\frac{2}{2} = 1$$

$$\frac{1}{2} = 0$$



$$15) \quad a) \begin{array}{r} 11 \\ + 101 \\ \hline 100 \end{array} \quad \begin{array}{r} 3 \\ + 1 \\ \hline 4 \end{array}$$

$$b) \begin{array}{r} 10 \\ + 10 \\ \hline 100 \end{array} \quad \begin{array}{r} 2 \\ + 2 \\ \hline 4 \end{array}$$

$$c) \begin{array}{r} 101 \\ + 11 \\ \hline 1000 \end{array} \quad \begin{array}{r} 5 \\ + 3 \\ \hline 8 \end{array}$$

$$d) \begin{array}{r} 111 \\ + 110 \\ \hline 1101 \end{array} \quad \begin{array}{r} 7 \\ + 6 \\ \hline 13 \end{array}$$

$$e) \begin{array}{r} 1001 \\ + 101 \\ \hline 1110 \end{array} \quad \begin{array}{r} 9 \\ + 5 \\ \hline 14 \end{array}$$

$$f) \begin{array}{r} 1101 \\ + 1011 \\ \hline 11000 \end{array} \quad \begin{array}{r} 13 \\ + 11 \\ \hline 24 \end{array}$$

19) 00000000 OR 11111111
using all zeros or all ones

$$28) \quad a) \begin{array}{r} 10011001 \\ 10011000 \\ 01100111 \\ 64 \quad 32 \quad 421 = -103 \end{array}$$

$$b) \begin{array}{r} 01110100 \\ 01110011 \\ 10001100 \\ 128 \quad 84 = 140 \end{array}$$

$$c) \begin{array}{r} 10111111 \\ 10111110 \\ 01000001 \\ 64 \quad 1 = -65 \end{array}$$

29)