Binary Numbers - Answers

Exercise 1

1. $(9 \times 10^5) + (2 \times 10^4) + (6 \times 10^3) + (0 \times 10^2) + (8 \times 10^1) + (3 \times 10^0)$

2. (a) $(5 \times 10^2) + (7 \times 10^1) + (9 \times 10^0)$

(b) $(7 \times 10^3) + (0 \times 10^2) + (0 \quad 10^1) + (8 \quad 10^0)$

(c) $(1 \times 10^4) + (2 \times 10^3) + (7 \times 10^2) + (3 \times 10^1) + (0 \times 10^0)$

(d) $(4 \times 10^5) + (8 \times 10^4) + (1 \times 10^3) + (5 \times 10^2) + (9 \times 10^1) + (7 \times 10^0)$

(e) $(6 \times 10^5) + (9 \times 10^4) + (0 \times 10^3) + (3 \times 10^2) + (4 \times 10^1) + (8 \times 10^0)$

(f) $(2 \times 10^6) + (4 \times 10^5) + (5 \times 10^4) + (1 \times 10^3) + (0 \times 10^2) + (9 \times 10^1) + (3 \times 10^0)$

(g) $(5 \times 10^7) + (1 \times 10^6) + (6 \times 10^5) + (7 \times 10^4) + (2 \times 10^3) + (9 \times 10^2) + (0 \times 10^1) + (1 \times 10^0)$

2. (h) $(8 \times 10^8) + (1 \times 10^7) + (8 \times 10^6) + (4 \times 10^5) + (0 \times 10^4) + (3 \times 10^3) + (5 \times 10^2) + (9 \times 10^1) + (2 \times 10^0)$

Exercise 2

1. (a) $(1 \times 2^5) + (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0)$

(b) $32 + 16 + 0 + 4 + 2 + 0 = 54$

2. $110110_2 = 54_{10}$

3. (a) 64 (b) 128 (c) 256 (d) 512
(e) 1024 (f) 2048 (g) 4096
(h) 8192 (i) 16 384 (j) 32 768
(k) 65 536 (l) 131 072

4. (a) 7_{10} (b) 9_{10} (c) 11_{10} (d) 49_{10}
(e) 47_{10} (f) 51_{10} (g) 106_{10}
(h) 202_{10} (i) 693_{10} (j) 2461_{10}
(k) 1295_{10} (l) $10\ 202_{10}$
(m) 8192_{10} (n) $32\ 772_{10}$
(o) $16\ 912_{10}$ (p) $65\ 535_{10}$

5. (a) 1101_2 (b) 10001_2 (c) 10100_2
(d) 10110_2 (e) 11000_2 (f) 11111_2
(g) 100000_2 (h) 100111_2
(i) 101101_2 (j) 111100_2
(k) 1001001_2 (l) 10011100_2
(m) 1101111_2 (n) 10010000_2
(o) 11100001_2 (p) 100000001_2
(q) 110110101_2 (r) 1100010101_2
(s) 10000000110_2
(t) 10000010111_2
(u) 110011001110_2
(v) 1000011010111_2
(w) 1101001111111_2
(x) 10010011110100_2

Exercise 3

1. (a) 111_2 (b) 100_2 (c) 1010_2 (d) 1110_2
(e) 1000110_2 (f) 1000110_2 (g) 10011100_2
(h) 111110_2 (i) 11101111_2 (j) 1001100010_2
(k) 1110101100_2 (l) 1000111010010_2

2. (a) $4_{10} + 3_{10} = 7_{10}$
(b) $3_{10} + 1_{10} = 4_{10}$
(c) $5_{10} + 5_{10} = 10_{10}$
(d) $11_{10} + 3_{10} = 14_{10}$
(e) $43_{10} + 27_{10} = 70_{10}$
(f) $11_{10} + 59_{10} = 70_{10}$
(g) $53_{10} + 103_{10} = 156_{10}$
(h) $31_{10} + 31_{10} = 62_{10}$
(i) $183_{10} + 56_{10} = 239_{10}$
(j) $129_{10} + 481_{10} = 610_{10}$
(k) $455_{10} + 485_{10} = 940_{10}$
(l) $479_{10} + 4083_{10} = 4562_{10}$

Exercise 4

1. (a) 1111_2 (b) 10010_2
(c) 11110_2 (d) 11110_2
(e) 1001011_2 (f) 1111110_2
(g) 10111101_2 (h) 1011001101_2
(i) 10000111_2 (j) 1001001001_2
(k) 10000110011_2 (l) 11101100111_2
(m) 10101100_2 (n) 11001100100_2
(o) 101011100_2 (p) 1100111101100_2

2. (a) $5_{10} \times 3_{10} = 15_{10}$ (b) $6_{10} \times 3_{10} = 18_{10}$
(c) $10_{10} \times 3_{10} = 30_{10}$ (d) $15_{10} \times 2_{10} = 30_{10}$
(e) $25_{10} \times 3_{10} = 75_{10}$ (f) $42_{10} \times 3_{10} = 126_{10}$
(g) $63_{10} \times 3_{10} = 189_{10}$ (h) $239_{10} \times 3_{10} = 717_{10}$
(i) $27_{10} \times 5_{10} = 135_{10}$ (j) $117_{10} \times 5_{10} = 585_{10}$
(k) $215_{10} \times 5_{10} = 1075_{10}$
(l) $379_{10} \times 5_{10} = 1895_{10}$
(m) $43_{10} \times 4_{10} = 172_{10}$
(n) $409_{10} \times 4_{10} = 1636_{10}$
(o) $87_{10} \times 4_{10} = 348_{10}$
(p) $1659_{10} \times 4_{10} = 6636_{10}$