# Huffman Solutions

**Example 1: SHE_SELLS_SEA_SHELLS**

*Solution A*

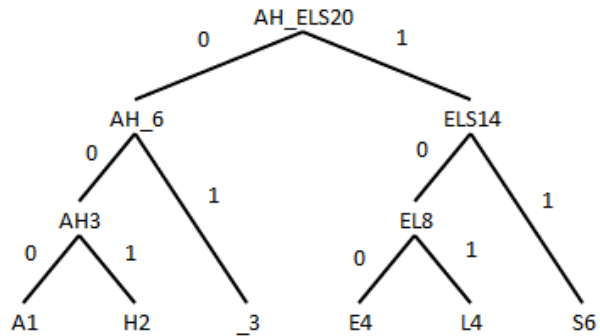| Symbol | Frequency | Huffman Code |
|--------|-----------|--------------|
| S | 6 | 00 |
| H | 2 | 0101 |
| E | 4 | 10 |
| _ | 3 | 011 |
| L | 4 | 11 |
| A | 1 | 0100 |
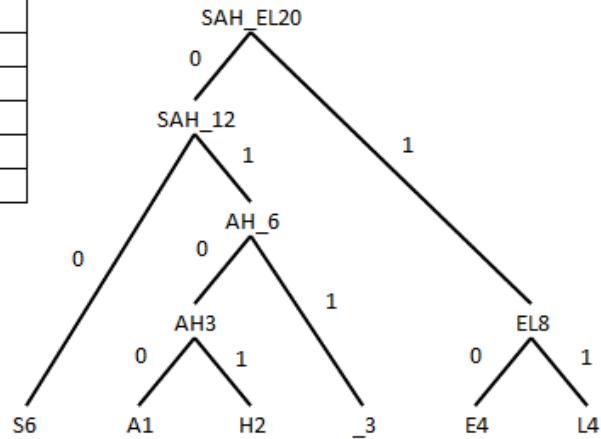


Enocde:   00 0101 10 011 00 10 11 11 00 011 00 10 0100 011 00 0101 10 11 11 00

49 bits

8-bit ASCI:  20 x 8 = 160 bits               79 % saving      3.3 : 1
3-bit minimal binary:   20 x 3 = 60 bits     18 % saving      1.2 : 1

# Huffman Solutions

## *Solution B*

| Symbol | Frequency | Huffman Code |
|--------|-----------|--------------|
| S | 6 | 11 |
| H | 2 | 001 |
| E | 4 | 100 |
| _ | 3 | 01 |
| L | 4 | 101 |
| A | 1 | 000 |



Enocde:    11 001 100 01 11 100 101 101 11 01 11 100 000 01 11 001 100 101 101 11
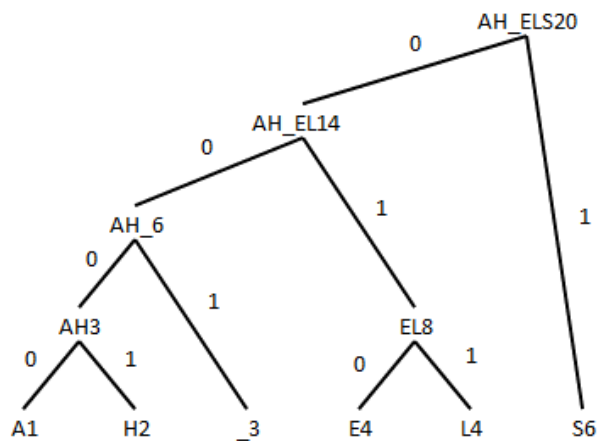           51 bits

8-bit ASCI:  20 x 8 = 160 bits            68 % saving       3.1 : 1
3-bit minimal binary:   20 x 3 = 60 bits            15 % saving       1.2 : 1

## *Solution C*

| Symbol | Frequency | Huffman Code |
|--------|-----------|--------------|
| S | 6 | 1 |
| H | 2 | 0001 |
| E | 4 | 010 |
| _ | 3 | 001 |
| L | 4 | 011 |
| A | 1 | 0000 |



Enocde:    1 0001 010 001 1 010 011 011 1 001 1 010 0000 001 1 0001 010 011 011 1
           51 bits

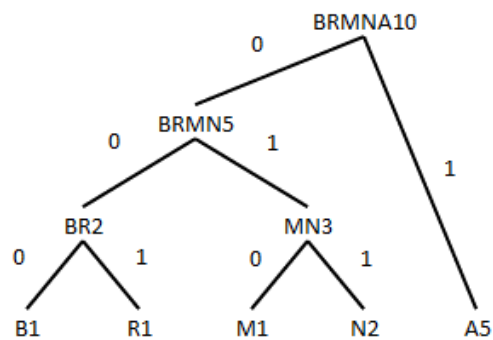8-bit ASCI:  20 x 8 = 160 bits            68 % saving       3.1 : 1
3-bit minimal binary:   20 x 3 = 60 bits            15 % saving       1.2 : 1

# Huffman Solutions

**Example 2: BANARAMA**

*Solution A*

| Symbol | Frequency | Huffman Code |
|--------|-----------|--------------|
| B | 1 | 000 |
| A | 5 | 1 |
| N | 2 | 011 |
| R | 1 | 001 |
| M | 1 | 010 |

BRMNA10
0
BRMN5
0    1
1
BR2      MN3
0   1    0   1
B1    R1    M1    N2    A5

Enocde:     000 1 011 1 011 1 001 1 010 1
            20 bits

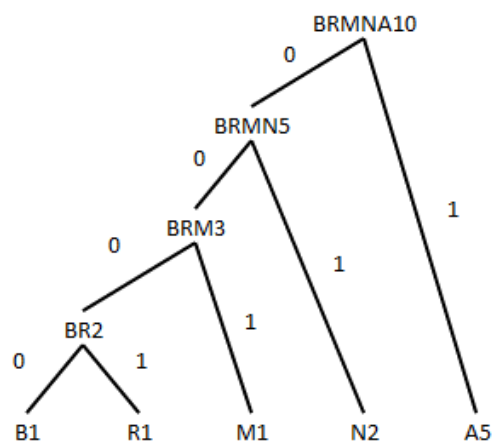8-bit ASCI: 10 x 8 = 80 bits           75 % saving     4 : 1
3-bit minimal binary:   10 x 3 = 30 bits       33 % saving     1.5 : 1

*Solution B*

| Symbol | Frequency | Huffman Code |
|--------|-----------|--------------|
| B | 1 | 0000 |
| A | 5 | 1 |
| N | 2 | 01 |
| R | 1 | 0001 |
| M | 1 | 001 |

BRMNA10
0
BRMN5
0
BRM3
0
BR2
0    1     1     1     1
B1    R1    M1    N2    A5

Enocde:     0000 1 01 1 01 1 0001 1 001 1
            20 bits

8-bit ASCI: 10 x 8 = 80 bits           75 % saving     4 : 1
3-bit minimal binary:   10 x 3 = 30 bits       33 % saving     1.5 : 1