Computer organization and architecture

Lesson 11

Machine language exercises

Exercise 11.1

Convert the following program from machine language into ARM assembly language.

```
0xE3A02000
0xE1A03001
0xE1510000
0x8A000002
0xE2822001
0xE0811003
0xEAFFFFFA
0xE1A00002
```

Exercise 11.2

Convert the following program from machine language into ARM assembly language.

```
0xE3A0201F
0xE1A03230
0xE2033001
0xE4C13001
0xE2522001
0x55DEEFFA
0xE1A0F00E
```

Exercise 11.3

Convert the following program from machine language into ARM assembly language.

```
0xE3A04003
0xE0640384
0xE0800184
0xE35000FF
0xC0110490
0x20234291
```

Exercise 11.4 The following questions examine the limitations of the branch instruction, `B`

Give your answer in number of instructions relative to the branch instruction.

a) In the worst case, how far can `B` branch forward (i.e., to higher addresses)? (The worst case is when the branch instruction cannot branch far.) Explain.

b) In the best case, how far can `B` branch forward? (The best case is when the branch instruction can branch the farthest.) Explain.

c) In the worst case, how far can `B` branch backward (to lower addresses)? Explain.

d) In the best case, how far can `B` branch backward? Explain.