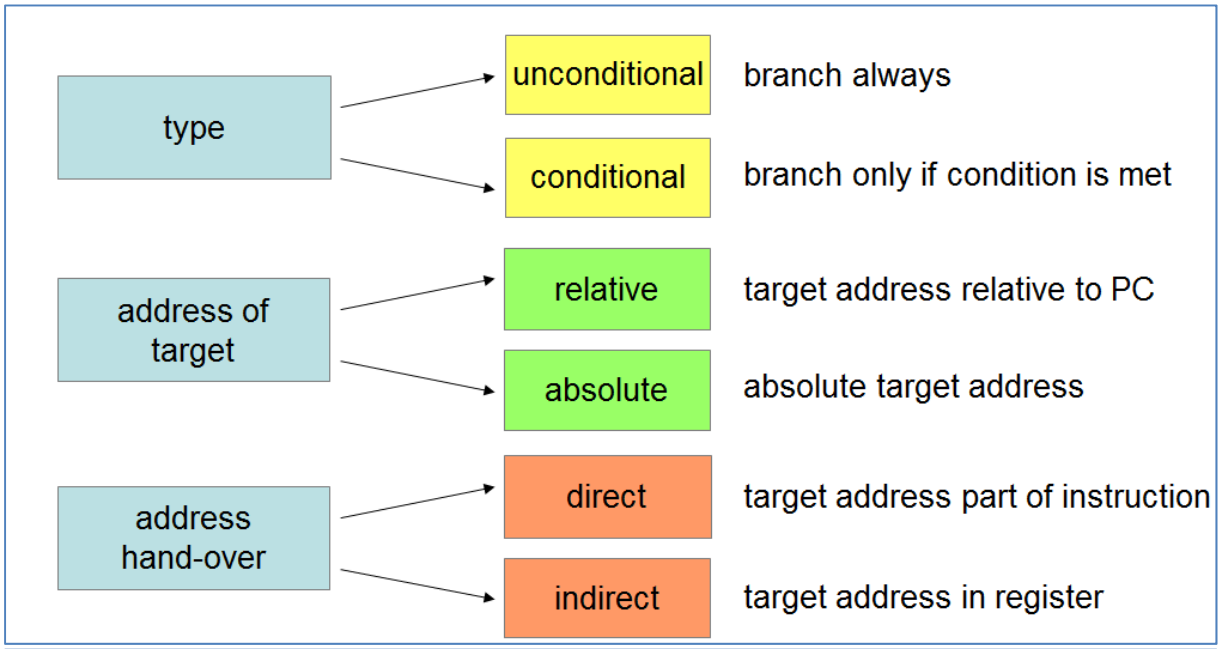
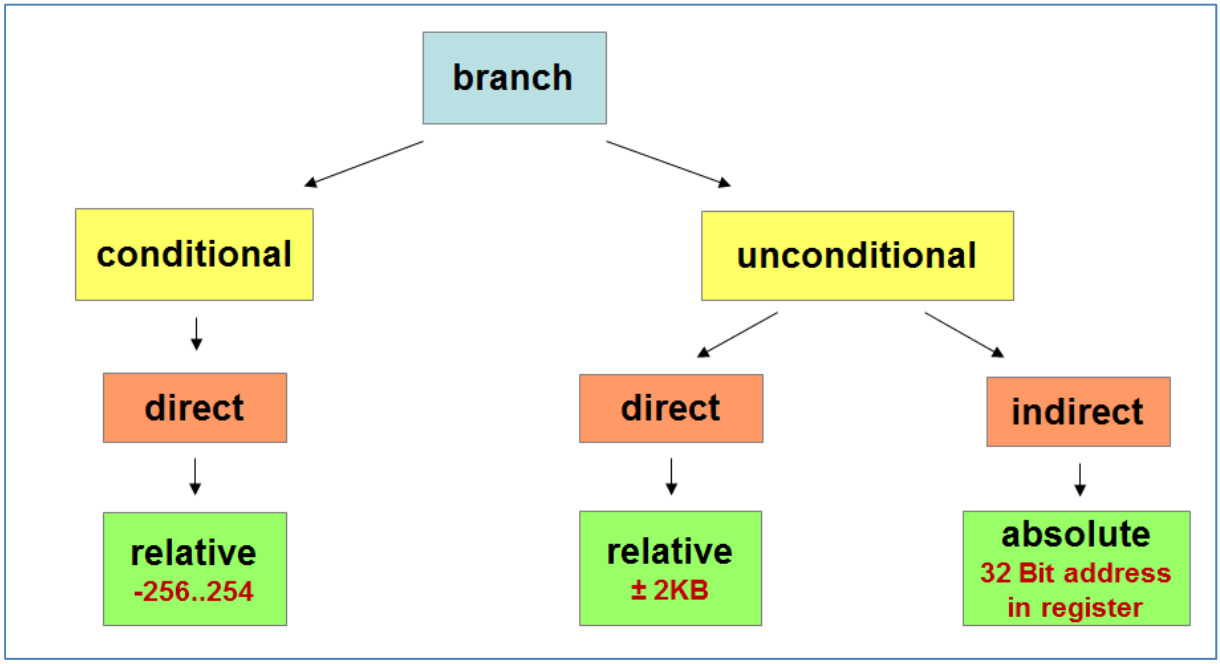
CT1 Exercises for Branching Instructions

Content





Exercise 1 – Unconditional Branches

The execution starts at line 10.

1) List the sequence of branch instructions that end in an infinite loop.
   Do this by stating the branches in tabular form: *from – to*.
   E.g. the first branch is **11 – 16** (branch unconditionally from line 11 to line 16).

2) At which line does the execution sequence finally loop forever?

```
10 | Label1    LDR  R0, =Label5
11 | Label2    BX   R0
12 | Jumptable DCD  Case0
13 |           DCD  Case1
14 |           DCD  Case2
15 |           DCD  Case3
16 | Label5    LDR  R0, =Label6
17 |           B    Label2
18 | Label6    LDR  R2, =Jumptable
19 |           ADDS R2, R2, #4
20 | Label4    LDR  R2, [R2]
21 |           BX   R2
22 | Case0     B    Case0
23 | Case1     LDR  R2, =Jumptable
24 |           MOVS R1, #3
25 |           LSLS R1, R1, #2
26 |           ADDS R2, R2, R1
27 |           B    Label4
28 | Case2     B    Label1
29 | Case3     B    Case0
```

Your solution (the number of cells below is no hint)

1)	11-16								

2) .....

Exercise 2 – Conditional Branches

The execution starts at line 10.

1) List which branch instructions jump to the given label.
   Do this by stating the branches in tabular form: *from – to*.

2) What is the final value in R0 as hexadecimal value?

```
10          LDR  R1, =0xFFFFFFFF-5
11          LDR  R2, =10
12          LDR  R3, =0x2341
13
14          MOVS R0, #0    ; mask of branches that are not taken
15
16  Label11 ADDS R1, R1, #5
17          BCS  Label12
18          ADDS R0, R0, #0x01      ; set flag if no branch
19  Label12 ADDS R1, R1, #1
20          BCS  Label13
21          ADDS R0, R0, #0x02      ; set flag if no branch
22  Label13 LDR  R5, =0x0F18C
23          ANDS R1, R1, R5
24          BEQ  Label21
25          ADDS R0, R0, #0x04      ; set flag if no branch
26
27  Label21 LDR  R5, =2000
28          SUBS R2, R2, R5
29          BVS  Label22
30          ADDS R0, R0, #0x08      ; set flag if no branch
31  Label22 LDR  R5, =0x7FFFFFFF
32          SUBS R2, R2, R5
33          BVS  Label23
34          ADDS R0, R0, #0x10      ; set flag if no branch
35  Label23 ADDS R2, R2, #1
36          BMI  Label31
37          ADDS R0, R0, #0x20      ; set flag if no branch
38
39  Label31 LSRS R3, R3, #1
40          BCS  Endless
41          ADDS R0, R0, #0x40      ; set flag if no branch
42
43  Endless B    Endless
```

Your solution (the number of cells below is no hint)

1) | | | | | | | | | |

2) R0 = 0x.....

Exercise 3 – Comparison Instructions

The execution starts at line 10.

1) List which branch instructions jump to the given label.
   Do this by stating the branches in tabular form: *from – to*.

2) What is the final value in R0 as hexadecimal value?

```
10          LDR  R1, =0xFFFFFFFF
11          LDR  R2, =0x80000000
12          LDR  R3, =0x9CFA0000
13          LDR  R4, =0xC2350000
14
15          MOVS R0, #0    ; mask of branches that are not taken
16
17  Label11 CMP  R1, #1
18          BLT  Label12
19          ADDS R0, R0, #0x01      ; set flag if no branch
20  Label12 CMP  R1, #1
21          BLO  Label21
22          ADDS R0, R0, #0x02      ; set flag if no branch
23
24  Label21 LDR  R5, =0x7FFFFFFF
25          CMP  R2, R5
26          BGT  Label22
27          ADDS R0, R0, #0x04      ; set flag if no branch
28  Label22 LDR  R5, =0x7FFFFFFF
29          CMP  R2, R5
30          BHI  Label31
31          ADDS R0, R0, #0x08      ; set flag if no branch
32
33  Label31 LDR  R5, =0x0040FFFF
34          TST  R3, R5
35          BNE  Label32
36          ADDS R0, R0, #0x10      ; set flag if no branch
37  Label32 TST R3, R5
38          BEQ  Label41
39          ADDS R0, R0, #0x20      ; set flag if no branch
40
41  Label41 LDR  R5, =0x02100000
42          TST  R4, R5
43          BEQ  Label42
44          ADDS R0, R0, #0x40      ; set flag if no branch
45  Label42 LDR  R5, =0x10080000
46          TST  R4, R5
47          BEQ  Endless
48          ADDS R0, R0, #0x80      ; set flag if no branch
49
50  Endless B    Endless
```

Your solution (the number of cells below is no hint)

1) | | | | | | | | | |

2) R0 = 0x.....