LDR是绝对位置，结果与代码位置无关
ADR是相对位置，结果是基于PC的偏移。
二者都是伪代码，但ADR的需要向为LDR的一半(16).

ADR r0, =start => the address of pc+16
LDR r0, =start => the value of [pc+8].

Study Questions (Chapter 03 – Part 4)

1. What are the main differences between LDR, and ADR?
   Provide numeric examples to demonstrate the differences.

   LDR load the immediate data into register using PC.
   ADR get the data via calculating instructions.

2. What is the difference between LDR r4, P3 and ADR r4, P3?

   ADR, r4, P3 will use ADD instruction and the PC value to load the address in P3

3. What will be the generated code if you replaced LDR r4, P3 by ADR r4, P3?

   the result might change.

4. What is the difference between ADR r4, P3 and LDR r4, = P3?

5. What is the difference between LDR r4, P3 and LDR r4, = P3?

   LDR, r4, P3: store the value in r4 LDR r4, =P3: store the address of P3 in literal pool and the value in r4.

6. What is the difference between LDR r4, =0x1234 and LDR r4, = P3?

7. In the following program, how the pseudo instructions are implemented?

```
            AREA my_First_Example, CODE, READONLY

            ENTRY
            LDR r0, =0x12345678
            LDR r1, =ppp
            LDR r2, ppp
            ADR r3, ppp
p           B   p

ppp         DCD 0xFFFF
            END
```

   What will be the values of r0, r1, r2, and r3 after executing this program?

8. The following program, how the pseudo instructions are implemented?

```
            AREA my_First_Example, CODE, READONLY

            ENTRY
            LDR r0, =0x12345678
            LDR r1, =ppp
            LDR r2, ppp
            ADR r3, ppp
p           B   p

            AREA my_First_Example, DATA, READONLY
ppp         DCD 0xFFFF
            END
```

   What will be the values of r0, r1, r2, and r3 after executing this program?

9. Consider the following program.
   Edit lines `L1`, `L2`, `L3`, `L4`, `L5`, `L6`, and `L7`, by adding any combinations of data definition directives, i.e., `DCD`, `DCW`, `DCB`, `SPACE`, and `ALIGN`.

   Manually calculate the values of `r1`, `r2`, `r3`, `r4`, `r5`, `r6`, and `r7`.

   Assemble and run the program to verify your answer.

```
     AREA data_definitions, CODE, READONLY

     ENTRY
     LDR r1, =L1
     LDR r2, =L2
     LDR r3, =L3
     LDR r4, =L4
     LDR r5, =L5
     LDR r6, =L6
     LDR r7, =L7
loop B   loop

L1   ……..
L2   ……..
L3   ……..
L4   ……..
L5   ……..
L6   ……..
L7   ……..

     END
```

10. Consider the following program.
Edit lines `L1, L2, L3, L4, L5, L6,` and `L7,` by adding any combinations of data definition directives, i.e., `DCD, DCW, DCB, SPACE,` and `ALIGN`.

Manually calculate the values of `r1, r2, r3, r4, r5, r6,` and `r7`.

Assemble and run the program to verify your answer.

```
     AREA data_definitions, CODE, READONLY

     ENTRY
     LDR r1, =L1
     LDR r2, =L2
     LDR r3, =L3
     LDR r4, =L4
     LDR r5, =L5
     LDR r6, =L6
     LDR r7, =L7
loop B   loop

     AREA data_definitions, DATA, READONLY
L1   ……..
L2   ……..
L3   ……..
L4   ……..
L5   ……..
L6   ……..
L7   ……..

     END
```