initialization happens once

for (i=0; i<12; i++):

    a = a+1

$i = X_{20}$

$a = X_{21}$

```
Addi  X20, X0, 0
Addi  X5, X0, 12
loop1:
BGE   X20, X5, Exit
Addi  X21, X21, 1
Addi  X20, X20, 1
Beq   X0, X0, loop1
Exit:
```

try yourself.

i = 0

while (i<12):

    a = a+1

    i = i+1

After wards, look at both of these assembly codes.

If given any of these two codes can you determine if it's a while/for loop?

A[B[C[i]]]

while (A[B[C[i]]] == K):

    A[i] = A[C[i]]   (C[i] already calculated!)

    i = j

    j = j+1

Double word

$A[0] = X_{25}$

Word

$B[0] = X_{26}$

Halfword

$C[0] = X_{27}$

$i = X_{28}$

$j = X_{29}$

$K = X_{30}$

Double word = 64b = 8 cells

word = 32b = 4 cells

Half word = 16b = 2 cells

Loop 1 :

$x_6 = C[i]$ ← this is the offset now for B

```
Slli  x5, x28, 1     ; x5 = i x 2^1 = i x 2   (2: half word)
Add   x5, x27, x5    ; x5 = x27 + x5          (x27: Base of C, x5: offset)
LH    x6, 0(x5)
```

$x_7 = B[C[i]]$ ← this is the offset now for A

```
Slli  x5, x6, 2      ; x5 = (C[i]) x 2^2 = C[i] x 4   (4: word)
Add   x5, x5, x26    ; x5 = x26 + x5          (x26: Base of B, x5: offset)
LW    x7, 0(x5)
```

$x_7 = A[B[C[i]]]$ Finally

```
Slli  x5, x7, 3      ; x5 = (B[C[i]] x 2^3 = B[C[i]] x 8   (8: Double word)
Add   x5, x5, x25    ; x5 = x25 + x5          (x25: Base of A, x5: offset)
LD    x7, 0(x5)
```

```
BNE   x7, x30, breakLoop1
```

$x_6 = A[C[i]]$

```
Slli  x5, x6, 3      ; x5 = (C[i]) x 2^3 = C[i] x 8   (8: Double word, offset)
Add   x5, x25, x5    ; x5 = x5 + x25          (x5: offset, x25: Base)
Ld    x6, 0(x5)
```

```
Slli  x5, x28, 3     ; x5 = i x 8 = 8i        (offset)
Add   x5, x5, x25    ; x5 = x5 + x25          (x5: offset, x25: Base)
Sd    x6, 0(x5)
```

```
Add   x28, x29, x0    ;   i = j + 0 => i = j

Addi  x29, x29, 1     ;   j = j + 1

Beq   x0, x0, Loop1

breakLoop1:
```

\# while (A[B[C[i]]] == K):
    i = j
    A[i] = A[C[i]]
    j = j + 1

try this

for (i=0; i<15; i+=2):

    if (a==5):
        for (j=i; j<12; j++):
            a+=2
    else:
        a *= 10

$i = x_{20}$

$a = x_{21}$

$j = x_{22}$

Solution:

```
Addi  x20, x0, 0        # i
Addi  x23, x0, 15       # 15
Loop1:
BGE   x20, x23, Loop1Exit
Addi  x24, x0, 5        # 5
BNE   x21, x24, Else
Add   x22, x0, x20      # j, i
Addi  x25, x0, 12       # 12
Loop2:
BGE   x22, x25, incrementI
Addi  x21, x21, 2
Addi  x22, x22, 1
Beq   x0, x0, loop2
```

```
Else:
Slli  x8, x21, 3    ;  x8 = a×8
Add   x8, x8, x21   ;  x8 = 8a + a = 9a
Add   x21, x21, x8  ;  x21 = a + 9a = 10a

incrementI:
Addi  x20, x20, 2
Beq   x0, x0, Loop1

Loop1Exit:
```