

```

1.  a. begin:  addi  $s0, $zero,    0    ; load 0 into $s0
           addi  $s1, $zero,    1    ; load 1 into $s1
           loop: slt   $t0,  $a0,   $s1  ; set $t0 to 1 if $a0 < $s1
                                ; otherwise set it to 0
           bne   $t0, $zero, finish  ; jump to finish if $t0 != 0
           add   $s0,  $s0,   $s1  ; $s0 += $s1
           addi  $s1,  $s1,    2    ; $s1 += 2
           j     loop              ; do the looping (jump to the loop label)
           finish: add  $v0,  $s0,  $zero ; $v0 = $s0

```

```

b. int foo(int n) {
    int sum = 0;

    for (int a = 1; a <= n; a += 2) {
        sum += a;
    }

    return sum;
}

```

c. This program sums up all positive odd integers $\leq n$.

```

2.  a.          addi  $s3, $zero,    0          ; 4
           addi  $t0,  $s0,    0          ; 4
           addi  $t1,  $s1,    0          ; 4
           addi  $t2,  $s2,    0          ; 4
           loop: slt   $t5,  $s3,   $s4      ; 4
           beq   $t5, $zero, finish        ; 5
           lw    $t3,  $t0                ; 5
           lw    $t4,  $t1                ; 5
           add   $t3,  $t3,   $t4          ; 4
           sw    $t3,  $t2                ; 5
           addi  $t0,  $t0,    4          ; 4
           addi  $t1,  $t1,    4          ; 4
           addi  $t2,  $t2,    4          ; 4
           addi  $s3,  $s3,    1          ; 4
           j     loop                    ; 5
           finish:

```

b. $\frac{16+1000 \cdot 49+9}{2e9}$ seconds

```

3. convert:  addi  $t0,  $a0,    0
           addi  $v0,  $zero,    0
           loop:  lbu  $t1, 0($t0)
           beq   $t1, $zero, return
           ssl  $t2,  $v0,    3
           ssl  $v0,  $v0,    1
           add  $v0,  $v0,   $t2
           addi  $t1,  $t1,  -48
           add  $v0,  $v0,   $t1
           bltz  $t1, break
           addi  $t1,  $t1,  -10
           bgez  $t1, break
           addi  $t0,  $t0,    1

```

```
        j    loop
break:   addi $v0, $zero,    -1
return:
```

$$\phi(48) = \phi(2^4) \cdot \phi(3^1) = (2^{4-1}) \cdot (2 - 1) \cdot (3^0 \cdot (3 - 1)) = 2^3 \cdot 2$$