Exercise #4 – blackboard scribble

Declare/Assign : 1 compare : 1	Return : 1 Add/Subtract : X	Call func : 2 + WCET(func) other : 0

Case 1 : z == 0

WCET(Calc(0)) = {Declare, R} + {Compare, z==0} +

{Assign, R} + {Return, R} = 1+1+1+1 = 4

Case 2 : z == 1

WCET(Calc(1)) = {Declare, R} + {Compare, z==0} +

{Compare, z==1} + {Assign, R} + {Return, R} = 1+1+1+1+1 = 5

```
int Calc(int z){
    int R;
    if (z==0) R=1;
    else if (z==1) R=1;
    else R = Calc(z-1) + Calc(z-2);
    return R;
}
```

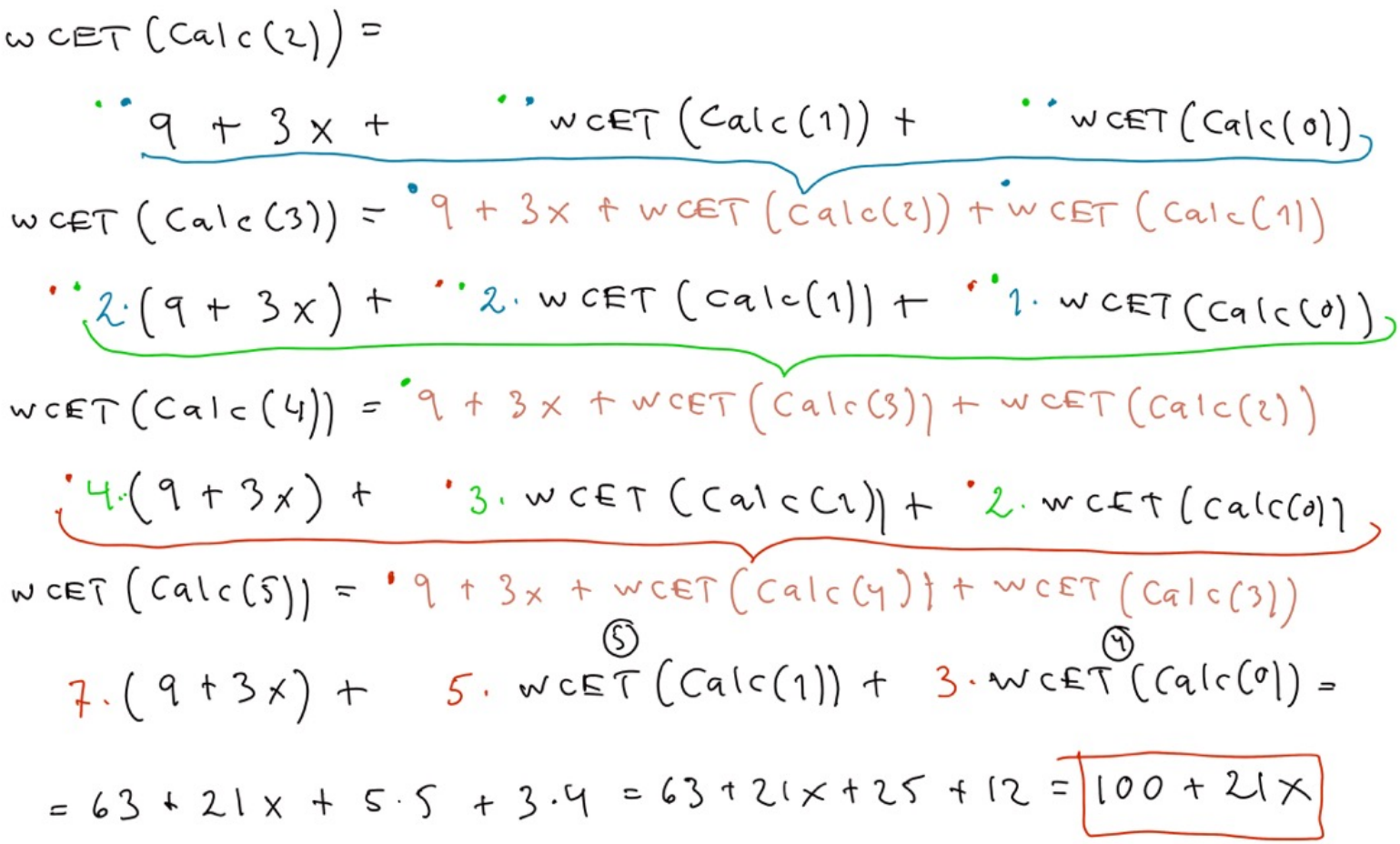
Exercise #4 – blackboard scribble

Declare/Assign : 1 compare : 1	Return : 1 Add/Subtract : X	Call func : 2 + WCET(func) other : 0

Case 3 : z > 1 (let x be cost for add & sub)

$$WCET(Calc(z>1)) = \{Declare^{1}, R\} + \{Compare^{1}, z==0\} + \{Compare^{1}, z==1\} +$$
$$\{Subtract^{X}, z-1\} + \{Call^{2}, Calc(z-1)\} + WCET(Calc(z-1)) +$$
$$\{Subtract^{X}, z-2\} + \{Call^{2}, Calc(z-2)\} + WCET(Calc(z-2)) +$$
$$\{Add^{X}, Calc(z-1)+Calc(z-2)\} + \{Assign^{1}, R\} + \{Return^{1}, R\} =$$
$$1+1+1+X+2+WCET(Calc(z-1)) +$$
$$X+2+WCET(Calc(z-2)) + X+1+1 =$$
$$9+3X+WCET(Calc(z-1))+WCET(Calc(z-2))$$

Exercise #4 – blackboard scribble



Exercise #4 – blackboard scribble

b) Derive WCET for main() (let x=4)

$$WCET(main()) = \{Declare_1, ans\} + \{Call_2, Calc(5)\} + WCET(Calc(5))^{100+21x} + \{Assign_1, ans\} =$$

$$1 + 2 + WCET(Calc(5)) + 1 = 4 + WCET(Calc(5)) =$$

$$4 + 100 + 21x = 104 + 21x = \{x=4\} = 104 + 84 = 188$$

c) Check deadline for main()

$$WCET(main()) = 188 > Deadline = 180 \Rightarrow Fail!$$

```
int main(){
  int ans;
  ans = Calc(5);
}
```

Exercise #4 – blackboard scribble

d) Derive WCET of main() in terms of X

According to subproblem b):

$WCET(main()) = 104 + 21X$

e) Find maximum cost X

Deadline

$WCET(main()) = 104 + 21X \leq 180 \Rightarrow 21X \leq 76$

That is: $X \leq \frac{76}{21} \approx 3,6$

If only integer values of X: Select $X = 3$ in order to meet deadline