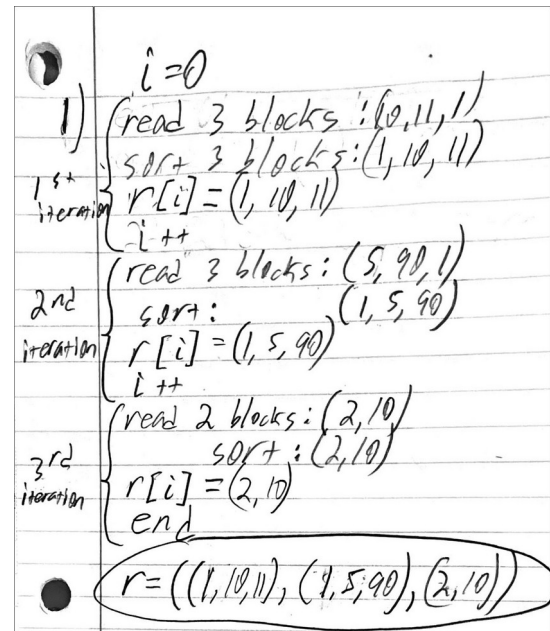


1)

- a) 5  
b) First three runs:  
1,10,11  
1,5,90  
2,10

I thought this would be harder so I wrote it out



2)

- T0 would have to be undone because  $\langle T0 \text{ start} \rangle$  is present but  $\langle T0 \text{ commit} \rangle$  nor  $\langle T0 \text{ abort} \rangle$  is not present.
- T1 would have to be redone because  $\langle T1 \text{ start} \rangle$  and  $\langle T1 \text{ commit} \rangle$  are present.
- Therefore X and Y would be set to 100 and Z would be set to 150 after recovery.

3)

If we were to use merge join, each record would first need to be sorted by ID before the comparisons can be made. A better algorithm would be hash-join because sorting is not required.

4)

Let  $h$  be a hash function on the ID attribute (c) of each tuple. Each  $t_r.C$  in  $r$  and each  $t_s.C$  in  $s$  need to be tested only if  $h(t_r) == h(t_s)$ . If they are not equal, then the two tuples must have different ID values.