CS140
Problem Set 2
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Q1.

a) Removal of entry in multiprocessor environment

(Assuming head does not have a element and thus points to first object in the list)

```
this->head->lock();
prev = this->head;

if (prev->next == NULL)
{
  prev->unlock();
  return false;
}
do
{
 prev->next->lock();
 cur = prev->next;
 if ( cur!= NULL && cur->val < this-> val)
 {
   prev = cur;
   cur->unlock();
 }
 else
  break;
} while(1);

if (cur != NULL && cur->key == key)
{
  prev->next = cur->next;
  cur->unlock();
  return true;
}
else
{
 if (cur!= NULL)
   cur->unlock();
 return false;
}
```

b) Software Transactions:

If transactions are trying to remove objects and if it happens that the committing transaction is removing the farthest element (so that write set of committing transaction does not overlap with read set of other transactions), then it will work fine.

Q2.

OpenMP safe loops - a, c, d, e, g

Q3. Nested Loop

Single Processor and small (n) : If the working set fits within the cache then it should make much difference as far as order of loop variables are concerned since it will always be present in cache.

Single Processor and Large (n) : i - outer loop ; j - inner loop ; Since we will get higher hits if we access the consecutive element in a block of elements.

MultiProcessor and small (n)/large (n) : Same argument as single processor and large(n).

Q4.

a) No bank conflicts. Access goes to different banks.

b) Two way bank conflict as shown in Fig G-2 (middle)). Two threads from different warps but access same data.

Q5.

a) 64 bytes / 600 cycles = 0.10667 bytes / cycle (Average and Used bandwidth)

b) 128 bytes / 600 cycles = 0.213333 bytes / cycle- Average Bandwidth ; 64 bytes / 600 cycles 0.106667 bytes / cycle- Used bandwidth

c) 64 bytes / 1200 cycles = 0.053333 bytes / cycle- Average Bandwidth ; 16 bytes / 600 cycles = 0.026667 bytes / cycle - Used bandwidth

d) 160 bytes / 1200 cycles = 0.133333 bytes / cycle - Average Bandwidth ; 64 bytes / 1200 cycles = 0.0533333 bytes / cycle - Used bandwidth