Exercise #17

We have given,
min_sup = 3
Each item can be represented by an integer (i.e. 4 bytes)
Each lock can be represented by an integer (i.e. 4 bytes)
For the Fixed Locking approach, the number of locks used is 8.
The size of a cache block is 64 bytes.

We have given below transactions,

T1: {P1,P2,P3,P5,P7}
T2: {P1,P4,P5,P6,P7}
T3: {P1,P4,P6}
T4: {P1,P4,P5,P6,P7}
T5: {P3,P5}
T6: {P1,P2,P3,P7}
T7: {P2,P7}
T8: {P1,P2,P3,P4,P6,P7}

Below table shows discovery of frequent item setS.

Ck - Size 1 (7)	Ck - Size 2 (21)	Ck - Size 3 (9)	Ck - Size 4 (2)
P1 = 6	P1, P2 = 3	P1, P2, P3 = 3	P1, P2, P3, P7 = 3
P2 = 4	P1, P3 = 3	P1, P2, P7 = 3	P1, P4, P6, P7 = 3
P3 = 4	P1, P4 = 4	P1, P3, P7 = 3	
P4 = 4	P1, P5 = 3	P1, P4, P6 = 4	
P5 = 4	P1, P6 = 4	P1, P4, P7 = 3	
P6 = 4	P1, P7 = 5	P1, P5, P7 = 3	
P7 = 6	P2, P3 = 3	P1, P6, P7 = 3	
	P2, P4 = 1	P2, P3, P7 = 3	
	P2, P5 = 1	P4, P6, P7 = 3	
	P2, P6 = 1		
	P2, P7 = 4		
	P3, P4 = 1		
	P3, P5 = 1		
	P3, P6 = 1		
	P3, P7 = 3		
	P4, P5 = 2		
	P4, P6 = 4		
	P4, P7 = 3		
	P5, P6 = 2		
	P5, P7 = 3		
	P6, P7 = 3		

S = Size of Reduction object = 4 * # of Reduction Elements

T = # of Threads (Processors).
Number of threads are not given so, I have assuming T = 4

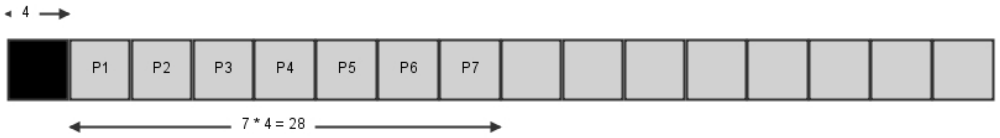
r = # of Elements

1. In Ck with Size 1, we have 7 Reduction Element in one Reduction Object;
   - Full Replication = S * T
     Where S = 7*4 = 28 and T = 4
     S*T = 28*4 = 112 Bytes

   - Full Locking and Optimized Full Locking = 2 * S
     Where S = 7*4 = 28
     2*S = 2*28 = 56 Bytes

   - Fixed Locking: We have 7 Reduction Element and 8 Locks. Each one required 4 bytes of memory.
     (8*4) + (7*4) = 32 + 28 = 60 Bytes

   - Cache-Sensitive Locking: We have 64 byte of one Cache block. So, each block can have 1 lock with 4 byte and 15 Reduction element with 4 bytes.
     (1*4) + (7*4) = 4 + 28 = 32 Bytes



This is how one cache block looks like for Ck with Size 1.

2. In Ck with Size 2, we have **21** Reduction Element in one Reduction Object: (Bold figures are correction from my previous submission)
   - Full Replication = S * T
     Where S = 21*4 = 84 and T = 4
     S*T = 84*4 = 336 Bytes

   - Full Locking and Optimized Full Locking = 2 * S
     Where S = 21*4 = 84
     2*S = 2*84 = 168 Bytes

   - Fixed Locking: 21 Reduction Elements and 8 Locks
     (8*4) + (21*4) = 32 + 84 = 116 Bytes

   - Cache-Sensitive Locking: 21 Reduction Elements and 2 Locks
     (2*4) + (21*4) = 8 + 84 = 92 Bytes

3. In Ck with Size 3, we have 9 Reduction Element in one Reduction Object:
   - Full Replication = S * T
     Where S = 9*4 = 36 and T = 4
     S*T = 36*4 = 144 Bytes

   - Full Locking and Optimized Full Locking = 2 * S
     Where S = 9*4 = 36
     2*S = 2*36 = 72 Bytes

   - Fixed Locking: 9 Reduction Elements and 8 Locks
     (8*4) + (9*4) = 32 + 36 = 68 Bytes

- Cache-Sensitive Locking: 9 Reduction Elements and 1 Lock
  (1*4) + (9*4) = 4 + 36 = 40 Bytes

4. In Ck with Size 4, we have 2 Reduction Element in one Reduction Object:
   - Full Replication = S * T
     Where S = 2*4 = 8 and T = 4
     S*T = 8*4 = 32 Bytes

   - Full Locking and Optimized Full Locking = 2 * S
     Where S = 2*4 = 8
     2*S = 2*8 = 16 Bytes

   - Fixed Locking: 2 Reduction Elements and 8 Locks
     (8*4) + (2*4) = 32 + 8 = 40 Bytes

   - Cache-Sensitive Locking: 2 Reduction Elements and 1 Lock
     (1*4) + (2*4) = 4 + 8 = 12 Bytes