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 (13)	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, P7 = 4	P2, P3, P7 = 3	
	P3, P7 = 3	P4, P6, P7 = 3	
	P4, P6 = 4		
	P4, P7 = 3		
	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 and Cache-Sensitive Locking = (1 + 1/r) * S
     Where S = 7*4 = 28 and r = 7
     (1 + 1/r) * S = (1+1/7)*28 = **32 Bytes**

2. In Ck with Size 2, we have 13 Reduction Element in one Reduction Object:
   - Full Replication = S * T
     Where S = 13*4 = 52 and T = 4
     S*T = 52*4 = **208 Bytes**

   - Full Locking and Optimized Full Locking = 2 * S
     Where S = 13*4 = 52
     2*S = 2*52 = **104 Bytes**

   - Fixed Locking and Cache-Sensitive Locking = (1 + 1/r) * S
     Where S = 13*4 = 52 and r = 13
     (1 + 1/r) * S = (1+1/13)*52 = **56 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 and Cache-Sensitive Locking = (1 + 1/r) * S
     Where S = 9*4 = 36 and r = 9
     (1 + 1/r) * S = (1+1/9)*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 and Cache-Sensitive Locking = (1 + 1/r) * S
     Where S = 2*4 = 8 and r = 2
     (1 + 1/r) * S = (1+1/2)*8 = **12 Bytes**