

Q1)

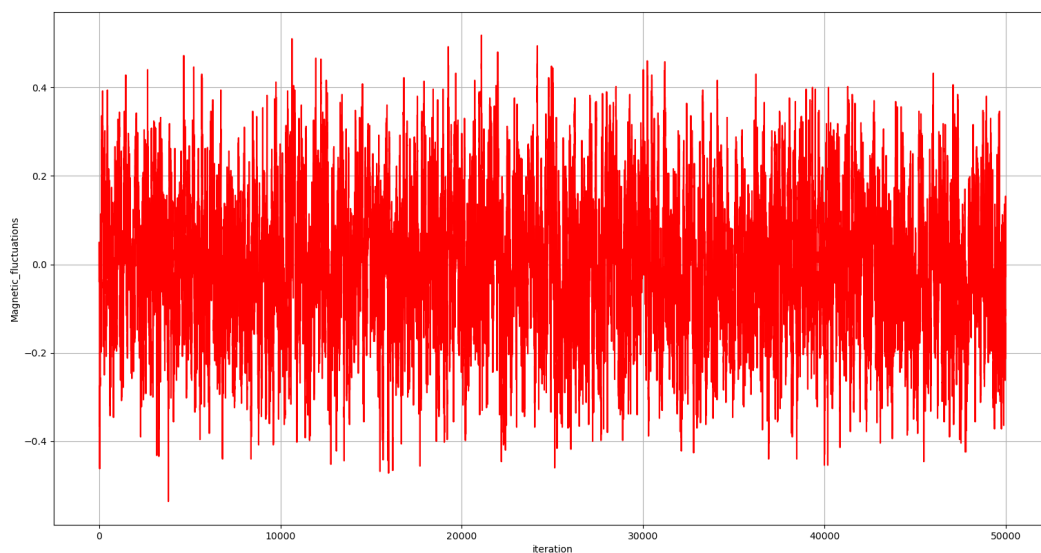
```
kaustavdutta@hplaptop:~/Desktop/fortran/Assignment 3$ gfortran q1.f90
kaustavdutta@hplaptop:~/Desktop/fortran/Assignment 3$ ./a.out
Enter the number of lattice points in one dimension
20
Enter the number of iterations
10000
initial energy E, E per spin= -24000.0000 -3.00000000
initial magnetisation M, M per spin= -8000.00000 -1.00000000
```

q2)

```
kaustavdutta@hplaptop:~/Desktop/fortran/Assignment 3$ gfortran q2.f90
kaustavdutta@hplaptop:~/Desktop/fortran/Assignment 3$ ./a.out
Enter the number of lattice points in one dimension
20
Enter the number of iterations
10000
initial energy E, E per spin= -24000.0000 -3.00000000
initial magnetisation M, M per spin= 8000.00000 1.00000000
```

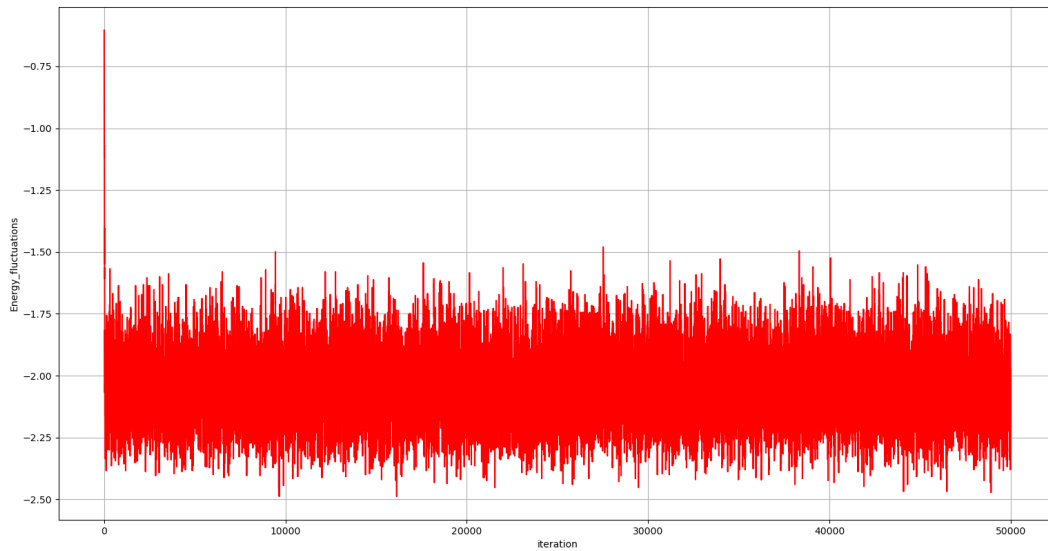
q3) Magnetization Fluctuates around 0 (T=4.9)

```
kaustavdutta@hplaptop:~/Desktop/fortran/Assignment 3$ gfortran q3.f90
kaustavdutta@hplaptop:~/Desktop/fortran/Assignment 3$ ./a.out
enter the number of lattice points in one dimension
10
enter the number of iterations
50000
initial energy E, E per spin= 4.00000000 4.00000019E-03
initial magnetisation M, M per spin= -64.0000000 -6.40000030E-02
```



q4) Energy Fluctuates around -2.05 (T=3.9)

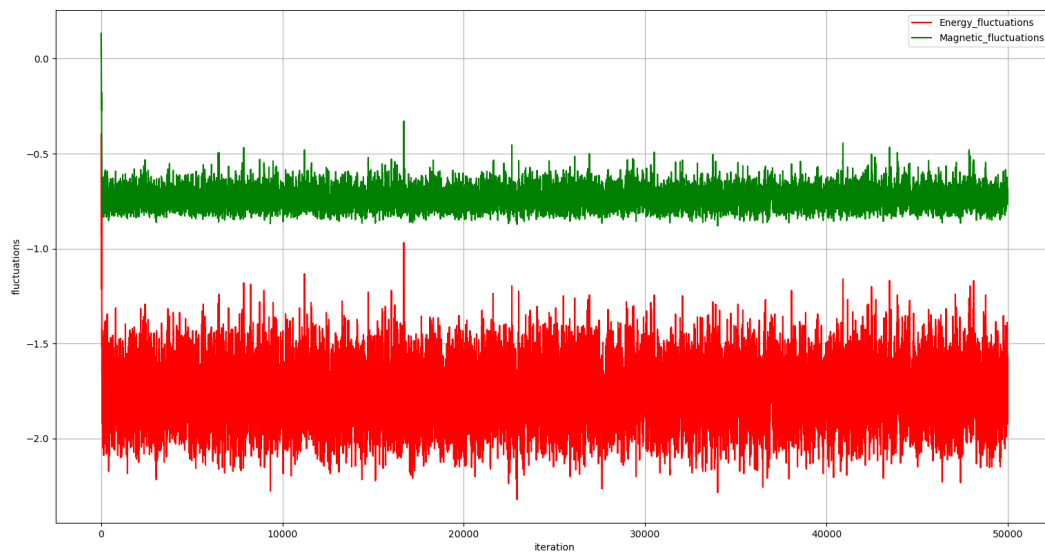
```
kaustavdutta@hplaptop:~/Desktop/fortran/Assignment 3$ ./a.out
enter the number of lattice points in one dimension
10
enter the number of iterations
50000
initial energy E, E per spin= -16.0000000 -1.60000008E-02
initial magnetisation M, M per spin= 14.0000000 1.40000004E-02
```



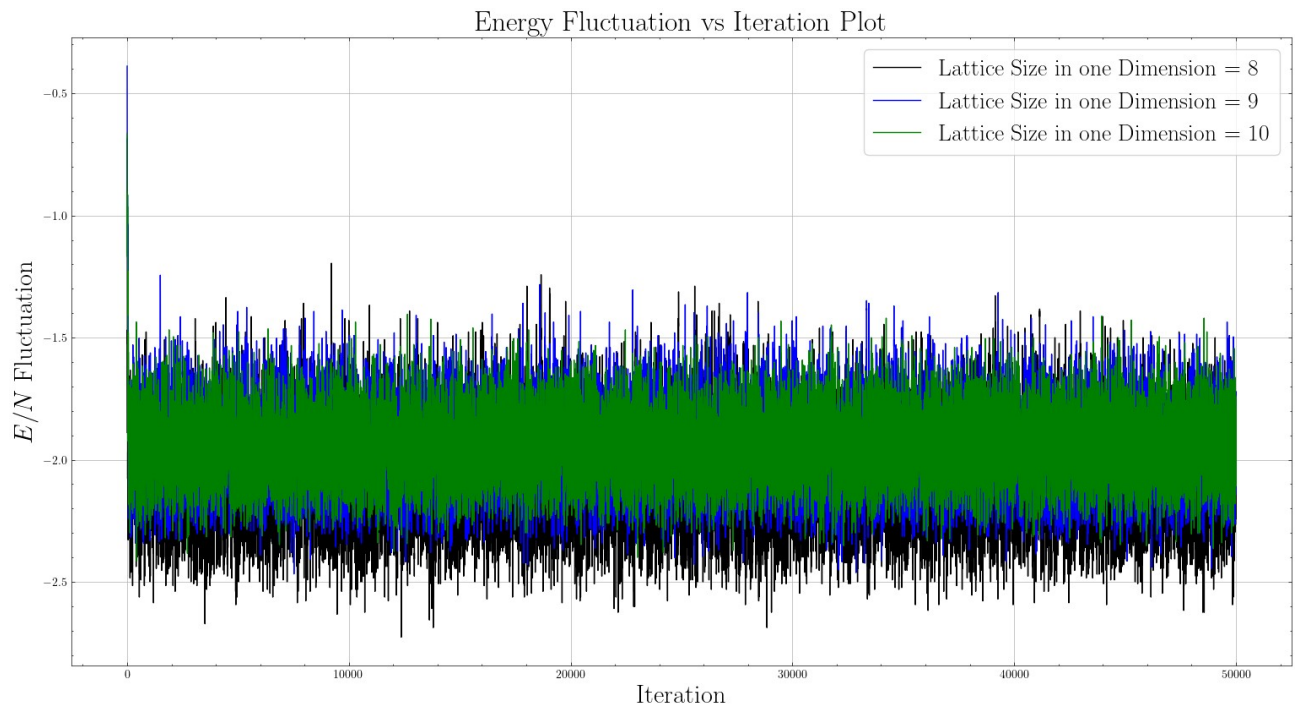
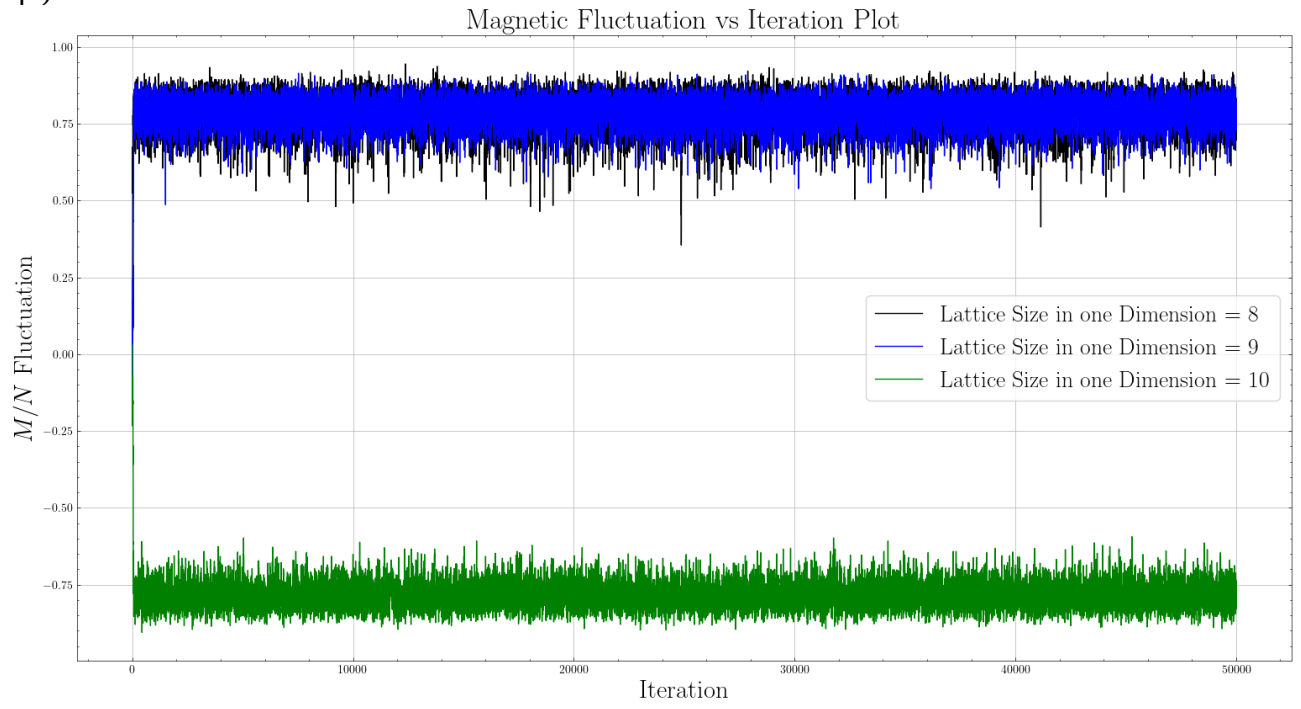
q5)Energy per spin fluctuates around -1.75( $T=4.05$ )

Magnetization per spin fluctuates around -0.75( $T=4.05$ )

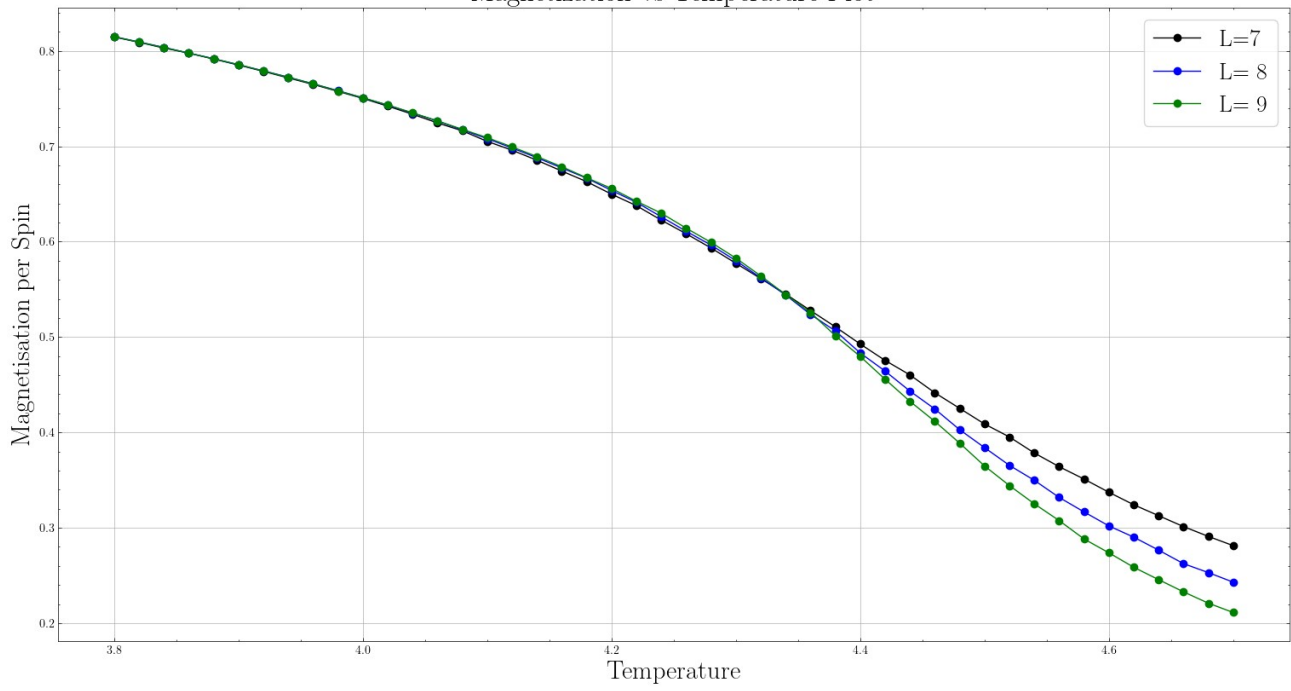
```
kaustavdutta@hplaptop:~/Desktop/fortran/Assignment 3$ gfortran q5.f90
kaustavdutta@hplaptop:~/Desktop/fortran/Assignment 3$ ./a.out
enter the number of lattice points in one dimension
10
enter the number of iterations
50000
initial energy E,E per spin= 56.0000000 5.60000017E-02
initial magnetisation M, M per spin= 12.0000000 1.20000001E-02
```



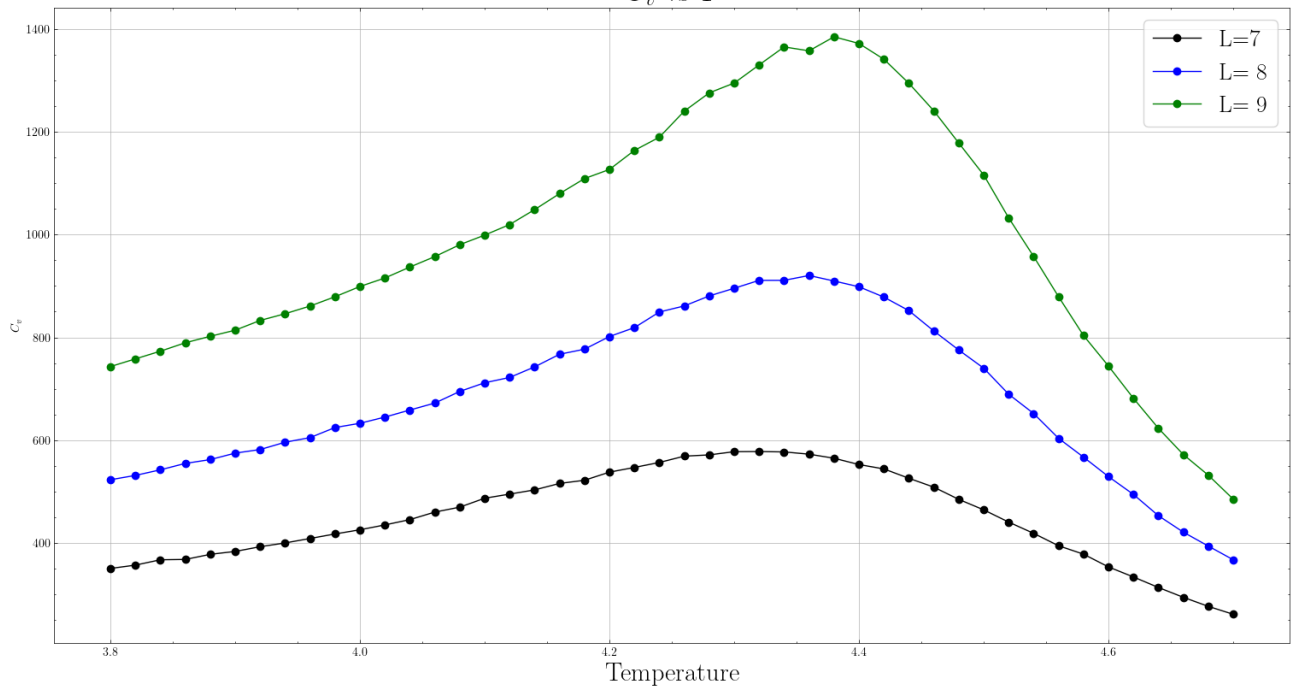
q6)

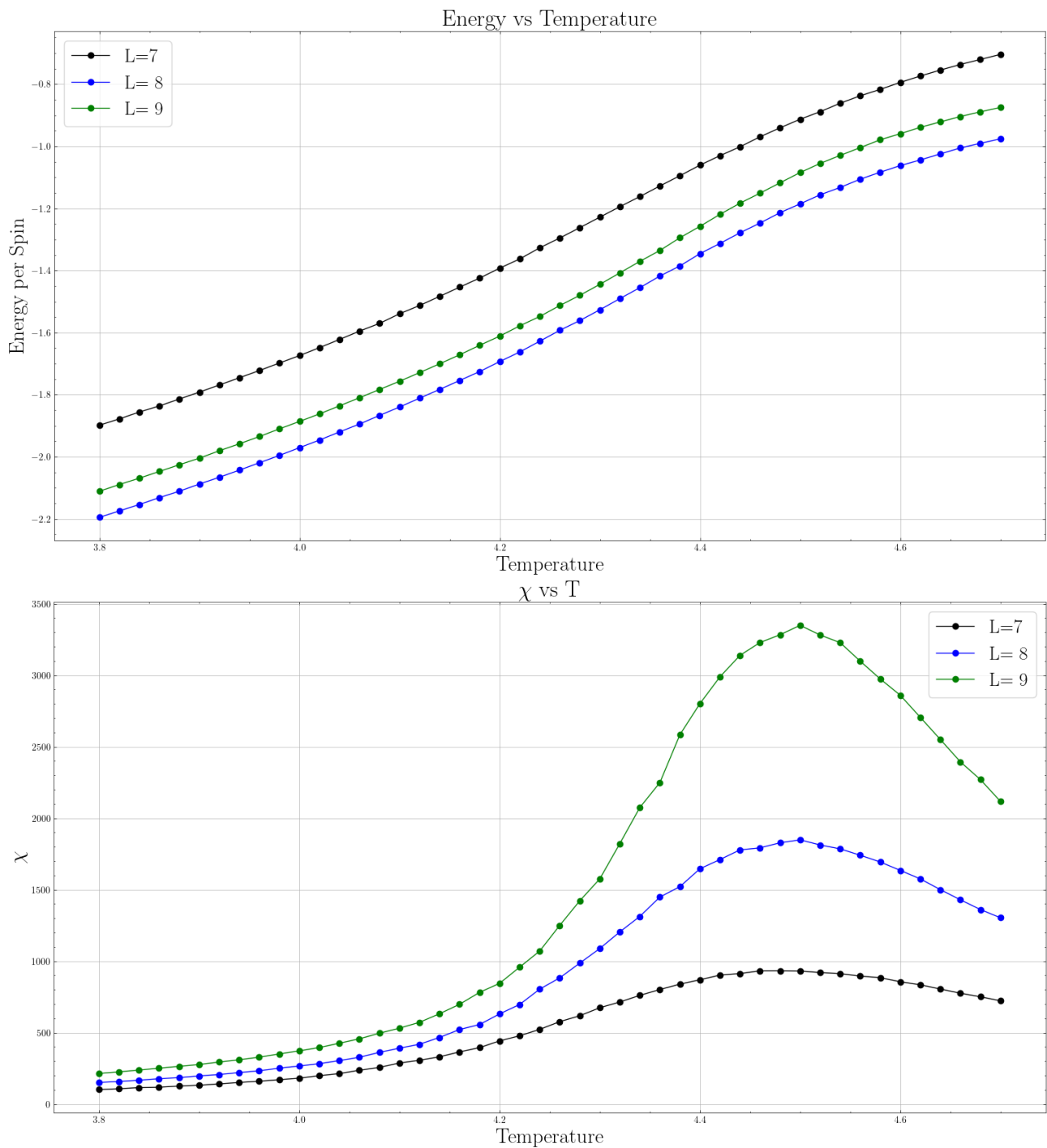


Magnetization vs Temperature Plot



$C_v$  vs T





Q7. The value of the quantity  $\chi$  at the temperature  $T=4.50000$ , for the different values of  $L$  are approximately : .

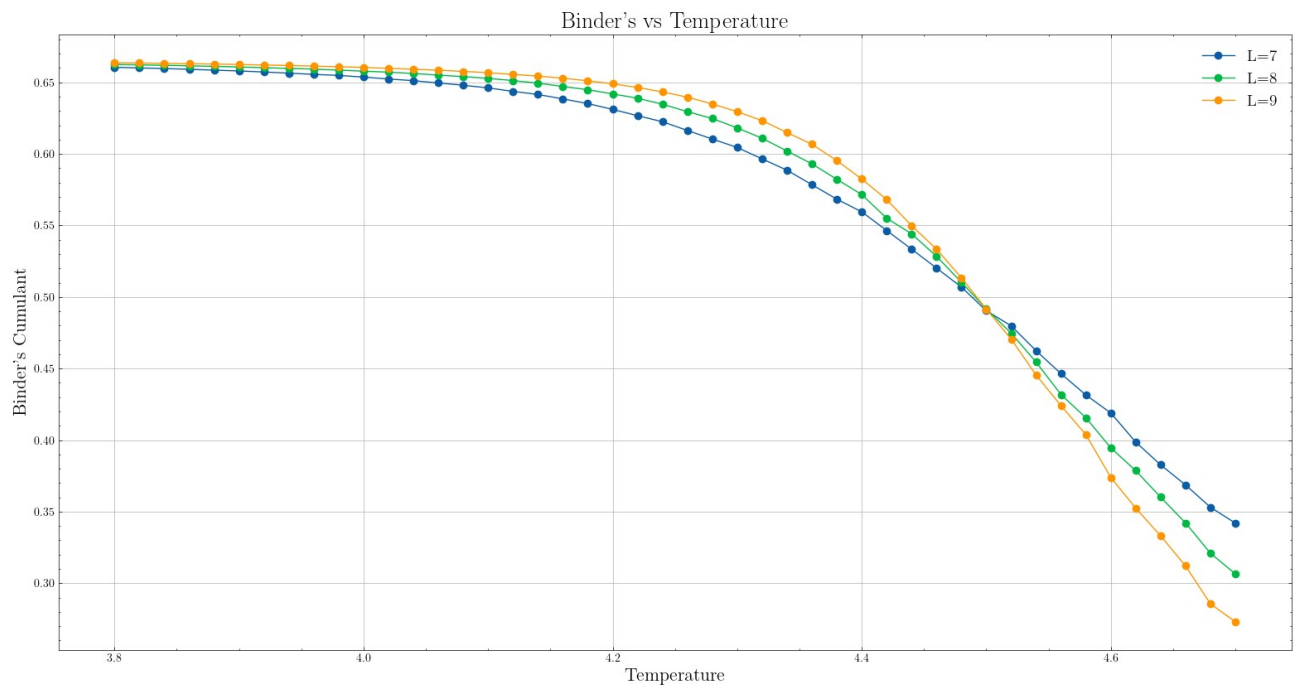
Ans:  $L=7, 730.784160, L=8, 1848.367616, L=9, 3348.90564$

Q8. The value of  $C_v$  at the peak position for  $L=8$  is (approximately):

Ans: 920.291768

Q9. The value of  $C_v$  at the peak position for  $L=9$  is (approximately) : 1384.4859962

Q10. At temperature 3.8, the value for magnetization per spin for  $L=7$  : 0.8145024



q5) Then the number of particles jumping per second from  $E_{10}$  to  $E_5$  is :10per second