In [ ]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from scipy.optimize import minimize
```

In [ ]:

```
df = pd.read_csv('student-por_2.csv',sep=';')
df.head()
```

Out[4]:

	school	sex	age	address	famsize	Pstatus	Medu	Fedu	Mjob	Fjob	...	famrel	f
0	GP	F	18	U	GT3	A	4	4	at_home	teacher	...	4	
1	GP	F	17	U	GT3	T	1	1	at_home	other	...	5	
2	GP	F	15	U	LE3	T	1	1	at_home	other	...	4	
3	GP	F	15	U	GT3	T	4	2	health	services	...	3	
4	GP	F	16	U	GT3	T	3	3	other	other	...	4	

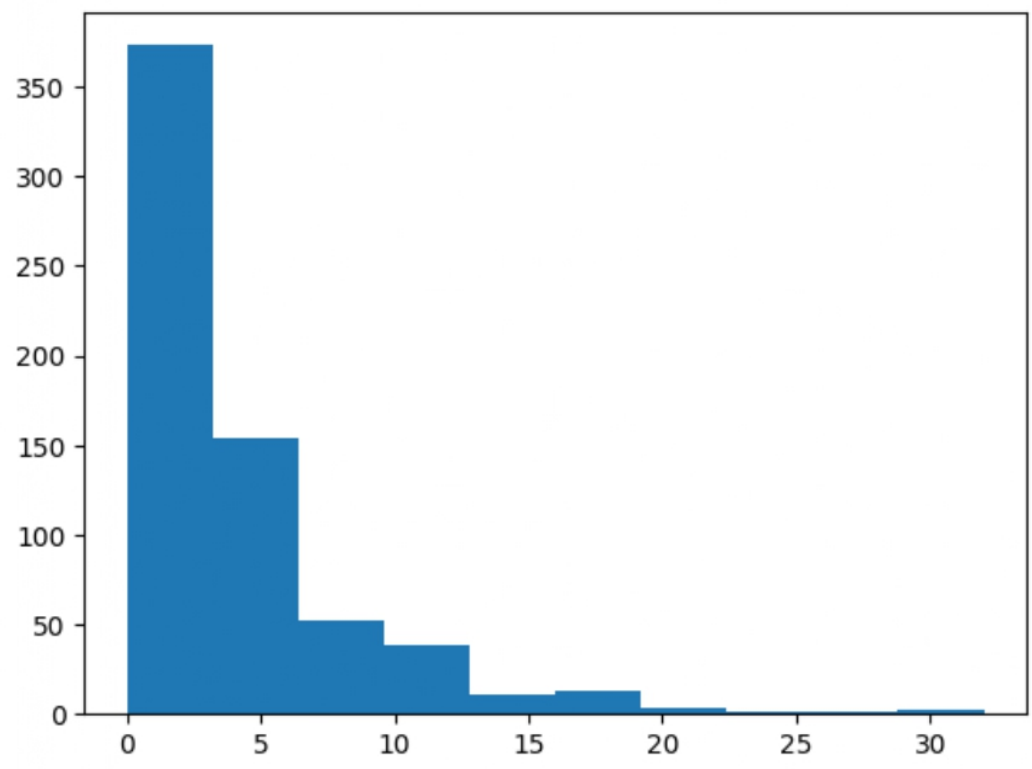
5 rows × 33 columns

In [ ]:

```
plt.hist(df['absences'])
```

Out[5]:

```
(array([373., 154.,  52.,  38.,  11.,  13.,   4.,   1.,   1.,   2.]),
 array([ 0. ,  3.2,  6.4,  9.6, 12.8, 16. , 19.2, 22.4, 25.6, 28.8, 32.
]),
 <BarContainer object of 10 artists>)
```



$f(x) = \lambda e^{-\lambda x}$

In [ ]:

```
def lamb_exp(data):
  return 1/(np.mean(data))
```

In [ ]:

```
lam = lamb_exp(df['absences'])
```

In [ ]:

```
print(lam)
```

```
0.2732631578947368
```

In [ ]:

```
def likelihood_fn(param,data):
  '''
  param: parameters of the distribution
  data: data from the distribution
  '''
  lam = param
  pdf = lam*np.exp(-lam*data)
  pdf[pdf<=0]=np.finfo(float).eps
  log_like= np.log(pdf)
  return -np.sum(log_like)
```

In [ ]:

```
for i in range(10):
  sol = minimize(likelihood_fn,i,args=df['absences'],method='Powell',bounds=((0,None),))
  print(sol.x,i)
```

```
[0.27326316] 0
[0.27326218] 1
[0.27326218] 2
[0.27326218] 3
[0.27326218] 4
[0.27326218] 5
[0.27326218] 6
[0.27326218] 7
[0.27326218] 8
[0.27326218] 9
```

In [ ]:

```

```