Practica 1
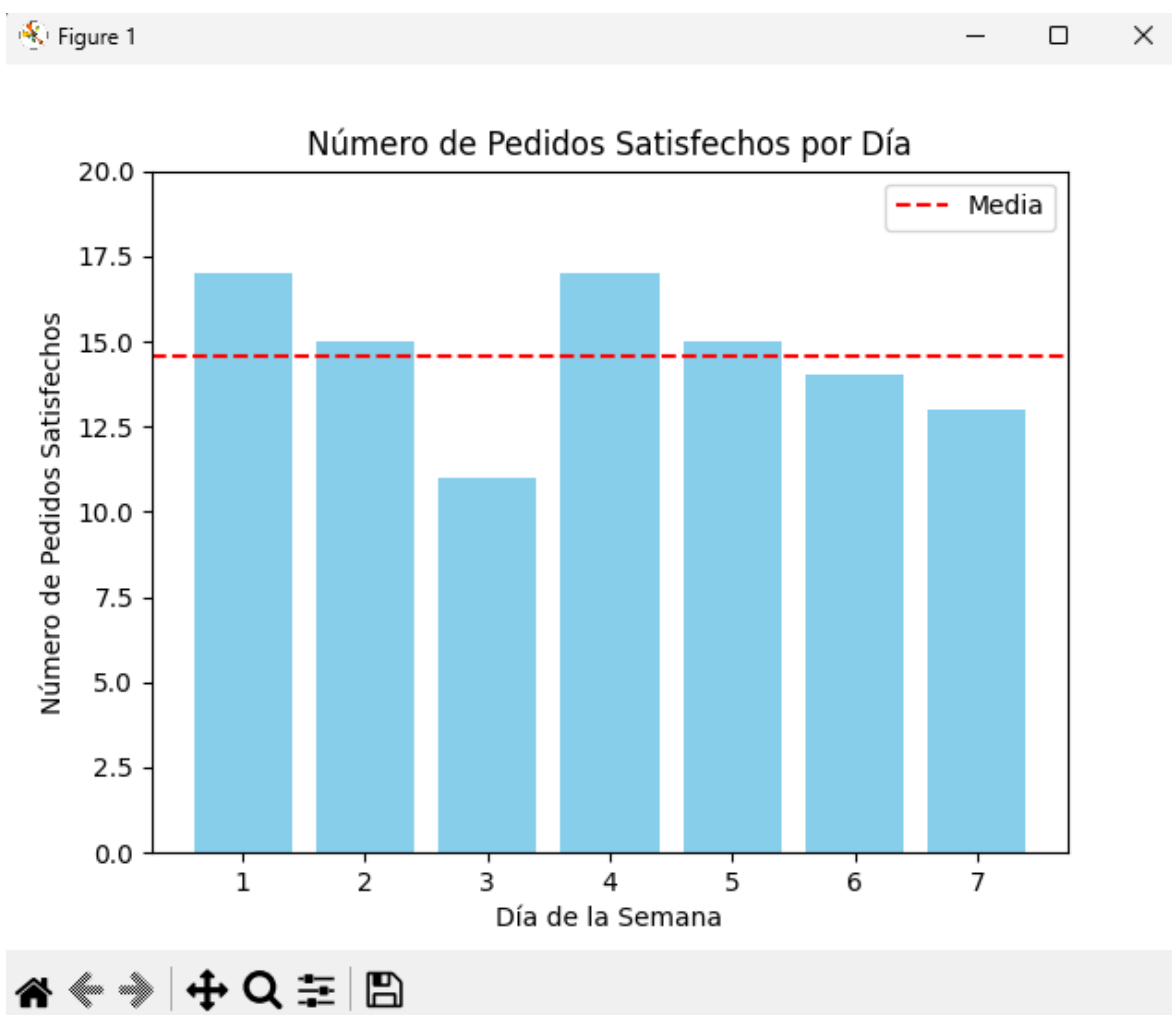
Pedidos satisfechos por día: [17 15 11 17 15 14 13]

Practica 2

```
Tiempos entre llegadas (minutos): [2.04518238e+01 3.44672847e+00 8.49785532e+00 8.96777973e+01
 2.41158267e+00 2.16298749e+01 3.45034464e+00 4.46849416e+01
 1.66352420e+01 4.80209267e+00 1.82609572e+01 1.74376608e+01
 2.65670103e+01 1.10506710e+00 1.30600920e+01 1.62142735e+01
 2.18853319e+01 1.28751400e+01 2.17450321e+01 3.91362363e+01
 8.65720511e+00 2.66060009e+01 9.29978075e+00 4.05726530e+00
 1.20403698e+01 2.31671010e+01 4.89542576e+00 3.32760105e+01
 1.35764999e+00 2.47723530e+01 6.37823196e+00 8.15427090e+00
 7.19382104e+00 2.70453423e+00 1.73287092e+01 1.17740334e+01
 4.00807690e+00 5.89955847e+00 1.42280460e+01 4.37568604e+00
 2.01735991e+01 9.03192866e+00 4.45155311e+00 1.93159809e+01
 3.34316644e+01 2.07264944e+01 2.81049021e+01 2.36961088e-02
 2.88546591e+00 1.13099153e+01 1.06466057e+01 7.00617153e+01
 2.37958275e+01 4.80372803e+00 2.31889721e+01 1.48538885e+01
 5.50950106e+00 2.28357316e+00 1.10526280e+01 1.59017608e+01
 5.35957834e+00 1.29555792e+00 2.04509365e+00 3.93971817e+00
 5.12883301e+00 4.45972958e+00 1.44980742e+00 4.69510903e+01
 6.99434636e+00 5.94301920e+00 1.49840839e+01 4.62504818e+00
 2.12427470e+01 2.89252622e+01 2.84025817e+01 5.47087118e+00
 3.81765712e+00 1.34942802e+00 4.46230214e+00 5.39806201e+00
 2.52472610e+01 3.17348552e-02 2.05365338e+01 4.51532588e+01
 3.14611985e+01 1.61281605e+01 1.83138556e+01 1.41559917e+01
 1.89154023e+01 2.86635018e+01 2.61623029e+00 8.86787362e+00
 3.85165810e+00 3.67835767e+01 1.07989430e-02 1.27960945e+01
 2.98399545e+01 2.46919816e+01 2.30383435e+01 1.45019359e+01
 1.71303791e+01 6.06863731e+01 1.30966733e+01 4.31721570e+00
 2.55735501e+00 1.09069402e+01 4.55785889e+01 7.97297494e+00
 1.59663559e-01 2.30687368e+01 1.70800043e+01 2.16129451e+01
 8.25106852e+00 3.52558767e+01 1.25550821e+00 3.71332210e+00
 1.82338859e+01 5.41667013e+00 1.88265713e+01 2.64701107e+01
 3.83137383e+01 1.85695748e+01 1.71792565e+01 1.68936961e+01
 2.71012077e+00 3.34630253e+01 1.36562663e+01 1.40878709e+01
 1.00722839e-01 2.60444442e+01 1.88426538e+01 4.74742376e+00
 1.85119140e+01 7.28180958e+00 5.22980362e+00 1.07773973e+01
 8.15286999e+00 3.59200674e+01 1.74448418e+01 1.29544872e+01
 3.94260307e+01 3.67939368e+01 2.16610493e+01 6.70881161e+00
 3.63466987e+00 5.20614960e-01 6.74674713e+00 6.30884412e+01
 4.07063984e+00 6.85111237e+00 3.01587780e+01 3.44896708e+00
 2.53425420e-02 3.44294759e+01 2.83651362e+01 1.15973377e+01
 5.44133845e-02 9.13442323e+00 9.64656186e+00 3.13694385e-02
 2.04924742e+01 3.25229618e+01 8.41883222e+00 9.13498821e+00
 2.63940881e+01 5.20942086e+00 2.21059732e+01 4.67767997e+00
 2.80863392e+00 6.26885937e+00 1.04619658e+01 1.70653130e+01
 1.67825620e+01 8.44187315e+00 1.65373299e+01 1.73057961e+01
 6.73768341e+00 2.06671845e+00 1.12879968e+01 5.26127736e+00
 3.42181318e+00 1.43651811e+01 9.35598379e+00 4.08637331e+00
 9.66888973e+00 3.89885946e-01 2.00839876e+01 1.30192327e+01
 1.87209898e+00 2.94739844e+00 7.49275586e+00 4.37595641e+00
 1.46911888e+01 1.10564796e+00 7.94087139e-02 1.41448600e+01
 2.61674255e+01 1.80496494e+01 7.06603003e+00 2.73167754e+00
```
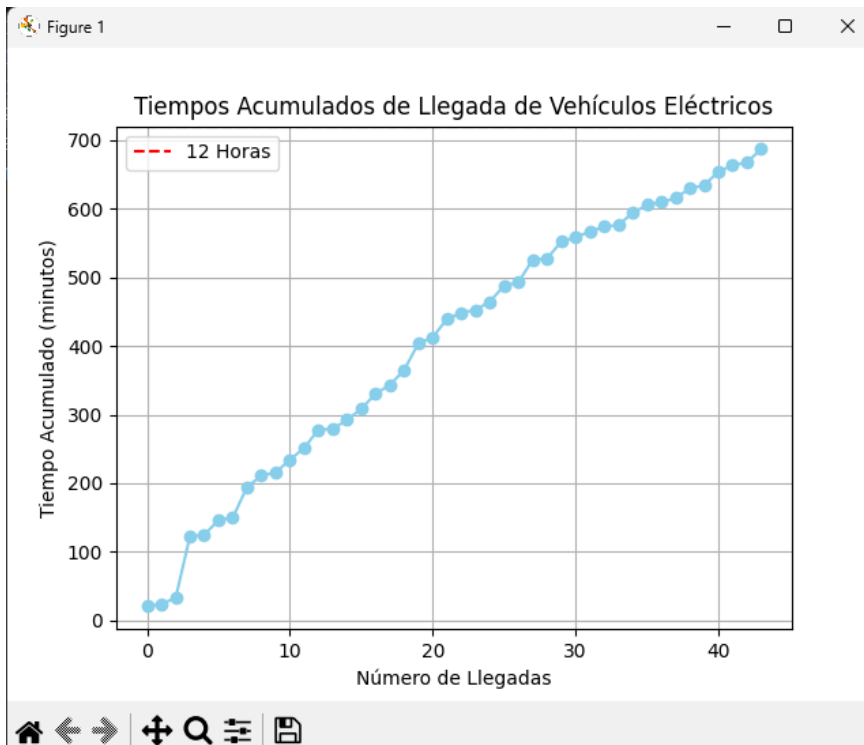
```
6.97410082e+00 2.25797243e+00 9.96318774e+00 3.15959541e+01
2.35567880e+01 3.08191853e+01 1.21133559e+01 4.86730001e+00
7.34182344e+00 9.05686417e-01 4.80075302e+00 4.27397091e+01
2.21554322e+01 3.02643170e+00 2.60802834e+01 8.47578935e+00
2.63011264e+01 5.01873355e+00 7.77793075e-01 6.31652098e-01
6.30877648e+00 4.52894712e-01 6.70797649e+00 4.22562859e+01
4.97517439e+01 6.86088733e+00 1.80444565e+01 1.48032850e+00
9.87929369e+00 1.02302599e+01 8.81285034e+00 1.52760099e+01
2.71854403e+00 1.23026698e+01 3.09108034e+01 1.18740366e+01
4.88897742e+01 3.97851340e+01 1.52388349e+01 3.15748843e+01
5.36223994e+00 1.16984206e+01 1.78121804e+01 2.21264584e+01
9.74806565e-01 1.22544303e+00 8.02411811e-01 6.85179762e-01
3.37217808e+01 8.80944647e+00 5.57675515e-01 2.49111801e+01
4.09851332e+01 4.32347369e+00 6.94387919e+00 1.36891791e+01
1.57305597e+01 2.52343489e+00 4.84099422e+00 3.24198649e-01
7.36332379e+00 8.45219985e+00 1.81402039e+01 1.68409734e+01
3.07968618e+00 1.46328964e+01 1.88379421e+01 7.54170273e+00
1.02249411e+01 1.28503468e+01 9.86629749e+00 1.08192876e+01
4.53264305e+00 1.64210531e-01 1.99790635e+00 1.97223588e+01
2.05381327e+01 2.92586394e+01 5.04541648e-01 8.84853119e-01
1.26548911e+01 2.38966674e+00 2.47291152e+01 6.06065562e+00
2.77048966e+00 3.90682047e+01 4.82136001e+00 2.66349831e+01
6.26045555e+00 2.71412936e+01 2.22224644e+01 2.30264647e+01
5.14657417e-01 7.72023325e+01 5.77507016e+01 1.36982628e+01
2.21302793e+01 1.42403795e+01 7.92884443e+00 1.13342117e+01
1.07989412e+01 3.99966754e+00 6.19924557e+00 4.17803093e-01
6.53367966e+00 1.35383055e+00 2.36627616e+01 2.07090654e-01
1.10116902e+00 2.56836860e+01 9.71982805e+00 2.11259675e+01
9.66729907e+00 2.21394172e+00 1.92721701e+00 1.34303911e+01
1.12466752e+01 3.18297496e+01 6.50584963e+00 7.52459031e+00
4.65971628e+00 1.59283443e+00 7.03830056e+00 1.17660546e+01
1.72949002e+01 1.13541963e+01 4.20540138e+00 5.62621786e+00
2.10330354e+01 6.54110221e+00 3.21802984e+00 8.30710885e-01
1.49017756e+01 2.55671740e+00 5.99341475e-02 2.06565557e+01
6.42306971e+01 7.58960200e+00 1.83622030e+00 1.68003744e+01
1.95192820e+01 2.23356412e+00 3.08957672e+00 1.27470273e+01
1.19390910e+01 3.78385795e+00 2.02216229e-01 6.82015136e-01
3.29452688e+00 9.97256405e+00 3.86676040e+00 1.59492138e+01
3.14192640e+01 2.55488094e+01 1.04658325e+00 2.59389933e+01
4.52938566e+00 2.61882744e+01 7.91241561e-01 9.53086939e+00
6.10897948e+00 1.40959544e+01 2.42543130e+01 6.38695304e+00
1.19310628e+01 2.44919079e+01 7.14810072e+00 3.51956956e+01
1.63734087e+01 2.97412661e+01 2.27577262e+01 1.54874504e+01
4.55456529e+01 1.21521747e+01 2.25606625e+01 8.99983875e+00
4.99180424e+00 3.06052308e+01 4.52243727e+01 1.01951205e+01
1.40819348e+01 6.59002951e+00 3.64092077e+00 1.48536797e+01
2.89219854e+01 2.74998210e+00 6.36842089e+00 2.54544721e+01
```

```
1.80686680e+01 6.98860042e+00 2.04965723e+01 4.17874214e+01
2.08713966e+01 1.39219082e+01 3.23527174e-01 4.80313671e+00
4.00906063e+01 2.06281313e+00 3.84620143e+00 5.88727487e-01
3.86702854e+00 2.89677824e+01 1.14530060e+01 7.57470870e+00
1.93665088e+01 2.23898914e+01 3.27630761e+00 1.93098717e+01
1.55615430e+01 1.82090994e+01 4.55941101e+00 3.37250895e+00
1.92197415e+01 3.60416700e+01 4.53035299e-02 2.66433690e+01
1.98317102e+01 2.50270621e+01 2.47917953e+00 1.90063103e+01
5.36539492e-01 1.38062454e+01 1.00057200e+01 9.27074042e+00
1.44540542e+01 1.89362540e+01 6.63844904e+00 6.90228367e+00
4.35679899e+01 1.68318859e+01 1.77287087e+01 1.83805015e+01
1.40207101e+01 6.32104527e-01 1.68996057e+01 1.22251087e+00
3.12181357e+00 6.75474316e+00 3.67784891e+00 6.53041806e+00
8.28834449e+00 1.36824527e+01 1.46106163e+00 7.57662420e+00
2.89378690e+00 8.16423980e+00 1.18221725e+01 2.78168164e+01
1.15572757e+01 4.91467080e+00 1.27770292e+01 1.21642754e+01
2.10647315e+01 2.50472205e+01 1.15324081e+01 5.80629959e-01
1.19654238e+01 2.12096777e+01 1.75928894e+01 3.11771351e+00
5.76879133e+00 6.42948083e+00 2.32609492e+01 6.88172324e+01
3.31936637e+00 1.53719162e+00 6.17787499e+00 2.44466530e+01
3.60826053e+00 1.76578947e+01 1.55033110e+01 4.30847427e+01
1.22283262e+01 4.46129286e+00 2.74394499e+01 1.25434525e+00
2.62324120e+01 4.17119030e+01 1.99738271e+01 5.94057968e+01
2.07308804e+01 2.61698165e+00 5.56151105e+00 2.40853062e+01
4.06715400e+01 1.23276184e+00 9.27706742e+00 2.35692268e+01
2.08145055e+01 4.14566240e+01 1.69883464e+00 4.18951102e+00
6.83612269e+00 2.64861149e+00 1.30358518e+00 1.63638148e+00
2.50549903e+00 2.03174688e+01 4.71691825e+00 2.17996730e+00
2.83514892e+01 1.44519792e+00 6.05754426e+00 5.75702459e+00
1.41497392e+01 2.22122530e+01 1.30912153e+00 3.16098056e+00
4.07798723e+01 1.34022085e+01 1.58295984e+01 2.79570870e+00
2.52806925e+00 3.03923229e+01 8.98154014e+00 1.70882726e+01
1.11624130e+01 1.49190291e+01 4.33456631e+00 6.11355627e+00
3.25608027e+01 6.21983988e+00 9.96916945e+00 6.22630926e+00
5.38690661e+00 3.41356718e+01 7.82538840e+00 2.18186559e+01
3.03208782e+00 1.54395008e+01 5.49184098e+00 6.32172082e-01
1.73554611e+01 3.14367838e-01 3.59441390e+00 1.83486555e+01
1.60862997e+00 2.50802853e+01 1.34546379e+01 7.98295249e+00
1.30645206e+01 4.08735595e+01 1.17386056e+01 1.53478527e+01
3.99873738e+01 2.61982427e+01 4.03163164e+00 1.38311607e+01
3.56392419e+00 6.92270239e+00 9.17370430e-01 7.64173309e+01
8.17526105e+00 5.27445892e+00 4.96875310e-01 1.87041759e+01
4.84240240e+00 1.44997509e+01 9.87656381e-01 3.65795589e+01
1.69755704e+01 6.39466104e+00 1.07087738e+00 4.51165181e+01
1.38606658e+01 2.35565131e+01 1.20402301e+01 1.79682409e+01
1.48189315e+01 8.55733496e-01 4.04786290e+01 5.16735516e+00
1.14271007e+01 1.23776181e+01 4.41664168e+00 9.58128989e-01
```

```
2.89219854e+01 2.74998210e+00 6.36842089e+00 2.54544721e+01
2.32874761e+01 3.44313921e+01 3.54624206e-01 1.70480216e+01
5.98187080e+00 6.61607226e+00 1.58647813e+01 7.51541394e+00
2.23881315e+01 5.08684017e+01 5.36489412e-01 4.03311198e+00
3.10617938e+00 1.03302758e+01 1.45195585e+01 4.45618394e+00
1.17023245e+01 1.53491997e+01 2.01546260e+01 1.05354222e+01
3.21089080e+00 1.89660873e+01 4.13507492e+00 1.96302744e+01
1.62235788e+01 1.60480410e+01 8.33651936e+00 1.19184109e+01
1.89750567e+01 5.04047873e+01 7.05291890e-01 4.27201310e+01
1.77737430e+01 3.14754407e+00 4.93933603e+00 1.80071791e-01
9.69006654e+00 1.26467851e+01 1.55971648e+01 2.27039796e+01
2.22335406e+01 1.27990816e+01 1.22767895e+01 1.28769574e+01
1.27543578e+01 2.67131546e+01 5.05271301e+00 6.57217797e+00
1.17369410e+01 1.55389553e+01 1.37544928e+01 6.74136861e+00
2.91259089e+01 5.30954772e-01 5.88913995e+00 6.16926831e+00
9.26386704e+00 4.26371864e+00 1.00889115e+01 4.65449956e+01
2.01945410e+01 7.15524375e+00 2.49778145e+01 4.45015696e+00
9.42731902e-01 9.60452842e+00 1.49142676e+01 7.50237447e+00
4.93737556e+00 8.42498656e-01 1.52859811e+01 4.35372110e+00
1.64739982e+01 5.76958189e+00 2.89985920e+01 1.46878260e+01
1.95796901e+01 8.83124032e+00 2.20872692e+00 3.17538808e+00
4.87256929e+00 1.05292723e+01 1.94339634e+01 4.23355819e+01
1.54518829e+01 1.20840199e+01 1.50618440e+01 9.09362368e+00
1.09971636e+01 9.24379633e+00 2.74108081e+01 1.70817716e+01
2.80741827e+01 2.90812843e+00 2.22315546e+00 1.08414376e+00
9.23397746e+00 5.89707146e+00 2.13146756e+00 2.90709053e+00
6.19234970e+00 1.08666064e+01 6.82114454e+00 1.11070537e-01
9.81373872e+00 5.29827452e+00 1.94855705e+01 3.38785315e+01
3.58803199e+01 4.56433203e+01 1.99262588e+01 8.14291796e+00
2.58000346e+00 6.72725619e+00 5.56557711e+00 2.04307035e+01
2.85976610e+01 3.09289578e+01 4.49949007e+00 3.16226563e+01
1.16699362e+01 3.22552970e-01 6.96855451e+00 2.92759168e+01
4.15431014e+01 6.64375382e+00 5.42819099e+00 8.48842562e+00
1.92375821e+01 1.04806082e+01 2.23867073e+01 3.15744432e+01
4.45296667e+00 2.45673309e+01 1.46943767e+01 3.98332114e+00
4.83938503e+00 1.09877782e+01 6.36758446e+00 9.95653803e+00
4.48912907e+01 3.39820996e+00 1.60347365e+01 7.28872488e+01]
iempos acumulados de llegada (minutos): [ 20.45182384  23.89855231   32.39640763 122.07420494 124.48578762
146.11566251 149.56600714 194.25094871 210.88619076 215.68828342
233.94924059 251.38690143 277.95391168 279.05897879 292.1190708
308.33334426 330.21867618 343.09381621 364.83884834 403.97508467
412.63228978 439.2382907  448.53807145 452.59533675 464.63570652
487.80280755 492.69823331 525.97424378 527.33189378 552.10424675
558.48247871 566.63674962 573.83057066 576.53510489 593.86381409
605.63784749 609.64592439 615.54548286 629.7735289  634.14921494
654.32281407 663.35474273 667.80629584 687.12227672]
```


Tiempos Acumulados de Llegada de Vehículos Eléctricos

Practica 3

Tiempos de espera generados (minutos): [11.46443875 10.53878747 9.20232865
9.58597243 9.83832474 8.81018011

 9.35878626 8.13918624 8.79069863 8.68163429 8.10067611 9.74729626

 9.71555045 11.07270228 8.62066529 6.64244269 6.96337531 14.32470647

 8.81306804 10.78640174 9.66632498 9.91502408 14.02127978 11.01463522

12.44554534 9.38653095 9.52154616 8.0595733 10.02701197 6.94225998

10.8225546 11.75529332 8.83235227 10.68085141 7.64537506 8.23576645

12.79598913 6.66432843 18.43004081 9.91392601 14.57920472 10.88389317

 6.97273871 12.36559468 9.58928407 8.03269881 10.17507657 5.93663231
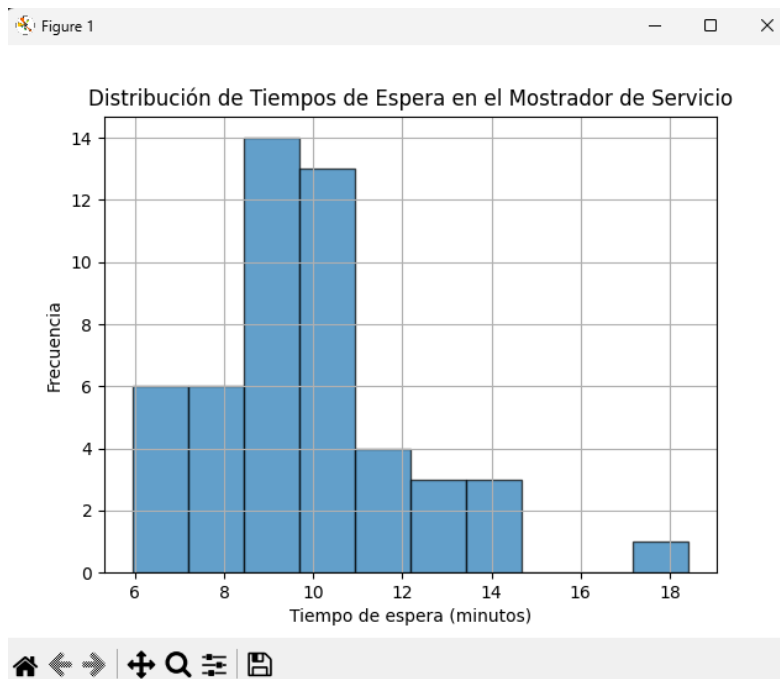
 8.57641178 10.28500243]

Estadísticas de los tiempos de espera:

Media: 9.87 minutos

Mediana: 9.63 minutos

Máximo: 18.43 minutos

Mínimo: 5.94 minutos

Distribución de Tiempos de Espera en el Mostrador de Servicio

Conclusion

El uso de variables aleatorias para simular tiempos de servicio, atención y otros aspectos presenta una serie de ventajas importantes para las organizaciones. En primer lugar, facilita una mejor toma de decisiones, ya que las simulaciones proporcionan información valiosa que ayuda a gestionar los recursos y a planificar las operaciones de manera más efectiva. Esto es fundamental para asegurar que las empresas puedan adaptarse a la demanda de sus clientes.

Además, al modelar diferentes escenarios, las empresas pueden anticipar problemas potenciales y abordarlos antes de que se conviertan en situaciones complicadas. Esto no solo ahorra tiempo, sino que también reduce costos y mejora la satisfacción del cliente.

Otro beneficio clave es la optimización de recursos. Las simulaciones permiten a las organizaciones determinar cuántos recursos realmente necesitan para cumplir con la demanda, evitando así tener demasiados o muy pocos, lo que puede afectar la eficiencia operativa.

Asimismo, al trabajar con sistemas complejos que involucran múltiples variables aleatorias, se logra una mejor comprensión del comportamiento de estos sistemas, lo cual es esencial para implementar mejoras.

Finalmente, la flexibilidad en la planificación es un aspecto que no se puede pasar por alto. Las simulaciones permiten a las empresas ajustar sus estrategias a medida que obtienen nuevos datos o cuando ocurren cambios en la demanda, lo que les ayuda a mantenerse competitivas en un entorno en constante evolución.