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In [1]: # ♦ PRACTICAL 8 – Time Series Forecasting (ARIMA)
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In [3]: #Name: Ritika R. Junekar
#Sub: PD
#Roll_No:29
```

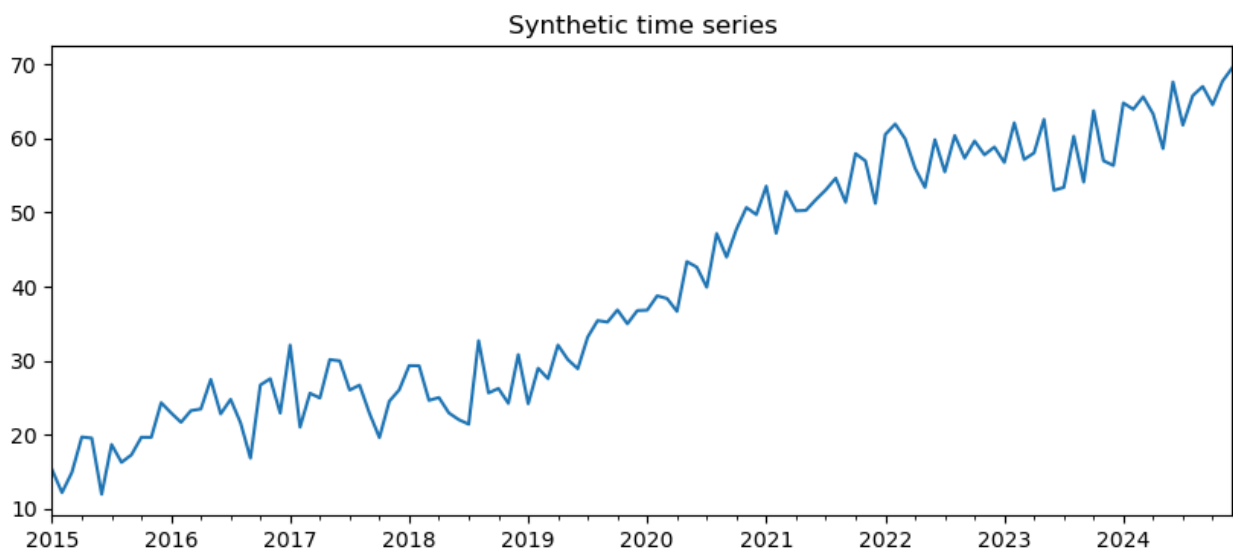
```
In [5]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from statsmodels.tsa.arima.model import ARIMA
```

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In [7]: # Synthetic monthly series
rng = pd.date_range('2015-01-01', periods=120, freq='ME') # month-end frequency
np.random.seed(0)
```

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In [9]: series = (
    10 + 0.5 * np.arange(120) +
    5 * np.sin(np.linspace(0, 12, 120)) +
    np.random.normal(0, 3, 120)
)
```

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In [11]: ts = pd.Series(series, index=rng)
```

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In [13]: ts.plot(title='Synthetic time series', figsize=(10, 4))
plt.show()
```



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In [15]: # Train-test split (last 12 points as test)
train, test = ts[:-12], ts[-12:]
```

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In [17]: # Fit ARIMA model
model = ARIMA(train, order=(1, 1, 1)).fit()
```

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In [19]: # Forecast next 12 periods
forecast = model.forecast(steps=12)
```

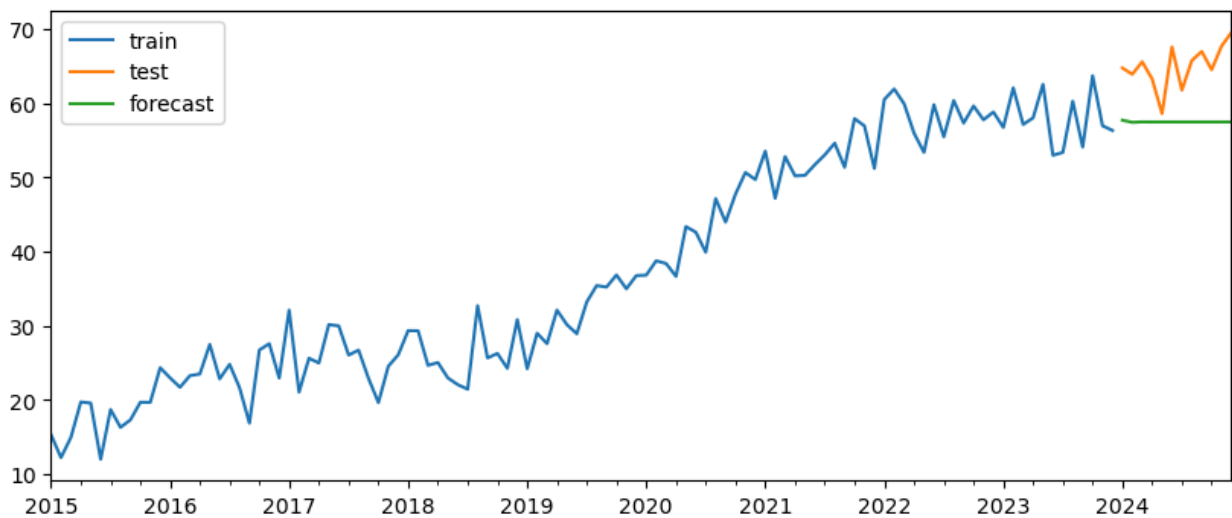
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print("Forecast:\n", forecast)
```

Forecast:

2024-01-31	57.743834
2024-02-29	57.457688
2024-03-31	57.516985
2024-04-30	57.504698
2024-05-31	57.507244
2024-06-30	57.506716
2024-07-31	57.506826
2024-08-31	57.506803
2024-09-30	57.506808
2024-10-31	57.506807
2024-11-30	57.506807
2024-12-31	57.506807

Freq: ME, Name: predicted\_mean, dtype: float64

```
In [21]: plt.figure(figsize=(10, 4))
train.plot(label='train')
test.plot(label='test')
forecast.plot(label='forecast')
plt.legend()
plt.show()
```



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In [ ]:
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