You are a data analyst working for an airline company. You are tasked with analyzing the seasonal patterns in monthly passenger numbers from 1949 to 1960. The goal is to identify the dominant frequencies in the data, which can reveal important periodic patterns such as yearly cycles.

# Load the AirPassengers dataset

data("AirPassengers")

# Plot the original time series data

plot(AirPassengers, main = "Monthly Airline Passenger Numbers (1949-1960)",

ylab = "Passengers", xlab = "Year")

# Compute the periodogram

airpassengers\_periodogram <- spec.pgram(AirPassengers, log = "no", plot = FALSE)

# Plot the periodogram

plot(airpassengers\_periodogram, main = "Periodogram of Monthly Airline Passenger Numbers",

xlab = "Frequency", ylab = "Spectral Density",

col = "blue", type = "h")

### Explanation:

**Load the Dataset:**

* 1. data("AirPassengers"): This command loads the AirPassengers dataset, which is a time series object in R.

**Plot the Time Series:**

* 1. plot(AirPassengers, ...): This command plots the original time series data, showing the monthly airline passenger numbers from 1949 to 1960.

**Compute the Periodogram:**

* 1. spec.pgram(AirPassengers, log = "no", plot = FALSE): This command computes the periodogram of the AirPassengers time series without plotting it immediately. Setting log = "no" specifies that the spectral density should not be logged.

**Plot the Periodogram:**

* 1. plot(airpassengers\_periodogram, ...): This command plots the periodogram, showing the spectral density against frequency. Peaks in the plot represent the dominant frequencies in the time series data.

### Interpretation:

The periodogram plot will show peaks at the frequencies corresponding to the seasonal cycles present in the airline passenger data. Typically, you'll see a significant peak corresponding to a yearly cycle, indicating that the number of passengers follows an annual seasonal pattern.