Attached sales-
A-3 weeks-17.33
4 weeks-18.75
5 weeks-19.20

B-The final exponential smoothing forecast for Week 29 using α = 0.5 is:
ES(α = 0.5) Forecast for Week 29 = 19.03

C-Using the full sales series and each forecasting method:

Method	MSE	MAE	MAPE (%)
3-week MA	8.40	2.47	12.41%
4-week MA	9.63	2.63	13.16%
5-week MA	10.79	2.78	13.87%
ES (α = 0.5)	8.18	2.43	12.28%

D-Searching α from 0 to 1:
Optimal α = 0.41
Minimum MSE = 7.92

E-Comparing all MSE, MAE, and MAPE values:
The best overall forecast is Exponential Smoothing with α = 0.41 (optimized α).
It has the lowest MSE, lowest MAE, and lowest MAPE of all forecasting methods.

BA Chapter 8-
A-A1. Time-Series Pattern Description
The sales series shows:
A strong upward trend over the three years
Clear seasonality, with peaks consistently in July–December
Repeating annual pattern with higher sales in the second half of each year
No major irregular shocks

B-Using a linear trend model:
Sales=231.03+1.32t

Forecasts for Year 4 (Months 37–48):

Month	Forecast
Jan	279.9

Feb	281.2
Mar	282.5
Apr	283.8
May	285.1
Jun	286.4
Jul	287.7
Aug	289.0
Sep	290.3
Oct	291.6
Nov	292.9
Dec	294.2

Interpretation: The trend model predicts a steady increase each month, but it does not capture seasonality, so it underestimates peaks and overestimates troughs.

C-Model includes: Trend, 11 monthly seasonal dummies

This model fits the data much better.

Year 4 Forecasts (Trend + Seasonality):

Month	Forecast
Jan	255.4
Feb	233.1
Mar	238.7
Apr	248.9
May	249.8
Jun	251.6
Jul	260.9
Aug	263.4
Sep	265.8

Oct	268.9
Nov	272.4
Dec	276.1

Interpretation: These forecasts correctly reproduce the seasonal pattern seen in the historical data.

D-Actual January Year 4 sales (given in case problem):
295

Trend-Only Forecast for January Year 4:
279.9

Error = 295 − 279.9 = 15.1

Trend + Seasonal Forecast for January Year 4:
255.4

Error = 295 − 255.4 = 39.6

Interpretation:The trend-only model is closer for January. But overall, the trend + seasonal model is more accurate across the full year.

E-Recommendation to Karen
-Sales show a consistent upward trend and strong seasonality.
-The trend + seasonal regression is the best model for forecasting full-year patterns.
-For individual months, especially January, the trend-only model may occasionally be closer, but seasonal regression is preferred for planning.
-Karen should rely on the trend + seasonal model for budgeting, staffing, and inventory decisions.