The number of customers at a service company for the past 6 months is shown in the table.

Month	Number of customers	F	E	|E|	|E|/D
1	45				
2	41				
3	38				
4	45	39	D−F = 6	6	6 ×100 / 45 = 13.3
5	39	43	−4	4	4×100 / 39 = 10.2
6	49	40	9	9	9×100 / 49 = 18.3
				Σ|E| = 19	= ξ = 41.7

a) Use exponential smoothing with α = 0.7 to forecast the number of customers for months 4 through 6. Let the forecast for month 3 be 42. $F_t = 42$

b) Calculate the mean absolute percent error as of the end of month 6 (i.e. from month 4 until 6)

(a) exponential smoothing : $F_{t+1} = \alpha D_t + (1-\alpha) F_t$

$F_4 = (0.7)(38) + (1-0.7)(42) = 39.2 \approx 39$ customers

$F_5 = (0.7)(45) + (1-0.7)(39) = 43.2 \approx 43$ customers

$F_6 = (0.7)(39) + (1-0.7)(43) = 40.2 \approx 40$ customers

(b) mean absolute percent = $\frac{\Sigma |E|/D}{n} = \frac{19}{3} = 6.3$ ~~×~~

$\frac{\Sigma \left((|E| / D) \times 100 \right)}{n}$

$= \frac{41.7}{3} = 13.9$

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A company is conducting an inventory control study of all their items. The company believes that the sales of its main product decreases with increasing the selling price of the product. The following data are for that item. Y (sales) X (price)

Product selling price (JD) (X)	Sales (Y)	XY	X^2	Y^2
25	110	2750		
23	125	2875		
22	124	2728		
20	134	2680		

$\Sigma X = 90$, $\Sigma Y = 493$, $\bar{X} = \frac{\Sigma X}{n} = 22.5$, $\Sigma XY = 11033$, $\Sigma X^2 = 2038$, $(\Sigma X)^2 = 90^2 = 8100$

$\Sigma Y^2 = 61057$

$(\Sigma Y)^2 = 243049$

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a) Use simple linear regression analysis to estimate the relationship between price and sales (state the equation). (Note: Show your solution in details and do not only write the final equation)

b) Determine the correlation coefficient.

c) Comment on the direction and strength of the relationship between price and sales.

d) Can you use this regression equation to forecast the sales?

e) If yes, forecast the sales if the price of the product is JD 24.

a) $Y = a + bX$, $b = \frac{\Sigma XY - n\bar{X}\bar{Y}}{\Sigma X^2 - n\bar{X}^2}$

$\bar{X} = 22.5$

$\bar{X}^2 = 506.25$

$\bar{Y} = 123.25$

$a = \bar{Y} - b\bar{X}$, $b = \frac{-59.5}{13} = -4.577$

$= 123.25 - (-4.577 \times 22.5)$

$a = 226.23$

$\therefore Y = 226.23 - 4.577X$ linear regression model.

b) $r = \frac{4 \times 11033 - (90 \times 493)}{\sqrt{(4 \times 2038 - 8100)(4 \times 61057 - 243049)}} = \frac{-238}{247.60} = -0.96$

c) The relationship is strong because r is near to (-1).

d) Yes.

e) $X = 24$ JD $\rightarrow Y = a + bX$

$= 226.23 - 4.577 \times 24$

$= 116.3 = 116$

Complete the MRP record for item A

			Lot Size:			POQ (P=3)				
Item: A			Lead Time:			2 weeks				
Description:			Safety Stock:			100				
Week	1	2	3	4	5	6	7	8	9	10
Gross requirements			70		50			55	80	
Scheduled receipts										
Projected on hand 100	100	100	150	150	100	100	100	180	100	100
Planned receipts	/	/	120	/	/	/	/	135	/	/
Planned order releases	120					135				

Complete the MRP record for item A

			Lot Size:			FOQ = 120				
Item: A			Lead Time:			2 weeks				
Description:			Safety Stock:			0				
Week	1	2	3	4	5	6	7	8	9	10
Gross requirements			90		70			75	80	
Scheduled receipts		120								
Projected on hand 20	20	140	50	50	100	100	100	25	65	65
Planned receipts	0	0	0	0	120	0	0	0	120	0
Planned order releases	/	/	120	/	/	/	120	/	/	/

Complete the MPS record for item A

Item: A **Lot Size: 200** **LT = 1 weeks**	**Week**									
Quantity on Hand: 140	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Forecast	100	100	100	100	100	100	100	100	100	100
Customer orders (booked)	80	115	50	0	43	0	0	0	0	0
Projected on-hand inventory	40	125	25	125	25	125	25	125	25	125
MPS quantity	0	200	0	200	0	200	0	200	0	200
MPS start	200		200		200		200		200	
ATP	60	35		157		200		200		200

140 - 80

200 - 115 - 50

200 - 43

200 - 0

10/10

The number of customers at a service company for the past 6 months is shown in the table.

Month	Number of customers (D)	F	|E|	|E| / Dt
1	45	45		
2	41			
3	35	~~37~~		
4	45	37.8	7.2	.16
5	39	41.6	2.6	.06667
6	49	40.4	8.6	.17551
				Σ = .4022

a) Use a 3-months weighted moving average to forecast the number of customers for month 4 through 6. Use weights of 0.6, 0.3 and 0.1, giving more weight to more recent data.

b) Calculate the mean absolute percent error as of the end of month 6 (i.e. from month 4 until 6)

a) $F_{t+1} = w_1 D_t + w_2 D_{t-1} + w_3 D_{t-2}$

$F_4 = .6(35) + .3(41) + .1(45) = 37.8$

b) $MAPE = \frac{\Sigma(|E_t| / D_t)}{n} \times 100\% = \frac{.4022}{3}(100) = 13.405\%$

$F_5 = .6(45) + .3(35) + .1(41) = 41.6$

$F_6 = .6(39) + .3(45) + .1(35) = 40.4$

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No unit measurment

The number of customers at a service company for the past 6 months is shown in the table.

Month	Number of customers	Forecast	E	$\frac{\lvert E \rvert}{D} \times 100$	
1	45				
2	41				
3	35				
4	45	38	7	15.5%	
5	39	42	−3	7.69%	
6	49	40	9	18.36%	

a) Use a 3-months weighted moving average to forecast the number of customers for month 4 through 6. Use weights of 0.6, 0.3 and 0.1, giving more weight to more recent data.

b) Calculate the mean absolute percent error as of the end of month 6 (i.e. from month 4 until 6)

$F_4 = D_t w_1 + D_{t-1} w_2 + D_{t-2} w_3 \rightarrow 35(0.6) + (41)(0.3) + (45)(0.1)$

$F_4 = 37.8 \rightarrow 38$ customers $\quad E_4 = 45 - 38 = 7$

~~$F_5 = (37.8)(0.6)$~~ $F_5 = 45(0.6) + (35)(0.3) + (41)(0.1) = 41.6 \rightarrow$

$F_5 = 42$ customers $\quad E_5 = 39 - 42 = -3$

$F_6 = 39(0.6) + 45(0.3) + 35(0.1) = 40.4 \rightarrow F_6 = 40$ customers

$E_6 = 49 - 40 = 9$

10

10

$$MAPE = \frac{\sum \frac{|E|}{D_t} \times 100\%}{n}$$

4	$\frac{\lvert E \rvert}{D} \times 100\% = \frac{7}{45} \times 100\% = 15.5\%$
5	$\frac{\lvert E \rvert}{D} \times 100\% = \frac{3}{39} \times 100\% = 7.69\%$
6	$\frac{\lvert E \rvert}{D} \times 100\% = \frac{9}{49} \times 100\% = 18.36\%$

$MAPE = \frac{15.5 + 7.69 + 18.36}{3}$

$MAPE = 13.85\%$

Complete the MRP record for item A

			Lot Size:		POQ (P=4)				
Item: A			**Lead Time:**		2 weeks				
Description:			**Safety Stock:**		40				
Week	1	2	3	4	5	6	7	8	9	10
Gross requirements			30		35	20	15	35	10	
Scheduled receipts										
Projected on hand 40	40	40	95	95	60	40	85	50	40	40
Planned receipts	0	0	85	0	0	0	60	0	0	
Planned order releases	85				60					

Complete the MRP record for item A

			Lot Size:			POQ (P=4)				
Item: A			**Lead Time:**			2 weeks				
Description:			**Safety Stock:**			40				
Week	1	2	3	4	5	6	7	8	9	10
Gross requirements			40 (0)	(1)	45 (5)	30 (4)	25 (0)	45 (2)	20 (2)	(4)
Scheduled receipts										
Projected on hand 50	50	50	115	115	~~70~~	40	105	~~80~~	~~40~~	40
Planned receipts	0	0	105	0	0	0	90	0	0	0
Planned order releases	105				90					

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Complete the MPS record for item A

Item: A **Lot Size: 150** **LT = 1 weeks**	**Week**									
Quantity on Hand: 90	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Forecast	60	60	60	60	60	60	60	60	60	60
Customer orders (booked)	[55	65]	[45	0]	[13	0	0]	0	0	0
Projected on-hand inventory	90	~~85~~ 115	~~115~~	~~55~~	~~145~~	~~85~~	~~25~~	~~115~~	~~55~~	~~145~~
MPS quantity 150		150	150		150			150		150
MPS start 1 weeks	150	~~150~~		150			150		150	
ATP	30	~~150~~	105		137			150	~	150

90	1	2	3	4	5	6	7	8	9	10
	60	60	60	60	60	60	60	60	60	60
customer	55	[65	45]	[0	13	0]	0	0	0	0
	~~30~~	115	55	145	85	25	115	55	145	85
MPS Quan		150		150			150		150	
	15		150			~~150~~ 150		150		
	35	40		137			150		150	

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