



# SC311 Modeling and Simulation

#### Lecture 06

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Spring 2023



#### **Chapter 4: Inventory Simulation**

- Introduction.
- Simulating of Inventory System.
- The Newspaper Seller's Problem.



#### Sim. of Inventory System(12/13)

#### Simulation Table (5 Cycles)

			Random					Random	Days until
		Beginning	Digits for		Ending	Shortage	Order	Digits for	Order
Cycle	Day	Inventory	Demand	Demand	Inventory	Quantity	Quantity	Lead Time	Arrives
1	1	3	24	1	2	0	_	_	1
	2	2	35	1	1	0	_	-	0
	3	9	65	2	7	0	_	_	-
	4	7	81	3	4	0	_	_	-
	5	4	54	2	2	0	9	5	1
2	1	2	03	0	2	0	_	_	0
	2	11	87	3	8	0	_	_	_
	3	8	27	1	7	0	_	_	-
	4	7	73	3	4	0	_	_	-
	5	4	70	2	2	0	9	0	3
3	1	2	47	2	0	0	_	_	2
	2	0	45	2	0	2	_	_	1
	3	0	48	2	0	4	_	_	0
	4	9	17	1	4	0	_	_	-
	5	4	09	0	4	0	7	3	1
4	1	4	42	2	2	0	_	_	0
	2	9	87	3	6	0	_	_	_
	3	6	26	1	5	0	_	_	_
	4	5	36	2	3	0	_	-	-
	5	3	40	2	1	0	10	4	1
5	1	1	07	0	1	0	_	_	0
	2	11	63	2	9	0	_	_	_
	3	9	19	1	8	0	_	_	-
	4	8	88	3	5	0	_	-	-
	5	5	94	4	1	0	10	8	2
					88				



#### **Performance analysis:**

- Based on five cycles of simulation, the average ending inventory is approximately 3.5 (88 ÷ 25) units.
- On 2 of 25 days a shortage condition existed.
- For large number of cycles, the computer is used.



## YOUR TURN

#### **Bonus Question:**

#### In the previous example:

- Perform the simulation for 10 cycles.
- Plot a graph for this simulation.
  - (Time, Amount in inventory)
- Submit your answer (Due Date: 6-April-2023)
  - https://docs.google.com/forms/d/e/1FAIpQLSfxnJfAK Mgo8cgC8RosczNjYYqwOPR3auqeznR4PiKqc5iNA/ ink





#### **Note: Graph**

1			Random		(			Random	Days until
		Beginning	Digits for		Ending	Shortage	Order	Digits for	Order
Cycle	Day	Inventory	Demand	Demand	Inventory	Quantity	Quantity	Lead Time	Arrives
1	1	3	24	1	2	0	-	-	1
	2	2	35	1	1	0	-	<b>1</b> –	0
	3	9	65	2	7	0			—
	4	7	81	3	4	0	Am	ount: y-Ax	is –
	5	4	54	2	2	0		<b>-</b>	1
2	1	2	03	0	2	0	-	_	0
	2	11	87	3	8	0	-	_	—
	3	8	27	1	7	0	-	-	-
	4	7	73	3	4	0	_	_	_
	- 2	4	70	2	2	0	9	0	3
3	1	2	47	2	0	0			
	2	0	45	2	0	2			
	3	0	48	2	0	4	1		
	4	9	1/	1	4	0	È.		
	- 3	4	09	0	4	0	- 12 M - 7	<r< th=""><th></th></r<>	
4	1	Time	e: x-Axis	2	2	0	ž.	$\setminus$ $ $ $ $	Qs
	2		26	3	6	0	. <u>.</u>		
	3	5	20	1	3	0	Ĭ		2
	4 5	3	40	2	1	0	10	i A I	i i
-		5	40	2	1	0	- F		
5	1	1	07	0	1	0			► T
	2	11	0.5	2	9	0	1	1 N	Time
	3 4	8	88	3	0 5	0		← N→!← N→!←	- N
	5	5	94	4	1	0	L'	1 1	
	5	5	24	-	88	Ŭ			
L					00				

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#### **The Newspaper Seller's Problem (1/2):**

- A classical inventory problem concerns the purchase and sale of newspapers.
- The paper seller buys the papers for 33 cents each and sells them for 50 cents each. Newspapers not sold at the end of the day are sold as scrap for 5 cents each.
- Newspapers can be purchased in bundles of 10. Thus, the paper seller can buy 10, 20, ..., 60, ... and so on.



#### The Newspaper Seller's Problem (2/2):

- There are three types of newsdays, "good," "fair," and "poor," with probabilities of 0.35, 0.45, and 0.20, respectively.
- The problem is to determine the optimal number of papers the newspaper seller should purchase.



#### Random-Digit Assignment for Type of Newsday

Type of Newsday	Probability
Good	0.35
Fair	0.45
Poor	0.20



#### Random-Digit Assignment for Type of Newsday

		Cumulative	Random-Digit
Type of Newsday	Probability	Probability	Assignment
Good	0.35	0.35	01-35
Fair	0.45	0.80	36-80
Poor	0.20	1.00	81-00



#### Random-Digit Assignment for Type of Newsday

		Cumulative	Random-Digit
Type of Newsday	Probability	Probability	Assignment
Good	0.35	0.35	01-35
Fair	0.45	0.80	36-80
Poor	0.20	1.00	81-00

#### **Distribution of Newspapers Demanded**

	Demand Probability Distribution								
Demand	Good	Fair	Poor						
40	0.03	0.10	0.44						
50	0.05	0.18	0.22						
60	0.15	0.40	0.16						
70	0.20	0.20	0.12						
80	0.35	0.08	0.06						
90	0.15	0.04	0.00						
100	0.07	0.00	0.00						



	Cumulative DistributionRandom-Digit Assignment						
Demand	Good	Fair	Poor	Good	Fair	Poor	
40							
50							
60							
70							
80							
90							
100							



	Cumul	Cumulative DistributionRandom-Digit Assignment									
Demand	Good	Fair Poor	r Good	l Fair	Poor						
40	0.03		Demand F	Probability	Distribution						
50	0.08	Demand	Good	Fair	Poor						
60	0.23	40	0.03	0.10	0.44						
70	0.43	50	0.05	0.18	0.22						
80	0.78	60	0.15	0.40	0.16						
00	0.03	70	0.20	0.20	0.12						
90	0.95	80	0.35	0.08	0.06						
100	1.00	90	0.15	0.04	0.00						
		100	0.07	0.00	0.00						



	Cumulative DistributionRandom-Digit Assignment							
Demand	Good	Fair	Poor	Good	Fair	Poor		
40	0.03			01-03				
50	0.08			04 - 08				
60	0.23			09-23				
70	0.43			24-43				
80	0.78			44 - 78				
90	0.93			79-93				
100	1.00			94-00				



	Cumulative DistributionRandom-Digit Assignment							
Demand	Good	Fair	Poor	Good	Fair	Poor		
40	0.03	0.10		Demand	Probabilit	y Distribut	ion	
50	0.08	0.28	Demand	Good	Fair	Poor		
60	0.23	0.68	40	0.03	0.10	0.44		
70	0.43	0.88	50	0.05	0.18	0.22		
80	0.78	0.96	60	0.15	0.40	0.16		
00	0.02	1.00	70	0.20	0.20	0.12		
90	0.95	1.00	80	0.35	0.08	0.06		
100	1.00	1.00	90	0.15	0.04	0.00		
			100	0.07	0.00	0.00		



	Cumulative DistributionRandom-Digit Assignment								
Demand	Good	Fair	Poor	Good	Fair	Poor			
40	0.03	0.10		Demand	Probabilit	y Distribut	ion		
50	0.08	0.28	Demand	Good	Fair	Poor			
60	0.23	0.68	40	0.03	0.10	0.44			
70	0.43	0.88	50	0.05	0.18	0.22			
80	0.78	0.96	60	0.15	0.40	0.16			
90	0.93	1.00	70	0.20	0.20	0.12			
100	1.00	1.00	80	0.35	0.08	0.06			
100	1.00	1.00	90	0.15	0.04	0.00			
			100	0.07	0.00	0.00			



	Cumulative DistributionRandom-Digit Assignment								
Demand	Good	Fair	Poor	Good	Fair	Poor			
40	0.03	0.10		Demand	Probabilit	y Distributi	ion		
50	0.08	0.28	Demand	Good	Fair	Poor			
60	0.23	0.68	40	0.03	0.10	0.44			
70	0.43	0.88	50	0.05	0.18	0.22			
80	0.78	0.96	60	0.15	0.40	0.16			
00	0.02	1.00	70	0.20	0.20	0.12			
90	0.95	1.00	80	0.35	0.08	0.06			
100	1.00		90	0.15	0.04	0.00			
			100	0.07	0.00	0.00			



	Cumul	Cumulative DistributionRandom-Digit Assignment										
Demand	Good	Fair	Poor	Good	Fair	Poor						
40	0.03	0.10		01-03	01-10							
50	0.08	0.28		04 - 08	11 - 28							
60	0.23	0.68		09-23	29-68							
70	0.43	0.88		24-43	69-88							
80	0.78	0.96		44 - 78	89-96							
90	0.93	1.00		79-93	97-00							
100	1.00			94-00								



	Cumul	ative D	istributi	onRandon	1-Digit A	ssignme	ent	
Demand	Good	Fair	Poor	oor Good Fair Poor		-		
40	0.03	0.10	0.44		Demand F	Probability	Distributi	on
50	0.08	0.28	0.66	Demand	Good	Fair	Poor	
60	0.23	0.68	0.82	40	0.03	0.10	0.44	
70	0.43	0.88	0.94	50	0.05	0.18	0.22	
80	0.78	0.96	1.00	60	0.15	0.40	0.16	
90	0.93	1.00	1.00	70	0.20	0.20	0.12	
100	1.00	1.00	1.00	80	0.35	0.08	0.06	
100	1.00		1.00	90	0.15	0.04	0.00	
			<b> </b>	100	0.07	0.00	0.00	



	Cumul	ative L	Distributio	onRandon	1-Digit A	ssignme	ent	
Demand	Good	Fair	Poor	Good	Fair	Poor		
40	0.03	0.10	0.44		Demand H	Probability	Distributi	on
50	0.08	0.28	0.66	Demand	Good	Fair	Poor	
60	0.23	0.68	0.82	40	0.03	0.10	0.44	
70	0.43	0.88	0.94	50	0.05	0.18	0.22	
80	0.78	0.96	1.00	60	0.15	0.40	0.16	
00	0.03	1.00	1.00	70	0.20	0.20	0.12	
90	0.95	1.00	1.00	80	0.35	0.08	0.06	
100	1.00		1.00	90	0.15	0.04	0.00	
				100	0.07	0.00	0.00	



	Cumul	ative D	oistributi	onRandon	n-Digit A	ssignme	ent	
Demand	Good	ood Fair Poor Good Fair Poor						
40	0.03	0.10	0.44		Demand H	Probability	Distributi	on
50	0.08	0.28	0.66	Demand	Good	Fair	Poor	
60	0.23	0.68	0.82	40	0.03	0.10	0.44	
70	0.43	0.88	0.94	50	0.05	0.18	0.22	
80	0.78	0.96	1.00	60	0.15	0.40	0.16	
00	0.02	1.00	1.00	70	0.20	0.20	0.12	
90	0.95	1.00		80	0.35	0.08	0.06	
100	1.00			90	0.15	0.04	0.00	
				100	0.07	0.00	0.00	



	Cumul	Cumulative DistributionRandom-Digit Assignment										
Demand	Good	Fair	Poor	Good	Fair	Poor						
40	0.03	0.10	0.44	01-03	01-10	01-44						
50	0.08	0.28	0.66	04 - 08	11-28	45-66						
60	0.23	0.68	0.82	09-23	29-68	67-82						
70	0.43	0.88	0.94	24-43	69-88	83-94						
80	0.78	0.96	1.00	44 - 78	89-96	95-00						
90	0.93	1.00		79-93	97-00							
100	1.00			94-00								



• The profits are given by the following relationship:

Profit = 
$$\binom{\text{revenue}}{\text{from sales}} - \binom{\text{cost of}}{\text{newspapers}}$$
  
-  $\binom{\text{lost profit from}}{\text{excess demand}} + \binom{\text{salvage from sale}}{\text{of scrap papers}}$ 

• This will be accomplished by simulating demands for **20** days and recording profits from sales each day. The policy (number of newspapers purchased) is changed to other values and the simulation repeated until the best value is found.

	Random						0 0.35	- ψ25.1
	Digits for		Random		Revenue	Lost Profit	Salvage	
	Type of	Type of	Digits for		from	from Excess	from Sale	Daily
Day	Newsday	Newsday	Demand	Demand	Sales	Demand	of Scrap	Profit
1	94	Poor	80	60	\$30.00	-	\$0.50	\$7.40
2	77	Fair	20	50	25.00	-	1.00	2.90
3	49	Fair	15	50	25.00	-	1.00	2.90
4	45	Fair	88	70	35.00	-	-	11.90
5	43	Fair	98	90	35.00	\$3.40	-	8.50
6	32	Good	65	80	35.00	1.70	-	10.20
7	49	Fair	86	70	35.00	-	-	11.90
8	00	Poor	73	60	30.00	-	0.50	7.40
9	16	Good	24	70	35.00	-	-	11.90
10	24	Good	60	80	35.00	1.70	_	10.20
11	31	Good	60	80	35.00	1.70	-	10.20
12	14	Good	29	70	35.00	-	_	11.90
13	41	Fair	18	50	25.00	_	1.00	2.90
14	61	Fair	90	80	35.00	1.70	_	10.20
15	85	Poor	93	70	35.00	-	_	11.90
16	08	Good	73	80	35.00	1.70	_	10.20
17	15	Good	21	60	30.00	_	0.50	7.40
18	97	Poor	45	50	25.00	_	1.00	2.90
19	52	Fair	76	70	35.00	_	_	11.90
20	78	Fair	96	80	35.00	1.70	_	10.20
					\$645.00	\$13.60	\$5.50	\$174.90



	Random Digits for Type of	Type of	Random Digits for		Revenue from	Lost Profit from Excess	Salvage from Sale	Daily
Day	Newsday	Newsday	Demand	Demand	Sales	Demand	of Scrap	Profit
1	94		80		÷		÷	*- ···
2	77		20					
3	49		15					
4	45		88					
5	43		98					
6	32		65					
7	49		86					
8	00		73					



Day	Random Digits for Type of Newsday	Type of Newsday	Random Digits for Demand	Demand	Revenue from Sales	Lost Profit from Excess Demand	Salvage from Sale of Scrap	Daily Profit
1	94		80		¥		÷	÷
2	77		20					
3	49		15					
4	45		88					
5	43		98					
6	32		65					
7	49		86					
8	00		73					











		Random							
		Digits for		Random		Revenue	Lost Profit	Salvage	
		Type of	Type of	Digits for		from	from Excess	from Sale	Daily
l	Day	Newsday	Newsday	Demand	Demand	Sales	Demand	of Scrap	Profit
	1	94		80				÷	* ·-
	2	77		20					
	3	49		15					
	4	45		88					
	5	43		98					
	6	32		65					
	7	49		86					
	8	00		73					



	Random Digits for Type of	Type of	Random Digits for		Revenue from	Lost Pro from Exe	ofit Salvage cess from Sale	Daily
Day	Newsday	Newsday	Demand	Demand	Sales	Deman	of Scrap	Profit
1	94		80		÷		*** ==	÷
2	77		20	Have	Dom	and	Lost Drofit	
3	49		15	паче	Den	iand		
4	45		88	70	90		20*(17 c	ents)
5	43		00					
6	32		T	he pape	er selle	r buy	s the paper	ts for 3
7	49		cen	ts each	and sel	ls the	em for 50 c	cents ea
8	00		73					



	Random						$\frown$	
	Digits for		Random		Revenue	Lost Profit	Salvage	
	Type of	Type of	Digits for		from	from Excess	from Sale	Daily
Day	Newsday	Newsday	Demand	Demand	Sales	Demand	of Scrap	Profit
1	94		80		÷			£
2	77		20					
3	49		15					
4	45		88					
5	43		98					
6	32		65					
7	49		86					
8	00		73					





## كلية الحاسبات والذكاء الإصطناعي

Sin	nulatio	on Tabl	e (70 i	newspa	apers, 5	5 days)	)	Cost = 7	of daily r 'O*O.33 :	1ewspap = \$23.1	oers 0
	Day	Random Digits for Type of Newsday	Type of Newsday	Random Digits for Demand	Demand	Revenue from Sales	L fre	ost Profit om Excess Demand	Salvage from Sale of Scrap	Daily Profit	
	1	94		80							
	2	77		20							
	3	49		15							
	4	45		88							
	5	43		98							

Simulation Table (70 newspapers, 5 days)

Cost of daily newspapers = 70\*0.33 = \$23.10

	Random						
	Digits for		Random			Cumulative	Random-Digit
	Type of	Type of	Digits for	Type of Newsday	Probability	Probability	Assignment
Day	Newsday	Newsday	Demand	Good	0.35	0.35	01-35
1	94		80	Fair	0.45	0.80	36-80
2	77		20	Poor	0.20	1.00	81-00
3	49		15				
4	45		88				
5	43		98				

Simulation Table (70 newspapers, 5 days)

كلية الحاسبات

والذكاء الإصطناعي

Cost of daily newspapers = 70\*0.33 = \$23.10

	Random						
	Digits for		Random			Cumulative	Random-Digit
	Type of	Type of	Digits for	Type of Newsday	Probability	Probability	Assignment
Day	Newsday	Newsday	Demand	Good	0.35	0.35	01-35
1	94	Poor	80	Fair	0.45	0.80	36-80
2	77	Fair	20	Poor	0.20	1.00	81-00
3	49	Fair	15				
4	45	Fair	88				
5	43	Fair	98				

Sin	nulatio	on Tabl	e (70 i	newspa	pers, 5	5 days	)	Cos =	t of c 70*0	daily r D.33 :	1ewsp = \$23	oapers 3.10
		Random Digits for		Random			Cumu	lative D	istributic	onRandon	ı-Digit A	ssignment
		Type of	Type of	Digits for		Demand	Good	Fair	Poor	Good	Fair	Poor
	Day	Newsday	Newsday	Demand	Demand	40	0.03	0.10	0.44	01-03	01-10	01-44
	1	94	Poor	80		50	0.08	0.28	0.66	04-08	11-28	45-66
	2	77	Fair	20		60	0.23	0.68	0.82	09-23	29-68	67-82
	3	49	Fair	15		70	0.43	0.88	0.94	24-43	69-88	83-94
	4	45	Fair	88		80	0.78	0.96	1.00	44-78	89-96	95-00
	5	43	Fair	98		90	0.93	1.00	1.00	79–93	97-00	
						100	1.00	1.00	1.00	94-00		

Simu	ulatio	on Tabl	e (70 i	newspa	ipers, 5	5 days	)	Cos =	t of o 70*0	daily r D.33 :	newsp = \$23	oapers 3.10	
		Random Digits for		Random			Cumu	lative D	istributio	onRandon	n-Digit A	ssignment	
		Type of	Type of	Digits for		Demand	Good	Fair	Poor	Good	Fair	Poor	
	Day	Newsday	Newsday	Demand	Demand	40	0.03	0.10	0.44	01-03	01-10	01-44	
	1	94	Poor	80		50	0.08	0.28	0.66	04-08	11-28	45-66	
	2	77	Fair	20		60	0.23	0.68	0.82	09-23	29-68	67-82	
	3	49	Fair	15		70	0.43	0.88	0.94	24-43	69-88	83-94	1
	4	45	Fair	88		80	0.78	0.96	1.00	44-78	89-96	95-00	
	5	43	Fair	98		90	0.93	1.00	1.00	79–93	97-00		
						100	1.00	1.00	1.00	94-00			

Simu	latio	on Tabl	e (70 ı	newspa	apers, 5	o days	)	Cos =	t of o 70*(	daily r D.33 :	newsp = \$23	oapers 3.10	5
		Random Digits for		Random			Сити	lative D	istributio	onRandon	n-Digit A	ssignment	
		Type of	Type of	Digits for		Demand	Good	Fair	Poor	Good	Fair	Poor	
	Day	Newsday	Newsday	Demand	Demand	40	0.03	0.10	0.44	01-03	01-10	01-44	
	1	94	Poor	80		50	0.08	0.28	0.66	04-08	11-28	45-66	L
	2	77	Fair	20		60	0.23	0.68	0.82	09-23	29-68	67-82	
	3	49	Fair	15		70	0.43	0.88	0.94	24-43	69-88	83-94	
	4	45	Fair	88		80	0.78	0.96	1.00	44-78	89-96	95-00	
	5	43	Fair	98		90	0.93	1.00	1.00	79–93	97-00		•
						100	1.00	1.00	1.00	94-00			

# كلية الحاسبات والذكاء الإصطناعي

Sin	nulatio	on Tabl	e (70 i	newspa	pers, 5	5 days)		Cost ( = 7	of daily r 0*0.33 :	1ewspap = \$23.1	oers O
		Random Digits for Type of	Type of	Random Digits for		Revenue from	La froi	ost Profit m Excess	Salvage from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	Ľ	emand	of Scrap	Profit	
	1	94	Poor	80	60						
	2	77	Fair	20							
	3	49	Fair	15							
	4	45	Fair	88							
	5	43	Fair	98							

Sim	ulatio	on Tabl	e (70 ı	newspa	apers, 5	5 days	)	Cos =	st of a 70*(	daily r 0.33 :	newsp = \$23	oapers 3.10
	Dau	Random Digits for Type of Newsday	Type of	Random Digits for Demand	Damand	Demand	Cumu Good	lative I Fair	Distributio Poor	onRandor Good	n-Digit As Fair 01–10	ssignment Poor 01–44
_	1	94	Poor	Bemana 80	Demana 60	50	0.05	0.10	0.44	01-03	11-28	45-66
	2	77	Fair	20		60	0.23	0.68	0.82	09–23	29-68	67-82
	3	49	Fair	15		70 80	0.43	0.88	0.94 1.00	24-43 44-78	69-88 80 06	83-94 05-00
	4 5	45 43	Fair Fair	88 98		90	0.78	0.90 1.00	1.00	44—78 79—93	97-00	95-00
						100	1.00	1.00	1.00	94-00		

# كلية الحاسبات والذكاء الإصطناعي

Sin	nulatio	on Tabl	e (70 i	newspa	pers, 5	5 days)		Cost ( = 7	of daily r 0*0.33 :	newspap = \$23.1	oers O
		Random Digits for Type of	Type of	Random Digits for		Revenue from	La fro	ost Profit m Excess	Salvage from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	L	)emand	of Scrap	Profit	
	1	94	Poor	80	60						
	2	77	Fair	20	50						
	3	49	Fair	15							
	4	45	Fair	88							
	5	43	Fair	98							

# كلية الحاسبات والذكاء الإصطناعي

Sin	nulatio	on Tabl	e (70 i	newspa	pers, 5	5 days)	)	Cost = 7	of daily r 'O*0.33 :	newspap = \$23.1	ers 0
		Random									
		Digits for		Random		Revenue	L	ost Profit	Salvage		
		Type of	Type of	Digits for		from	fro	om Excess	from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	l	Demand	of Scrap	Profit	
	1	94	Poor	80	60						
	2	77	Fair	20	50						
	3	49	Fair	15	50						
	4	45	Fair	88	70						
	5	43	Fair	98	90						

Sim	nulatio	on Tabl	e (70 i	newspa	pers, 5	5 days)	)	Cost ( = 7	of daily r 0*0.33 :	newspap = \$23.1	oers O
		Random Digits for		Dandom		Данания	1	oet Profit	Salvaga		
		Type of	Type of	Digits for		from	fra	om Excess	from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	l	Demand	of Scrap	Profit	
	1	94	Poor	80	60	\$30.00		-	\$0.50	\$7.40	
	2	77	Fair	20	50	$\sim$					
	3	49	Fair	15	50					_	
	4	45	Fair	88	70	60*(50	) c	ents) =	= \$30.0	0	
	5	43	Fair	98	90						

Sin	nulatio	on Tabl	e (70 ı	newspa	pers, 5	5 days)	)	Cost = 7	of daily n '0*0.33 =	ewspaj = \$23.1	oers 0
		Random Digits for Type of	Type of	Random Digits for		Revenue	L	ost Profit um Excess	Salvage from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	1	Demand	of Scrap	Profit	
	1	94	Poor	80	60	\$30.00		_	\$0.50	\$7.40	
	2	77	Fair	20	50						
	3	49	Fair	15	50						
	4	45	Fair	88	70	10*(.	5 c	ents) =	= \$0.50		
	5	43	Fair	98	90						



# كلية الحاسبات والذكاء الإصطناعي

Sin	nulatio	on Tabl	le (70 i	newspa	ipers, 5	5 days)	)	Cost = 7	of daily r 'O*O.33 :	newspap = \$23.1	oers O
		Random Digits for		Random		Revenue	L	ost Profit	Salvage		
	Day	Type of Newsday	Type of Newsday	Digits for Demand	Demand	from Sales	fre	om Excess Demand	from Sale of Scrap	Daily Profit	
	1	94	Poor	80	60	\$30.00		_	\$0.50	\$7.40	1
	2	77	Fair	20	50	25.00		-	1.00	2.90	
	3	49	Fair	15	50						
	4	45	Fair	88	70						
	5	43	Fair	98	90						

## كلية الحاسبات والذكاء الإصطناعي

Sin	nulatio	on Tabl	e (70 i	newspa	pers, !	5 days)	)	Cost = 7	of daily r '0*0.33 =	newspap = \$23.1	oers O
		Random									
		Digits for		Random		Revenue	L	ost Profit	Salvage		
		Type of	Type of	Digits for		from	fro	m Excess	from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	1	Demand	of Scrap	Profit	
	1	94	Poor	80	60	\$30.00		_	\$0.50	\$7.40	
	2	77	Fair	20	50	25.00		-	1.00	2.90	
	3	49	Fair	15	50	$\sim$					
	4	45	Fair	88	70						
	5	43	Fair	98	90	50*(50	) c	ents) =	= \$25.0	0	

## The New كلية الحاسيات والذكاء الإصطناعي

Sin	nulatio	on Tabl	e (70 ı	newspa	pers, 5	5 days)		Cost = 7	of daily n 0*0.33 =	iewspap = \$23.1	oers O
		Random Digits for		Random		Revenue	L	ost Profit	Salvage		
		Type of	Type of	Digits for		from	fra	om Excess	from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	l	Demand	of Scrap	Profit	
	1	94	Poor	80	60	\$30.00		-	\$0.50	\$7.40	7
	2	77	Fair	20	50	25.00		-	( 1.00 )	2.90	
	3	49	Fair	15	50						
	4	45	Fair	88	70						
	5	43	Fair	98	90	20*(	5 c	ents) =	= \$1.00		



# كلية الحاسبات والذكاء الإصطناعي

Sim 「	nulatio	on Tabl	le (70 i	newspa	apers, 5	5 days)		Cost = 7	of daily r '0*0.33 =	newspap = \$23.1	ers 0
		Random Digits for		Random		Revenue	L	ost Profit	Salvage		
		Type of	Type of	Digits for		from	fro	m Excess	from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	l	Demand	of Scrap	Profit	
	1	94	Poor	80	60	\$30.00		_	\$0.50	\$7.40	
	2	77	Fair	20	50	25.00		-	1.00	2.90	
	3	49	Fair	15	50	25.00		-	1.00	2.90	
	4	45	Fair	88	70	35.00		-	-	11.90	
	5	43	Fair	98	90						

## كلية الحاسبات والذكاء الإصطناعي

Sin	nulatio	on Tabl	e (70 i	newspa	pers, !	5 days)		Cost ( = 7	of daily r O*0.33 =	newspap = \$23.1	oers O
		Random Digits for		Random		Revenue	L	ost Profit	Salvage		
		Type of	Type of	Digits for		from	fra	om Excess	from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	l	Demand	of Scrap	Profit	
	1	94	Poor	80	60	¢20.00	_	、 、	¢n 5n	\$7.40	]
	2	77	Fair	20	50	70*(50	) c	ents) =	= \$35.00	<u>2.90</u>	
	3	49	Fair	15	50	25.00		-	1.00	2.90	
	4	45	Fair	88	70	35.00		+	-	11.90	
	5	43	Fair	98	90						

Sin	nulation	n Ta	ble (70 r	newspa	apers,	5 days)		Cost = 7	of daily 0*0.33	newspap = \$23.10	ers D
	$Profit = \binom{r}{fr}$	om sa	$\binom{10}{10} - \binom{10}{10}$ cost newsp $\binom{10}{10}$ lost profit from excess demand	$\begin{pmatrix} a \text{ of } \\ a \text{ pers} \end{pmatrix}$ $\begin{pmatrix} a \\ b \\ d \end{pmatrix} + \begin{pmatrix} salv \\ of s \end{pmatrix}$	age from sa scrap paper	le le s ) <sub>Sales</sub>	Lost from Det	t Profit Excess mand	Salvage from Sale of Scrap	Daily Profit	
	1 2	94 77	P F F =	Profit ( = 35.00 = \$11 9	Day#4 0 — 23	·) .10 — 0	+ (	C	\$0.50 1.00	\$7.40 2.90	
	3 4 5	49 45 43	R Fair Fair	88 98	70 90	35.00		-	1.00	2.90	

# كلية الحاسبات والذكاء الإصطناعي

Sin	nulatio	on Tabl	e (70 i	newspa	ipers, §	5 days)	)	Cost = 7	of daily r '0*0.33 :	newspap = \$23.1	ers 0
		Random Digits for		Random		Revenue	L	ost Profit	Salvage		
		Type of	Type of	Digits for		from	fro	m Excess	from Sale	Daily	
	Day	Newsday	Newsday	Demand	Demand	Sales	l	Demand	of Scrap	Profit	
	1	94	Poor	80	60	\$30.00		_	\$0.50	\$7.40	1
	2	77	Fair	20	50	25.00		-	1.00	2.90	
	3	49	Fair	15	50	25.00		-	1.00	2.90	
	4	45	Fair	88	70	35.00		-	-	11.90	
	5	43	Fair	98	90	35.00		\$3.40	-	8.50	

## كلية الحاسبات والذكاء الإصطناعي

mula	tion Tab	le (70	newspa	ipers, <sup>g</sup>	5 days)		Cost = 7	of daily r '0*0.33 =	newspape = \$23.10
	Random Digits for Type of	Type of	Random Digits for		Revenue from	La fro	ost Profit m Excess	Salvage from Sale	Daily
Da	y Newsday	Newsday	Demand	Demand	Sales	L	Demand	of Scrap	Profit
1	94	Poor	80	60	\$30.00		_	\$0.50	\$7.40
2	2. 77	Fair	20	50	25.00		_	1.00	2.90
3	3 49	Fair	15	50	70*(50	c	ents) =	= \$35.0	0
4	4 45	Fair	88	t.	35.00		-	-	11.90
5	5 43	Fair	98	90	35.00		\$3.40	-	8.50
							-		

## The News كلية الحاسبات والذكاء الإصطناعي

Sim	ulatio	on Tabl	e (70	newspa	ipers, <sup>g</sup>	5 days)	)	Cost	of daily ne 70*0.33 =	ewspaper \$23.10
		Random Digits for Type of	Type of	Random Digits for		Revenue from	L fre	ost Profit om Excess	Salvage from Sale	Daily
	Day	Newsday	Newsday	Demand	Demand	Sales		Demand	of Scrap	Profit
	1	94	Poor	80	60	\$30.00		-	\$0.50	\$7.40
	2	77	Fair	20	50	25.00		_	1.00	2.90
	3	49	Fair	15	50	20*(1	.7 (	cents)	= \$3.40	2.90
	4	45	Fair	88	1	35.00		-	-	11.90
	5	43	Fair	98	90	35.00		\$3.40	-	8.50

Sin	nulatio	on Tab	le (70 ı	newspa	pers, 5	5 days)	Cost	of daily r 7 <mark>0*0.33</mark> :	newspap = \$23.10	ers D
	Droft	Random	) ( cos	t of		21/2111/2	Lost Profit	Salvane		
	Pront =	from sales	(news)	papers)		from	from Excess	from Sale	Daily	
		$-\begin{pmatrix}1\\\epsilon\end{pmatrix}$	ost profit from excess deman	$\binom{m}{d} + \binom{\text{salv}}{\text{of s}}$	age from sa scrap papers	$\left(s\right) \frac{s_{ales}}{s_{30.00}}$	Demand	of Scrap \$0.50	Profit \$7.40	
	2	77	R Pı	ofit (D	ay#5)	,		1.00	2.90	
	3	49 45	F2 ==	35.00 \$8.50	- 23.1	0 – 3.4	0 + 0	1.00	2.90 11.90	
	5	43	Fair	98	90	35.00	\$3.40		8.50	



Ρ

## The Newspaper Seller (8/8)

ofit	(1,	/5):						Cost = 7	of daily r 70*0.33	newspape = \$23.10
		Random Digits for		Random		Revenue	Le	ost Profit	Salvage	
		Type of	Type of	Digits for		from	fro	m Excess	from Sale	Daily
1	Day	Newsday	Newsday	Demand	Demand	Sales	Ι	Demand	of Scrap	Profit
	1	94	Poor	80	60	\$30.00		-	\$0.50	\$7.40

On day 1 the demand is for 60 newspapers. The revenue from the sale of 60 newspapers is \$30.00. Ten newspapers are left over at the end of the day. The salvage value at 5 cents each is 50 cents.



Cost of daily newspapers = 70\*0.33 = \$23.10

Profit = 
$$\binom{\text{revenue}}{\text{from sales}} - \binom{\text{cost of}}{\text{newspapers}}$$
  
-  $\binom{\text{lost profit from}}{\text{excess demand}} + \binom{\text{salvage from sale}}{\text{of scrap papers}}$ 

On day 1 the demand is for 60 newspapers. The revenue from the sale of 60 newspapers is \$30.00. Ten newspapers are left over at the end of the day. The salvage value at 5 cents each is 50 cents. The profit for the first day is determined as follows:

Profit (Day#1) = 30.00 - 23.10 - 0 + 0.50 = \$7.40

كلية الحاسبات والذكاء الإصطناعي

**Profit (2/5)**:



rc ا	ofit (3	/5):						Cost = 7	of daily r '0*0.33 :	newspap = \$23.1	er: 0
	Day	Random Digits for Type of Newsday	Type of Newsday	Random Digits for Demand	Demand	Revenue from Sales	L fra 1	ost Profit om Excess Demand	Salvage from Sale of Scrap	Daily Profit	
	5	43	Fair	98	90	35.00		\$3.40	-	8.50	1

On the fifth day the demand is greater than the supply. The revenue from sales is \$35.00, since only 70 papers are available under this policy. An additional 20 papers could have been sold. Thus, a lost profit of \$3.40 ( $20 \times 17$  cents) is assessed.



**Profit (4/5)**:

### The Newspaper Seller (8/8)

Cost of daily newspapers = 70\*0.33 = \$23.10

Profit = 
$$\binom{\text{revenue}}{\text{from sales}} - \binom{\text{cost of}}{\text{newspapers}}$$
  
-  $\binom{\text{lost profit from}}{\text{excess demand}} + \binom{\text{salvage from sale}}{\text{of scrap papers}}$ 

On the fifth day the demand is greater than the supply. The revenue from sales is \$35.00, since only 70 papers are available under this policy. An additional 20 papers could have been sold. Thus, a lost profit of \$3.40 ( $20 \times 17$  cents) is assessed.

Profit (Day#5) = 35.00 - 23.10 - 3.40 + 0 = \$8.50



Pro <sup>-</sup>	fit (5	/5):					Cost of 2 = 70*(	0 days n <mark>).33*20</mark>	ewspap = \$462	ers
	Day	Random Digits for Type of Newsday	Type of Newsday	Random Digits for Demand	Demand	Revenue from Sales	Lost Profit from Excess Demand	Salvage from Sale of Scrap	Daily Profit	
	20	78	Fair	96	80	35.00 \$645.00	1.70 \$13.60	\$5.50	10.20 \$174.90	

The profit for the 20-day period is the sum of the daily profits, \$174.90. It can also be computed from the totals for the 20 days of the simulation as follows:

Total profit = 
$$$645.00 - $462.00 - $13.60 + $5.50$$
  
= \$174.90



#### **YOUR TURN**

#### You can do the following, and not only:

- 1. Repeat the simulations many times and take the average of the total profits.
- 2. Change the number of purchased Newspapers, then repeat the simulation.
- 3. Draw a graph to show the relation between the number of purchased Newspapers and the total profits.

4. .



#### **Video Lectures**

All Lectures: <a href="https://www.youtube.com/playlist?list=PLxlvc-MG0s6geFJmdvD0IN5zE89-Hq8lj">https://www.youtube.com/playlist?list=PLxlvc-MG0s6geFJmdvD0IN5zE89-Hq8lj</a>

Lecture #6: <a href="https://www.youtube.com/watch?v=6UYLkzvBnCQ&list=PLxlvc-MGOs6geFJmdvD0IN5zE89-Hq8lj&index=18">https://www.youtube.com/watch?v=6UYLkzvBnCQ&list=PLxlvc-MGOs6geFJmdvD0IN5zE89-Hq8lj&index=18</a>

# Thank You

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