ACC575: Data Analytics for Accounting

LN6: Excel Application - Part I

Jaeyoon Yu, Ph.D.
Central Michigan University

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Learning Objectives

Understand the following concepts using examples:

- Maps in Excel.
- Dashboard in Excel.
- Separation of Duties (Lab7-1).
- Regression Analysis (Lab7-9).
- Fraud detection (Lab7-8).
- Sequence check (Lab7-6).
- Duplicate payments (Lab7-7).
- Fraud detection (Lab7-8).
- vlookup() (Lab7-2).
- match() (Lab7-3).
- pivotby() (Lab7-1).
- groupby() (Lab7-2).
- Conditional Formatting (Lab5-2; Lab7-6,7,8,9)

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Background: Maps

Geographic information can be summarized in a map. Examples:

- Sales by region; county, state, country, etc.
- Population by region; county, state, country, etc.
- Average of county population by state.

Example: Michigan Population by County

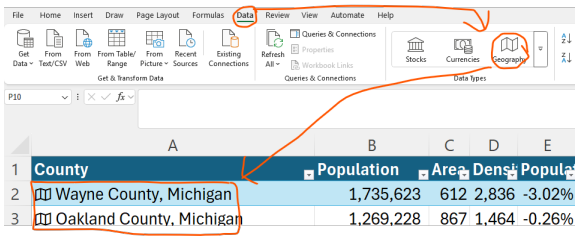
How?

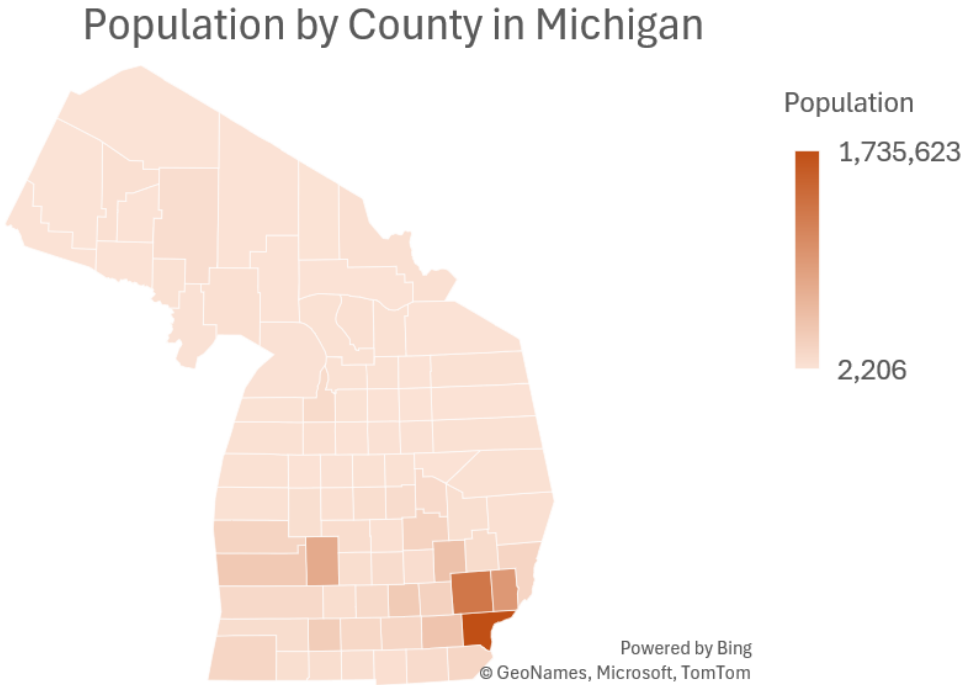
How to Create a Map in Excel

1. Open Michigan-County-Population.xlsx (Data is slightly different from the figure below).
2. Select your data. Go to Data tab. Click **Geography**.
3. Select County and Population columns. Go to Insert tab. Click **Maps**.

Data Preview

	A	B	C	D	E
1	County	Population	Area	Density	Populat
2	Wayne (	1735623.00	612	2,836	-3.02%
3	Oaklanc	1269228.00	867	1,464	-0.26%
4	Macom	876,833	479	1,831	-0.39%





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Background: Dashboard

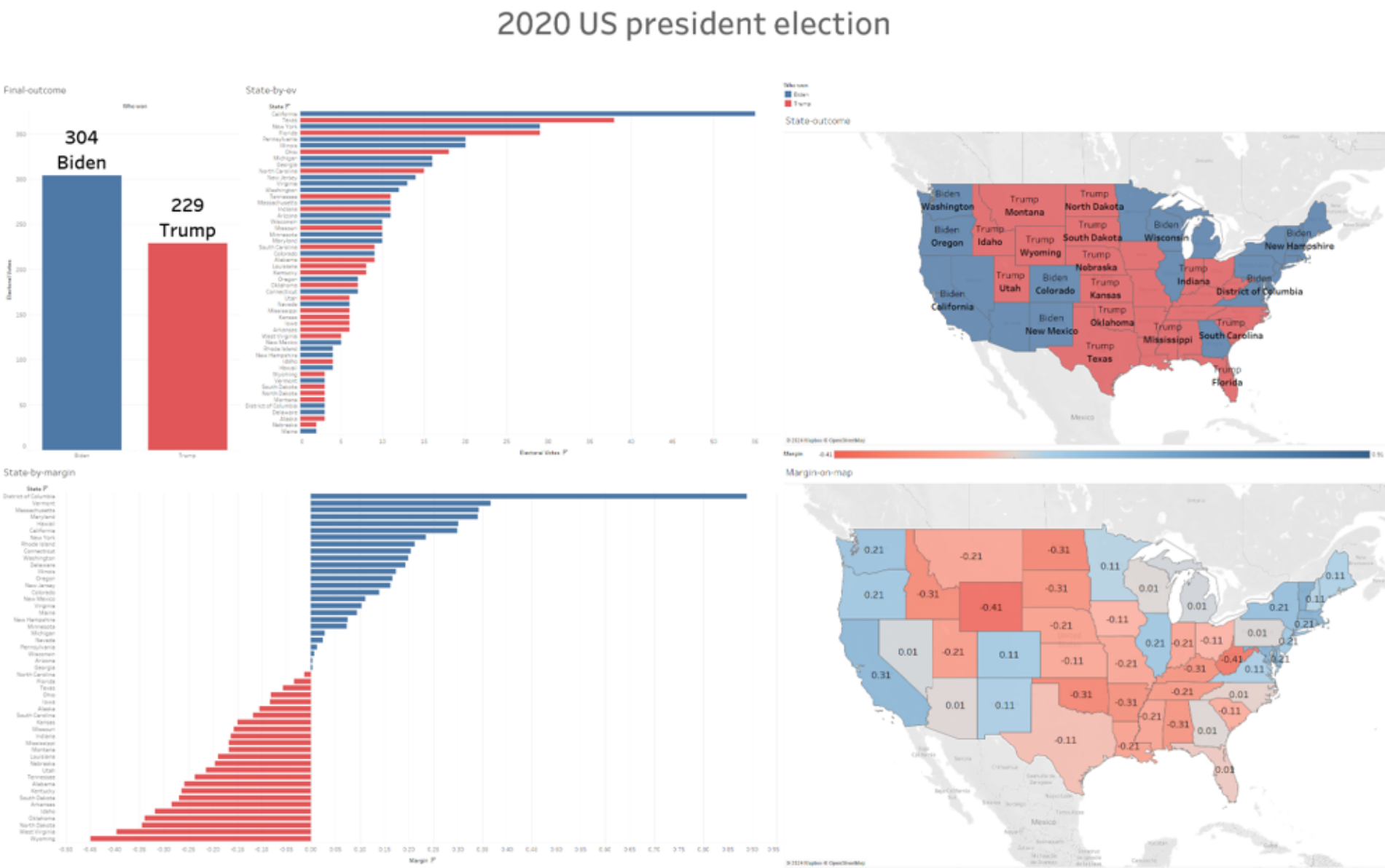
Dashboard

- A dashboard is a **visual representation** of data that is used to track and analyze performance.
- A dashboard is a **collection** of charts, tables, and other visualizations that are used to track and analyze performance.

A dashboard should:

- **Easy to understand and use**.
- **Dynamic** dashboard should be able to update automatically based on the data.
- **Include information that is relevant to the user**.

Dashboard Example 1



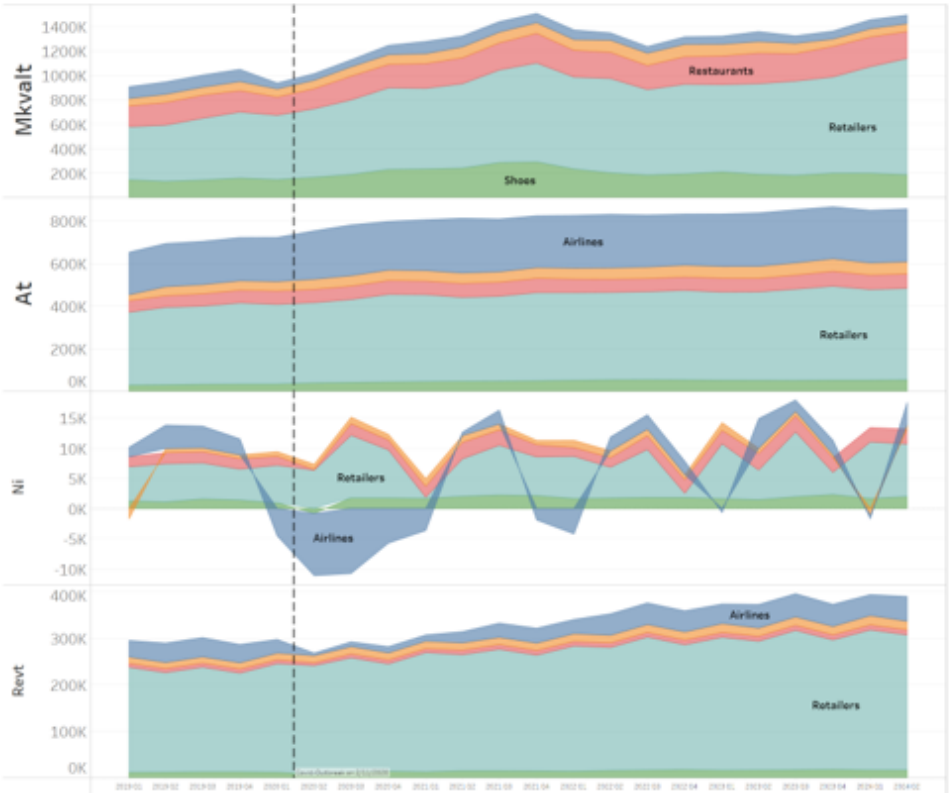
Dashboard Example 2

Market information

2024Q2 | market numbers

19	5	17,551	389,267	855,658	1,493,636
N_firms	N_sectors	Net Income	Revenues	Total assets	Market Value

Market Overview using all firms



Quarterly Net Income

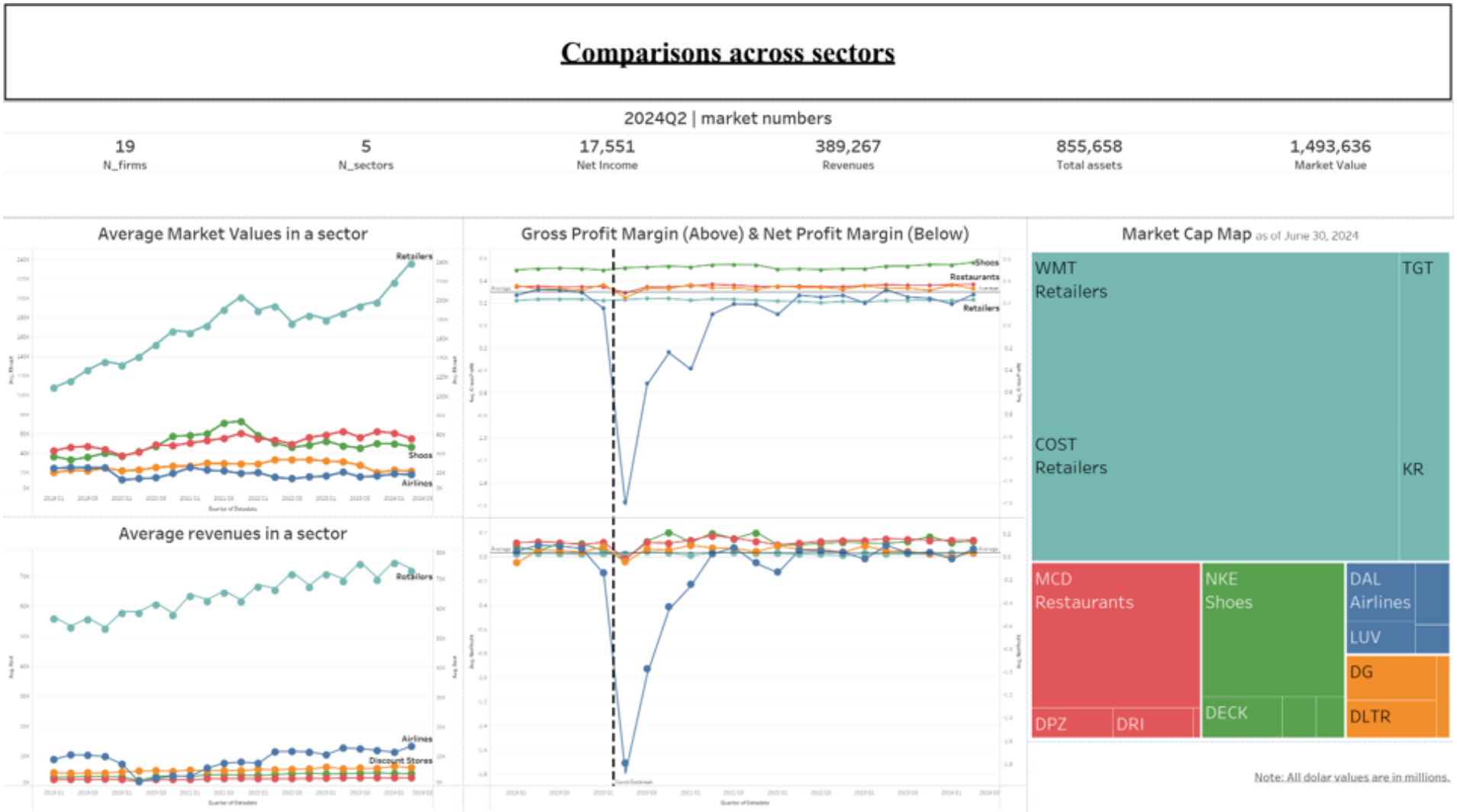
Sector	Tic	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3	2023 Q4	2024 Q1	2024 Q2
Airlines	UAL	292	1,052	1,024	641	-1,704	-1,627	-1,040	-1,098	-1,357	-434	473	-646	-1,377	329	942	843	-194	1,075	1,137	600	-124	1,323
	DAL	730	1,443	1,496	1,066	-534	-6,787	-3,378	-755	-1,177	652	1,213	-408	-940	735	694	829	-363	1,827	1,108	2,037	37	1,305
	AAL	185	662	425	414	-2,241	-2,067	-2,399	-2,178	-1,256	19	170	-932	-1,635	476	483	803	10	1,338	-545	19	-312	717
	LUV	387	741	659	513	-94	-915	-1,157	-908	116	347	446	68	-278	760	277	-220	-198	683	193	-252	-231	368
Discount Stores	DG	483	385	427	366	535	650	788	574	643	678	637	487	587	553	678	526	659	514	469	276	402	363
	DLTR	-2,307	268	180	256	123	246	262	330	503	375	282	217	454	536	360	267	452	299	200	212	-1,710	300
	FIVE	89	26	29	10	113	-51	30	20	124	90	65	24	140	33	41	16	171	37	47	15	202	31
Restaur...	MCD	1,328	1,517	1,608	1,572	1,167	494	1,763	1,377	1,537	2,219	2,150	1,639	1,104	1,188	1,962	1,903	1,902	2,310	2,317	2,039	1,929	2,022
	DRI	224	208	171	25	232	-480	36	96	129	369	231	193	247	282	193	187	287	315	195	212	313	308
	DPZ	93	92	86	329	122	119	99	352	118	117	120	156	91	102	101	158	105	109	148	157	126	142
	PZZA	-2	8	0	-2	8	21	16	13	34	32	29	25	10	25	8	24	22	18	16	26	15	12
Retailers	WMT	3,687	3,842	3,610	3,288	4,142	3,990	4,476	5,135	-2,091	2,730	4,276	3,105	3,582	2,054	5,140	-1,796	6,271	1,673	7,891	403	5,404	5,104
	COST	889	906	1,097	844	931	838	1,389	1,166	951	1,220	1,670	1,324	1,299	1,353	1,868	1,364	1,466	1,302	2,160	1,589	1,743	1,681
	KR	259	772	297	263	327	1,212	819	631	-77	140	467	483	565	664	730	399	451	962	-180	646	736	947
	TGT	758	755	938	714	834	284	1,690	1,014	1,580	2,097	1,817	1,488	1,544	1,009	183	712	876	950	835	971	1,382	942
Shoes	NKE	1,101	999	1,367	1,115	847	-790	1,518	1,251	1,449	1,509	1,874	1,337	1,396	1,439	1,468	1,331	1,240	1,031	1,450	1,578	1,172	1,500
	CROX	25	39	36	20	11	57	62	183	98	319	153	155	73	160	169	138	150	212	177	254	152	229
	SKX	109	75	183	60	49	-68	64	53	99	137	103	402	121	90	86	76	160	153	145	87	207	140
	DECK	24	-19	78	202	16	-8	102	256	33	48	102	233	69	45	102	279	92	64	179	390	128	116
Grand Total		8,394	13,801	13,631	11,527	-4,821	-3,821	-4,337	6,513	1,261	12,623	16,279	9,350	7,043	11,834	15,513	7,837	13,502	14,873	17,941	11,309	13,660	17,551

Quarterly Revenues

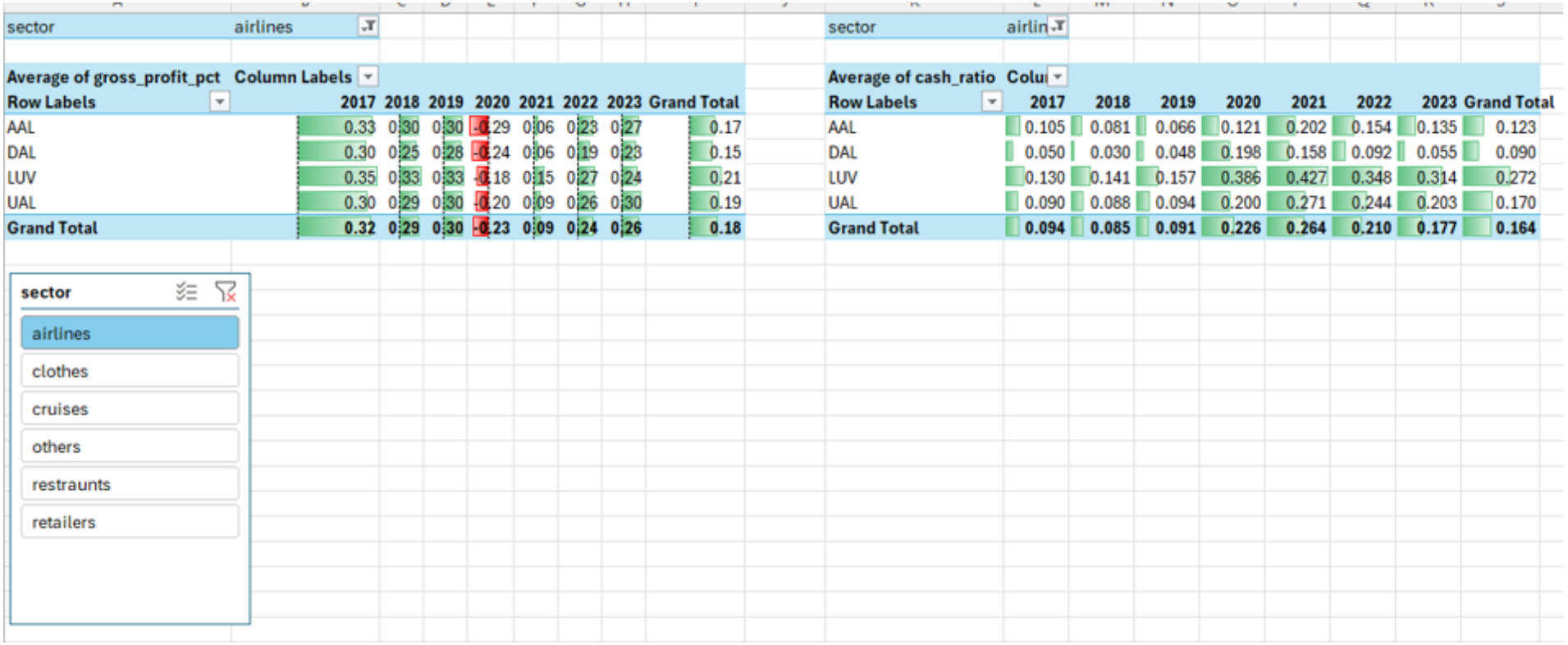
Sector	Tic	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3	2023 Q4	2024 Q1	2024 Q2
Airlines	DAL	10,472	12,536	12,560	11,439	8,582	1,468	3,062	3,973	4,150	7,126	9,153	9,479	9,348	13,825	13,974	13,435	12,759	15,578	15,488	14,223	13,748	16,658
	UAL	9,589	11,402	11,380	10,888	7,679	1,475	2,489	3,412	3,221	5,471	7,750	8,192	7,566	12,112	12,877	12,400	11,429	14,178	14,484	13,626	12,539	14,986
	AAL	10,584	11,960	11,911	11,313	8,515	1,622	3,172	4,029	4,008	7,478	8,969	9,427	8,899	13,422	13,462	13,188	12,189	14,055	13,482	13,062	12,570	14,334
	LUV	5,140	5,910	5,639	5,730	4,234	1,008	1,793	2,013	2,052	4,008	4,679	5,051	4,604	6,728	6,220	6,582	5,706	7,037	6,525	6,823	6,329	7,354
Discount Stores	DG	6,650	6,623	6,962	6,901	7,158	8,448	8,684	8,200	8,415	8,401	8,650	8,518	8,651	8,751	9,426	9,465	10,203	9,343	9,796	9,694	9,859	9,914
	DLTR	6,205	5,809	5,741	5,746	6,315	6,287	6,278	6,177	6,768	6,480	6,343	6,418	7,081	6,903	6,769	6,940	7,721	7,324	7,325	7,315	8,640	7,633
	FIVE	603	365	417	377	687	201	426	477	959	598	647	608	996	640	669	645	1,123	726	759	736	1,338	812
Restaur...	MCD	5,924	5,410	5,502	5,428	4,714	3,762	5,418	5,314	5,125	5,888	6,201	6,009	5,866	5,718	5,872	5,927	5,898	6,498	6,692	6,406	6,169	6,490
	DRI	2,247	2,229	2,134	2,056	2,347	1,270	1,527	1,657	1,733	2,279	2,306	2,272	2,449	2,603	2,446	2,487	2,766	2,769	2,731	2,727	2,975	2,957
	DPZ	836	832	821	1,150	873	920	968	1,357	984	1,032	998	1,343	1,011	1,065	1,060	1,392	1,024	1,025	1,027	1,403	1,085	1,098
	PZZA	399	400	404	418	410	461	473	470	512	515	513	529	543	523	511	526	527	515	523	571	514	508
Retailers	WMT	136,793	123,925	130,377	127,991	141,671	134,622	137,742	134,708	152,079	138,310	141,048	140,525	152,871	141,569	152,859	152,813	164,048	152,301	161,632	160,804	173,386	161,508
	COST	35,396	34,740	47,498	37,040	39,072	37,266	53,383	43,208	44,769	45,277	62,675	50,363	51,904	52,596	72,091	54,437	55,266	53,648	78,939	57,799	58,442	58,515
	KR	28,206	37,251	26,168	27,974	28,093	41,549	30,489	29,723	30,737	41,298	31,682	31,950	33,048	44,600	34,638	34,198	34,822	45,165	33,853	33,957	37,064	45,269
	TGT	22,977	17,627	18,422	19,664	23,399	19,615	22,975	22,632	28,339	24,197	25,160	25,652	30,996	25,170	26,037	26,518	31,395	25,322	24,773	25,398	31,919	24,531
Shoes	NKE	9,611	10,184	10,660	10,326	10,104	6,313	10,594	11,243	10,357	12,344	12,248	11,357	10,671	12,234	12,667	13,315	12,390	12,825	12,939	13,388	12,429	12,606
	SKX	1,282	1,265	1,360	1,335	1,248	732	1,304	1,330	1,434	1,662	1,558	1,655	1,820	1,868	1,878	1,879	2,002	2,013	2,025	1,961	2,252	2,158
	CROX	296	359	313	263	281	332	362	412	460	641	626	587	660	965	985	945	884	1,072	1,046	960	939	1,112
	DECK	394	277	342	939	375	283	624	1,078	561	505	722	1,188	736	614	876	1,346	792	676	1,092	1,560	960	825
Grand Total		294,792	289,082	300,831	286,070	296,867	267,633	291,762	281,409	306,562	313,509	331,926	321,023	339,809	351,906	375,345	358,437	372,963	372,068	395,131	372,414	393,156	389,267

Note: All dolar values are in millions.

Dashboard Example 3



Dashboard Example 4



sector	airlines

Average of gross_profit_pct	Column Labels							
Row Labels	2017	2018	2019	2020	2021	2022	2023	Grand Total
AAL	0.33	0.30	0.30	-0.29	0.06	0.23	0.27	0.17
DAL	0.30	0.25	0.28	-0.24	0.06	0.19	0.23	0.15
LUV	0.35	0.33	0.33	-0.18	0.15	0.27	0.24	0.21
UAL	0.30	0.29	0.30	-0.20	0.09	0.26	0.30	0.19
Grand Total	**0.32**	**0.29**	**0.30**	**-0.23**	**0.09**	**0.24**	**0.26**	**0.18**

sector	airlin

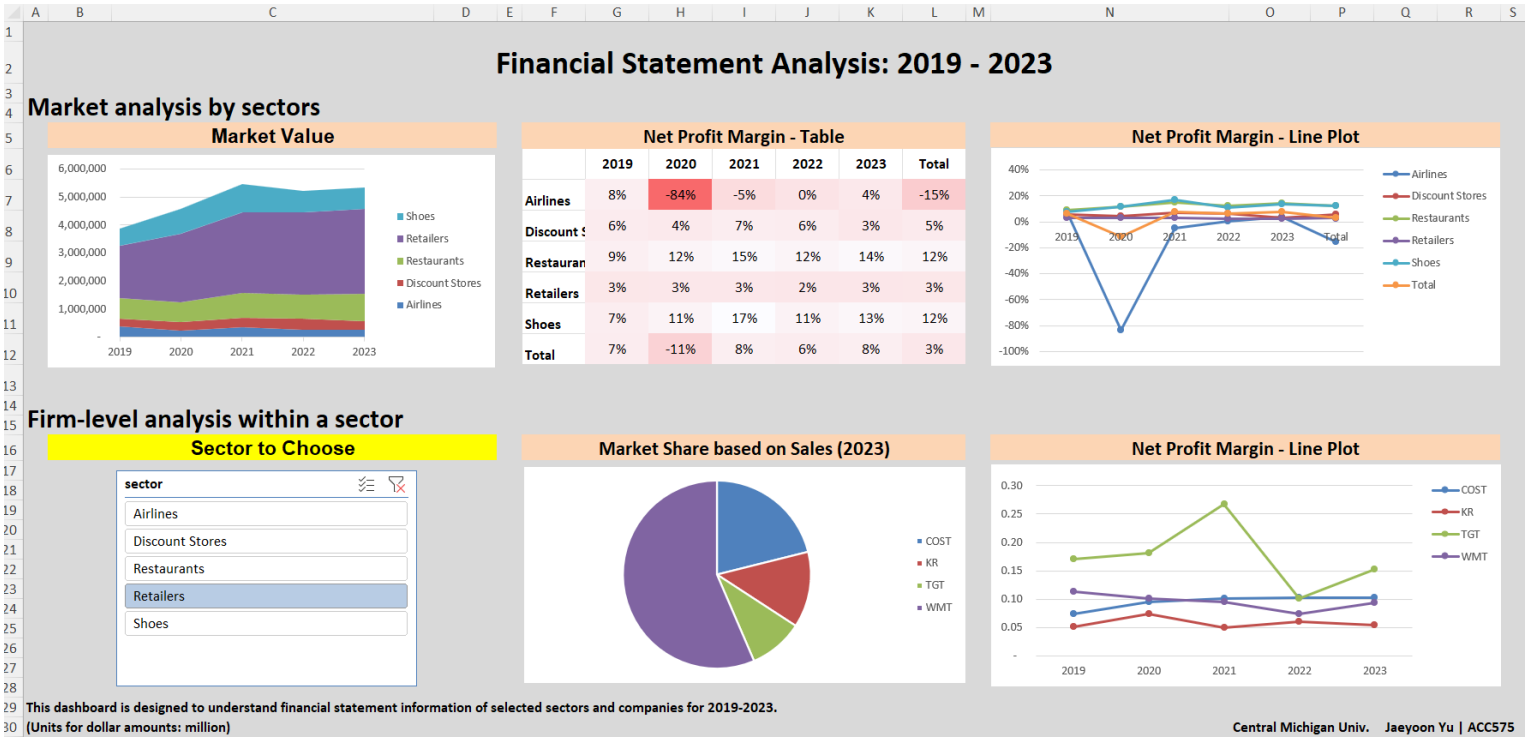
Average of cash_ratio	Colu							
Row Labels	2017	2018	2019	2020	2021	2022	2023	Grand Total
AAL	0.105	0.081	0.066	0.121	0.202	0.154	0.135	0.123
DAL	0.050	0.030	0.048	0.198	0.158	0.092	0.055	0.090
LUV	0.130	0.141	0.157	0.386	0.427	0.348	0.314	0.272
UAL	0.090	0.088	0.094	0.200	0.271	0.244	0.203	0.170
Grand Total	**0.094**	**0.085**	**0.091**	**0.226**	**0.264**	**0.210**	**0.177**	**0.164**

sector

- airlines
- clothes
- cruises
- others
- restraunts
- retailers

Assignment: Submit your dashboard to BlackBoard

Let's make this dashboard using `FS-Quarterly-Practice.xlsx`.



The follwing skills might be useful:

- PivotTable and PivotChart.
- Slicer - connected to the second row of the dashboard.
- Filter for "Market Share based on Sales (2023)"

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Background: Separation of Duties

Separation of Duties

- The principle that no single individual should have control over the entire process.

Examples:

- Separate those who handle cash from those who keep the records or write the journal entries.
- Separate those who authorize payments from those who handle cash.
- Separate those who bill customers for goods delivered or services performed from those who handle cash.
- Separate those who reconcile cash from those who make bank deposits and control the general ledger.

Why?

- To prevent fraud and errors.
- To ensure that the records are accurate and complete.
- To ensure that the records are consistent and reliable.
- To ensure that the records are secure and confidential.

Test of Separation of Duties [Lab7-1]

Lab7-1: Journal entries with who entered and approved

Purpose: Who entered and approved the same journal entries?
(i.e., **violation of separation of duties**)

1. Use PivotTable to summarize the data by who entered and approved the journal entries.
2. Make the table more readable. Highlight the cells that are not following the separation of duties.
3. Repeat the same thing using pivotby().

Data Preview

	A	B	C	D	E	F	G
1	Date	JE#	Account Name	Debit	Credit	Entered	Approved
2	1/3/2025	1	Cash	50,000		VR	AC
3	1/3/2025	1	Common Stock		50,000	VR	AC
4	1/3/2025	2	Travel Expense	250		VR	AC
5	1/3/2025	2	Cash		250	VR	AC

1. Use PivotTable to summarize the data by who entered and approved the journal entries.

How?

1. Insert > PivotTable.
2. Move `Who Entered` to Row Labels.
3. Move `Who Approved` to Column Labels.
4. Move `Debit` to Values.
5. Make sure `Count` is selected for the Values field.

Count of Debit	Column Labels			
Row Labels	AC	DH	VR	Grand Total
MW	13	10		23
VR	20	9	1	30
Grand Total	**33**	**19**	**1**	**53**

2. Make the table more readable. Highlight the cells that are not following the separation of duties.

How?

1. Edit Row Labels, Column Labels, background colors properly.
2. Highlight the cells that are not following the separation of duties.

	Approved			
Entered	**AC**	**DH**	**VR**	**Grand Total**
MW	13	10		23
VR	20	9	1	30
Grand Total	**33**	**19**	**1**	**53**

3. Repeat the same thing using pivotby().

How?

1. Use pivotby() to summarize the data by who entered and approved the journal entries.
2. pivotby(arg1, arg2, arg3, arg4):
    1. arg1 - row range
    2. arg2 - column range
    3. arg3 - value range
    4. arg4 - aggregation function (e.g., count, sum)

=PIVOTBY(F1:F106,G1:G106,D1:D106,COUNT)				
	AC	DH	VR	Total
MW	13	10		23
VR	20	9	1	30
Total	33	19	1	53

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Days of the Week Transactions [Lab7-2]

Lab7-2: Days of the Week Transactions

Purpose: Are the transactions recorded on the correct days of the week?

1. Convert the data to Table. Use weekday() to get day of week (number).
2. Make a dictionary for day of week conversion.
3. Use vlookup() to get day of week (text).
4. Use pivottable to check if the transactions are recorded on the correct day of the week.
5. Use groupby() to generate the same pivot table.

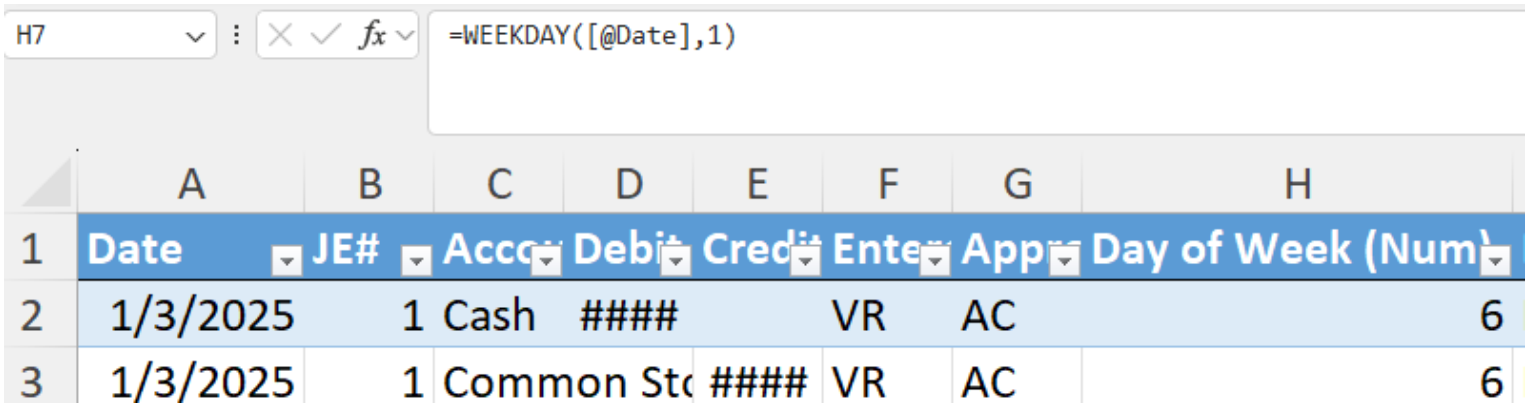
Data Preview

	A	B	C	D	E	F	G
1	Date	JE#	Account Name	Debit	Credit	Entered	Approved
2	1/3/2025	1	Cash	50,000		VR	AC
3	1/3/2025	1	Common Stock		50,000	VR	AC
4	1/3/2025	2	Travel Expense	250		VR	AC
5	1/3/2025	2	Cash		250	VR	AC

1. Convert the data to Table. Use weekday() to get day of week (number).

How?

1. Convert the data to Table.
2. Use weekday() to get day of week (number).



2. Make a dictionary for day of week conversion.

How?

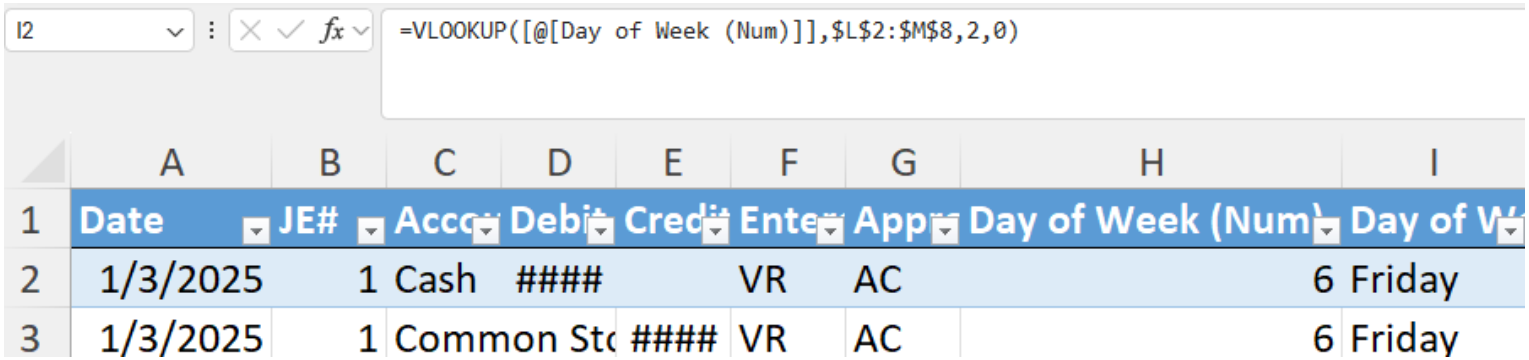
1. Make the below dictionary table manually.

L	M
Day of Week (num)	Day of Week (text)
1	Sunday
2	Monday
3	Tuesday
4	Wednesday
5	Thursday
6	Friday
7	Saturday

3. Use vlookup() to get day of week (text).

How?

1. Use vlookup() to get day of week (text).



4. Use PivotTable to check if the transactions are recorded on the correct day of the week.

How?

1. Make a pivot table by Day of Week.
2. Move Day of Week to Row Labels.
3. Move Debit to Values.
4. Make sure Count is selected for the Values field.
5. Clean up the table.

Row Labels	Count of Debit
Sunday	7
Monday	3
Tuesday	6
Wednesday	10
Thursday	11
Friday	4
Saturday	12
Grand Total	**53**

5. Use groupby() to generate the same pivot table.

How?

1. Use groupby() to generate the same pivot table.
2. groupby(arg1, arg2, arg3):
    1. arg1 - Row Fields
    2. arg2 - Value Fields
    3. arg3 - Summary Function

=GROUPBY(Table1[[#All],[Day of Week (text)]],Table1[[#All],[Debit]],COUNT)	
Friday	4
Monday	3
Saturday	12
Sunday	7
Thursday	11
Tuesday	6
Wednesday	10
Total	53

Note: Further cleaning up the table is needed.

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Background: Bank Reconciliation

Bank Reconcilation

- The process of comparing the company's records with the bank's records to ensure that they are in agreement.

- Bank Reconciliation is a key control to prevent fraud and errors.

Bank Reconciliation [Lab5-2]

Lab5-2: Bank Reconciliation

Purpose: Use Conditional Formatting to identify suspicious numbers.

1. Select all numbers in columns B and E.
2. Click Conditional Formatting under Home tab. Then New Rule.
3. Set it up to highlight the cells that are not reconciled.

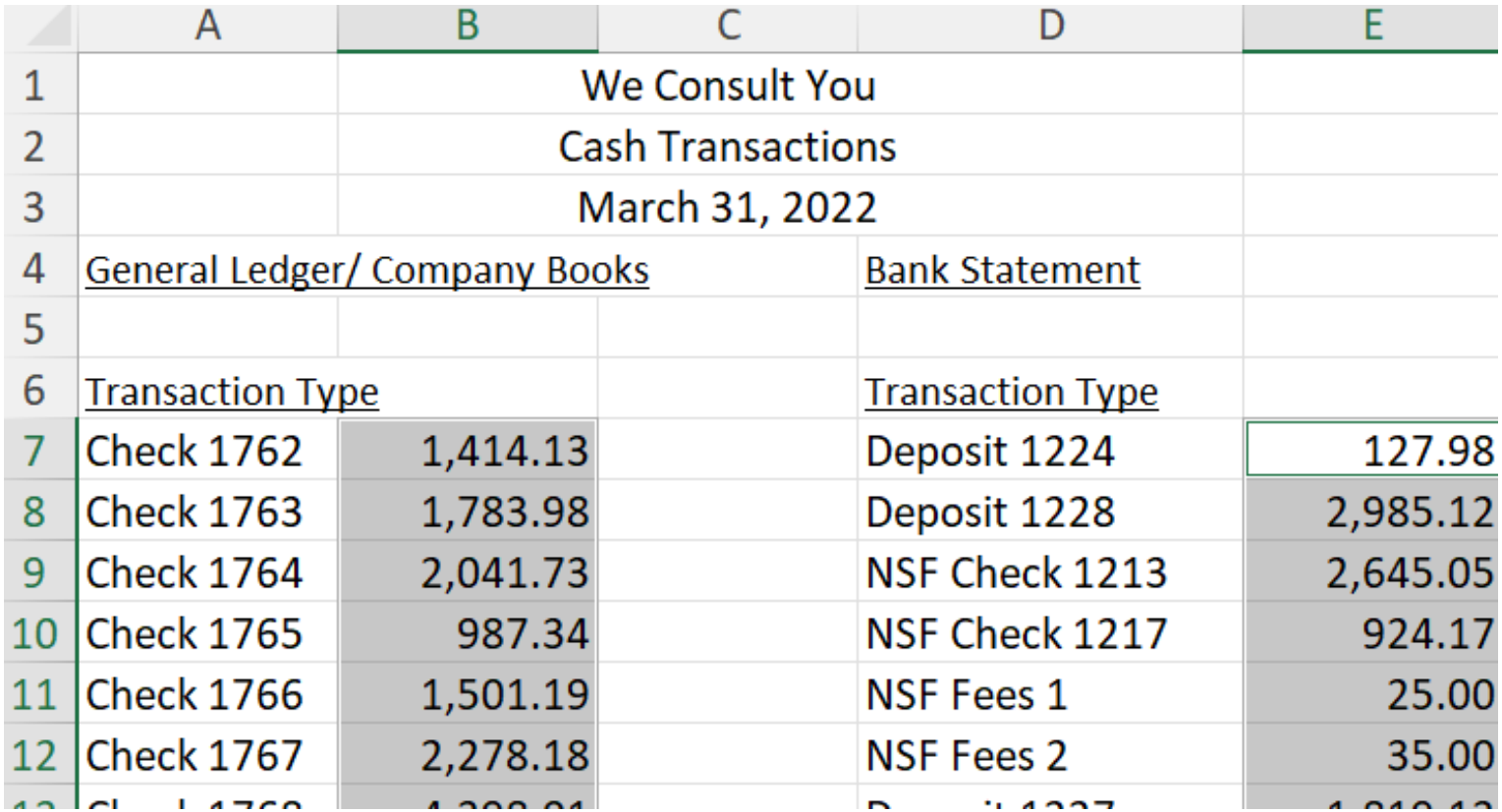
Data Preview

	A	B	C	D	E
1		We Consult You			
2		Cash Transactions			
3		March 31, 2022			
4	General Ledger/ Company Books			Bank Statement	
5					
6	Transaction Type			Transaction Type	
7	Check 1762	1,414.13		Deposit 1224	127.98
8	Check 1763	1,783.98		Deposit 1228	2,985.12
9	Check 1764	2,041.73		NSF Check 1213	2,645.05
10	Check 1765	987.34		NSF Check 1217	924.17
11	Check 1766	1,501.19		NSF Fees 1	25.00
12	Check 1767	2,278.18		NSF Fees 2	35.00
13	Check 1768	4,398.01		Deposit 1227	1,819.13
14	Check 1769	1,349.56		Deposit 1225	289.75
15	Check 1770	2,430.61		Deposit 1226	699.46
16	Check 1771	1,513.19		Deposit 1223	2,073.14

1. Select all numbers in columns B and E.

How?

1. Select all numbers in columns B and E.

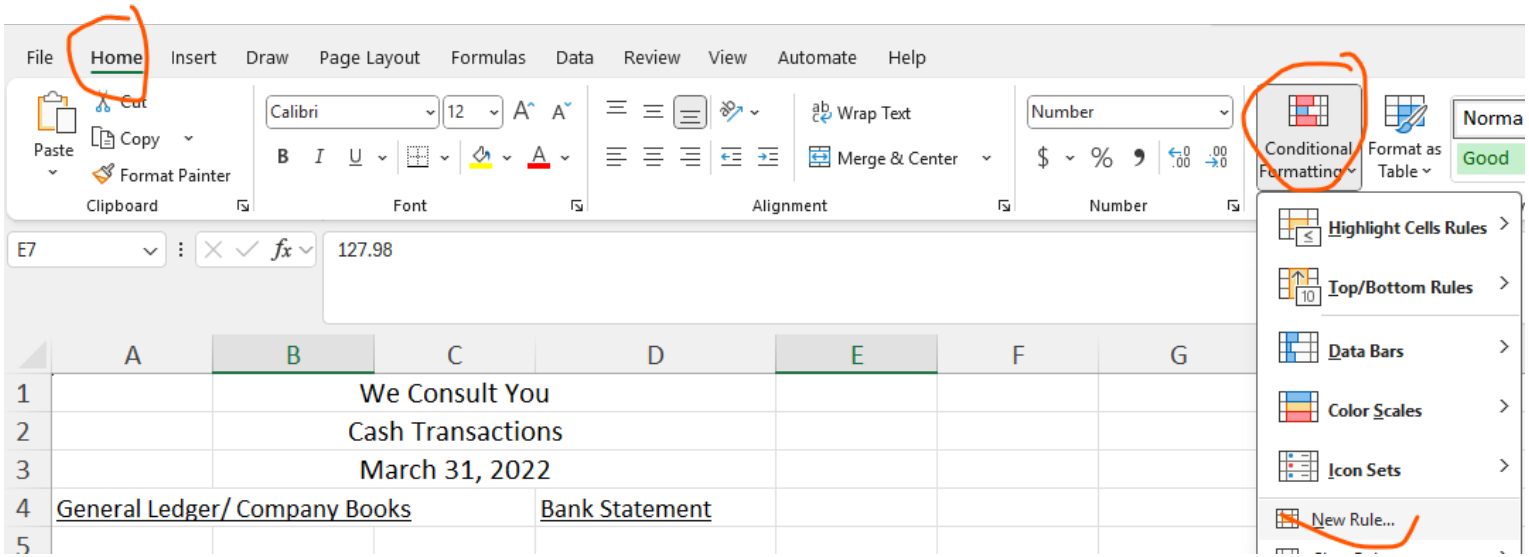


	A	B	C	D	E
1		We Consult You			
2		Cash Transactions			
3		March 31, 2022			
4	General Ledger/ Company Books			Bank Statement	
5					
6	Transaction Type			Transaction Type	
7	Check 1762	1,414.13		Deposit 1224	127.98
8	Check 1763	1,783.98		Deposit 1228	2,985.12
9	Check 1764	2,041.73		NSF Check 1213	2,645.05
10	Check 1765	987.34		NSF Check 1217	924.17
11	Check 1766	1,501.19		NSF Fees 1	25.00
12	Check 1767	2,278.18		NSF Fees 2	35.00

2. Click Conditional Formatting under Home tab. Then New Rule.

How?

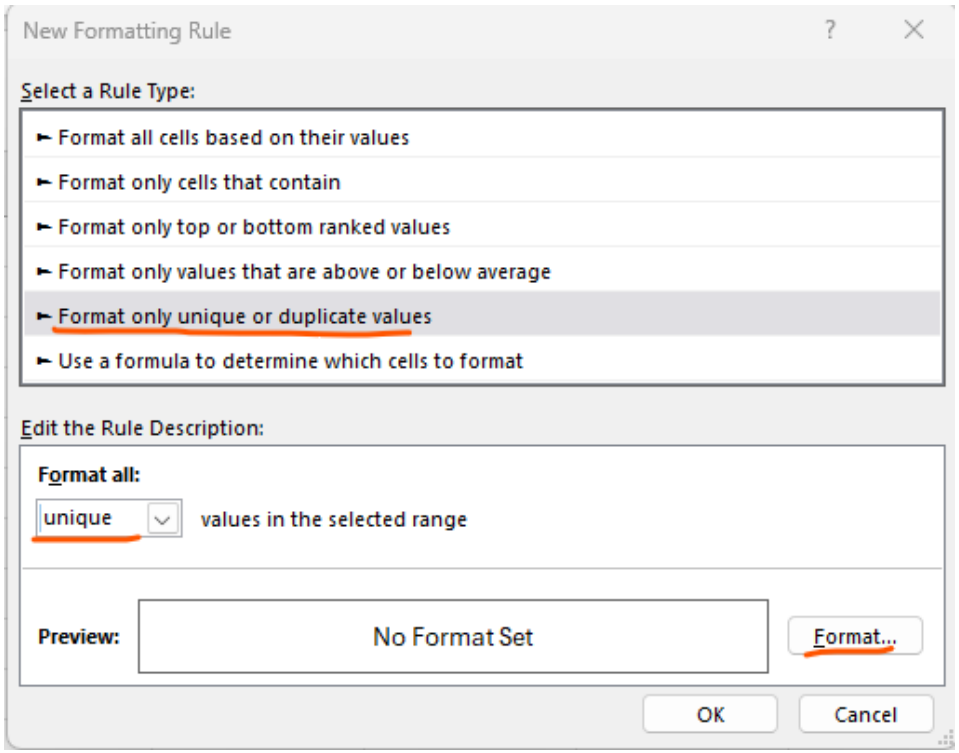
1. Click Conditional Formatting under Home tab. Then New Rule.

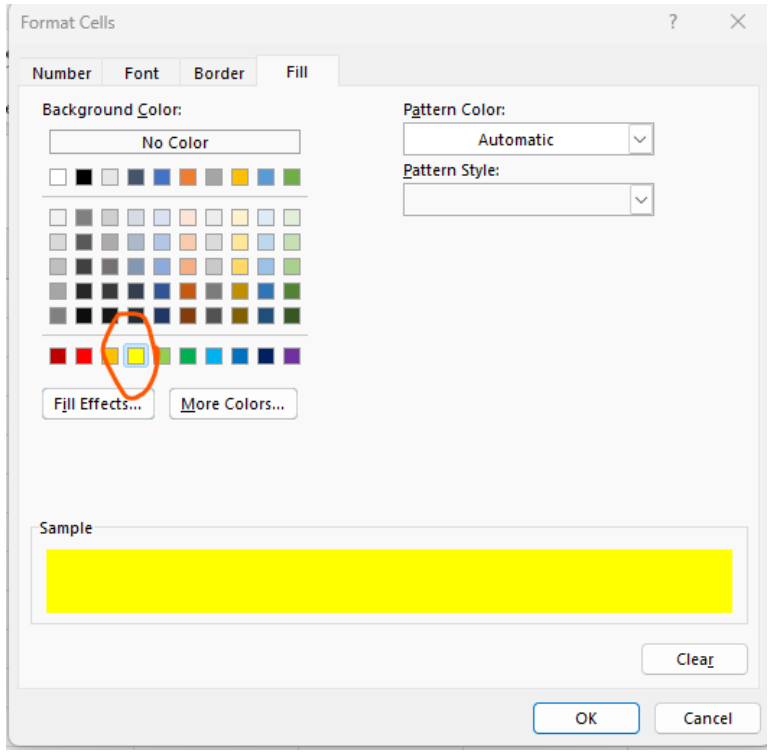


3. Set it up to highlight the cells that are not reconciled.

How?

1. "Select a rule type": Choose "Format only unique or duplicate values".
2. "Edit the Rule Description": Choose "Unique".
3. Click "Format" at the bottom right.
4. Choose "Yellow" for "Background Color".
5. Go to "Fill" tab and choose "Yellow" for "Background Color".





* Interpretation: We need to look into these cases.
  - The cells highlighted only in column B (company's book): not required by banks
  - The cells highlighted only in column E (bank's side): not required by companies

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Bank Reconciliation [Lab7-3]

Lab7-3: Bank Reconciliation

Purpose: Use match() to find the matching records.

1. Use match() to find the matching records.

Data Preview

	A	B	C	D	E
1		We Consult You			
2		Cash Transactions			
3		March 31, 2022			
4	General Ledger/ Company Books			Bank Statement	
5					
6	Transaction Type			Transaction Type	
7	Check 1762	1,414.13		Deposit 1224	127.98
8	Check 1763	1,783.98		Deposit 1228	2,985.12
9	Check 1764	2,041.73		NSF Check 1213	2,645.05
10	Check 1765	987.34		NSF Check 1217	924.17
11	Check 1766	1,501.19		NSF Fees 1	25.00
12	Check 1767	2,278.18		NSF Fees 2	35.00
13	Check 1768	4,398.01		Deposit 1227	1,819.13
14	Check 1769	1,349.56		Deposit 1225	289.75
15	Check 1770	2,430.61		Deposit 1226	699.46
16	Check 1771	1,513.19		Deposit 1223	2,073.14
17	Check 1772	2,985.09		Deposit 1229	993.09

1. Find the matching records using match() for company's book.

How?

1. Add index number in column A.
2. Values in the company's book - name as "company";
3. Values in the bank's side - name as "bank".
4. Use match() to find the matching records for company's book.
5. Use match() to find the matching records for bank's side.

MATCH(arg1, arg2, arg3): to find the index number of the matching record.

1. arg1 - The value to match.
2. arg2 - The range to search.
3. arg3 - The type of match (0: exact match...).

7				=MATCH(C9,bank,0)			=MATCH(F9,company,0)
8	Index	Transaction Type			Transaction Type		
9	1	Check 1762	1,852.37	14	Check 1767	2,417.82	6
10	2	Check 1763	1,658.22	#N/A	Check 1768	1,926.75	7
11	3	Check 1764	2,930.78	15	Deposit 1224	2,436.76	15
12	4	Check 1765	1,371.63	16	Deposit 1228	1,851.13	19
13	5	Check 1766	2,778.50	17	NSF Check 1155	2,645.05	#N/A
14	6	Check 1767	2,417.82	1	NSF Check 1186	924.17	#N/A
15	7	Check 1768	1,926.75	2	NSF Check 1187	1,418.95	#N/A
16	8	Check 1769	1,664.18	18	NSF Fees 1	25.00	#N/A
17	9	Check 1770	1,479.91	19	NSF Fees 2	35.00	#N/A
18	10	Check 1771	2,255.74	#N/A	Deposit 1227	2,242.57	18
19	11	Check 1772	2,329.55	#N/A	Deposit 1225	2,025.09	20
20	12	Check 1773	2,669.14	#N/A	Deposit 1226	2,173.54	17
21	13	Check 1774	2,106.89	#N/A	Deposit 1223	2,632.24	14
22	14	Deposit 1223	2,632.24	13	Check 1762	1,852.37	1

*Interpretation: Bank reconciliations are a basic internal control used by the company to ensure that the company's book and the bank's side are reconciled. The company and its auditors need to look into those that are not matched.

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Sequence Check [Lab7-6]

Lab7-6: Sequence Check

Purpose: Check if the transactions are recorded in the correct sequence.

1. Use Conditional Formatting to highlight the cells that are not in the correct sequence.
2. Choose yellow for background color.

Data Preview

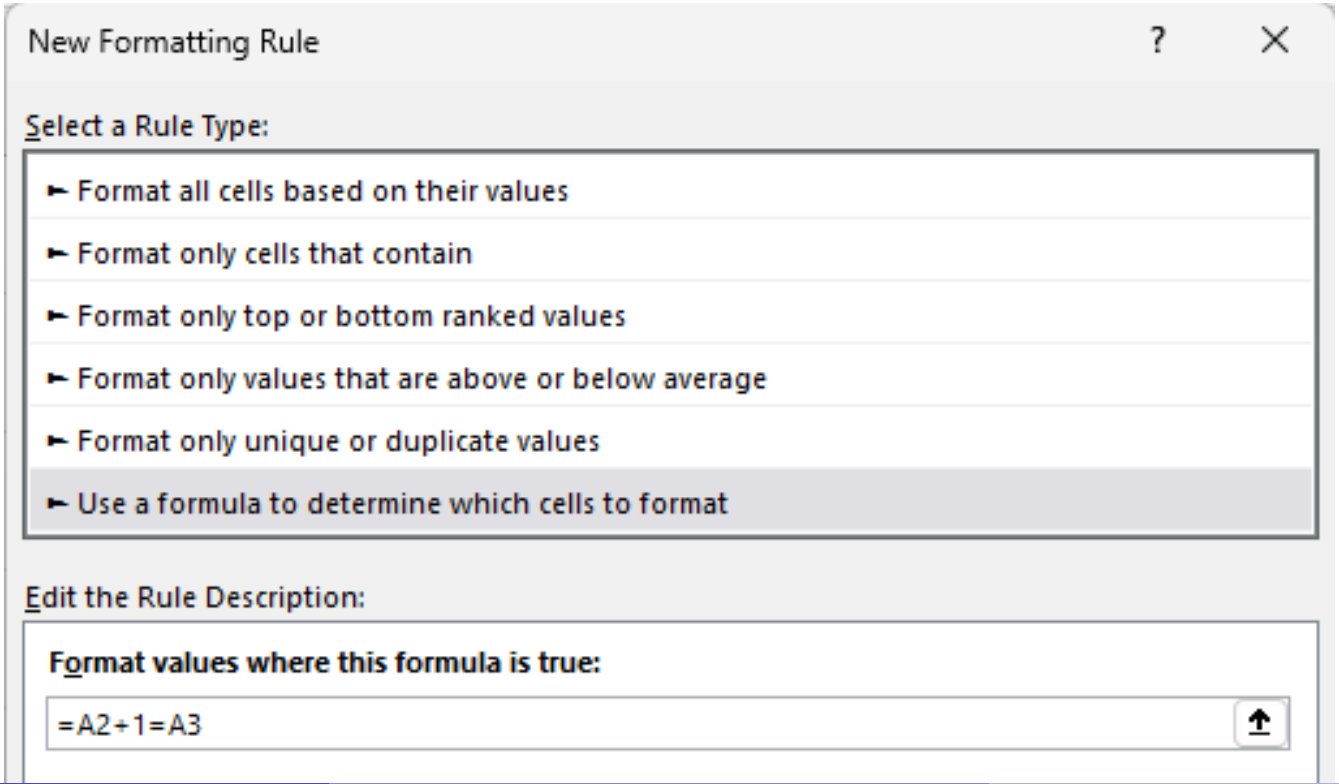
	Check Numbers
2	1000
3	1001
4	1002
5	1004
6	1005
7	1007
8	1008
9	1009
10	1010
11	1011
12	1013

1. Use Conditional Formatting to highlight the cells that are not in the correct sequence.

How?

1. Select all the values in column A (from A2:).
2. Click Conditional Formatting under Home tab. Then New Rule.
3. Choose "Use a formula to determine which cells to format".
4. Enter the formula: **=A2+1 = A3** in the formula box.[a]

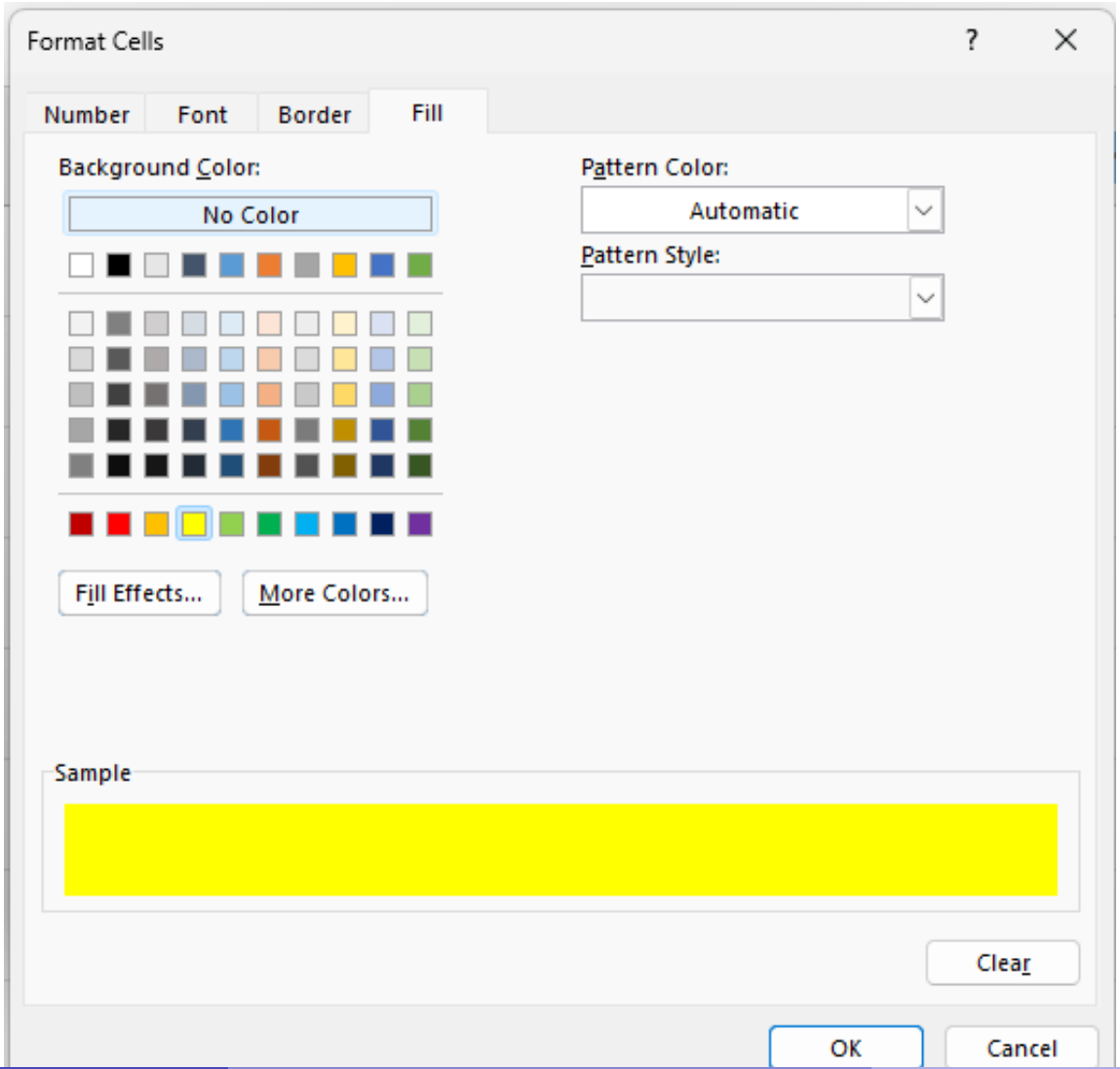
[a] The formula looks as if it applies to the first cell, but the same logic actually applies to the rest of the cells.



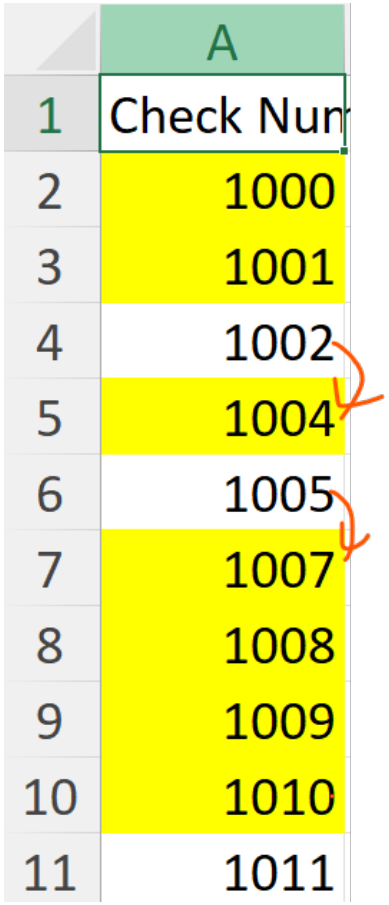
2. Choose yellow for background color.

How?

1. Choose yellow for background color.



*Interpretation: The cells highlighted follow the sequence. Those not highlighted indciate there's a gap in the sequence.



	A
1	Check Nur
2	1000
3	1001
4	1002
5	1004
6	1005
7	1007
8	1008
9	1009
10	1010
11	1011

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Duplicate Payments [Lab7-7]

Lab7-7: Duplicate Payments

Purpose: Check if there are duplicate payments; then remove the duplicates.

1. Convert data to Table. Make a new column combining Date, Memo, and Payment.
2. Use COUNTIF() to count to see how many times the current value appears in the column.
3. Use Conditional Formatting to highlight the main columns with values that appear more than once.
4. Remove the duplicates.

Data Preview

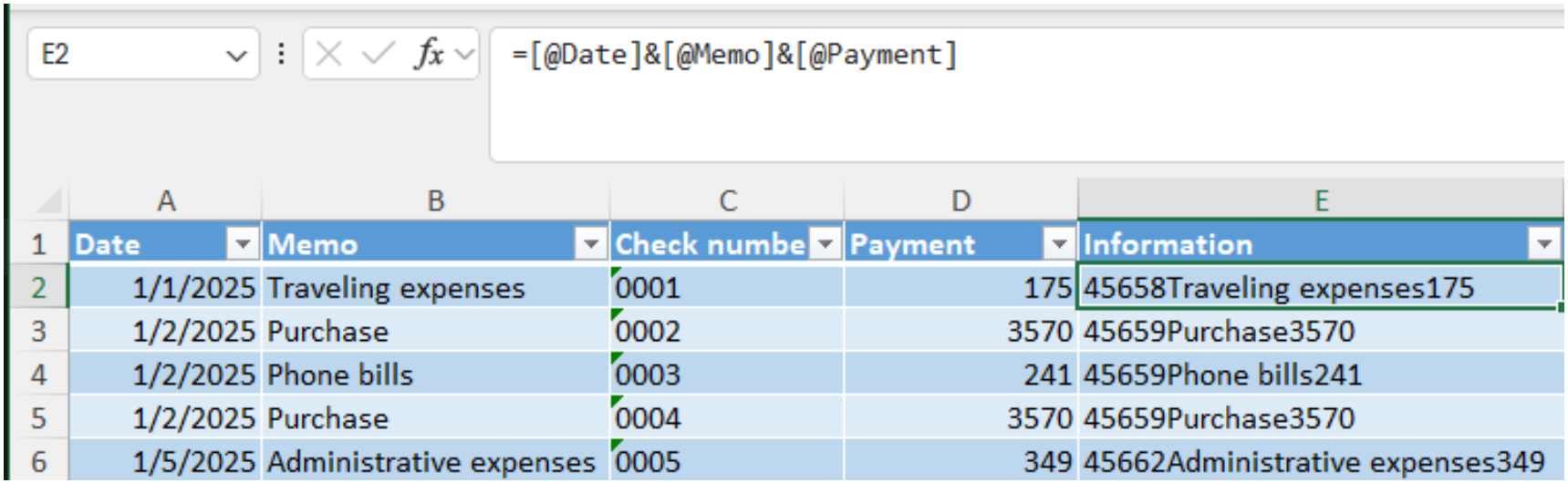
	A	B	C	D
1	Date	Memo	Check numbe	Payment
2	1/1/2025	Traveling expenses	0001	175
3	1/2/2025	Purchase	0002	3570
4	1/2/2025	Phone bills	0003	241
5	1/2/2025	Purchase	0004	3570
6	1/5/2025	Administrative expenses	0005	349
7	1/6/2025	Traveling expenses	0006	709
8	1/7/2025	Traveling expenses	0007	592

1. Convert data to Table. Make a new column combining Date, Memo, and Payment.

How?

1. Convert data to Table.
2. Make a new column E. In E2: =A2&B2&C2.
3. Then the following formula will show up: **[@Date] & [@Memo] & [@Payment]**.[a]
4. This is called **Structured Reference**.

[a] @ indicates the current row's value.



	A	B	C	D	E
1	Date	Memo	Check numbe	Payment	Information
2	1/1/2025	Traveling expenses	0001	175	45658Traveling expenses175
3	1/2/2025	Purchase	0002	3570	45659Purchase3570
4	1/2/2025	Phone bills	0003	241	45659Phone bills241
5	1/2/2025	Purchase	0004	3570	45659Purchase3570
6	1/5/2025	Administrative expenses	0005	349	45662Administrative expenses349

2. Use COUNTIF() to count to see how many times the current value appears in the column.

How?

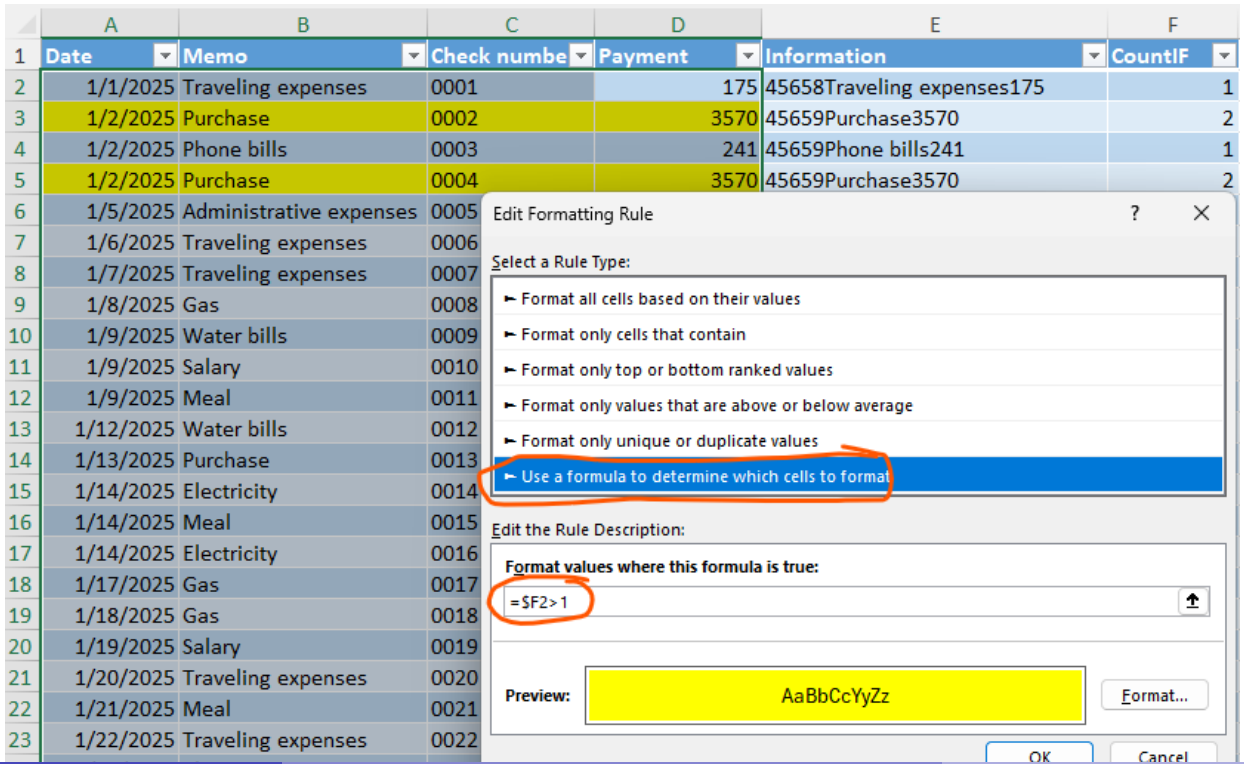
1. Make a new column F.
2. In F2, type COUNTIF([Information], [@Information]).
3. You don't need to type "Information". Just click the cell E2 after typing COUNTIF().

	A	B	C	D	E	F	G	H	I
1	Date	Memo	Check numbe	Payment	Information	CountIF			
2	1/1/2025	Traveling expenses	0001	175	45658Traveling expenses175	1	=COUNTIF([Information],[@Information])		
3	1/2/2025	Purchase	0002	3570	45659Purchase3570	2			
4	1/2/2025	Phone bills	0003	241	45659Phone bills241	1			
5	1/2/2025	Purchase	0004	3570	45659Purchase3570	2			
6	1/5/2025	Administrative expenses	0005	349	45662Administrative expenses349	1			

3. Use Conditional Formatting to highlight the main columns with values that appear more than once.

How?

1. Select columns A to D (Date to Payment).
2. Click Conditional Formatting under Home tab. Then New Rule.
3. Choose "Use a formula to determine which cells to format".
4. Enter =$F2>1 in the formula box. Be careful not to lock the row number in $F2 (~~$F$2~~).
5. Set up the background color to yellow.

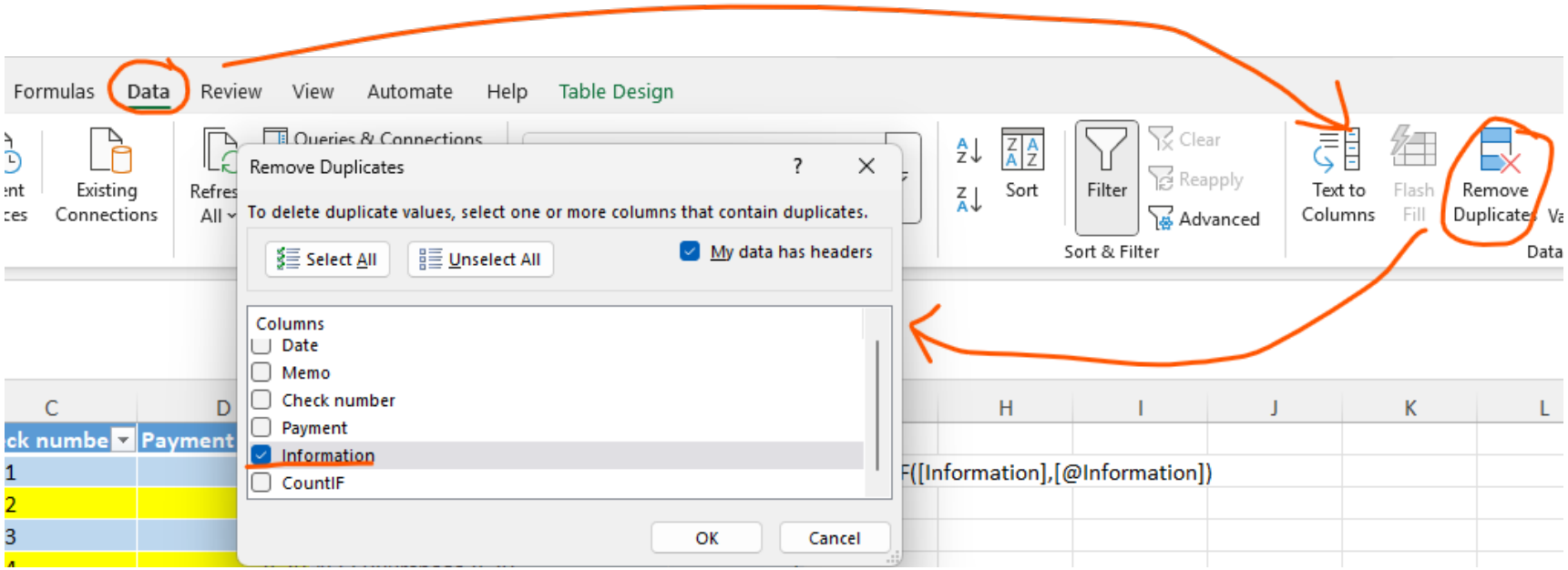


	A	B	C	D	E	F
1	Date	Memo	Check numbe	Payment	Information	CountIF
2	1/1/2025	Traveling expenses	0001	175	45658Traveling expenses175	1
3	1/2/2025	Purchase	0002	3570	45659Purchase3570	2
4	1/2/2025	Phone bills	0003	241	45659Phone bills241	1
5	1/2/2025	Purchase	0004	3570	45659Purchase3570	2
6	1/5/2025	Administrative expenses	0005			
7	1/6/2025	Traveling expenses	0006			
8	1/7/2025	Traveling expenses	0007			
9	1/8/2025	Gas	0008			
10	1/9/2025	Water bills	0009			
11	1/9/2025	Salary	0010			
12	1/9/2025	Meal	0011			
13	1/12/2025	Water bills	0012			
14	1/13/2025	Purchase	0013			
15	1/14/2025	Electricity	0014			
16	1/14/2025	Meal	0015			
17	1/14/2025	Electricity	0016			
18	1/17/2025	Gas	0017			
19	1/18/2025	Gas	0018			
20	1/19/2025	Salary	0019			
21	1/20/2025	Traveling expenses	0020			
22	1/21/2025	Meal	0021			
23	1/22/2025	Traveling expenses	0022			

4. Remove the duplicates.[1]

How?

1. Select all the values in column A (from A2:).
2. Data tab > Remove Duplicates.
3. Select Information column to make it unique.
4. Click OK. Then two obs are removed.



[1] Before removing, check if the duplicates are resulted from errors.

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Background: Kickback

Kickback

- A bribe paid to a person in a position of authority to influence their decision.

- Vendors have incentives to collect cash from clients quickly.
- Vendors might offer kickbacks to A/P clerks to collect cash from clients quickly.
- It would be easier for vendors if only one A/P clerk handles all the transactions with the vendor.

Lab7-8: Fraud Detection

Purpose: Check if there are fraudulent transactions.

1. Calculate the number of days it took the company to pay its invoice.
2. Any relationship between an A/P clerk and a vendor (i.e., supplier)?
3. Any unusually quick payments?
4. Are the two above related? Then suspicious (e.g., Kickback)

Data Preview

	A	B	C	D	E
1	**A/P Clerk**	**Vendor**	**Invoice Amount**	**Invoice Date**	**Payment Date**
2	AP0040	SLC Inc.	305	2/1/2025	2/22/2025
3	AP0080	Journeys Co.	422	2/1/2025	2/25/2025
4	AP0090	Eng. Inst. Inc	454	2/1/2025	3/30/2025
5	AP0050	Twin Inc.	313	2/1/2025	3/27/2025
6	AP0090	Cool Ent.	419	2/1/2025	3/26/2025

1. Calculate the number of days it took the company to pay its invoice.

How?

1. Make a new column F. In F2: =Payment Date - Invoice Date.

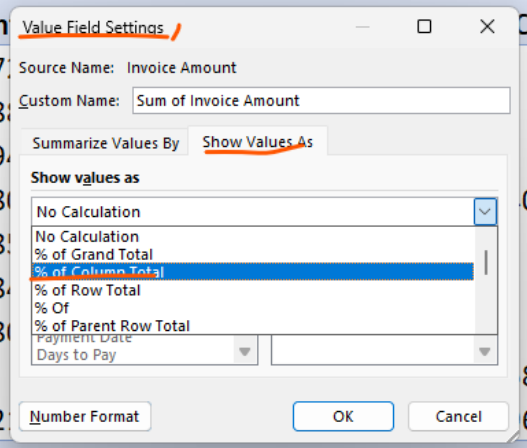
	A	B	C	D	E	F
1	**A/P Clerk**	**Vendor**	**Invoice Amount**	**Invoice Date**	**Payment Date**	**Days to Pay**
2	AP0040	SLC Inc.	305	2/1/2025	2/22/2025	21
3	AP0080	Journeys Co.	422	2/1/2025	2/25/2025	24
4	AP0090	Eng. Inst. Inc	454	2/1/2025	3/30/2025	57
5	AP0050	Twin Inc.	313	2/1/2025	3/27/2025	54

2. Any relationship between an A/P clerk and a vendor (i.e., supplier)?

How?

1. Make a pivot table by Vendor and A/P Clerk.
2. CHoose Invoice Amount for Values.
3. Choose % of Column Total for Values.
4. Then use conditional formatting to highlight the cells properly.

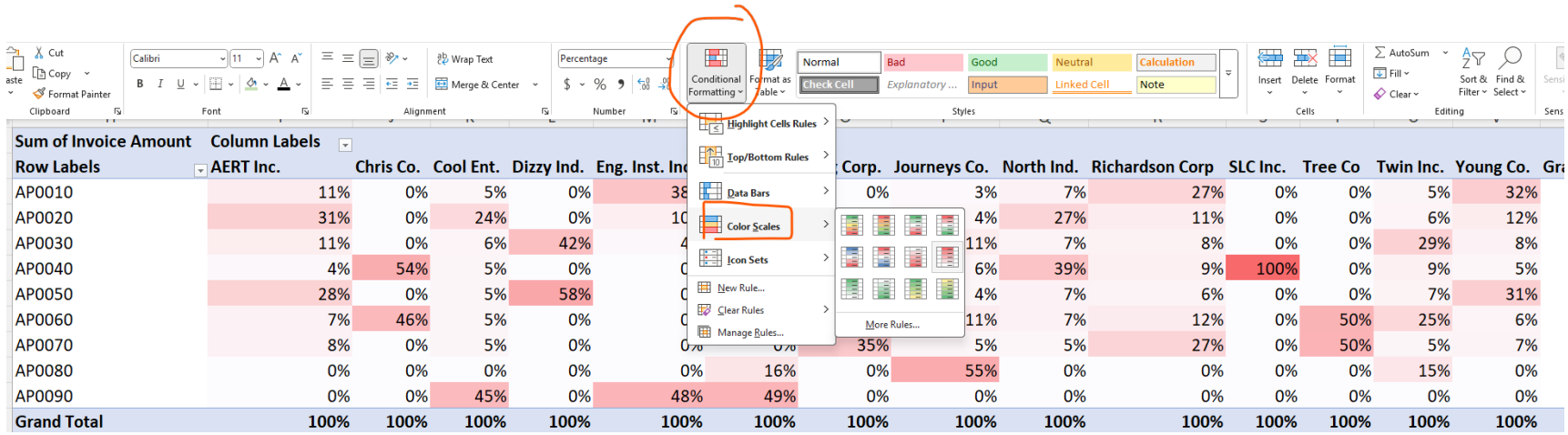
Sum of Invoice Amount	Column Labels							
Row Labels	AERT Inc.	Chris Co.	Cool En			C	Feng Corp.	Journeys Co.
AP0010	1642		7					902
AP0020	4416		38					1444
AP0030	1567		9				3996	3783
AP0040	520	2874	8			0	929	1901
AP0050	4111		8				646	1369
AP0060	1033	2416	8				865	3628
AP0070	1148		8				3534	1707
AP0080						8		18192
AP0090			72			6		
Grand Total	**14437**	**5290**	**16068**	**4997**	**10235**	**11394**	**9970**	**32926**



Choosing the % of Column Total converts the table to the below one. This figure shows which A/P clerk handles transactions with which vendor.

Sum of In	Column														
Row Lab	AERT Inc.	Chris Co.	Cool Ent.	Dizzy Ind.	Eng. Inst.	Facade LL	Feng Corp	Journeys	North Ind.	Richardso	SLC Inc.	Tree Co	Twin Inc.	Young Co.	Grand Total
AP0010	11%	0%	5%	0%	38%	0%	0%	3%	7%	27%	0%	0%	5%	32%	10%
AP0020	31%	0%	24%	0%	10%	0%	0%	4%	27%	11%	0%	0%	6%	12%	10%
AP0030	11%	0%	6%	42%	4%	0%	40%	11%	7%	8%	0%	0%	29%	8%	11%
AP0040	4%	54%	5%	0%	0%	35%	9%	6%	39%	9%	100%	0%	9%	5%	16%
AP0050	28%	0%	5%	58%	0%	0%	6%	4%	7%	6%	0%	0%	7%	31%	9%
AP0060	7%	46%	5%	0%	0%	0%	9%	11%	7%	12%	0%	50%	25%	6%	11%
AP0070	8%	0%	5%	0%	0%	0%	35%	5%	5%	27%	0%	50%	5%	7%	10%
AP0080	0%	0%	0%	0%	0%	16%	0%	55%	0%	0%	0%	0%	15%	0%	13%
AP0090	0%	0%	45%	0%	48%	49%	0%	0%	0%	0%	0%	0%	0%	0%	10%
Grand Tot	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Then use conditional formatting to highlight the cells properly.



Sum of Invoice Amount	Column Labels													
Row Labels	AERT Inc.	Chris Co.	Cool Ent.	Dizzy Ind.	Eng. Inst. Inc		Corp.	Journeys Co.	North Ind.	Richardson Corp	SLC Inc.	Tree Co	Twin Inc.	Young Co.	Gra
AP0010	11%	0%	5%	0%	38		0%	3%	7%	27%	0%	0%	5%	32%	
AP0020	31%	0%	24%	0%	10			4%	27%	11%	0%	0%	6%	12%	
AP0030	11%	0%	6%	42%	4			11%	7%	8%	0%	0%	29%	8%	
AP0040	4%	54%	5%	0%	0			6%	39%	9%	100%	0%	9%	5%	
AP0050	28%	0%	5%	58%	0			4%	7%	6%	0%	0%	7%	31%	
AP0060	7%	46%	5%	0%	0			11%	7%	12%	0%	50%	25%	6%	
AP0070	8%	0%	5%	0%	0%		35%	5%	5%	27%	0%	50%	5%	7%	
AP0080	0%	0%	0%	0%	0%	16%	0%	55%	0%	0%	0%	0%	15%	0%	
AP0090	0%	0%	45%	0%	48%	49%	0%	0%	0%	0%	0%	0%	0%	0%	
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

3. Any unusually quick payments?

How?

1. Use pivottable to show how quickly a vendor paid its invoice by A/P clerk.

Average o	Column														
Row Lab	AERT Inc.	Chris Co.	Cool Ent.	Dizzy Ind.	Eng. Inst.	Facade LL	Feng Corp	Journeys	North Ind.	Richardso	SLC Inc.	Tree Co	Twin Inc.	Young Co.	Grand Tota
AP0010	42		27		42			49	37	45			48	42	42
AP0020	40		47		29			44	39	47			40	41	42
AP0030	39		36	41	54		42	41	36	42			38	25	39
AP0040	52	46	44			43	52	32	43	35	14		40	53	32
AP0050	39		45	42			43	34	39	45			43	38	40
AP0060	52	39	25				42	45	29	35		42	31	44	38
AP0070	48		36				43	39	39	43		36	31	46	40
AP0080						37		15					41		19
AP0090			43		39	40									41
Grand Tot	**42**	**43**	**42**	**42**	**39**	**41**	**43**	**27**	**39**	**42**	**14**	**39**	**37**	**40**	**36**

4. Are the two pivot tables related? Then suspicious (e.g., Kickback)

How?

1. Home tab > Conditional Formatting.

Sum of In\	Column '														
Row Lab	AERT Inc.	Chris Co.	Cool Ent.	Dizzy Ind.	Eng. Inst. I	Facade LL	Feng Corp	Journeys (	North Ind.	Richardso	SLC Inc.	Tree Co	Twin Inc.	Young Co.	Grand Total
AP0010	11%	0%	5%	0%	38%	0%	0%	3%	7%	27%	0%	0%	5%	32%	10%
AP0020	31%	0%	24%	0%	10%	0%	0%	4%	27%	11%	0%	0%	6%	12%	10%
AP0030	11%	0%	6%	42%	4%	0%	40%	11%	7%	8%	0%	0%	29%	8%	11%
AP0040	4%	54%	5%	0%	0%	35%	9%	6%	39%	9%	100%	0%	9%	5%	16%
AP0050	28%	0%	5%	58%	0%	0%	6%	4%	7%	6%	0%	0%	7%	31%	9%
AP0060	7%	46%	5%	0%	0%	0%	9%	11%	7%	12%	0%	50%	25%	6%	11%
AP0070	8%	0%	5%	0%	0%	0%	35%	5%	5%	27%	0%	50%	5%	7%	10%
AP0080	0%	0%	0%	0%	0%	16%	0%	55%	0%	0%	0%	0%	15%	0%	13%
AP0090	0%	0%	45%	0%	48%	49%	0%	0%	0%	0%	0%	0%	0%	0%	10%
Grand Tot	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Average o	Column '														
Row Lab	AERT Inc.	Chris Co.	Cool Ent.	Dizzy Ind.	Eng. Inst. I	Facade LL	Feng Corp	Journeys (	North Ind.	Richardso	SLC Inc.	Tree Co	Twin Inc.	Young Co.	Grand Total
AP0010	42		27		42			49	37	45			48	42	42
AP0020	40		47		29			44	39	47			40	41	42
AP0030	39		36	41	54		42	41	36	42			38	25	39
AP0040	52	46	44			43	52	32	43	35	14		40	53	32
AP0050	39		45	42			43	34	39	45			43	38	40
AP0060	52	39	25				42	45	29	35		42	31	44	38
AP0070	48		36				43	39	39	43		36	31	46	40
AP0080						37		15					41		19
AP0090			43		39	40									41
Grand Tot	**42**	**43**	**42**	**42**	**39**	**41**	**43**	**27**	**39**	**42**	**14**	**39**	**37**	**40**	**36**

Interpretation

Two AP clerks handle mosts of the transactions with the two vendors (Dizzy Ind. and SLC Inc.).

- Dizzy Ind. and AP0050: With 42 days to payment, it does not appear that there is any special treatment. Not likely to be a kickback.
- SLC Inc. and AP0040: With 14 days to payment, it appears that there is a special treatment. Likely to be a kickback.

Relationship between Sales and Advertising Expense [Lab7-9]

Lab7-9: Relationship between Sales and Advertising Expense

Purpose: Find out if sales and advertising expense are related.

1. Show a scatter plot.
2. Add a regression line.
3. Use regression analysis under Data Analysis.

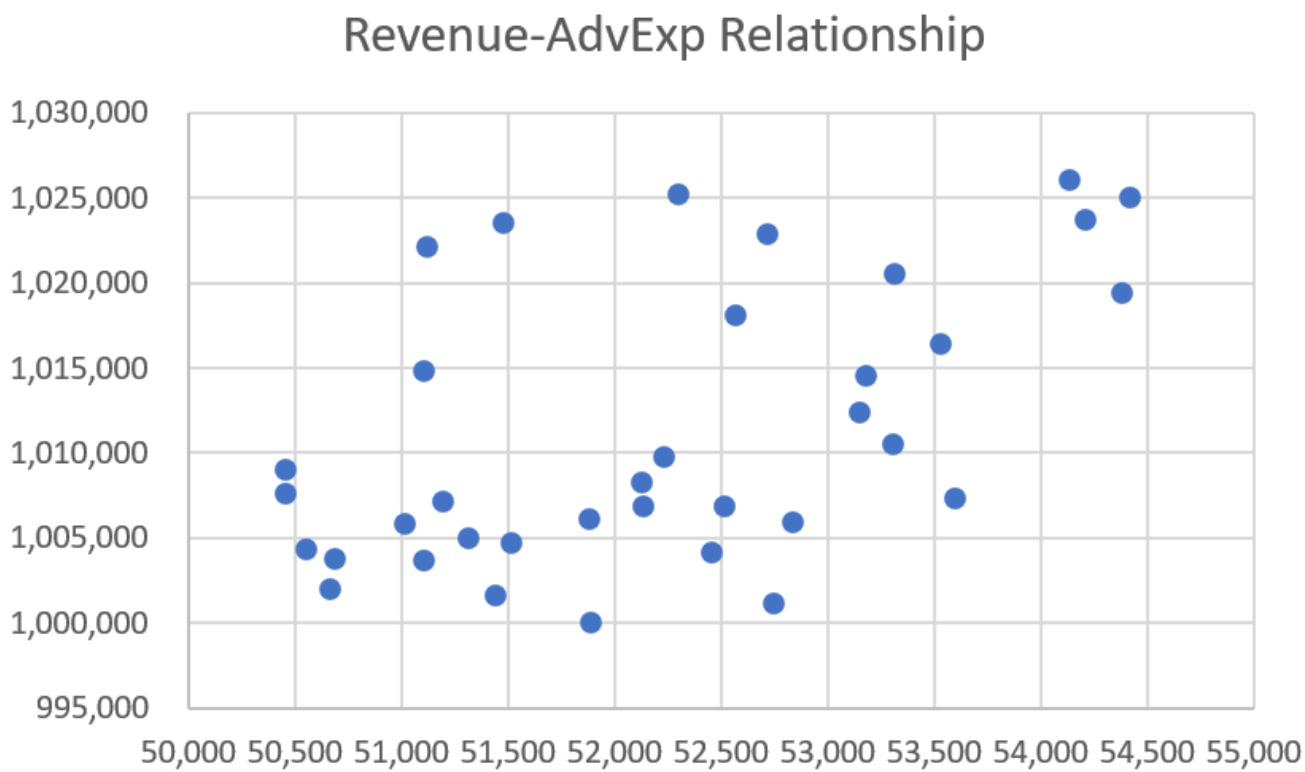
Data Preview

1	Month	Date	Advertising Expenses	Revenues
2	1	1/1/2025	51,891	1,000,052
3	2	2/1/2025	52,750	1,001,166
4	3	3/1/2025	50,668	1,001,966
5	4	4/1/2025	51,106	1,003,704
6	5	5/1/2025	51,316	1,004,956
7	6	6/1/2025	52,841	1,005,937

1. Show a scatter plot.

How?

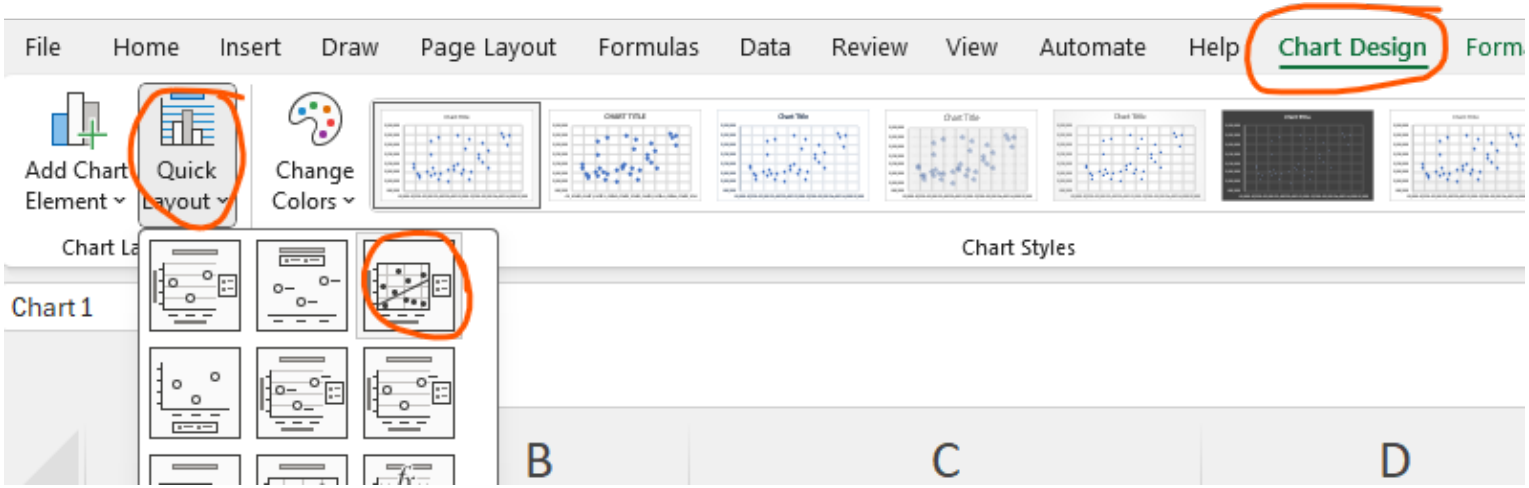
1. Select the Sales and Advertising Expense columns in your dataset.
2. At Insert tab Charts Scatter plot.

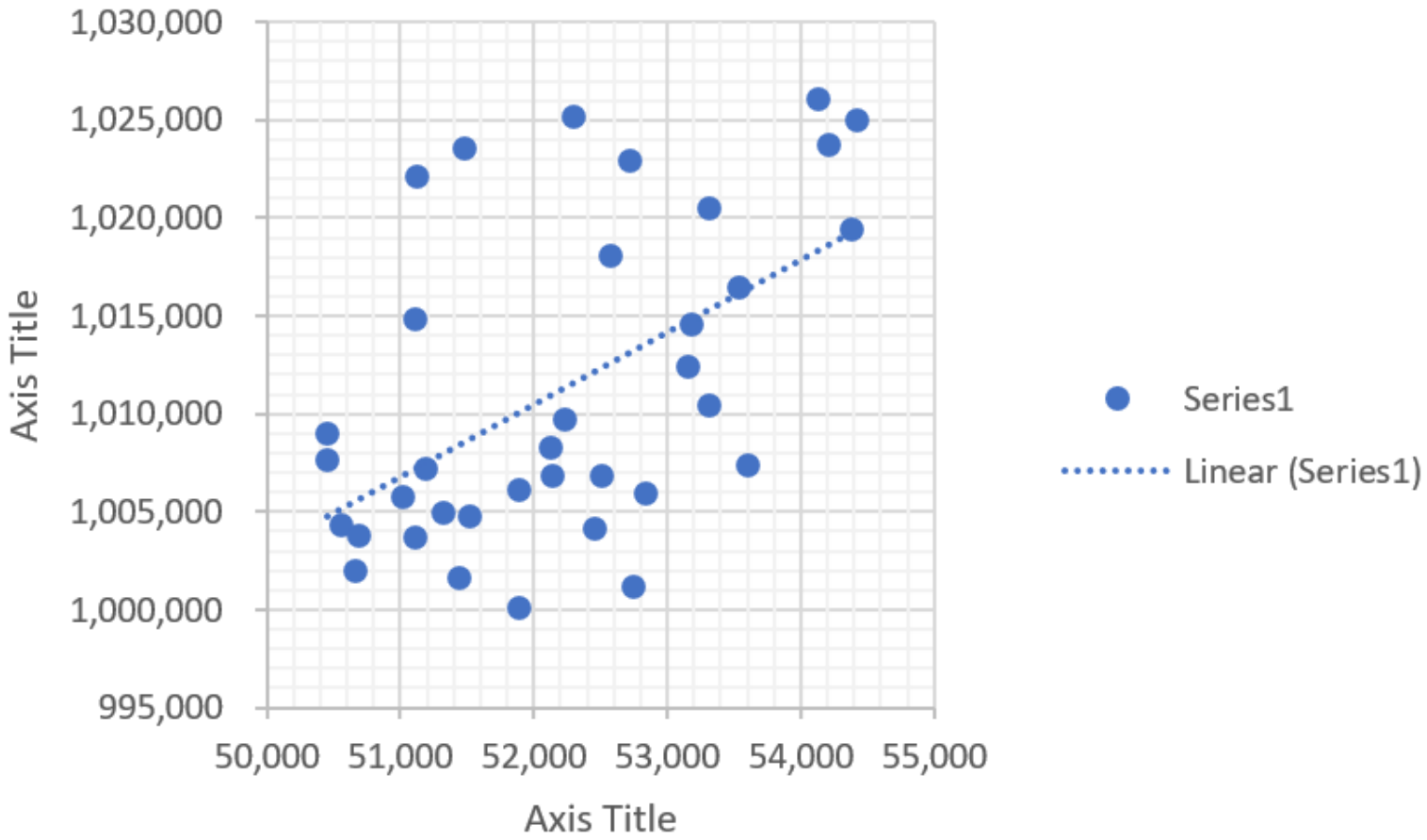


2. Add a regression line.

How?

1. Click anywhere on the scatter plot to select it.
2. Chart Design Quick Layout Layout 3.



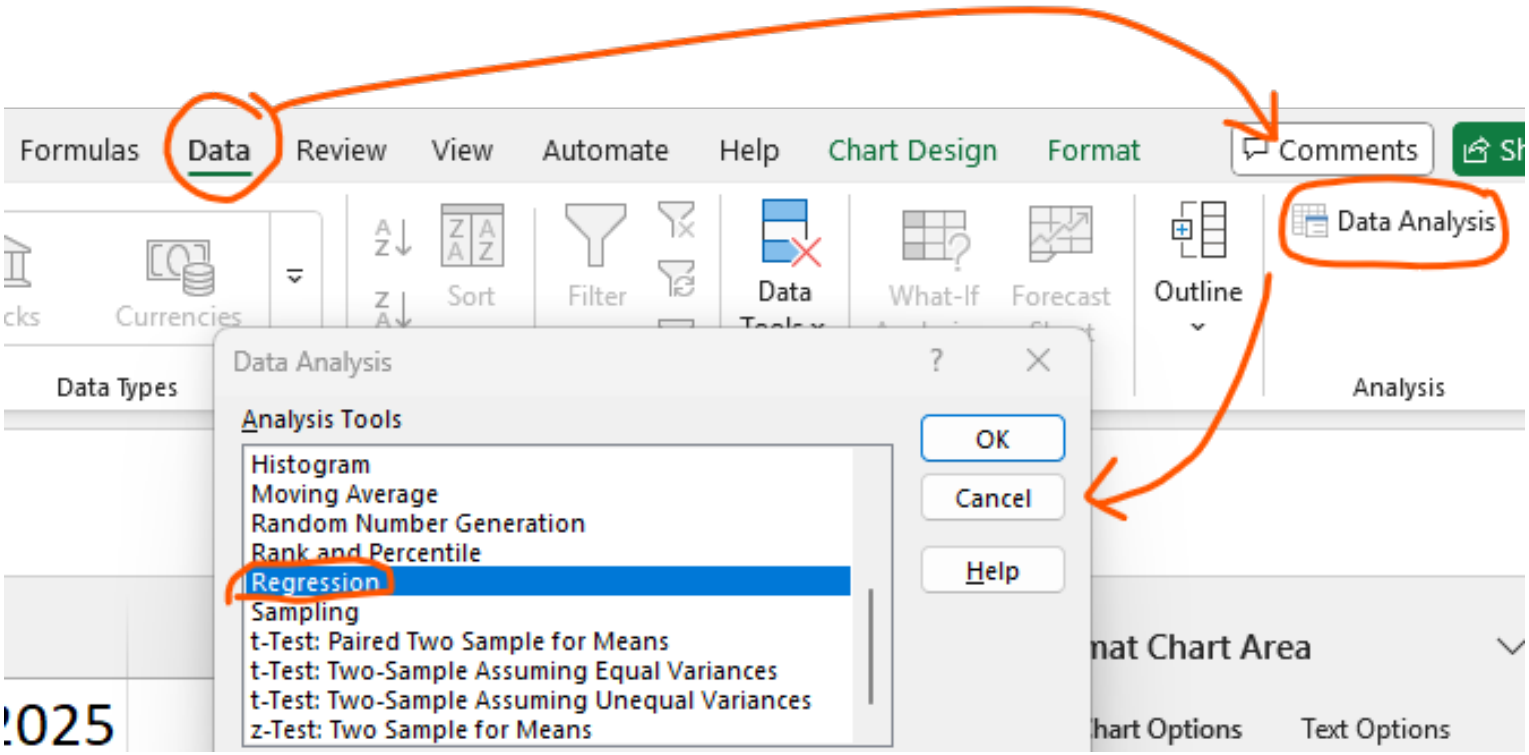


- A positive relationship.
- Axis Titles and legend should be updated.

3. Use regression analysis to find out the relationship between sales and advertising expense.

How?

1. Data tab Data Analysis Regression OK.
2. Input Y Range: Sales. Input X Range: Advertising Expense.



SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.5359275
R Square	0.2872183
Adjusted R Sc	0.2662541
Standard Erro	6938.7347
Observations	36

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	659621859	659621859	13.700439	0.0007551
Residual	34	1.637E+09	48146039		
Total	35	2.297E+09			

	Coefficients	Standard Erro	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	819247.46	51893.259	15.787165	3.22E-17	713787.66	924707.25	713787.66	924707.25
X Variable 1	3.6775543	0.9935549	3.7014104	0.0007551	1.6584079	5.6967007	1.6584079	5.6967007

Interpretation:

- Adj. R2 - The overall fit of the model. The higher, the better.
- Coeff. on X: 3.67: One unit inrease in X would increase Y by 3.67 units.
- P-value for the coeff. (0.0007) indicates that the coeff. is significantly different from 0.
- Overall, the result supports that there is a positive relationship between sales and advertising expense.