Techniques in Excel and VBA

This document lists 3 versatile techniques for VBA:

1- Excel formulae as VBA code
2- Name Manager as an intermediate
3- Dynamic ranges (3 notations)

1- Excel formulae as VBA code

In VBA, EVALUATE("text") parses "text" as a formula
Therefore, we can write complex formulae iteratively, in simple steps

Example:

replace "X" in "SUM(X)" with "1 + Y"	→	"SUM(1 + Y)"
replace "Y" in the result with "3 * 4"	→	"SUM(1 + 3 * 4)"
EVALUATE("=" & the result)	→	13

In practice:

```
'Get the full date range from the database (e.g., "Sheet1!F2:F100")
Dim inputRangeStr As String
inputRangeStr = "Sheet1!$F$2: $F$" & ThisWorkbook.Sheets("Sheet1").Range("F:F").End(xlDown).Row


'Compute the # of hires per day
Dim arrStr As String
arrStr = inputRangeStr
arrStr = "FREQUENCY(" & arrStr & ", " & arrStr & ")"
arrStr = "INDEX(" & arrStr & ", SEQUENCE(ROWS(" & arrStr & ")-1))"
```

The result closely resembles:

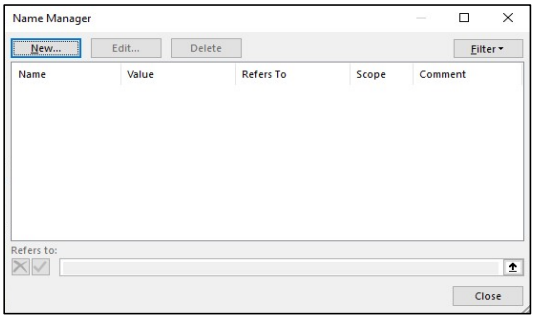
```
"INDEX(FREQUENCY('Employee data'!F2:F108, 'Employee data'!F2:F108),
SEQUENCE(ROWS(FREQUENCY('Employee data'!F2:F108, 'Employee data'!F2:F108))-1))"
```

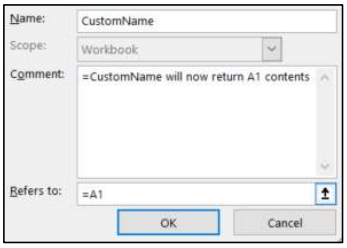
The logic represents a count of hires for every day in the dataset

However, "text" is capped at 255 characters
Question: Is there a workaround?

2- Name Manager as an intermediate

The Name Manager has a powerful secret
Usually, it is a tool to give ranges custom names (shortcut: Ctrl + F3)
However, the "Refers to" field doesn't have to contain ranges -- it can also hold EVALUATE("text")





The key is that here, "text" is not capped at 255 characters
Furthermore, VBA can see this field

Use case:

VBA - Function script

Defining SpecialEvaluate(): Runs particularly long Excel formulae

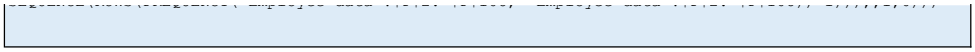
```
Public Function SpecialEvaluate(ByVal formula As String) As Variant
'This creates a named variable in the name manager holding the formula as a string, then evaluates it there
'It bypasses Evaluate()'s 255 character limit, enabling complicated, compounded formulae

'Source: https://codereview.stackexchange.com/a/275184

    With ThisWorkbook.Names.Add(Name:="Named_Variable_Passing_By", RefersTo:=formula, Visible:=False)
        SpecialEvaluate = Evaluate("=Named_Variable_Passing_By")
        .Delete
    End With

End Function
```

This function was used in "VBA Query result (nHires)" (see sheet)

```
step4 = SpecialEvaluate(step4_Str)
```

Where:

```
step4_Str = "=TRANSPOSE(MMULT(TRANSPOSE((MONTH('Employee data'!$F$2: $F$108) = SEQUENCE(,12)) *
INDEX(FREQUENCY('Employee data'!$F$2: $F$108, 'Employee data'!$F$2: $F$108),
SEQUENCE(ROWS(FREQUENCY('Employee data'!$F$2: $F$108, 'Employee data'!$F$2: $F$108))-
1))),SEQUENCE(ROWS((MONTH('Employee data'!$F$2: $F$108) = SEQUENCE(,12)) *
INDEX(FREQUENCY('Employee data'!$F$2: $F$108, 'Employee data'!$F$2: $F$108),
SEQUENCE(ROWS(FREQUENCY('Employee data'!$F$2: $F$108, 'Employee data'!$F$2: $F$108))-1))),,1,0)))"
```



This (convoluted) formula evaluates to a count of hires by month

step4 =	14	13	17	7	6	11	7	9	5	6	5	7

Note: The formula above is purposefully exagerated -- it uses matrix algebra instead of MONTH("date")

3- Dynamic ranges (3 notations)

Goal: Simple arithmetic in both Excel and VBA (array math)

Example:

Data retrieval	Illustration	1	2	3	4	5	Note
as a range:	fx =H85:L85	becomes:					This spills a cell's contents
		1	2	3	4	5	
as a dynamic array:	fx =H87#	or:					"#" specifies "spilled version"
		1	2	3	4	5	
as an offset range:	fx =OFFSET(H85,,,,5)	or:					OFFSET() has 2 "dimensions"
		1	2	3	4	5	

OFFSET(reference, rows, cols, **[height]**, [width])

Reminder: VBA recognizes this syntax inside Evaluate()

Reference: Original worksheet code (.xlsm)

VBA - Function script

Defining SpecialEvaluate(): Runs particularly long Excel formulae

Original location: Alt + F11 > Sheet > Insert > Module

```
Public Function SpecialEvaluate(ByVal formula As String) As Variant
'This creates a named variable in the name manager holding the formula as a string, then evaluates it there
'It bypasses Evaluate()'s 255 character limit, enabling complicated, compounded formulae

'Source: https://codereview.stackexchange.com/a/275184

  With ThisWorkbook.Names.Add(Name:="Named_Variable_Passing_By", RefersTo:=formula, Visible:=False)
    SpecialEvaluate = Evaluate("=Named_Variable_Passing_By")
    .Delete
  End With

End Function
```

VBA - Worksheet script

Using SpecialEvaluate(): Turning a daily hire count into a monthly one

Original location: Alt + F11 > Microsoft Excel Objects > Sheet3 (VBA Query result (nHires))

```
Sub nHires_EvaluateMethod()
'Function: Across 12 months, aggregate the # of hires


'0. Get the full date range from the database (e.g., "Sheet1!F2:F100")
Dim inputRangeStr As String
inputRangeStr = "'Employee data'!$F$2: $F$" & ThisWorkbook.Sheets("Employee data").Range("F:F").End(xlDown).Row


'1. Start with the # of hires per day
Dim step1_Str As String
step1_Str = inputRangeStr                                                   'What would be a range is replaced with " & step1_Str & "
step1_Str = "FREQUENCY(" & step1_Str & ", " & step1_Str & ")"               'Hiring frequency (the formula appends an extra row)
step1_Str = "INDEX(" & step1_Str & ", SEQUENCE(ROWS(" & step1_Str & ")-1))" 'The extra row is trimmed


'2. A 12 month sequence
Dim step2_Str As String                                                     'What would be a range is replaced with " & step2_Str & "
step2_Str = "SEQUENCE(,12)"


'3. A 2D truth matrix (e.g., was so-and-so hired on month 2?)
Dim step3_Str As String                                                     'What would be a range is replaced with " & step3_Str & "
step3_Str = "(MONTH(" & inputRangeStr & ") = " & step2_Str & ")"
step3_Str = step3_Str & " * " & step1_Str                                   'TRUEs are scaled by the # of hires per day.


'4. Convert the # of daily hires into monthly
Dim step4_Str As String
step4_Str = "TRANSPOSE(MMULT(TRANSPOSE(" & step3_Str & "),SEQUENCE(ROWS(" & step3_Str & "),,1,0)))"   'Columns are collapsed via MMULT (a matrix * {1,1,1,...}).
                                                                            '(12 sums along the matrix's 12 columns)
                                                                            '(Modern version: BYCOL(...))


'5. Send off the final expression
step1_Str = "=" & step1_Str
step2_Str = "=" & step2_Str
step3_Str = "=" & step3_Str
step4_Str = "=" & step4_Str

Dim step1, step2, step3, step4 As Variant
step1 = Evaluate(step1_Str)
step2 = Evaluate(step2_Str)
step3 = Evaluate(step3_Str)
step4 = SpecialEvaluate(step4_Str)                                          'The final expression is getting long at this point.
                                                                            'Solution: Evaluate via the name manager
                                                                            '(This bypasses the 255 character limit!)
```

```
'_____________________________________
'(Optional) Writing to sheet:
Dim rangeStr As String
Dim s As Worksheet
Set s = ThisWorkbook.Sheets("VBA Query result (nHires)")

'Months
s.Range("D3") = "Month"
s.Range("D3").Font.Bold = True

rangeStr = "OFFSET(D4,,," & UBound(step2) & ")"
s.Range(rangeStr) = Application.WorksheetFunction.Transpose(step2)

'Employees hired
s.Range("E3") = "Hires"
s.Range("E3").Font.Bold = True

rangeStr = "OFFSET(E4,,," & UBound(step4) & ")"
s.Range(rangeStr) = Application.WorksheetFunction.Transpose(step4)



'_____________________________________
'(Debug) Print arrays & info:
Debug.Print "step1:", step1_Str
Debug.Print LBound(step1), UBound(step1)
Debug.Print step1(1)

Debug.Print "step2:", step2_Str
Debug.Print LBound(step2), UBound(step2)
Debug.Print step2(5)

Debug.Print "step3:", "VarType=", VarType(step3), step3_Str
Debug.Print LBound(step3), UBound(step3)
Debug.Print step3(5, 1)
Debug.Print step3(37, 11)
Debug.Print step3(3, 1)

Debug.Print "step4:", "VarType=", VarType(step4), step4_Str
Debug.Print LBound(step4), UBound(step4)
Debug.Print step4(2)

End Sub
```

Counting hired employees by month					
with Excel formulae			with VBA		
Month	Hires		Month	Hires	
1	14		1	14	
2	13		2	13	
3	17		3	17	
4	7		4	7	
5	6		5	6	
6	11		6	11	
7	7		7	7	
8	9		8	9	
9	5		9	5	
10	6		10	6	
11	5		11	5	
12	7		12	7	

Employee data

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	COMMISSION_PCT	MANAGER_ID	DEPARTMENT_ID
100	Steven	King	SKING	515.123.4567	1987-06-17	AD_PRES	24000			90
101	Neena	Kochhar	NKOCHHAR	515.123.4568	1989-09-21	AD_VP	17000		100	90
102	Lex	De Haan	LDEHAAN	515.123.4569	1993-01-13	AD_VP	17000		100	90
103	Alexander	Hunold	AHUNOLD	590.423.4567	1990-01-03	IT_PROG	9000		102	60
104	Bruce	Ernst	BERNST	590.423.4568	1991-05-21	IT_PROG	6000		103	60
105	David	Austin	DAUSTIN	590.423.4569	1997-06-25	IT_PROG	4800		103	60
106	Valli	Pataballa	VPATABAL	590.423.4560	1998-02-05	IT_PROG	4800		103	60
107	Diana	Lorentz	DLORENTZ	590.423.5567	1999-02-07	IT_PROG	4200		103	60
108	Nancy	Greenberg	NGREENBE	515.124.4569	1994-08-17	FI_MGR	12000		101	100
109	Daniel	Faviet	DFAVIET	515.124.4169	1994-08-16	FI_ACCOUNT	9000		108	100
110	John	Chen	JCHEN	515.124.4269	1997-09-28	FI_ACCOUNT	8200		108	100
111	Ismael	Sciarra	ISCIARRA	515.124.4369	1997-09-30	FI_ACCOUNT	7700		108	100
112	Jose Manuel	Urman	JMURMAN	515.124.4469	1998-03-07	FI_ACCOUNT	7800		108	100
113	Luis	Popp	LPOPP	515.124.4567	1999-12-07	FI_ACCOUNT	6900		108	100
114	Den	Raphaely	DRAPHEAL	515.127.4561	1994-12-07	PU_MAN	11000		100	30
115	Alexander	Khoo	AKHOO	515.127.4562	1995-05-18	PU_CLERK	3100		114	30
116	Shelli	Baida	SBAIDA	515.127.4563	1997-12-24	PU_CLERK	2900		114	30
117	Sigal	Tobias	STOBIAS	515.127.4564	1997-07-24	PU_CLERK	2800		114	30
118	Guy	Himuro	GHIMURO	515.127.4565	1998-11-15	PU_CLERK	2600		114	30
119	Karen	Colmenares	KCOLMENA	515.127.4566	1999-08-10	PU_CLERK	2500		114	30
120	Matthew	Weiss	MWEISS	650.123.1234	1996-07-18	ST_MAN	8000		100	50
121	Adam	Fripp	AFRIPP	650.123.2234	1997-04-10	ST_MAN	8200		100	50
122	Payam	Kaufling	PKAUFLIN	650.123.3234	1995-05-01	ST_MAN	7900		100	50
123	Shanta	Vollman	SVOLLMAN	650.123.4234	1997-10-10	ST_MAN	6500		100	50
124	Kevin	Mourgos	KMOURGOS	650.123.5234	1999-11-16	ST_MAN	5800		100	50
125	Julia	Nayer	JNAYER	650.124.1214	1997-07-16	ST_CLERK	3200		120	50
126	Irene	Mikkilineni	IMIKKILI	650.124.1224	1998-09-28	ST_CLERK	2700		120	50
127	James	Landry	JLANDRY	650.124.1334	1999-01-14	ST_CLERK	2400		120	50
128	Steven	Markle	SMARKLE	650.124.1434	2000-03-08	ST_CLERK	2200		120	50
129	Laura	Bissot	LBISSOT	650.124.5234	1997-08-20	ST_CLERK	3300		121	50
130	Mozhe	Atkinson	MATKINSO	650.124.6234	1997-10-30	ST_CLERK	2800		121	50
131	James	Marlow	JAMRLOW	650.124.7234	1997-02-16	ST_CLERK	2500		121	50

132	TJ	Olson	TJOLSON	650.124.8234	1999-04-10	ST_CLERK	2100		121	50
133	Jason	Mallin	JMALLIN	650.127.1934	1996-06-14	ST_CLERK	3300		122	50
134	Michael	Rogers	MROGERS	650.127.1834	1998-08-26	ST_CLERK	2900		122	50
135	Ki	Gee	KGEE	650.127.1734	1999-12-12	ST_CLERK	2400		122	50
136	Hazel	Philtanker	HPHILTAN	650.127.1634	2000-02-06	ST_CLERK	2200		122	50
137	Renske	Ladwig	RLADWIG	650.121.1234	1995-07-14	ST_CLERK	3600		123	50
138	Stephen	Stiles	SSTILES	650.121.2034	1997-10-26	ST_CLERK	3200		123	50
139	John	Seo	JSEO	650.121.2019	1998-02-12	ST_CLERK	2700		123	50
140	Joshua	Patel	JPATEL	650.121.1834	1998-04-06	ST_CLERK	2500		123	50
141	Trenna	Rajs	TRAJS	650.121.8009	1995-10-17	ST_CLERK	3500		124	50
142	Curtis	Davies	CDAVIES	650.121.2994	1997-01-29	ST_CLERK	3100		124	50
143	Randall	Matos	RMATOS	650.121.2874	1998-03-15	ST_CLERK	2600		124	50
144	Peter	Vargas	PVARGAS	650.121.2004	1998-07-09	ST_CLERK	2500		124	50
145	John	Russell	JRUSSEL	011.44.1344.429268	1996-10-01	SA_MAN	14000	0.4	100	80
146	Karen	Partners	KPARTNER	011.44.1344.467268	1997-01-05	SA_MAN	13500	0.3	100	80
147	Alberto	Errazuriz	AERRAZUR	011.44.1344.429278	1997-03-10	SA_MAN	12000	0.3	100	80
148	Gerald	Cambrault	GCAMBRAU	011.44.1344.619268	1999-10-15	SA_MAN	11000	0.3	100	80
149	Eleni	Zlotkey	EZLOTKEY	011.44.1344.429018	2000-01-29	SA_MAN	10500	0.2	100	80
150	Peter	Tucker	PTUCKER	011.44.1344.129268	1997-01-30	SA_REP	10000	0.3	145	80
151	David	Bernstein	DBERNSTE	011.44.1344.345268	1997-03-24	SA_REP	9500	0.25	145	80
152	Peter	Hall	PHALL	011.44.1344.478968	1997-08-20	SA_REP	9000	0.25	145	80
153	Christopher	Olsen	COLSEN	011.44.1344.498718	1998-03-30	SA_REP	8000	0.2	145	80
154	Nanette	Cambrault	NCAMBRAU	011.44.1344.987668	1998-12-09	SA_REP	7500	0.2	145	80
155	Oliver	Tuvault	OTUVAULT	011.44.1344.486508	1999-11-23	SA_REP	7000	0.15	145	80
156	Janette	King	JKING	011.44.1345.429268	1996-01-30	SA_REP	10000	0.35	146	80
157	Patrick	Sully	PSULLY	011.44.1345.929268	1996-03-04	SA_REP	9500	0.35	146	80
158	Allan	McEwen	AMCEWEN	011.44.1345.829268	1996-08-01	SA_REP	9000	0.35	146	80
159	Lindsey	Smith	LSMITH	011.44.1345.729268	1997-03-10	SA_REP	8000	0.3	146	80
160	Louise	Doran	LDORAN	011.44.1345.629268	1997-12-15	SA_REP	7500	0.3	146	80
161	Sarath	Sewall	SSEWALL	011.44.1345.529268	1998-11-03	SA_REP	7000	0.25	146	80
162	Clara	Vishney	CVISHNEY	011.44.1346.129268	1997-11-11	SA_REP	10500	0.25	147	80
163	Danielle	Greene	DGREENE	011.44.1346.229268	1999-03-19	SA_REP	9500	0.15	147	80
164	Mattea	Marvins	MMARVINS	011.44.1346.329268	2000-01-24	SA_REP	7200	0.1	147	80

165	David	Lee	DLEE	011.44.1346.529268	2000-02-23	SA_REP	6800	0.1	147	80
166	Sundar	Ande	SANDE	011.44.1346.629268	2000-03-24	SA_REP	6400	0.1	147	80
167	Amit	Banda	ABANDA	011.44.1346.729268	2000-04-21	SA_REP	6200	0.1	147	80
168	Lisa	Ozer	LOZER	011.44.1343.929268	1997-03-11	SA_REP	11500	0.25	148	80
169	Harrison	Bloom	HBLOOM	011.44.1343.829268	1998-03-23	SA_REP	10000	0.2	148	80
170	Tayler	Fox	TFOX	011.44.1343.729268	1998-01-24	SA_REP	9600	0.2	148	80
171	William	Smith	WSMITH	011.44.1343.629268	1999-02-23	SA_REP	7400	0.15	148	80
172	Elizabeth	Bates	EBATES	011.44.1343.529268	1999-03-24	SA_REP	7300	0.15	148	80
173	Sundita	Kumar	SKUMAR	011.44.1343.329268	2000-04-21	SA_REP	6100	0.1	148	80
174	Ellen	Abel	EABEL	011.44.1644.429267	1996-05-11	SA_REP	11000	0.3	149	80
175	Alyssa	Hutton	AHUTTON	011.44.1644.429266	1997-03-19	SA_REP	8800	0.25	149	80
176	Jonathon	Taylor	JTAYLOR	011.44.1644.429265	1998-03-24	SA_REP	8600	0.2	149	80
177	Jack	Livingston	JLIVINGS	011.44.1644.429264	1998-04-23	SA_REP	8400	0.2	149	80
178	Kimberely	Grant	KGRANT	011.44.1644.429263	1999-05-24	SA_REP	7000	0.15	149	
179	Charles	Johnson	CJOHNSON	011.44.1644.429262	2000-01-04	SA_REP	6200	0.1	149	80
180	Winston	Taylor	WTAYLOR	650.507.9876	1998-01-24	SH_CLERK	3200		120	50
181	Jean	Fleaur	JFLEAUR	650.507.9877	1998-02-23	SH_CLERK	3100		120	50
182	Martha	Sullivan	MSULLIVA	650.507.9878	1999-06-21	SH_CLERK	2500		120	50
183	Girard	Geoni	GGEONI	650.507.9879	2000-02-03	SH_CLERK	2800		120	50
184	Nandita	Sarchand	NSARCHAN	650.509.1876	1996-01-27	SH_CLERK	4200		121	50
185	Alexis	Bull	ABULL	650.509.2876	1997-02-20	SH_CLERK	4100		121	50
186	Julia	Dellinger	JDELLING	650.509.3876	1998-06-24	SH_CLERK	3400		121	50
187	Anthony	Cabrio	ACABRIO	650.509.4876	1999-02-07	SH_CLERK	3000		121	50
188	Kelly	Chung	KCHUNG	650.505.1876	1997-06-14	SH_CLERK	3800		122	50
189	Jennifer	Dilly	JDILLY	650.505.2876	1997-08-13	SH_CLERK	3600		122	50
190	Timothy	Gates	TGATES	650.505.3876	1998-07-11	SH_CLERK	2900		122	50
191	Randall	Perkins	RPERKINS	650.505.4876	1999-12-19	SH_CLERK	2500		122	50
192	Sarah	Bell	SBELL	650.501.1876	1996-02-04	SH_CLERK	4000		123	50
193	Britney	Everett	BEVERETT	650.501.2876	1997-03-03	SH_CLERK	3900		123	50
194	Samuel	McCain	SMCCAIN	650.501.3876	1998-07-01	SH_CLERK	3200		123	50
195	Vance	Jones	VJONES	650.501.4876	1999-03-17	SH_CLERK	2800		123	50
196	Alana	Walsh	AWALSH	650.507.9811	1998-04-24	SH_CLERK	3100		124	50
197	Kevin	Feeney	KFEENEY	650.507.9822	1998-05-23	SH_CLERK	3000		124	50

198	Donald	OConnell	DOCONNEL	650.507.9833	1999-06-21	SH_CLERK	2600	124	50
199	Douglas	Grant	DGRANT	650.507.9844	2000-01-13	SH_CLERK	2600	124	50
200	Jennifer	Whalen	JWHALEN	515.123.4444	1987-09-17	AD_ASST	4400	101	10
201	Michael	Hartstein	MHARTSTE	515.123.5555	1996-02-17	MK_MAN	13000	100	20
202	Pat	Fay	PFAY	603.123.6666	1997-08-17	MK_REP	6000	201	20
203	Susan	Mavris	SMAVRIS	515.123.7777	1994-06-07	HR_REP	6500	101	40
204	Hermann	Baer	HBAER	515.123.8888	1994-06-07	PR_REP	10000	101	70
205	Shelley	Higgins	SHIGGINS	515.123.8080	1994-06-07	AC_MGR	12000	101	110
206	William	Gietz	WGIETZ	515.123.8181	1994-06-07	AC_ACCOUNT	8300	205	110