Excel – Understanding and navigating cell addresses

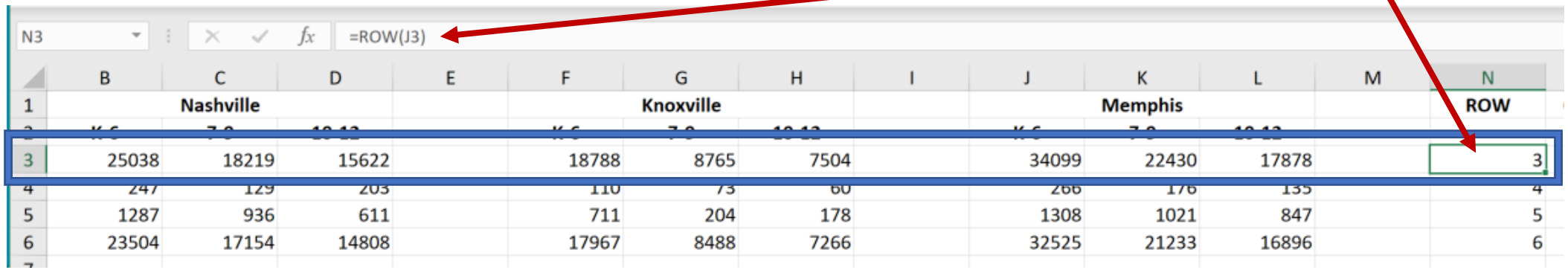
The location of data on a spreadsheet may follow a pattern (like in the spreadsheet below) that you need to understand to make your work easier. We'll use the totally fabricated Tennessee student data below to explore some functions that work with cell addresses:

- **=ROW()** – returns an integer that corresponds to the position of the row, ordering top to bottom
- **=COLUMN()** – returns an integer that corresponds to the position of the column, ordering left to right
- **=ADDRESS()** – returns the cell address in standard excel form given a row and column value; a third optional input directs the function to return as:
  - Absolute reference (1, the default)
  - Row absolute reference (2)
  - Column absolute reference (3)
  - Relative reference (4)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Nashville				Knoxville				Memphis			
2		K-6	7-9	10-12		K-6	7-9	10-12		K-6	7-9	10-12	
3	Number of students	25038	18219	15622		18788	8765	7504		34099	22430	17878	
4	disabled	247	129	203		110	73	60		266	176	135	
5	gifted	1287	936	611		711	204	178		1308	1021	847	
6	mainstream	23504	17154	14808		17967	8488	7266		32525	21233	16896	
7													
8	Number of courses offered												
9	math	9	6	11		8	6	10		9	5	9	
10	science	7	4	7		7	4	8		7	4	7	
11	english and literature	10	7	9		8	7	10		8	9	8	
12	history and social studies	6	5	9		6	6	8		5	6	7	
13													
14													
15													

=ROW(cell reference)

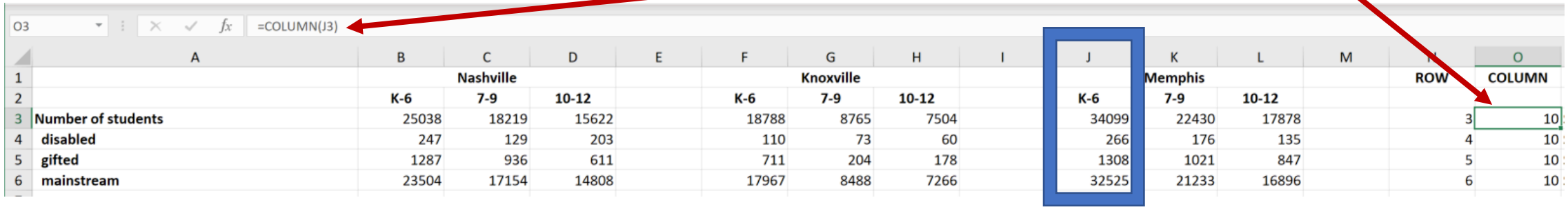
Excel returns 3 as the **ROW** position for J3



	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Nashville				Knoxville				Memphis			ROW
3	25038	18219	15622		18788	8765	7504		34099	22430	17878		3
4	247	129	203		110	73	60		266	176	135		4
5	1287	936	611		711	204	178		1308	1021	847		5
6	23504	17154	14808		17967	8488	7266		32525	21233	16896		6

=COLUMN(cell reference)

Excel returns 10 as the **COLUMN** position for J3



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1		Nashville				Knoxville					Memphis			ROW	COLUMN
2		K-6	7-9	10-12		K-6	7-9	10-12		K-6	7-9	10-12			
3	Number of students	25038	18219	15622		18788	8765	7504		34099	22430	17878		3	10
4	disabled	247	129	203		110	73	60		266	176	135		4	10
5	gifted	1287	936	611		711	204	178		1308	1021	847		5	10
6	mainstream	23504	17154	14808		17967	8488	7266		32525	21233	16896		6	10

=ADDRESS(<row number>, <column number>, <level of absoluteness>**)**

1 → Absolute (the default)
2 → Absolute row, relative column
3 → Relative row, absolute column
4 → Relative

=ADDRESS(N3, O3)

			Knoxville				Memphis				ROW	COLUMN	ABSOLUTE
-12		K-6	7-9	10-12		K-6	7-9	10-12					
15622		18788	8765	7504		34099	22430	17878			3	10	J3
203		110	73	60		266	176	135			4	10	J4
611		711	204	178		1308	1021	847			5	10	J5
14808		17967	8488	7266		32525	21233	16896			6	10	J6

Omitting the level of absoluteness gives the default level (fully absolute)

=ADDRESS(N3, O3, 4)

			Knoxville				Memphis				ROW	COLUMN	ABSOLUTE	RELATIVE
-12		K-6	7-9	10-12		K-6	7-9	10-12						
15622		18788	8765	7504		34099	22430	17878			3	10	J3	J3
203		110	73	60		266	176	135			4	10	J4	J4
611		711	204	178		1308	1021	847			5	10	J5	J5

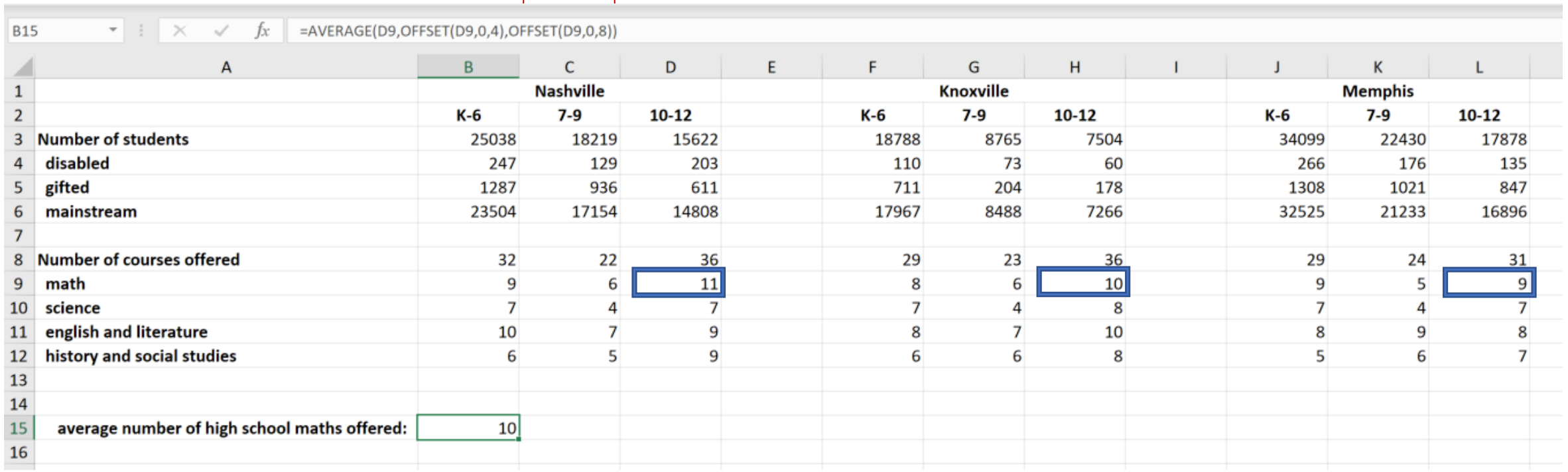
Here we set the level of absoluteness to 4 to get a relative address

=OFFSET(<cell reference>, <offset rows>, <offset columns>**)**

Suppose we want to find the **average number of high school math courses** offered across three cities.
We can use offsets to get our second and third values relative to the location of our first value.

Start at D9 and go down 0 and over 4

Start at D9 and go down 0 and over 8

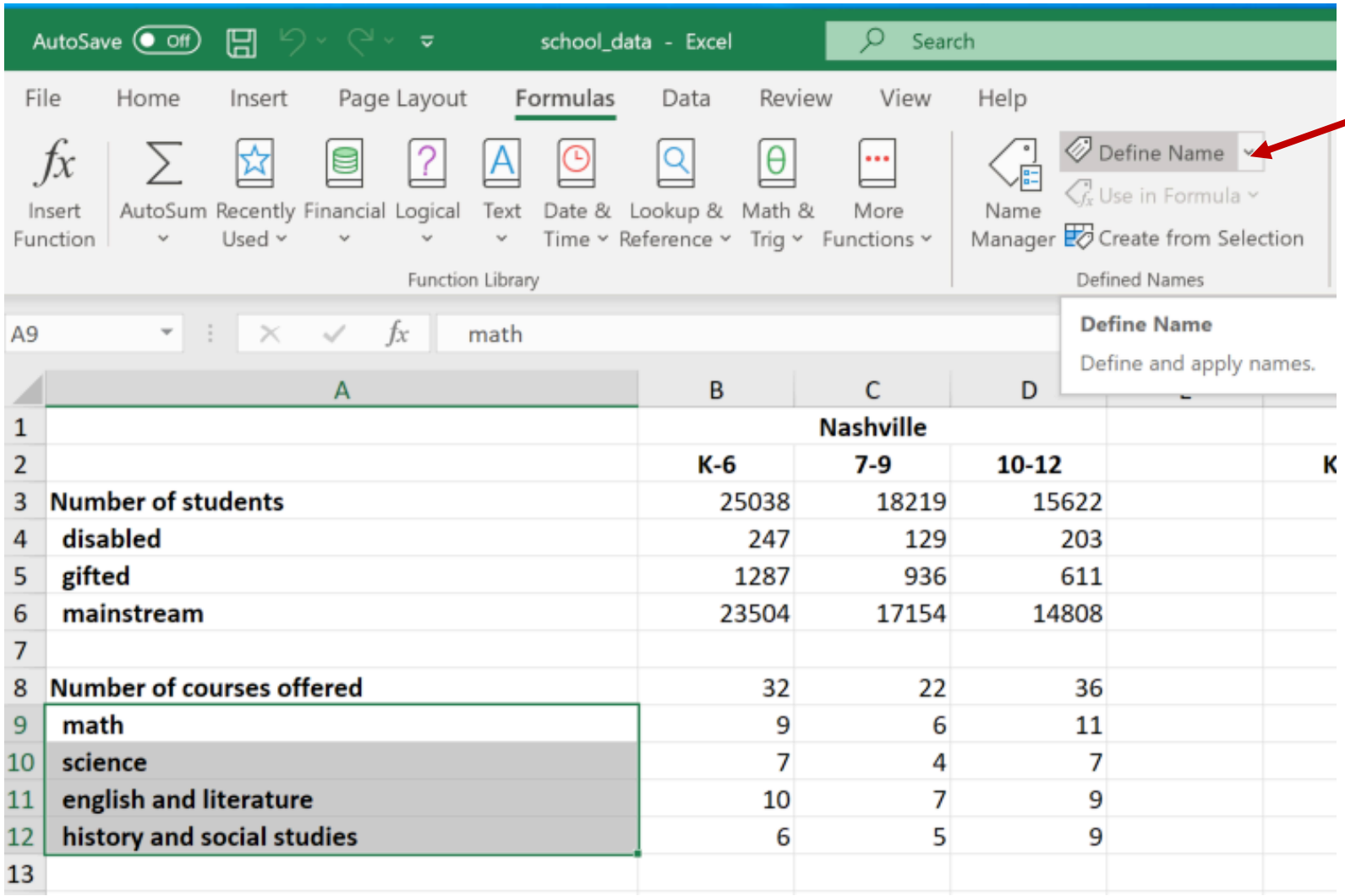


B15 =AVERAGE(D9,OFFSET(D9,0,4),OFFSET(D9,0,8))

	A	B	C	D	E	F	G	H	I	J	K	L
1			Nashville				Knoxville				Memphis	
2		K-6	7-9	10-12		K-6	7-9	10-12		K-6	7-9	10-12
3	Number of students	25038	18219	15622		18788	8765	7504		34099	22430	17878
4	disabled	247	129	203		110	73	60		266	176	135
5	gifted	1287	936	611		711	204	178		1308	1021	847
6	mainstream	23504	17154	14808		17967	8488	7266		32525	21233	16896
7												
8	Number of courses offered	32	22	36		29	23	36		29	24	31
9	math	9	6	11		8	6	10		9	5	9
10	science	7	4	7		7	4	8		7	4	7
11	english and literature	10	7	9		8	7	10		8	9	8
12	history and social studies	6	5	9		6	6	8		5	6	7
13												
14												
15	average number of high school maths offered:	10										
16												

Named Regions

It can be useful to assign a name to a range of data. First select the data you want to assign a name to. Next, from the top menu go **to Formulas → Define Name**



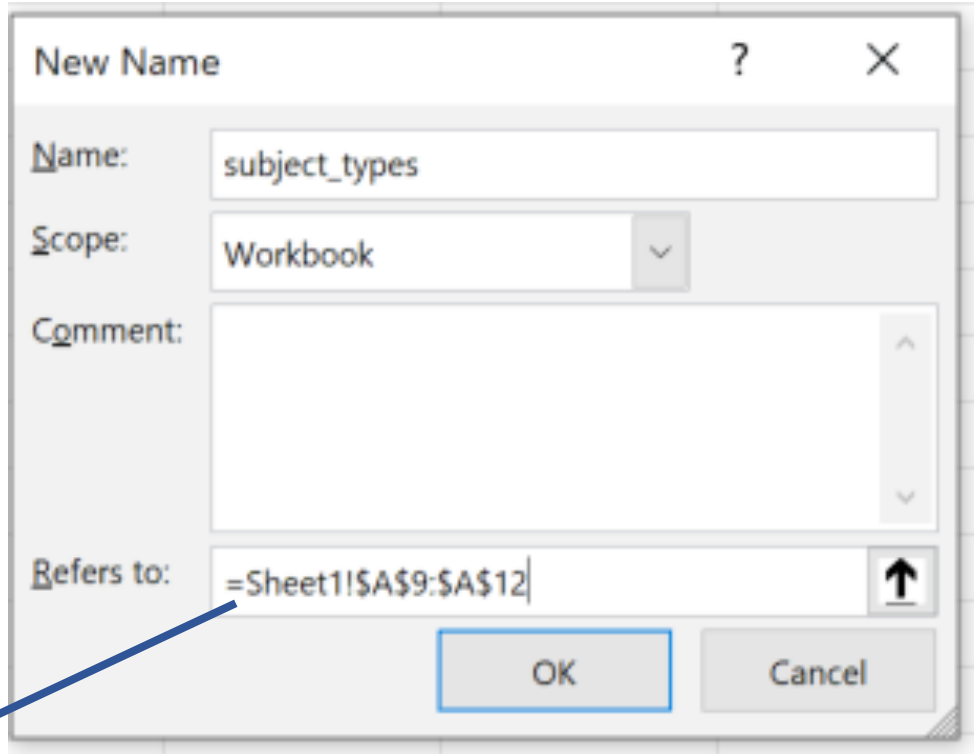
	A	B	C	D
1			Nashville	
2		K-6	7-9	10-12
3	Number of students	25038	18219	15622
4	disabled	247	129	203
5	gifted	1287	936	611
6	mainstream	23504	17154	14808
7				
8	Number of courses offered	32	22	36
9	math	9	6	11
10	science	7	4	7
11	english and literature	10	7	9
12	history and social studies	6	5	9
13				

From the Formulas menu find **Define Name**

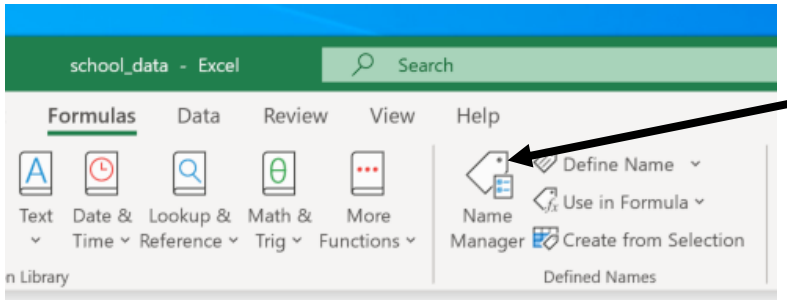
Select the range you want to name

Named Regions

	A
1	
2	
3	Number of students
4	disabled
5	gifted
6	mainstream
7	
8	Number of courses offered
9	math
10	science
11	english and literature
12	history and social studies



Complete the New Name Dialogue Box to give your region a Name and Scope, and set the area.



You can change these later if you need to in the Name Manager.

You can use the named region in place of referencing a cell range. In the example below, a named region (student_counts) has been created for B3:L3 (the light blue highlighted row)

max cohort1 is calculated using the cell range

=MAX(B3:L3)

	B	C	D	E	F	G	H	I	J	K	L
		Nashville				Knoxville				Memphis	
		K-6	7-9	10-12		K-6	7-9	10-12		K-6	7-9	10-12
		25038	18219	15622		18788	8765	7504		34099	22430	17878
		247	129	203		110	73	60		266	176	135
		1287	936	611		711	204	178		1308	1021	847
		23504	17154	14808		17967	8488	7266		32525	21233	16896
		32	22	36		29	23	36		29	24	31
		9	6	11		8	6	10		9	5	9
		7	4	7		7	4	8		7	4	7
		10	7	9		8	7	10		8	9	8
		6	5	9		6	6	8		5	6	7
	max cohort1:	=MAX(B3:L3)										
	max cohort2:											

max cohort2 is calculated using the name created for that region

=MAX(student_counts)

	B	C	D	E	F	G	H	I	J	K	L
		Nashville				Knoxville				Memphis	
		K-6	7-9	10-12		K-6	7-9	10-12		K-6	7-9	10-12
		25038	18219	15622		18788	8765	7504		34099	22430	17878
		247	129	203		110	73	60		266	176	135
		1287	936	611		711	204	178		1308	1021	847
		23504	17154	14808		17967	8488	7266		32525	21233	16896
		32	22	36		29	23	36		29	24	31
		9	6	11		8	6	10		9	5	9
		7	4	7		7	4	8		7	4	7
		10	7	9		8	7	10		8	9	8
		6	5	9		6	6	8		5	6	7
	max cohort1:	34099										
	max cohort2:	34099										

=MATCH(<lookup value>, <lookup array>, <match type>**)**

match type = 1 (exact or next smallest)

match type = 0 (exact)

match type = -1 (exact or next largest)

Note: Match returns a *position*

Where is science on the list of subject types?

1
2
3
4

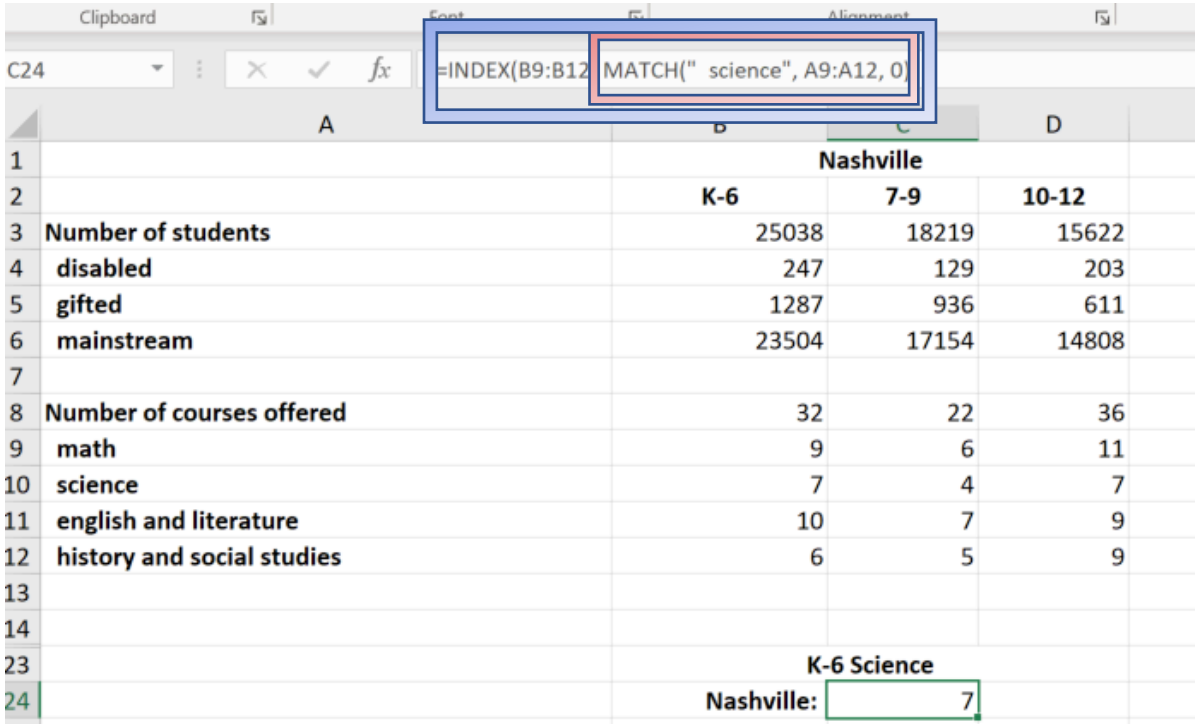
B18 =MATCH(" science", subject_types, 0)

	A	B	C	D	E
1			Nashville		
2		K-6	7-9	10-12	
3	Number of students	25038	18219	15622	
4	disabled	247	129	203	
5	gifted	1287	936	611	
6	mainstream	23504	17154	14808	
7					
8	Number of courses offered	32	22	36	
9	math	9	6	11	
10	science	7	4	7	
11	english and literature	10	7	9	
12	history and social studies	6	5	9	
13					
14					
15	average number of high school maths offered:	10			
16		6			
17					
18	Position of Science in List of course types:	2			
19					

The MATCH() function is especially powerful when combined with INDEX().
=INDEX() returns a value at a known position in either one or two dimensions:

=INDEX(<array>, MATCH(<value>, <lookup region>, <type of match>)

1. **Match()** the specified value in the lookup region and return its position.
2. Use that position as the second input to lookup the value with **Index()**



	A	B	C	D
1			Nashville	
2		K-6	7-9	10-12
3	Number of students	25038	18219	15622
4	disabled	247	129	203
5	gifted	1287	936	611
6	mainstream	23504	17154	14808
7				
8	Number of courses offered	32	22	36
9	math	9	6	11
10	science	7	4	7
11	english and literature	10	7	9
12	history and social studies	6	5	9
13				
14				
23			K-6 Science	
24		Nashville:	7	

INDEX(MATCH())
functions like
VLOOKUP() / HLOOKUP()

Exercises

Use the metro_budget spreadsheet to answer the following questions.

1. What is the row position for the Sports Authority 2018 Budget amount?
2. What is the column position for the Emergency Communication Center's 2019 Actual Spending?
3. Use a formula with ROW and COLUMN to find the Address of the Mayor's Office actual spending for 2017?
4. Create a new column at the end of the data called Avg_diff. Use the OFFSET() function to find the average budget/actual differences across all three years. Note that a negative number means that the department spent more than was budgeted. Copy this formula down to get the average diff for all departments. Do you see a trend?
5. Look for the table below at the bottom of the spreadsheet. Fill in the cells to report on budget/actual spending differences for select boards and commissions. Use Index() and Match together to fill in the cells.

53				
54				
55	Department	FY17_diff	FY18_diff	FY19_diff
56	Community Education Commission			
57	Community Oversight Board			
58	Election Commission			
59	Historical Commission			
60	Human Relations Commission			
61	Planning Commission			
62				
63				
64				
65				