

CS 105 Midterm Exam #2
Fall 2014 Exam (w/ Solutions)

For the next three questions, consider the following Microsoft Office documentation to a built-in function in Excel that you have not seen as part of CS 105:

FIND

FIND locates one text string within a second text string, and return the number of the starting position of the first text string from the first character of the second text string. FIND is case sensitive.

Syntax

FIND(find_text, within_text, [start_num])

find_text Required. The text you want to find.

within_text Required. The text containing the text you want to find.

start_num Optional. Specifies the character at which to start the search. The first character in **within_text** is character number 1. If you omit **start_num**, it is assumed to be 1.

Examples:

	A
1	Data
2	Miriam McGovern

Formula: =FIND("M",A2) Result: 1

Formula: =FIND("m",A2) Result: 6

Formula: =FIND("M",A2,3) Result: 8

- Which of the following returns the largest number?
 - =FIND("H", "Hello")
 - =FIND("e", "Hello")
 - =FIND("l", "Hello")
 - =FIND("o", "Hello")
 - Multiple answers return the same, largest number.
- What is the value returned by the formula =FIND("n", "Illinois")?
 - 1
 - 2
 - 3
 - 4
 - 5
- What is the value returned by the formula:

=FIND("Ill", "Illinois") - FIND("ino", "Illinois")?
 - 3
 - 1
 - 0
 - 1
 - 3

The following spreadsheet contains historical data on the average price of crude oil. *Note that some rows are excluded to save space, but data exists in all rows from 2 to 69.*

	A	B	C	D	E
1	Year	Average Price (USD\$/Barrel)	Percent Change (Year over Year)	Percent Change (vs 1946)	Inflation-Adjusted Price
2	1946	\$ 1.63	---		
3	1947	\$ 2.16			
4	1948	\$ 2.77			
5	1949	\$ 2.77			
...			
67	2011	\$ 87.04			
68	2012	\$ 86.46			
69	2013	\$ 91.17			

4. Which formula correctly returns the year of the highest average oil price?

- A. =INDEX (A2 : B69 , MATCH (MAX (A2 : A69) , A2 : A69 , 0) , 1)
- B. =INDEX (A2 : A69 , MATCH (MAX (B2 : B69) , B2 : B69 , 0) , 1)
- C. =INDEX (B2 : B69 , MATCH (MAX (B2 : B69) , B2 : B69 , 0) , 1)
- D. =INDEX (B2 : B69 , MATCH (MAX (A2 : A69) , A2 : A69 , 0) , 1)
- E. =INDEX (B2 : B69 , MATCH (MAX (B2 : B69) , A2 : A69 , 0) , 1)

5. Column C requires the calculation of the percentage change from the previous years' price. As shown in lecture, the percentage change is calculated by the formula:

$$([New Value] - [Old Value]) / [Old Value]$$

Which formula can be entered into c3, and then be copied and pasted into c4:c69, to generate the percentage change in prices from the previous year?

- A. =(B3-B2) / B2
- B. =(\$B\$3-B2) / B2
- C. =(B3-\$B\$2) / \$B\$2
- D. =(\$B\$3-\$B\$2) / \$B\$2

6. Column D requires the calculation of the percentage change from 1946 (Row 2) for each year. Using the same method as the previous question, which formula can be entered into d2, and then be copied and pasted into d3:d69, to generate the correct result?

- A. =(B2-B2) / B2
- B. =(\$B\$2-B2) / B2
- C. =(B2-\$B\$2) / \$B\$2
- D. =(\$B\$2-\$B\$2) / \$B\$2

7. Which formula correctly returns the percentage change average crude oil price from the year 2002 to the year 2003?

- A. =INDEX (2003 , A2 : D69 , 1)
- B. =MATCH (2003 , A2 : D69 , 0)
- C. =INDEX (2003 , MATCH (2003 , A2 : D69 , 0) , 1)
- D. =VLOOKUP (2003 , A2 : D69 , 3 , FALSE)
- E. =VLOOKUP (2003 , A2 : D69 , 4 , FALSE)

This page continues from the crude oil prices spreadsheet from the previous page, which has the following spreadsheet design:

	A	B	C	D	E
1	Year	Average Price (USD\$ /Barrel)	Percent Change (Year over Year)	Percent Change (vs 1946)	Inflation- Adjusted Price
...

When one compares historical prices, one often wants to adjust for inflation so that the prices are compared in terms of the current value of a dollar adjusted for inflation. Since 1946, the average inflation has been approximately 3.2% per year.

In order to calculate the inflation-adjusted price, the following mathematical formula can be used:

$$\text{Price}_{(\text{Inflation Adjusted})} = \text{Price}_{(\text{Original})} \times (1 + (\text{Average Inflation}))^{(\text{Years Passed})}$$

As an example, the inflation-adjusted price for a barrel of 1946 oil:

$$\text{Price}_{(\text{Inflation Adjusted})} = \$1.63 \times (1 + 0.032)^{(2014-1946)}$$

$$\text{Price}_{(\text{Inflation Adjusted})} = \$1.63 \times (1.032)^{(68)}$$

$$\text{Price}_{(\text{Inflation Adjusted})} = \$13.88$$

8. Which formula can be entered into E2, and then be copied and pasted into E3:E69, to calculate the inflation-adjusted price?

A. `=B2 * (1 + 0.032) ^ (2014-A2)`

B. `=B2 * (1 + 0.032) ^ (2014-A2)`

C. `=B2 * (1 + 0.032) ^ (2014-A2)`

D. `=B2 * (1 + 0.032) ^ (2014-A2)`

9. Which formula correctly returns the inflation-adjusted price from the year with the highest non-adjusted price (Column B)?

A. `=VLOOKUP (MAX (B2 : B69) , E2 : E69 , 1 , FALSE)`

B. `=VLOOKUP (MAX (B2 : B69) , B2 : E69 , 3 , FALSE)`

C. `=VLOOKUP (MAX (B2 : B69) , B2 : E69 , 4 , FALSE)`

D. `=VLOOKUP (MAX (B2 : B69) , A2 : E69 , 4 , FALSE)`

E. `=VLOOKUP (MAX (B2 : B69) , A2 : E69 , 5 , FALSE)`

10. Earlier this month, the closing price of crude oil was \$77.40 per barrel. Which formula correctly calculates the **increase in price (the dollar amount)**, as measured in 2014 dollars) between the inflation-adjusted price of 1946 and the price of crude oil earlier this month?

A. `=(77.40 - E2) / E2`

B. `=(E2 - 77.40) / 77.40`

C. `=E2 / 77.40`

D. `=77.40 / E2`

E. `=77.40 - E2`

FR1. Write a formula that returns the average inflation-adjusted price across all of the years in (10pts) the data set.

...answer this question on your free response answer sheet as question FR1.

`=AVERAGE(E2:E69)`

In various athletics events that contain a subjective assessment of performance (such as diving, gymnastics, and others), a multi-judge panel is used and the lowest and highest scores are dropped. For example, consider an event where five judges judged a performance:

	A	B	C	D	E	F	G	H	I	J	K
1		Judges							Adj.		Final
2	Performer	#1	#2	#3	#4	#5	High	Low	Average	DD	Score
3	Alice	8.4	8.2	8.5	8.1	8.3				4.5	
4	Bob	7.9	8.4	6.1	8.1	9.2				4.0	
5	Charlie	6.2	6.4	6.3	6.9	6.8				5.5	
6	Eve	6.6	7.9	5.4	6.8	7.3				5.0	

11. Which formula can be used to in G3 to calculate the highest judge score for the performer?
- =SUM(B3:F3)
 - =COUNT(B3:F3)
 - =AVERAGE(B3:F3)
 - =MAX(B3:F3)**
 - =MIN(B3:F3)
12. Which formula can be used to in H3 to calculate the lowest judge score for the performer?
- =SUM(B3:F3)
 - =COUNT(B3:F3)
 - =AVERAGE(B3:F3)
 - =MAX(B3:F3)
 - =MIN(B3:F3)**
13. Which formula can be used in I3 to calculate the “Adjusted Average”, the average of all scores after the highest and lowest scores are dropped?
- =AVERAGE(B3:F3)
 - =AVERAGE(B3:F3) - G3 - H3
 - =AVERAGE(B3:F3) - (G3 + H3) / 2
 - =AVERAGE(B3:H3) - AVERAGE(G3 + H3)
 - =(SUM(B3:F3) - SUM(G3 + H3)) / 3**
14. The “Final Score” (Column K) is calculated by taking the “Adjusted Average” and multiplying that score by the Degree of Difficulty (DD, shown in Column J). Which formula(s) can be used in K3, and can be copied and pasted into K4:K6, to calculate the “Final Score”?
- =I3 * J3
 - =\$I3 * \$J3
 - =\$I\$3 * \$J\$3
 - (A) and (B) are both correct**
 - (A), (B), and (C) are all correct
15. With the setup of the spreadsheet above, is it possible to use VLOOKUP to find the name of the performer with the highest final score?
- Yes, VLOOKUP can be used
 - No, it is not possible to use VLOOKUP**

Suppose you opened your own bakery and sold three types of treats: cookies, muffins, and cupcakes. As a sales tactic, you charge a different price per item based on the quantity of the item a customer buys. For example, if a customer orders 1 or 2 cookies, the cookies are \$1.00 each; if the customer orders 3 or 4 cookies, the cookies are \$0.80 each; 5-9 cookies are \$0.75 each; and 10 or more cookies are \$0.60.

Your Excel Workbook contains two sheets. The first sheet, Menu, contains the prices of your items based on the minimum quantity ordered (as explained above):

	A	B	C	D	E
1		Minimum Quantity / Price per Item			
2	Item Type	1	3	5	10
3	Cookie	\$ 1.00	\$ 0.80	\$ 0.75	\$ 0.60
4	Muffin	\$ 2.00	\$ 1.90	\$ 1.75	\$ 1.50
5	Cupcake	\$ 3.00	\$ 2.75	\$ 2.50	\$ 2.25
Sheet Name:		Menu	Order		

The second sheet contains the order processing logic, where data is entered in order to process the order:

	A	B	C	D	E	F
1		Quantity			Column	Total
2	Cookies Ordered:	3		Cookie Sub-Total:		
3	Muffins Ordered:	1		Muffin Sub-Total:		
4	Cupcakes Ordered:	12		Cupcake Sub-Total:		
5					Grand Total:	
Sheet Name:		Menu	Order			

16. Which formula can be used in **Order!E2** to find the correct column number within **Menu!B2:E2** to be used to calculate the price based on the quantity ordered? (For example, an order of 4 cookies would use the column number **2** within **B2:E2** since column the second column in **B2:E2** represents a quantity of 3-4 cookies ordered.)

- A. =MATCH(Order!B2, Menu!B\$2:E\$2, 0)
- B. =MATCH(Order!B2, Menu!B\$2:E\$2, 1)
- C. =INDEX(Order!A\$3:A\$5, MATCH(Order!B2, Menu!B\$2:E\$2, 1), 0)
- D. =INDEX(Order!A\$3:A\$5, MATCH(Order!B2, Menu!B\$2:E\$2, 0), 1)
- E. =INDEX(Order!A\$3:A\$5, MATCH(Order!B2, Menu!B\$2:E\$2, 1), 1)

17. Suppose you copied your formula from the previous question (cell **E2**) and pasted it into **E3** and **E4**. Will **E3** and **E4** have formulas that calculate the correct values?

- A. Yes
- B. No

FR2. Write a formula that can be used in **F2** to calculate the total price for **all of the cookies** purchased (not just the price for one cookie, but **all** the cookies in the order). (18pts)

In writing this formula, you should assume that cell **E2** has been filled in correctly. It is **not necessary** to make your formula able to be copied and pasted into other cells. (It just needs to work in **F2**.)

...answer this question on your free response answer sheet as question FR2.

=Order!B2 * INDEX(B3:E3, 1, Order!E2)

Suppose you have been hired as a consultant on a major renovation of a building. After some research, you identified several ways to reduce the energy usage in the building:

	A	B	C	D	E
1	Project / Renovation	Initial Cost	Yearly Savings	Recovery	Efficiency
2	LED Lighting	\$ 300,000	\$ 12,000		
3	Updated HVAC System	\$ 800,000	\$ 40,000		
4	High-R Windows	\$ 1,200,000	\$ 60,000		
5	Motion Detection Lighting	\$ 1,600,000	\$ 40,000		
6	Green Rooftop	\$ 2,100,000	\$ 70,000		
7	Low-Energy Elevators	\$ 3,700,000	\$ 200,000		

18. Which column(s) can be searched correctly when using **TRUE** as the value for the fourth parameter (*range_lookup*) in the **VLOOKUP** function?
- Only Column A
 - Only Column B
 - Only Column C
 - Only columns B and C
 - Columns A, B, and C
19. Which column(s) can be searched correctly when using **FALSE** as the value for the fourth parameter (*range_lookup*) in the **VLOOKUP** function?
- Only Column A
 - Only Column B
 - Only Column C
 - Only columns B and C
 - Columns A, B, and C
20. Column D requires the calculation of the “Capital Recovery”, the number of years it will take for the yearly savings to add up to the initial cost of the project. For example, the “Updated HVAC System” takes 20 years to recover the initial capital ($\$40,000 * 20 = \$800,000$). Which formula can be used in **D2** to calculate the Capital Recovery?
- $=B2 * C2$
 - $=B2 - C2$
 - $=C2 - B2$
 - $=B2 / C2$
 - $=C2 / B2$
21. Column E requires the calculation of an “Efficiency” of a project, which is defined to be 100 times the yearly savings divided by the initial cost of the project. Which formula can be used in **E2**, and then copied and pasted into **E3:E7**, to calculate Efficiency?
- $=100 * (B2 / C2)$
 - $=100 * (B$2 / C$2)$
 - $=100 * ($B2 / $C2)$
 - $=100 * ($B$2 / C2)$

This page continues to use the same spreadsheet as the previous page. At this point, you should assume that all cells are now completed:

	A	B	C	D	E
1	Project / Renovation	Initial Cost	Yearly Savings	Recovery	Efficiency
2	LED Lighting	\$ 300,000	\$ 12,000	25	4
...

22. Which formula can be used to find the name of the project with the highest “Efficiency” rating?

- A. =MAX(E:E)
- B. =MATCH(MAX(E:E), E:E, 1)
- C. =VLOOKUP(A:E, MAX(E:E), 5, FALSE)
- D. =VLOOKUP(MAX(E:E), A:E, 5, FALSE)
- E. =INDEX(A:A, MATCH(MAX(E:E), E:E, 0), 1)

23. Which formula finds the total number of projects where the initial cost is less than \$2,000,000?

- A. =COUNT(B:B)
- B. =SUM(B:B)
- C. =COUNTIFS(B:B, "<2000000")
- D. =SUMIFS(B:B, B:B, "<2000000")
- E. =IF(B:B > 2000000, 1, 0)

24. Which formula finds the total initial cost of all projects that have an “Efficiency” rating of at least 5?

- A. =COUNTIFS(E:E, ">=5")
- B. =SUMIFS(E:E, B:B, ">=5")
- C. =SUMIFS(B:B, E:E, ">=5")
- D. =IF(E:E <= 5, B:B, 0)
- E. =IF(B:B <= 5, E:E, 0)

25. Suppose we created a new column, Column F, that describes the project as either “Great” (Efficiency of 10 or more), “Good” (Efficiency between 10 and 4), or “Poor” (Efficiency of 4 or less). Which formula could be used in F2 to display the correct description of the project?

- A. =IF(E2 > 10, "Great", E2 < 4, "Poor", "Good")
- B. =IF(E2 > 10, "Great", IF(10 < E2 < 4, "Good", "Poor"))
- C. =IF(E2 > 4, "Good", IF(E2 > 10, "Great", "Poor"))
- D. =IF(E2 > 4, "Good", IF(E2 < 4, "Poor", "Great"))
- E. =IF(E2 < 4, "Poor", IF(E2 > 10, "Great", "Good"))

FR3. Write a formula that finds the total initial cost of all projects that are rated as “Great”. (10pts)

In writing this formula, you should assume that Column F has the correct rating for each of the projects (described in the previous question).

...answer this question on your free response answer sheet as question FR3.

=SUMIFS(B2:B7, F2:F7, "Great")

The University of Illinois is part of the Big Ten Conference, a collection of fourteen different universities in or around the Midwest. The Universities that make up the Big Ten are shown the following sheet, along with the year they joined the Big Ten Conference:

	A	B	C	D	E	F
1	University of Illinois at Urbana–Champaign	1896				
2	Indiana University	1899				
3	University of Iowa	1899				
4	University of Maryland	2014				
5	University of Michigan	1896				
6	Michigan State University	1950				
7	University of Minnesota	1896				
8	University of Nebraska–Lincoln	2011				
9	Northwestern University	1896				
10	The Ohio State University	1912				
11	Pennsylvania State University	1990				
12	Purdue University	1896				
13	Rutgers University	2014				
14	University of Wisconsin–Madison	1896				

26. What is the result of the formula `=COUNTIFS(A:A, "University*")`?

- A. 0
- B. 3
- C. 7
- D. 13
- E. 14

27. What is the result of the formula `=INDEX(A:A, COUNTIFS(B:B, 1896))`?

- A. University of Illinois at Urbana–Champaign
- B. Indiana University
- C. Michigan State University
- D. Rutgers University
- E. University of Wisconsin–Madison

28. Suppose the formula `=IF(B$1=1896, "Founding Member", "---")` was entered into c1. What would be the value of c1 once the formula was evaluated by Excel?

- A. ---
- B. Founding Member
- C. University of Illinois at Urbana–Champaign
- D. #ERR!, #VAL!, or some other error message by Excel

29. Suppose the cell with the formula from the previous question (c1) was copied and pasted into c2:c14. What would be the value of the c2?

- A. ---
- B. Founding Member
- C. University of Illinois at Urbana–Champaign
- D. #ERR!, #VAL!, or some other error message by Excel

For the next three questions, consider the following sheet of United Nations population data that was presented in lecture during two different lectures. As in lecture, there are over 2,000 rows that include data from over 200 different countries for each year from 2000 until 2010 (inclusively, a total of 11 years). The sheet presented here includes only two columns of data, the population of the country and its GDP, as shown below.

	A	B	C	D	E	F
1	Country	Date	Population	GDP (MM\$)		
2	Afghanistan	7/1/2000	25,950,816	2,281		
3	Afghanistan	7/1/2001	26,697,430	2,461		
...		
12	Afghanistan	7/1/2010	34,385,068	17,243		
13	Albania	7/1/2000	3,071,856	3,686		
...		
2239	United States	7/1/2006	301,231,207	13,314,500		
2240	United States	7/1/2007	304,093,966	13,961,800		
...		

30. If a pivot table was set up with the row values coming from the “Country” column and the column values coming from the “Date” values, how many times would “United States” appear in the pivot table?
- A. 0
 - B. 1**
 - C. 10
 - D. 11
 - E. 100
31. Suppose you wrote an INDEX/MATCH function to look for an exact match of “Afghanistan” in column **A** and then return the population (column **C**) for the row that was selected. What value would be returned?
- A. 25,950,816**
 - B. 26,697,430
 - C. 34,385,068
 - D. 3,071,856
 - E. There is not enough information to determine what row Excel would return.
32. Suppose you wrote a VLOOKUP function to look for an exact match of “Afghanistan” in column **A** and then return the population (column **C**) for the row that was selected. What value would be returned?
- A. 25,950,816**
 - B. 26,697,430
 - C. 34,385,068
 - D. 3,071,856
 - E. There is not enough information to determine what row Excel would return.

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