CS 105 Final Exam
Practice Exam (Spring 2014 Final Exam)

In biology, messenger RNA (mRNA) is a family of RNA molecules that convey genetic information from DNA to the ribosome. Since this process is critical for protein production and gene expression, analysis on mRNA is extremely common. **For the next ten questions**, you will be doing some simple analysis on mRNA. Don't worry, you won't need to know anything about biology (and knowing the biology behind mRNA won't help you here!).

mRNA, like all RNA, is a series of nucleotides that are represented by the letters G, A, U, and C. For example, the following string is a representation of some mRNA:

```
var mRNA = "GAAAUGCCAUUCAAAGAUUAA";
```

Instead of trying to make sense out of a long string, mRNA is often read as a series of **codes**. These codes are created by simply dividing the mRNA into regions that each contains exactly three nucleotides (G, A, U, or C) For example, the string introduced earlier can be divided up into these codes by looking at exactly three characters at a time:

1st Code	2nd Code	3rd Code	4th Code	5th Code	6th Code	7th Code
GAA	AUG	CCA	UUC	AAA	GAU	UAA

1. We can express this sequence of codes as an array in JavaScript:
   ```
   var a = ["GAA", "AUG", "CCA", "UUC", "AAA", "GAU", "UAA"]
   ```

   In JavaScript, which of the following accesses the element of the array `a` with the value "`CCA`"?
   - A. `a[1]`
   - B. `a[2]`
   - C. `a[3]`
   - D. `a["CCA"]`
   - E. `"CCA"[a]`

2. Suppose we want to search the array from the previous question for a specific code. If we want the search to be correct while running as fast as possible, what kind of search can we use on array `a`?
   - A. A binary search
   - B. A linear search

3. Suppose we use a selection sort to sort the codes in array `a` before performing the search. After one pass (iteration) of the selection sort, which of the following is true?
   - A. The "AAA" code will be the first element in the array
   - B. The middle element, "GAA", will be the 4th (middle) element in the array
   - C. The location of every element appearing after "UUC" has been shifted to the left by one index (eg: "AAA" moves from the 5th to the 4th Code in the table above)
   - D. The first half of the array will never be visited again, since it was thrown out
   - E. The last half of the array will never be visited again, since it was thrown out

For the next three questions, consider the following JavaScript function that takes a string containing a series of nucleotides (G, A, U, or Cs) and processes the string:

```
1  function process(mRNA)
2  {
3     var result = "";
4     for (var i = 0; i < mRNA.length; i++)
5     {
6        result += mRNA[i];
7
8        // Lines 7-10 are initially empty, for use in
9        // in later question.
10
11    }
12
13    return result;
14 }
```

4. If Lines 7-10 are left blank, what does the function `process()` return when the value of the input `mRNA` parameter is `"GAAAUGCCAUUCAAAGAUUAA"`?
   A. `""`, an empty string
   B. `21`, the length of the string
   C. `"GAA"`, a string containing only the first code
   D. `"GAAAUGCCAUUCAAAGAUUAA"`, a string containing the full mRNA input string
   E. `["GAA", "AUG", "CCA", "UUC", "AAA", "GAU", "UAA"],` an array of codes

5. Suppose we want the `process()` function to return **only the first code** contained in the input string. What JavaScript code could be added in Lines 7-10 in order to ensure that only the first code is returned?

   A.
   ```
   if  (i == 2)
   {
       return mRNA[i];
   }
   ```
   B.
   ```
   if  (i == 2)
   {
       return result;
   }
   ```

   C.
   ```
   if  (i == 3)
   {
       return mRNA[i];
   }
   ```
   D.
   ```
   if  (i == 3)
   {
       return result;
   }
   ```

6. Instead of replacing Lines 7-10 with your answer from the previous question, suppose that Lines 7-10 were replaced with the following code:

```
7        if (mRNA[i]  == "U")
8        {
9            print("RNA!");
10       }
```

If the print() function prints a value to the screen, how many times is "RNA!" printed given the input mRNA string of `"GAAAUGCCAUUCAAAGAUUAA"`?
   A. 0
   B. 1
   C. 2
   D. 3 or more times

Each of the 64 possible codes (combinations of the nucleotides G, A, U, or C) has a specific translation to an amino acid. For the next four questions, consider the following table describing the translation from genetic code to amino acid and category.

	A	B	C	D	E	F
1	*My Code:*		➔	➔		
2						
3	Code	First	Second	Third	Amino Acid	Category
4	AAA	A	A	A	Lysine (K)	Basic
5	AAC	A	A	C	Asparagine (N)	Polar
6	CAA	C	A	A	Glutamine (Q)	Polar
7	CUG	C	U	G	Leucine (L)	Nonpolar
8	GAA	G	A	A	Glutamic acid (E)	Acidic
...	...	...	...	...	...	...
67	UUU	U	U	U	Phenylalanine (F)	Nonpolar

7. Suppose we want the user to enter their code into cell B1 and then the amino acid appears in E1. Which formula could be used in E1 to generate the correct result?
   A. `=VLOOKUP(B1, A4:F67, 5, FALSE)`
   B. `=INDEX(E:E, MATCH(B1, B:D, 0))`
   C. `=INDEX(E:E, MATCH(B1, A:A, -1))`
   D. `=IF(A4=B1, E4, F4)`
   E. `=IF(B1=A4, E4, F4)`

8. Instead of using user input, suppose we want to find out the number of codes that translate to an amino acid that has been categorized as "Nonpolar" (column F). Which formula will return the total number of codes that are nonpolar?
   A. `=COUNT(A:A)`
   B. `=SUMIF(A:A, "Nonpolar", A:A)`
   C. `=COUNTIF(A:A, "Nonpolar")`
   D. `=SUMIF(F:F, "Nonpolar", A:A)`
   E. `=COUNTIF(F:F, "Nonpolar")`

9. Continuing from the previous question, which formula will find the total number of codes that are both nonpolar **and** the first letter of their code is "U"?
   A. `=COUNT(A:A)`
   B. `=SUMIFS(B:B, "U", F:F, "Nonpolar")`
   C. `=COUNTIFS(B:B, "U", F:F, "Nonpolar")`
   D. `=COUNTIF(B:B, "U") + COUNTIF(F:F, "Nonpolar")`
   E. `=IF( B4 = "U" && F4 = "Nonpolar", ct++ )`

FR1. Write a formula for **F1** that displays "Basic" if the user entered a code in **B1** that
10 pts. translates to an entry with the "Basic" category. Otherwise, display "Not Basic" if the code in **B1** translates to any other category.

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

In Champaign-Urbana, there are two airports within 60 miles:
- CMI: Willard Airport (Savoy, IL)
- BMI: Central Illinois Airport (Bloomington, IL)

Often, air prices differ significantly between these two airports allowing for a consumer to save some money by choosing one airport over another. **For the next three questions**, consider the following Excel sheet that lists the prices of flights from the two airports:

	A	B	C	D	E	F	G	H
1	**Airport**	**Dest.**	**Airline**	**Fare**	**Distance (mi)**			
2	CMI	Miami	American	$ 145.52	6			
3	CMI	Chicago	American	$ 67.12	6			
4	BMI	Chicago	Delta	$ 57.11	59			
5	BMI	Chicago	American	$ 56.57	59			
6	BMI	Miami	Delta	$ 133.11	59			

10. Suppose we want to find the minimum fare to Chicago. Unfortunately, Excel does not contain a `=MINIF()` function for us to use. Instead, we will populate column `F` with data such that the formula `=MIN(F:F)` will generate the minimum fare to Chicago. Which formula can be used in `F2`, and copied/pasted down to `F3:F6`, to generate a result that can be used with `=MIN(F:F)` to find the lowest fare to Chicago?
    A. `=MIN( D:D )`
    B. `=MIN( F:F )`
    C. `=IF( MIN(D:D) = D2, D2, 999999 )`
    D. `=IF( MIN(F:F) = D2, D2, 999999 )`
    E. `=IF( B2 = "Chicago", D2, 999999 )`

11. Instead of just looking at fares, suppose we are interested in both the fare and the cost of gas to get to the airport. Column E lists the number of miles each airport is away from the user. If the user's car gets 20 miles per gallon and gas costs $3.80 /gallon, what formula can be used in G2, and copied/pasted down to G3:G6, to correctly calculate the fuel cost for the travel to the airport?
    A. `=(E2/20) * 3.80`
    B. `=(20/E2) * 3.80`
    C. `=(E2/3.80) * 20`
    D. `=(3.80/E2) * 20`
    E. `=E2 * 20 * 3.80`

FR2.
10 pts. Write a formula for `H2`, which can be copied and pasted into `H3:H6`, so that the formula `=MIN(H:H)` correctly generates the **minimum total price** of travel (gas plus fare) **to Chicago** among all of the options. In your answer, you should assume that Columns `F` and `G` have been filled in correctly in accordance with the description of those columns in the previous questions (you should be using data from both column F and column G in your answer).
...answer this question on your free response answer sheet as question FR2.

12. The layout of a database is very similar to that of a spreadsheet. However, in a database, each row is called a:
    A. Key
    B. Record
    C. Schema
    D. SQL
    E. Table

13. What are the two types of keys in a database?
    A. Foreign and domestic
    B. Local and regional
    C. Foreign and local
    D. Regional and global
    E. Foreign and primary

14. In encryption, such as the encryption of web traffic over SSL/TLS, what is the result of the mathematical operation 01 XOR 11?
    A. 00
    B. 01
    C. 10
    D. 11
    E. 0111

15. The Heartbleed vulnerability made which of the following things accessible to a hacker/attacker that would normally not be accessible to the hacker/attacker?
    A. The shared certificate
    B. The client's web browser's secret
    C. The server's secret

16. In programming, an object is which of the following:
    A. An instance of a class?
    B. A collection of records in a database?
    C. A programming language like SQL?
    D. A special type of function call?
    E. A special type of an array?

17. In lecture, Prof. Cinda Heeren spoke on visualizing literature. What is the primary way visualizations are done in "viz lit"?
    A. By using machine learning to learn the story and projecting the events.
    B. By using artificial intelligence to project the expected ending.
    C. By allowing the user to select her favorite chapter in the book.
    D. By using the sentences and words only.

For the next seven questions (spanning this page and the next page), consider the following Excel workbook. For the next three questions, consider only this first spreadsheet. Note that the population column represents the city's population in millions of people.

	A	B	C	D	E	F	G
1	**City**	**State**	**Population**	**California**	**Texas**	**Illinois**	**Water**
2	New York City	New York	8.34				Atlantic
3	Los Angeles	California	3.86				Pacific
4	Chicago	Illinois	2.71				Lake Michigan
5	Houston	Texas	2.16				Gulf of Mexico
6	Phoenix	Arizona	1.49				None
7	San Antonio	Texas	1.38				None
8	San Diego	California	1.39				Pacific
9	Dallas	Texas	1.24				None
Sheet Name:	**Population**	Employment					

18. Suppose the formula `=IF($B2=D$1, $A2, 0)` is entered into cell `D2`. What value will Excel calculate for the cell `D2`?
    A. 0
    B. 8.34
    C. New York City
    D. New York
    E. California

19. After entering the formula from the previous question into `D2`, suppose we copy the cell `D2` and paste it into `D2:F9`. After pasting the formula, how many cells in the range `D2:F9` contains 0?
    A. 0
    B. 6
    C. 12
    D. 18
    E. 24

20. After pasting the formula described in the previous question into `D2:F9`, what is the value of the formula: `=COUNTA(D:D) – COUNT(D:D)`?
    A. 0
    B. 1
    C. 2
    D. 3
    E. 4

For the next four questions, continue using the spreadsheet from the previous sheet and consider this second spreadsheet in the same workbook:

	A	B	C	D	E	F
1	**City**	**Unemployed**	**Rate**			
2	Chicago	314,000				
3	Dallas	100,300				
4	Houston	185,800				
5	Los Angeles	536,500				
6	New York City	775,300				
7	Phoenix	167,000				
8	San Antonio	100,700				
9	San Diego	146,000				

Sheet Name: | Population | **Employment** |

21. What is the value of the formula: `=INDEX(Employment!A:A, 3)`?
    A. Chicago
    B. Dallas
    C. Houston
    D. Los Angeles
    E. New York City

22. Suppose we want to calculate the unemployment rate (a percentage) for each of the cities listed. For example, Chicago's unemployment rate is an unfortunate 0.116 (11.6%). Which formula can be inserted into cell `C2` to correctly calculate the unemployment for Chicago?
    A. `=100 * (B2 / (VLOOKUP(A2, Population!A2:C9, 3, FALSE) * 1000000))`
    B. `=B2 / (VLOOKUP(A2, Population!A2:C9, 3, FALSE) * 1000000)`
    C. `=100 * ((VLOOKUP(A2, Population!A2:C9, 3, FALSE) * 1000000) / B2)`
    D. `=(VLOOKUP(A2, Population!A2:C9, 3, FALSE) * 1000000) / B2`
    E. `=100 * B2 * (VLOOKUP(A2, Population!A2:C9, 3, FALSE) / VLOOKUP(A2, Population!A2:C9, 3, FALSE))`

23. Suppose we want to copy and paste cell `C2` into `C3:C9`. Which value(s) from the previous question's formula must have at least one `$` added?
          (i): `A2`   (ii): `B2`   (iii): `Population!A2:C9`
    A. (i) only
    B. (ii) only
    C. (iii) only
    D. (i) and (ii) only
    E. (i) and (iii) only

FR3.
10 pts.
Write a formula to that can go into cell `Employment!E2` which displays the **name of the state** whose city has the **lowest** unemployment rate. This formula must dynamically look at the unemployment rate, find the lowest, and not simply reference the city.
...answer this question on your free response answer sheet as question FR3.

24. What is the decimal (base 10) value of the following binary number: 101
- A. 3
- B. 5
- C. 6
- D. 7
- E. 9

25. What is the binary (base 2) value of the following decimal number: 3
- A. 011
- B. 100
- C. 101
- D. 110
- E. 111

26. In investment banking, one property of a good loan is a healthy Loan-To-Value ratio (LTV). An LTV is calculated by taking the value of the loan and dividing it by the value of the property. An LTV of 0.8 or less is considered **safe**, an LTV of 1.0 or greater is considered **dangerous**, and all other LTVs are considered **risky**. Consider three functions that return the safety of a given property given its LTV:

(i)	(ii)	(iii)

``
function safety(ltv)
{
  if (ltv >= 1.0)
  {
    return "dangerous";
  }
  else if (ltv <= 0.8)
  {
    return "safe";
  }
  else
  {
    return "risky";
  }
}
``
	``
	function safety(ltv)
	{
	  if (ltv <= 0.8)
	  {
	    return "safe";
	  }
	  else if (ltv >= 1.0)
	  {
	    return "dangerous";
	  }
	  else
	  {
	    return "risky";
	  }
	}
	``
		``
		function safety(ltv)
		{
		  if (ltv <= 0.8)
		  {
		    return "safe";
		  }
		
		  if (ltv >= 1.0)
		  {
		    return "dangerous";
		  }
		
		  return "risky";
		}
		``

Which of the function(s) will always return the correct safety rating?
- A. Only (i)
- B. Only (i) and (ii)
- C. Only (i) and (iii)
- D. Only (ii)
- E. (i), (ii), and (iii)

27. What is ASCII code?
- A. A special version of JavaScript that we are using in CS 105
- B. A universally recognized translation between letters and numbers
- C. An encryption technique that makes text hard to read
- D. A programming language used to make Android and iPhone apps
- E. The five primary colors of light used on a computer screen

For the next five questions, consider the following menu for ordering a burrito:
- A burrito with chicken or no meat (vegetarian) costs $6.20
- A burrito with any other choice of meat costs $6.40
- Guacamole can be added to the burrito for an extra charge of $1.50, unless it is a vegetarian burrito
    - A vegetarian burrito can have guacamole added without an extra charge

As an example, a chicken burrito ($6.20) with guacamole (+$1.50) costs $7.70 while a vegetarian burrito ($6.20) with guacamole (+$0.00) costs only $6.20; a steak burrito without guacamole costs $6.40 and costs $7.90 with guacamole.

28. Which of the following conditionals correctly calculates the base price of the burrito if the meat selection is contained in the variable meat as "chicken" for chicken, "none" for vegetarian, and any other value should be considered to be another meat choice?

A.
```
if (meat == "chicken" || "none")
{
    base = 6.20;
}
```
B.
```
if (meat == "chicken" || meat == "none")
{
    base = 6.20;
}
```
C.
```
if (meat == "chicken" && meat == "none")
{
    base = 6.20;
}
```
D.
```
base = 6.20;
if (meat != "chicken" || meat != "none")
{
    base += 0.20;
}
```
E.
```
base = 6.20;
if (meat != "chicken" && meat != "none")
{
    base += 0.20;
}
```

29. Which of the following conditionals correctly calculates extra charge for guacamole?

A.
```
if ("none")
{
    extra += 1.50;
}
```
B.
```
if (meat == "none")
{
    extra = 1.50;
}
```
C.
```
if (meat != "none")
{
    extra = 1.50;
}
```

For this page, instead of using a meat variable to represent what meat selection was made, suppose the order comes to the computer system as an array. The array contains an element with the name of the meat if and only if meat is in the burrito; "chicken" for chicken, "steak" for steak, and so forth. Further, the array contains an element "guacamole" if and only if the order contains guacamole. This means a chicken burrito with guacamole is ["chicken", "guacamole"] while a vegetarian burrito with guacamole is simply ["guacamole"]; a steak burrito without guacamole is only ["steak"] and becomes ["steak", "guacamole"] when guacamole is added.

Consider the following program that returns the price based on an order:

```
1  function get_price(order)
2  {
3     var price = 0.00;
4     for (var i = 0; i < order.length; i++)
5     {
6        var s = order[i];
7
8        if (order.length > 1 && s == "guacamole")
9        {
10          price += 1.50;
11       }
12       else if (s != "chicken")
13       {
14          price += 0.20;
15       }
16    }
17
18    return 6.20 + price;
19 }
```

30. Which burrito combination reveals an error (bug) in the function:
- A. `[]`
- B. `["steak"]`
- C. `["chicken"]`
- D. `["guacamole"]`
- E. `["steak", "guacamole"]`

31. Suppose a user orders a double-chicken burrito without guacamole and the system registers the order as ["chicken", "chicken"]. What is the calculated price of this burrito according to the function above?
- A. $6.20
- B. $6.40
- C. $6.60
- D. $7.70
- E. $9.20

32. Suppose the order is now ["guacamole", "guacamole"]. What is the calculated price?
- A. $6.20
- B. $6.40
- C. $6.60
- D. $7.70
- E. $9.20

Recall the ASCII chart shown to you during lecture, MP2, and Lab #4, reprinted below:

60 +					70 +											80 +										9
5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

90 +					100 +											110 +										120 +		
7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2			
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z			

Suppose we define every word to have a score, where the score for the word is found by taking the first two letters of the word and:
- if the **first letter has a larger** ASCII code than the second, **subtract** one point;
- if the **second letter has a larger** ASCII code than the first, **add** one point;
- if the letters have the **same ASCII code, do not add or subtract any points**.

After comparing the first and second letters, move on to compare the second and third letters. After the second and third, continue with the third and fourth. This process should continue until the end of the word.

For example "HALL" scores 0 points because:
- H (ASCII code 72) has a larger ASCII code than A (ASCII code 65), -1 point
- A (ASCII code 65) has a smaller ASCII code than L (ASCII code 76), +1 point
- L (ASCII code 76) has the same ASCII code as L (ASCII code 76, 0 points

33. What is the point value of the word "EXCEL"?
- A. -2
- B. -1
- C. 0
- D. 1
- E. 2

34. What is the point value of the word "ExceL" (where the first E is an uppercase letter, the middle three letters are lowercase, and the L at the end is uppercase)?
- A. -2
- B. -1
- C. 0
- D. 1
- E. 2

FR4. Write an English word that receives a point value of 2 or more.
5 pts.   *...answer this question on your free response answer sheet as question FR4.*

FR-JS. *[Note: This answer goes into FR-JS, which is the right side of your FR sheet!]*
15 pts. Write JavaScript function called **process()** that takes in a word, as a string, as an input parameter and returns the score of that word. Remember, the **.getCharCode()** function that can be applied to a string may be useful for you.
...answer this question on your free response answer sheet as question FR-JS.

For the next five questions, consider the following Excel spreadsheet of highest lifetime grossing films in the United States domestic market:

	A	B	C	D	E	F
1	Name of Movie	Gross ($m)	Year	Studio	Years Ago	$ /year
2	Avatar	760.5	2009	Fox		
3	Titanic	658.7	1997	Paramount		
4	Marvel's The Avengers	623.4	2012	BV		
5	The Dark Knight	534.9	2008	WB		
6	Star Wars: Episode 1	474.5	1999	Fox		

35. What formula returns the **gross income**, in millions ($m), that the highest grossing film has grossed?
    A. `=MAX(B:B)`
    B. `=MAX(A:F)`
    C. `=AVERAGE(B:B)`
    D. `=INDEX(A:A, MATCH(MAX(B:B), B:B, 0))`
    E. `=VLOOKUP(A:A, A:F, 2, FALSE)`

36. What formula returns the **average amount of gross income**, in millions ($m), that was made among the top file all-time highest grossing movies?
    A. `=MAX(B:B)`
    B. `=MAX(A:F)`
    C. `=AVERAGE(B:B)`
    D. `=INDEX(A:A, MATCH(MAX(B:B), B:B, 0))`
    E. `=VLOOKUP(A:A, A:F, 2, FALSE)`

37. What formula, which can be placed in `E2` and copied/pasted into `E3:E6`, calculates the total number of years that have passed since the year the movie was first released. (For example, Avatar was released in 2009, which was 5 years ago.)
    A. `=2014 - C2`
    B. `=C2 - 2014`
    C. `=2014 - MIN(C:C)`
    D. `=MIN(C:C) - 2014`

38. Assuming `E:E` are solved and correct, which formula calculates the average amount of money the movie has made per year since it has been released and can be placed in `F2`?
    A. `=B2 / E2`
    B. `=B:B / E:E`
    C. `=AVERAGE(B:B) / AVERAGE(E:E)`
    D. `=AVERAGE(B2, E2)`

39. In order to find the **name** of the movie with the earliest release, which of the following is true among the functions you have learned in CS 105?
    A. You can only use `VLOOKUP` to do this
    B. You can use either `VLOOKUP` or `INDEX/MATCH` to do this
    C. You can only use `INDEX/MATCH` to do this
    D. You can only use a pivot table to do this
    E. This is not possible to do based on what was taught in CS 105

For the next four questions, consider the lab assignment where you calculated the minimum quantity of each coin (quarters, nickels, dimes, and pennies) generated for a given amount of change. Instead of using JavaScript, consider this Excel sheet:

	A	B	C	D	E	F
1	**Coin Name**	**¢ Value**	**# of Coins**			**¢ Value**
2	Quarters	25			**Requested:**	**42**
3	Dimes	10				
4	Nickels	5				
5	Pennies	1				

For the next four questions, *consider the following answer choices:*

   A. It calculates the number of quarters **correctly** for any input in `F2`
   B. If you **round** the result of the formula **to the nearest whole number**, the answer is will be shown correctly for any input in `F2`
   C. If you take the result of the formula and **always raise the number to the next whole number if it has a fraction component** (that is, 43.01 becomes 44; 23.99 becomes 24; and 34 stays 34 since it is already a whole number), then the answer will be correct for any input in `F2`.
   D. If you take the **whole number component** (discarding any fraction/decimal component, such that 43.91 would be 43; 41.32 would be 41; 39 stays 39 since it is already a whole number), the answer will be correct for any input in `F2`.
   E. **None of these options** would result in a correct answer for any input in `F2`.

40. Suppose the formula `=$F2/B2` was used in cell `C2` to calculate the number of quarters to give to the customer. Which answer choice from the above list best describes the use of the formula?

41. Suppose the formula `=F$2/B3` was used in cell `C3` to calculate the number of quarters to give to the customer. Which answer choice from the above list best describes the use of the formula?

42. Assuming that `C2`'s value contained the correct answer for the number of quarters, the formula `=($F$2-(25*C2))/B3` was used in cell `C3` to calculate the number of quarters to give to the customer. Which answer choice from the above list best describes the use of the formula?

Suppose a `REMAINDER()` function was available to you in Excel that returns the remainder of a division operation as a whole number.   For example, `=REMAINDER(11, 4)` returns the remainder of 11/4, which is 3 (11/4 = 2r3).

43. Assuming that the values of quarters, dimes, nickels in `C2`, `C3`, and `C4` had the correct values, which answer choice from the above list best describes the use of `=REMINDER((C2 * 25) + (C3 * 10) + (C4 * 5), 5)` as the formula for use in `C5` to calculate the number of pennies to give to the customer?

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