# Milk Quality & Products CDE

## Purpose

The purpose of the Milk Quality & Products Career Development Event is to enhance learning activities related to the quality production, processing, distribution, promotion, marketing, and consumption of dairy foods. Through participation in this event, members develop knowledge of milk production and marketing; characteristics of raw and pasteurized milk; and develop an understanding of milk quality and yield. Members evaluate the flavor quality of milk, differentiate the fat content of various milk products, and identify cheese varieties and characteristics.

## State Event Superintendent

The superintendent for this event is Mrs. Allison Jennings, Eastern Region Agricultural Education Coordinator, Phone: 252-241-3532, Email: allison_jennings@ncsu.edu

## Eligibility and General Guidelines

This event will be held during the North Carolina State FFA Convention. FFA Members may not participate in a Career Development Event that leads to a state level event after July 1, following their high school/early college graduation. This event is open to all FFA chapters and FFA members in good standing. Members winning a previous state event in this area or that have participated in a previous national event in this area are ineligible.

Teams shall consist of three or four members. Four scores will count towards the team total (a three-member team will earn a zero for the 4$^{th}$ score). No alternates are allowed in state events. Any alternate found participating in a state event will result in team disqualification.

FFA members in good standing may also participate as individuals in this event. A chapter may have up to two members participate as individuals as long as the chapter does not have a team participating in the event. Their scores will only count toward individual recognition and will not be tallied as a team score.

The use or possession of cellular phones or any other mobile electronic communication device is prohibited during any state-level career development event. Any violation of this rule by any team member will result in total team disqualification.

FFA members participating in career development events that require the use of calculators may only use non-programmable/graphing calculators that do not have the ability to communicate with other calculators. Calculators will be screened prior to the start of a CDE for acceptability. Students caught using data stored on a calculator or communicating with other calculators will result in a total team disqualification for the event.

Any member found cheating in any state-level career development event will result in total team disqualification for that event.

The North Carolina FFA Association, in keeping with the FFA mission and purposes, does not permit the use of tobacco products, e-cigarettes, vapes, or Juuls at any FFA facility or at any FFA activity.

At the North Carolina FFA State Convention, participation in more than one FFA career development event is permitted if events are not being held concurrently and no special provisions are required to facilitate participation. Members may participate in only one career development event with the exceptions of Creed Speaking and Parliamentary Procedure or Prepared Public Speaking and Parliamentary Procedure, which are held concurrently will allow dual participation and special provisions for flighting.

In compliance with the Americans with Disabilities Act, North Carolina FFA will honor requests for reasonable accommodations made by individuals with disabilities. Please direct accommodation requests through the CDE/LDE Accommodation Request Form. If the accommodation can be made for all and/or doesn't provide an unfair advantage, then every effort will be made to provide the accommodation. Requests can be accommodated more effectively if notice is provided at least 10 days before the event.

## Middle School Participation

Middle school students and teams may participate in any Career Development Event or Leadership Development Event. The top three middle school participants will be recognized at the state FFA convention. Middle school participants should designate during registration.

## Dress Code

Participants are required to follow the North Carolina FFA Career Development Event Dress Code. Participants are allowed to wear long pants, an appropriate shirt with a collar or an appropriate high school or FFA T-shirt.

The North Carolina FFA Association strives to promote a positive image at all Official FFA Events. The dress code policy was established to address the issue of appropriate attire at all Official FFA Events. Members should adhere to this policy for all events. A ten percent reduction will be applied to all individual scores from a chapter if a participant from that chapter violates the dress code during that career event.

## Procedures for Administering the Event

Written Test (100 Points)

The written test will be comprised of a total of 25 multiple-choice items designed to determine each team member's understanding of the dairy foods industry.

The reference for the written test is: Dairy Foods: Producing the Best, Dr. Robert Marshall. Instructional Materials Laboratory. This reference is available through ffa.org.
https://ffa.app.box.com/s/qnw1v5f1f7nyprywe8sc0aojv9m4glci/file/499945395561

Milk Sampling (100 Points)

Participants will identify the flavor (taste & odor) of ten milk samples by matching the sample number with the appropriate flavor on the Milk Sampling – Answer Sheet. The "Official Recipe" for making off flavors of milk is included as a reference at the end of this guide *(Appendix A).*

Cheese Identification and Characteristics – 100 Points

- **Cheese Identification = 60 total points.** Participants will identify ten cheese samples by writing the sample number that matches the appropriate cheese listed on the *Cheese Identification and Characteristic Scorecard*. Each correctly identified cheese sample is worth 6 points for a total of 60 points if all ten samples are identified correctly. *Yellow or white varieties as well as smoked or fresh varieties may be used for this section.*
- **Cheese Characteristics = 40 total points.** Participants will also use the *Cheese Identification and Characteristic Scorecard* to classify four characteristics for each identified cheese. Each correct classification is worth one point for a total of 40 points if all characteristics are correctly classified for all 10 cheese samples.

The Cheese Characteristic Information Matrix *(Appendix B)* is a reference and study guide to help participants prepare for the *Cheese Characteristics* section of the *Milk Quality CDE*. While participants may not bring the matrix to the event, they should memorize the codes identified in the matrix to abbreviate their answers on the *Cheese Identification and Characteristic Scorecard*. Students should only fill out the characteristics for the cheeses they identified. If the Cheese Characteristics information is filled out for more than the 10 identified cheeses, the student will receive a zero score for the Cheese Characteristics portion of the scorecard. A sample-completed scorecard is provided to help participants understand how the scorecard will be used *(Appendix C).*

Fat Content Identification – 100 points

Students will differentiate the fat content in five samples of milk or milk products. Students will then identify each sample by product based on the criteria listed below.

| Product | Fat Content |
|---|---|
| Nonfat Milk | <0.5% |
| Reduced Fat Milk | 2% |
| Whole Milk | 3.25% |
| Yogurt (Plain) | 3.25% |
| Cottage Cheese | 4% |
| Ice Cream (Vanilla) | 10% |
| Half & Half | 10.5% |
| Sour Cream | 18% |
| Light Whipping Cream | 30% |
| Heavy Whipping Cream | 35% |
| Butter | 80% |

Milk Quality Team Activity – 50 points

Each team will solve five problems valued at ten points each. Problems may include:

1. Reading and interpreting data.
2. Answering questions pertaining to charts and tables.
3. Using given formulas related to milk and component prices to make calculations.
4. Determining percent increase and decrease as related to chart and table data.

The references for the team activity are:

1. "Dairy Business" is available online at dairybusiness.com. Only information from January through May of the current calendar year will be used. Sample questions using material from "Dairy Business" are found in *Appendix D.*
2. Formula calculations used in "Federal Milk Market Orders." Sample problems using formula calculations are found in *Appendix E.*

## Scoring

| *Maximum Score* | *450* |
|---|---|
| Written Test | 100 |
| Milk Sampling | 100 |
| Cheese Identification | 100 |
| Fat Content Identification | 100 |
| Milk Quality Team Activity | 50 |

## Procedure for Determining the State Event Winner When Scores are Tied

In the event a tie score exists, the following methods will be applied in sequential order until the tie is broken:

1. Compare the total team scores for the written test and the higher scoring team is the winner.
2. Compare the total team scores for the milk sampling and the higher scoring team is the winner.
3. Compare the total team score on cheese identification and the higher scoring team is the winner.
4. If these methods fail to break the tie, co-winners will be declared, and a run-off event will be held to determine which team will represent North Carolina at the National FFA Convention. The run-off event will follow the same rules as the state event.

## Procedure for Determining the State Event High Scorer When Scores are Tied for Individual Participants

In the event a tie score exists, apply the following methods in sequential order until the tie is broken.

1. Compare the individual scores on the written test and the high scoring individual is the winner.
2. Compare the individual scores on milk sampling and the high scoring individual is the winner.
3. Compare the individual score on cheese identification and the high scoring individual is the winner.
4. If a tie still exists for individuals, co-high scorers will be declared, and all tied individuals will be recognized.

## State Awards

The awards for the state event will be presented annually at the state FFA convention to include a team 1st, 2nd and 3rd place plaque and a travel monetary award. The high scoring individual will receive a plaque.

## National Career Development Event Participation

State winning teams advancing to the national career development event will be automatically registered for the national event. It is the responsibility of the FFA chapter advisor to complete all necessary national certification and waiver forms and return them to the State FFA Coordinator by the assigned due date.

State winning CDE Teams that choose not to participate at the national level should contact the state office by September 1 prior to national convention. Teams that fail to inform the state office prior to September 1 will be ineligible to participate in that same CDE for the next year (chapters may appeal to the State FFA Board of Directors). Teams that do not compete at the National Convention will be required to pay back the travel award.

**NORTH CAROLINA FFA ASSOCIATION**
**MILK QUALITY AND PRODUCTS**
**CAREER DEVELOPMENT EVENT**

**Milk Sampling - ANSWER SHEET**
**Maximum Points = 100**

**Name: _____**

**Chapter: _____**

**Participant Number: _____**

**Score = Number Right _____x 10 = _____**

*Instructions: Identify the flavor (taste and odor) of the ten milk samples provided. Write the sample number beside the appropriate flavor description.*

_____ Acid

_____ Bitter

_____ Feed

_____ Flat/Watery

_____ Foreign

_____ Garlic/Onion

_____ Malty

_____ Oxidized

_____ Rancid

_____ Salty

_____ No Defect

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_____ Malty

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_____ Rancid

_____ Salty

_____ No Defect

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**Cheese Identification and Characteristics Scorecard**
**Maximum Point Value = 100 points**
**Identification = 60 points**
**Characteristics = 40 points**

**Name: _____ Chapter: _____Participant Number: _____**

| Scoring Use Only | Number Correct | | | | |
|---|---|---|---|---|---|
| Cheese ID | | x | 6 | = | |
| Characteristics | | x | 1 | = | |
| | | | Total Points | | |

**Cheese Identification: Write the correct sample number in the left column that matches the correct cheese sample.**

**For each cheese sample identified, give the information for the four characteristics for that sample. One may use the codes supplied in the reference for this activity when answering these questions.**

| Sample Number | Variety 6 points each | Receives Pasta Filata Treatment (Yes or NO) 1 point each | Salted in Brine (Yes or No) 1 point each | Method of Ripening 1 point each | Place of Origin 1 point each | Total Number Correct For Characteristics (Scoring Use Only) |
|---|---|---|---|---|---|---|
| | Blue/Bleu | | | | | |
| | Brie | | | | | |
| | Cheddar, Mild | | | | | |
| | Cheddar, Sharp | | | | | |
| | Colby | | | | | |
| | Cream | | | | | |
| | Feta | | | | | |
| | Gouda | | | | | |
| | Havarti | | | | | |
| | Gruyere | | | | | |
| | Monterey Jack | | | | | |
| | Mozzarella | | | | | |
| | Munster | | | | | |
| | Parmesan | | | | | |
| | Processed American | | | | | |
| | Provolone | | | | | |
| | Queso Fresco | | | | | |
| | Ricotto | | | | | |
| | Romano | | | | | |
| | Swiss | | | | | |

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**CAREER DEVELOPMENT EVENT**

**Fat Content Identification – ANSWER SHEET**
**Maximum Points = 100**

**Name: _____**

**Chapter: _____**

**Participant Number: _____**

**Score = Number Right _____ x 20 = _____**

*Instructions: Identify each sample by product type using the table below along with visual observation and/or taste. Write the appropriate product name beside the sample number.*

| Product | Fat Content |
|---|---|
| Nonfat Milk | <0.5% |
| Reduced Fat Milk | 2% |
| Whole Milk | 3.25% |
| Yogurt (Plain) | 3.25% |
| Cottage Cheese | 4% |
| Ice Cream (Vanilla) | 10% |
| Half & Half | 10.5% |
| Sour Cream | 18% |
| Light Whipping Cream | 30% |
| Heavy Whipping Cream | 35% |
| Butter | 80% |

**Sample 1: _____**

**Sample 2: _____**

**Sample 3: _____**

**Sample 4: _____**

**Sample 5: _____**

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**MILK QUALITY AND PRODUCTS**
**CAREER DEVELOPMENT EVENT**

**Fat Content Identification – ANSWER SHEET**
**Maximum Points = 100**

**Name: _____**

**Chapter: _____**

**Participant Number: _____**

**Score = Number Right _____ x 20 = _____**

*Instructions: Identify each sample by product type using the table below along with visual observation and/or taste. Write the appropriate product name beside the sample number.*

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| Butter | 80% |

**Sample 1: _____**

**Sample 2: _____**

**Sample 3: _____**

**Sample 4: _____**

**Sample 5: _____**

**Official Recipe for Preparing Off-Flavors of Milk *(Appendix A)***

North Carolina FFA Association

Milk Quality and Products CDE

- **One may achieve various intensities by diluting the sample with high-quality pasteurized, homogenized milk intended for table use.**
- **The goal is to get students to be able to detect the slightest variation from normal fresh pasteurized/homogenized milk with no defect.**
- **For tasting, samples should be tempered at 60°F (16°C).**
- **For more detailed information, see Judging, Identifying, and Scoring Dairy Products by Jan L. Allen, Vocational Agriculture Service, University of Illinois at Urbana-Champaign.**

| | | |
|---|---|---|
| **Acid** | Add 1 to 1.5 ounces of fresh cultured buttermilk to a quart of fresh pasteurized/homogenized milk. | Prepared 24 to 48 hours prior to use. |
| **Bitter** | Add 1 (NoDoz®) or similar brand caffeine tablet to about 1 oz. of water and let it dissolve for 30 minutes. Then you add the "caffeine solution" to a quart of fresh pasteurized/homogenized milk. | **Note:** One may increase the (NoDoz®) or similar brand caffeine tablets in the solution to begin with or add the "caffeine solution" to a smaller volume of water to help students get the taste. |
| **Feed** | Add 1/2 ounce (1 tablespoon or 15.0 ml) of molasses and mix with one quart of pasteurized/homogenized milk. | **Important: There are ways to do this with roughages, but for the sake of simplicity we are using molasses.** |
| **Flat/Watery** | Add 4 to 6 ounces of distilled water to a quart of fresh pasteurized/homogenized milk. | Good quality tap water will work but may have some additional flavors. You may wish to use approximately 10% volume for the quart of milk. |
| **Foreign** | Add 1-teaspoon (5 to 6 ml of 2-fold or double) vanilla extract per quart of milk. | |
| **Garlic/Onion** | Add about 0.2 grams of garlic or onion salt or 3 drops of garlic or onion extract to a quart of pasteurized/homogenized milk. | **Optional:** Use garlic powder or cut up onion. If cut-up onion is used filter through a coffee filter or cheesecloth and allow sitting for 30 minutes. |
| **Malty** | Add ½ ounce (15 grams) Grape Nuts® or Grape Nuts Flakes® breakfast cereal to 3 ounces (about 100 ml) of milk and allow to sit for 20 to 30 minutes to create a stock solution. This stock solution should then be strained through cheesecloth, a coffee filter, etc. (in a funnel) into another container. *Add 1 ounce of the stock solution to a quart of milk.* | Add 1 to 1.5 teaspoons (5 – 7 ml) of unflavored malted milk powder (available at some grocery stores) to a quart of pasteurized/homogenized milk. |
| **Oxidized** | Expose one quart of pasteurized/homogenized milk in a clear glass or plastic (polyethylene) milk container to direct sunlight for 30 minutes to one hour. **Note:** This is the most common form of oxidized milk found in homogenized milk. **Do not use a container that is colored (yellow)** and keep the milk cool by placing in ice. Samples prepared in this way will probably develop the generic (metal-induced) off-flavor within 36 to 48 hours after light exposure. | Metal-induced oxidized samples may be prepared by preparing 100 ml of 1 percent $CuSO_4.5H_2O$ as a "stock copper solution" and keep refrigerated. Add 0.5 to 1 ml of the "stock copper solution" to a quart of pasteurized/homogenized milk. **Note:** Prepare 24 to 48 hours prior to use. |
| **Rancid** | Add ½ ounce (15 grams) of blue cheese to a quart of pasteurized/homogenized milk and allow it to sit for 30 minutes. | Filter for the final sample using coffee filter or cheesecloth and funnel. |
| **Salty** | Add common table salt to a quart of fresh pasteurized/homogenized milk. | Determine the degree of saltiness by the amount of salt added to the milk. |
| **NO DEFECT** | Use fresh pasteurized/homogenized milk that has not been exposed to any of the treatments named. | |

**NORTH CAROLINA FFA ASSOCIATION**
**MILK QUALITY AND PRODUCTS CAREER DEVELOPMENT EVENT**

## Cheese Identification and Characteristics Information Matrix *(Appendix B)*

**Participants will be required to know the information within this matrix in order to complete the cheese characteristic section on the scorecard. Participants will use the answer codes identified in this matrix by parenthesis ( ) to complete the cheese characteristics.**

| Variety<br>6 points each | Receives Pasta Filata Treatment | Salted in Brine | Method of Ripening | Place of Origin |
|---|---|---|---|---|
| Blue/Bleu | (N) No | (Y) Yes | (M) Mold | (F) France |
| Brie | (N) No | (N) No | (B/M) Bacteria/Mold | (F) France |
| Cheddar, Mild | (N) No | (N) No | (B) Bacteria | (E) England |
| Cheddar, Sharp | (N) No | (N) No | (B) Bacteria | (E) England |
| Colby | (N) No | (N) No | (B) Bacteria | (U) United States |
| Cream | (N) No | (N) No | (U) Unripened | (U) United States |
| Feta | (N) No | (Y) Yes | (B) Bacteria | (G) Greece |
| Gouda | (N) No | (Y) Yes | (B) Bacteria | (N) Netherlands |
| Havarti | (N) No | (N) No | (B) Bacteria | (D) Denmark |
| Gruyere | (N) No | (Y) Yes | (B) Bacteria | (S) Switzerland |
| Monterey Jack | (N) No | (N) No | (B) Bacteria | (U) United States |
| Mozzarella | (Y) Yes | (Y) Yes | (B) Bacteria | (I) Italy |
| Munster | (N) No | (N) No | (B) Bacteria | (F) France |
| Parmesan | (N) No | (Y) Yes | (B) Bacteria | (I) Italy |
| Processed American | (N) No | (N) No | (B) Bacteria | (U) United States |
| Provolone | (Y) Yes | (Y) Yes | (B) Bacteria | (I) Italy |
| Queso Fresco | (N) No | (N) No | (U) Unripened | (M) Mexico |
| Ricotto | (N) No | (N) No | (U) Unripened | (I) Italy |
| Romano | (N) No | (Y) Yes | (B) Bacteria | (I) Italy |
| Swiss | (N) No | (Y) Yes | (B) Bacteria | (S) Switzerland |

**NORTH CAROLINA FFA ASSOCIATION**
**MILK QUALITY AND PRODUCTS CAREER DEVELOPMENT EVENT**

## Sample Cheese Identification and Characteristics Scorecard *(Appendix C)*

**Maximum Point Value = 100 points**
**Identification = 60 points**
**Characteristics = 40 points**

**Name: _____ Chapter: _____Participant Number: _____**

| Scoring Use Only | Number Correct | | | | |
|---|---|---|---|---|---|
| Cheese ID | | x | 6 | = | |
| Characteristics | | x | 1 | = | |
| | | | Total Points | | |

| Cheese Identification: Write the correct sample number in the left column that matches the correct cheese sample. | | For each cheese sample identified, give the information for the four characteristics for that sample. One may use the codes supplied in the reference for this activity when answering these questions. | | | | |
|---|---|---|---|---|---|---|
| Sample Number | Variety 6 points each | Receives Pasta Filata Treatment (Yes or NO) 1 point each | Salted in Brine (Yes or No) 1 point each | Method of Ripening 1 point each | Place of Origin 1 point each | Total Number Correct For Characteristics (Scoring Use Only) |
| 8 | Blue/Bleu | N | Y | M | F | |
| 7 | Brie | N | N | B/M | F | |
| 5 | Cheddar, Mild | N | N | B | E | |
| | Cheddar, Sharp | | | | | |
| | Colby | | | | | |
| | Cream | | | | | |
| 1 | Feta | N | Y | B | G | |
| | Gouda | | | | | |
| | Havarti | | | | | |
| 9 | Gruyere | N | Y | B | S | |
| 10 | Monterey Jack | N | N | B | U | |
| 3 | Mozzarella | Y | Y | B | I | |
| 2 | Munster | N | N | B | F | |
| | Parmesan | | | | | |
| 4 | Processed American | N | N | B | U | |
| | Provolone | | | | | |
| | Queso Fresco | | | | | |
| | Ricotto | | | | | |
| 6 | Romano | N | Y | U | I | |
| | Swiss | | | | | |

# Samples of Questions from "Dairy Business" *(Appendix D)*

**There are many samples that could be used for problems and questions related to interpreting data from Dairy Business. A few samples are included as a general guide to teachers as they prepare their team for this event.**

## A. Interpreting Data, Graphs and Charts

### 1. Data Interpretation
**Scenario:**

Farm Credit Mid-America, a financial services cooperative serving farmers and rural residents in Indiana, Ohio, Kentucky and Tennessee, reported overall stable performance in second quarter 2018. Second quarter highlights include:

- Net income reached $192 million, a 29.7 percent increase from 2017.
- Total members' equity increased $127.1 million from year-end 2017.
- Total loans were $20.3 billion, a decrease of $33.0 million from year-end 2017.

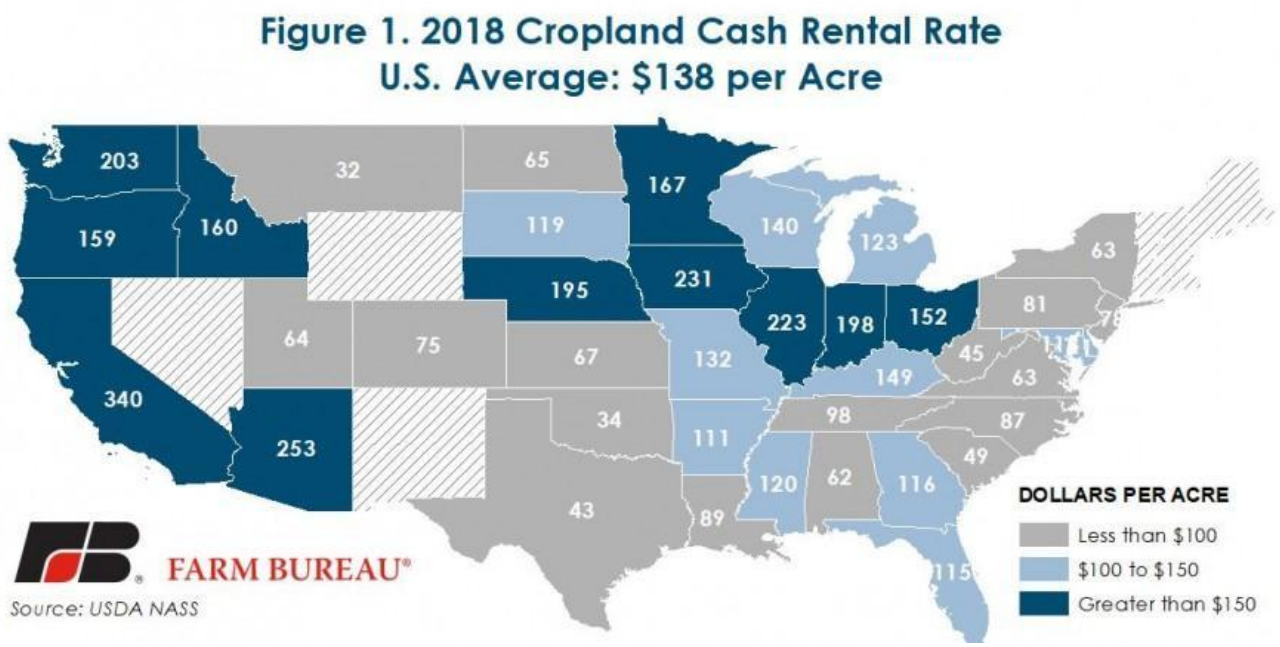
"Low commodity prices and foreign trade activity continue to stress net farm earnings, creating tight margins for many of our grain and livestock producers," said Bill Johnson, president and CEO, Farm Credit Mid-America. "Despite these challenges, we're committed to our customers and will continue to provide access to capital and help them manage to long-term success." The credit quality of Farm Credit's portfolio declined slightly from year-end 2017, as adversely classified loans increased to 4.2 percent of the portfolio, up from 3.9 percent at year-end 2017. Farm Credit Mid-America's Board of Directors elected to distribute capital back to its customers in 2019 as part of its patronage program – a testament to the strength and overall financial stability of the Association.

**Sample question:**

What was the total loans at year-end 2017 for Farm Credit Mid-America?

A. 20,660,000,000
B. 33,000,000
**C. <u>20,267,000,000</u>**
D. 20,300,000,000

### 2. Graph/Table Interpretation with accompanying data:




With agricultural land values rising in 2018, an increase in cash rents was not unanticipated. The national average rate moved from $136 per acre in 2017 to $138 per acre in 2018, again about the same rate as inflation. This was essentially the same rental rate as observed in 2013. While rates did bump up to a high of $144 per acre in 2015, land rent has been fairly static around this $135-to-$140-per-acre rate for the last six years. Figure 1

highlights U.S. average cash rents for cropland in 2018. Taking the numbers apart, it is little surprise that California came in with the highest average rent – $340 per acre averaged across all land and $528 per acre for irrigated land. Corn Belt states – Nebraska, Iowa, Illinois and Indiana – all came in with rental rates near or above $200 per acre. These rates were up over the previous year's values, even with corn and soybean prices facing significant downside pressure over the last several months.

**Sample questions:**

1. What is the average dollar per acre reported for North Carolina in 2018?
   A. $187
   **B. $87**
   C. $13
   D. $138

2. What is the increase in rent per acre in California if renting irrigated land?
   **A. $188**
   B. $340
   C. $528
   D. $200

### 3. Table interpretation without accompanying data:

Dairy Products per capita Consumption in the United States

| Year | Fluid Milk and Cream | Butter | Natural Cheese | Cottage Cheese | Evaporated and Condensed Milk | Ice Cream | Lowfat Ice Cream | Nonfat Dry Milk | All Dairy Products Milk Equivalent Milkfat Basis |
|---|---|---|---|---|---|---|---|---|---|
| ---------- Pounds ---------- | | | | | | | | | |
| 1970 | 264 | 5.4 | 11.4 | 5.2 | 12.0 | 17.8 | 7.7 | 5.3 | 564 |
| 1975 | 261 | 4.7 | 14.3 | 4.7 | 8.9 | 18.5 | 7.7 | 3.3 | 539 |
| 1980 | 246 | 4.5 | 17.5 | 4.5 | 7.1 | 17.5 | 7.1 | 3.0 | 543 |
| 1985 | 241 | 4.9 | 22.5 | 4.1 | 7.4 | 18.1 | 6.9 | 2.3 | 594 |
| 1990 | 233 | 4.4 | 24.6 | 3.4 | 8.0 | 15.8 | 7.7 | 2.9 | 568 |
| 1995 | 221 | 4.4 | 26.9 | 2.7 | 6.8 | 15.5 | 7.4 | 3.4 | 576 |
| 2000 | 210 | 4.5 | 29.8 | 2.6 | 5.8 | 16.7 | 7.3 | 2.6 | 591 |
| 2007 | 206 | 4.7 | 32.7 | 2.5 | 7.6 | 14.0 | 7.0 | 2.2 | 610 |

Source: Economic Research Service, USDA

**Sample Question:**

1. Which category of dairy products shows a continuous increase in per capita consumption from 1970 to 2007 in the "Dairy Products per capita Consumption in the United States" table?
   **A. Natural Cheese**
   B. Fluid Milk and Cream
   C. Butter
   D. Lowfat Ice Cream

**As one can readily see, the questions and problems for the team activity are more about using formulas and interpreting data than they are about memorizing data from Dairy Facts. The samples provided give a glimpse of the kinds of questions that could be included. The presence of a scenario, table, or graph in these samples does not guarantee their presence in the team activity.**

North Carolina Milk Quality & Products Career Development Event
Part V: Team Activity (50 points)

# Sample Formula Calculations Used in "Federal Milk Market Orders" *(Appendix E)*

Some of the questions for the team activity may involve calculations using formulas to determine information for any of the four classes of milk provided by the Federal Milk Marketing Orders. **When calculations are being made, participants should remember to round all values to the nearest 0.01.** Formulas are provided that are applied in Federal Milk Marketing Orders.

Questions may require the use of a scantron form to accompany the work that is performed. If a scantron form is provided, participants will turn in their work paper along with their scantron form upon completion of the activity. For example, if the student has been asked to calculate the price of butterfat, the question might state:

Calculate the price of butterfat when given:

- NASS average price for AA grade butter = $2.00/lb
- Make allowance = $0.115/lb
- Yield factor = 1.20

Formula to be used: Butterfat value/lb. = (price of butter – make allowance) x yield factor

Solution: (2.00 - .115) x 1.20 = $2.262/lb butterfat

1. Mark the correct answer on the scantron form for the price of butterfat:

   a. $1.02
   b. $1.56
   c. $2.26
   d. $2.56

**Samples for calculating the price of Class III milk** (used for cheese making) by summing the values of butterfat, protein, and other solids.

**Sample 1** Calculate the price of butterfat when given:

- NASS average price for AA grade butter = will be provided
- Make allowance = will be provided
- Yield factor = will be provided

Formula to be used: Butterfat value/lb. = (price of butter – make allowance) x yield factor

Solution: (_____ - _____) x _____ = $_____/lb butterfat

**Solution 1** Calculate the price of butterfat when given:

- NASS average price for AA grade butter = $2.00/lb
- Make allowance = $0.115/lb
- Yield factor = 1.20

Formula to be used: Butterfat value/lb. = (price of butter – make allowance) x yield factor

Solution: (2.00 - .115) x 1.20 = **$2.262/lb butterfat**

**Sample 2** Calculate the value of protein in Class III milk when given:

- NASS weighted average cheese price = will be provided
- Make allowance = will be provided
- Yield factor attributable to protein = will be provided
- Yield factor attributable to fat = will be provided
- Butterfat price = will be provided
- Average ratio of fat to protein in milk = will be provided

Formula to be used: Protein value/lb. = ((cheese price – make allowance) x protein's yield factor)) + ((cheese price – make allowance) x fat's yield factor)) – ((butterfat price x 0.9) x fat to protein ratio))

Solution: ((____ - ____) x _____)) + ((____ -____) x ____)) – ((_____ x 0.9) x _____)) = $_____/lb. protein

**Solution 2** Calculate the value of protein in Class III milk when given:

- NASS weighted average cheese price = $1.60/lb
- Make allowance = $0.16/lb
- Yield factor attributable to protein = 1.38
- Yield factor attributable to fat = 1.57
- Butterfat price = $2.00
- Average ratio of fat to protein in milk = 1.17

Formula to be used: Protein value/lb. = ((cheese price – make allowance) x protein's yield factor)) + ((cheese price – make allowance) x fat's yield factor)) – ((butterfat price x 0.9) x fat to protein ratio))

Solution:
((1.60 - .16) x 1.38) + (1.60 -.16) x 1.57) – ((2.00 x 0.9) x 1.17)) = $_____/lb. protein
(1.44 x 1.38) + (1.44 x 1.57) – (1.8 x 1.17) = $_____/lb. protein
1.9872 + 2.2608 – 2.106 =$_____/lb. protein
1.99 + 2.26 - 2.11 = **$2.14/lb. protein**

**Sample 3** Calculate the value of "other solids" when given:

- Dry whey price = Will be provided
- Make allowance = Will be provided
- Yield factor = Will be provided

Formula to be used: "Other solids" value/lb. = (dry whey price – make allowance) x yield factor

Solution: (____ - _____) x _____ = $_____/lb. other solids

**Solution 3** Calculate the value of "other solids" when given:

- Dry whey price = $0.22/lb
- Make allowance = $0.16/lb
- Yield factor = 1.03

Formula to be used: "Other solids" value/lb. = (dry whey price – make allowance) x yield factor

Solution: (.22 - .16) x 1.03 = **$.0618/lb. other solids**

**Sample 4** Calculate the Class III skim milk price of milk from Best Milk Company when given:

- Best Milk Company's milk tested out at:
  - % protein to be provided
  - % "other solids" to be provided
- Price of protein /lb. will be provided
- Price of other solids/lb. will be provided

Formula to be used: Class III skim milk price/cwt = (% protein (100) x protein price/lb) + (% other solids (100) x other solids price/lb) Shortcut: convert percentage to pounds by just using the number given for percentage without multiplying by 100.

Solution: (_____ x____) + (____ x ____) = $_____/cwt Class III skim milk

**Solution 4** Calculate the Class III skim milk price of milk from Best Milk Company when given:

- Best Milk Company's milk tested out at:
  - 3.0% protein
  - 6.0% "other solids"
- Price of protein /lb. = $2.00/lb
- Price of other solids/lb. = $0.10/lb

Formula to be used: Class III skim milk price/cwt = (% protein (100) x protein price/lb) + (% other solids (100) x other solids price/lb)

Solution: (3% (100) x 2.00) + (6% (100) x .10) = $_____/cwt Class III skim milk
(3 x 2.00) + (6 x .10) = 6.00 + .60 = **$6.60/cwt Class III skim milk**

**Sample 5** Calculate the price of Class III whole milk by summing the values of the components used by Dairy's Best Milk Company when given the following data:

- % protein in the milk and price per pound for the protein
- % butterfat in the milk and price per pound for the butterfat
- % other solids in the milk and price per pound for other solids

Formula to be used: Class III milk price/cwt = ((% protein x 100) x price/lb)) + ((% fat x 100) x price/lb) = ((% other solids x 100) x price/lb)). Shortcut: convert percentage to pounds by just using the number given for percentage without multiplying by 100.

Solution: (____ x____) + (____ x ____) + (_____ x _____) = $ ____/cwt Class III milk

**Solution 5** Calculate the price of Class III whole milk by summing the values of the components used by Dairy's Best Milk Company when given the following data:

- 3.1% protein @ $3.00/lb
- 3.5% butterfat @ $2.00/lb
- 6.2% other solids @ $0.20/lb

Formula to be used: Class III milk price/cwt = (% protein x price/lb) + (% fat x price/lb) = (% other solids x price/lb).

Solution: (3.1 x $3.00) + (3.5 x $2.00) + (6.2 x .20) = $ ____/cwt Class III milk
$ 9.30 + $7.00 + 1.24 = **$17.54/cwt Class III milk**

**Samples for calculating the price of Class IV milk** (used to make butter and nonfat dry milk) by summing the values of Class IV skim milk and butterfat using the three steps below.

**Sample 6** Calculate the nonfat milk solids price when given:

- Average NASS price of nonfat dry milk (NDM) = will be provided
- Make allowance = will be provided
- Yield factor = will be provided

Formula to be used: Nonfat solid price/lb = (NDM price – make allowance) x yield factor

Solution: (_____ - _____) x _____ = $ _____/lb. NMS

**Solution 6** Calculate the nonfat milk solids price when given:

- Average NASS price of nonfat dry milk (NDM) = $0.84/lb
- Make allowance = $0.14/lb
- Yield factor = 0.99

Formula to be used: Nonfat solid price/lb = (NDM price – make allowance) x yield factor

Solution: (.84 - .14) x .99 = **$0.693/lb. NMS price/lb.**

**Sample 7** Calculate the value of Class IV skim milk containing ____% nonfat solids and the value of those solids is $ _____/lb.

Formula to be used: Price of Class IV skim milk = % nonfat milk solids x price/lb. of NMS

Solution: _____ x _____ = $ _____/cwt Class IV skim milk

**Solution 7** Calculate the value of Class IV skim milk containing 9.3% nonfat solids and the value of those solids is $1.02/lb.

Formula to be used: Price of Class IV skim milk = % nonfat milk solids x price/lb. of NMS

Solution: 9.3 x 1.02 = $ 9.486 or **$ 9.49/cwt Class IV skim milk**

**Sample 8** Calculate the Class IV milk price when given:

- Price of skim milk = $____ (will be provided)
- Butterfat content = ___% (will be provided)
- Price of butterfat/lb = $ _____ (will be provided)
- Note: To obtain lb. skim milk/lb. milk, subtract from 1 the amount of milk fat in 1 lb of milk. For example, if the milk fat is 5%, 5/100 = .05 and 1.00 – 0.05 = 0.95 lb skim milk/lb milk).

Formula to be used: Class IV milk price = (lb skim milk/lb milk x price/cwt) + (lb butterfat x price/lb). Note: lbs. of butterfat = % butterfat x 100

Solution: (_____ x _____) + (____ x _____) = $ ____/cwt Class IV milk

**Solution 8** Calculate the Class IV milk price when given:

- Price of skim milk = $7.00/cwt
- Butterfat content = 4.2%
- Price of butterfat/lb = $2.00/lb Note: *To obtain lb. skim milk/lb. milk, subtract from 1 the amount of milk fat in 1 lb of milk. For example, if the milk fat is 5%, 5/100 = .05 and 1.00 – 0.05 = 0.95 lb skim milk/lb milk).

Formula to be used: Class IV milk price = (lb skim milk/lb milk* x price/cwt) + (lb butterfat x price/lb)

Solution: (1.0-0.042 x $ 7.00) + (4.2 x $ 2.00) = $ ____/cwt Class IV milk
(.958 x $ 7.00) + ($ 8.40) =
6.706 (6.71) + 8.40 = **$ 15.11/cwt Class IV milk**

**Sample for calculating** the prices of Classes I and II milk when values are provided in a table such as the one below. These are **NOT** the same values calculated in previous problems.

NOTE: THE FEDERAL ORDER POLICY IS THAT THE SKIM MILK PRICE FOR CLASSES I AND II ARE THE HIGHER OF SKIM MILK PRICES OF CLASS III OR IV.

| | |
|---|---|
| Class III Skim Milk | Price/cwt will be provided |
| Class IV Skim Milk | Price/cwt will be provided |
| Butterfat | Price/lb. will be provided |
| Class I Butterfat content | % will be provided |
| Protein | Price/lb. will be provided |
| Class I differential | Price/cwt. will be provided |
| Class II differential | Price/cwt. will be provided |

**Sample** Calculate the value per cwt of Class I milk containing _____% butterfat.

Formula to be used: Class I value/cwt = (lb skim milk/lb milk x price/cwt) + (lb butterfat x price/lb) + Class I differential

Solution: (_____ x_____) + (_____ x _____) + _____ = $ _____/cwt Class I milk

**Solution** Calculate the value per cwt of Class I milk containing 3.5% butterfat.

NOTE: THE FEDERAL ORDER POLICY IS THAT THE SKIM MILK PRICE FOR CLASSES I AND II ARE THE HIGHER OF SKIM MILK PRICES OF CLASS III OR IV.

| | |
|---|---|
| Class III Skim Milk | $7.70/cwt |
| Class IV Skim Milk | $7.68/cwt |
| Butterfat | $2.10/lb. |
| Class I Butterfat content | 3.5% |
| Protein | $2.20/lb. |
| Class I differential | $2.00/cwt. |
| Class II differential | $0.80/cwt. |

Formula to be used: Class I value/cwt = (lb skim milk/lb milk x price/cwt) + (lb butterfat x price/lb) + Class I differential

- Note: To obtain lb. skim milk/lb. milk, subtract from 1 the amount of milk fat in 1 lb of milk. For example, if the milk fat is 5%, 5/100 = .05 and 1.00 – 0.05 = 0.95 lb skim milk/lb milk).

**Solution:** (1 -.035 x $7.68) + (3.5 x $2.10) + $2.00 = $ _____/cwt Class I milk
(.965 x $7.68) + $ 7.35 + $ 2.00 =
$ 7.41~~12~~ + $ 9.35 = $ 16.76/cwt Class I milk

**Sample - calculating** the individual values for the four classes of milk and then calculating the overall value per hundred-weight (cwt) of milk from any company when given utilization percentages and prices for the four classes of milk in the market during the pay period. A table similar to the one below will have the information needed.

| Premium Dairy Producer Marketing Order | | | |
|---|---|---|---|
| Class of Milk | Utilization Percentage (%) | Price/cwt ($) | Value ($) |
| I | Will be provided | Will be provided | |
| II | Will be provided | Will be provided | |
| III | Will be provided | Will be provided | |
| IV | Will be provided | Will be provided | |
| | | | |
| | | All Milk Price/cwt = | |

**Solution - calculating** the individual values for the four classes of milk and then calculating the overall value per hundred-weight (cwt) of milk from any company when given utilization percentages and prices for the four classes of milk in the market during the pay period. A table similar to the one below will have the information needed.

| Premium Dairy Producer Marketing Order | | | |
|---|---|---|---|
| Class of Milk | Utilization Percentage (%) | Price/cwt ($) | Value ($) |
| I | 20 | 16.00 | 16.00 (.20) = 3.20 |
| II | 20 | 15.20 | 15.20 (.20) = 3.04 |
| III | 30 | 14.00 | 14.00 (.30) = 4.20 |
| IV | 30 | 13.80 | 13.80 (.30) = 4.14 |
| | | | |
| | | All Milk Price/cwt = | **$ 14.58** |