2016 Virginia FFA Milk Quality and Products Career Development Event
Problem Solving

Name: _____ **FFA Chapter:** _____

General instructions: *This exercise consists of 20 multiple-choice questions. Each question is worth 5 points. Mark your answer in the "Problem Solving" section on your Scantron sheet. Time limit is 40 minutes.*

1. **A dairy producer plans to start an ice cream business. He estimates that he can sell 700 gallons of ice cream per week. How many pounds of the farm's milk will he need to dedicate to ice cream production on a daily basis on average?**

   A) 120
   B) 700
   C) 840
   D) 1,200
   E) 8,400

2. **If 900 pounds of fat were obtained from a batch of 18% cream, what was the weight of the cream?**

   A) 50
   B) 162
   C) 918
   D) 5,000
   E) 16,200

3. **How many pounds of skim milk (0% fat) must be added to 5,000 pounds of 30% cream to bring the fat test to 16%?**

   A) 167
   B) 4,375
   C) 5,000
   D) 5,714
   E) 80,000

4. **A tanker load of milk was delivered to the milk plant. There were 400 hundredweights of milk on the trailer. The milk tested 3.7% fat and 3.0% protein. How many pounds of protein were delivered in the load?**

   A) 12
   B) 120
   C) 1,200
   D) 1,480
   E) 13,333

5. **If a grocery store sells milk for $3.69 per gallon, what is the equivalent price per hundredweight?**

   A) $17.41
   B) $20.00
   C) $31.73
   D) $36.90
   E) $42.91

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Table 1: Per capita consumption of dairy products in the United States (Source: ERS, USDA)

Year	Fluid milk	Butter	Natural cheese	Cottage cheese	Evaporated and condensed milk	Ice cream	Reduced fat ice cream	Nonfat dry milk	All Products[1]
					Pounds				
1975	247	4.7	14.3	4.6	8.7	18.2	7.7	3.3	539
1980	233	4.5	17.5	4.4	7.0	17.1	7.1	3.0	543
1985	227	4.9	22.5	4.0	7.5	17.8	6.9	2.3	594
1990	219	4.3	24.6	3.3	7.9	15.5	6.3	2.9	568
1995	205	4.6	26.7	2.7	6.5	15.2	7.1	3.4	570
2000	196	4.5	29.5	2.6	5.8	16.3	6.7	2.7	590
2005	185	4.5	31.3	2.6	6.1	15.2	6.0	4.0	603
2010	177	4.9	32.7	2.3	7.2	14.1	6.5	3.2	603

[1]Milk equivalent, milkfat basis

Use Table 1 to answer questions 6-8.

6. What category of dairy products shows a constant increase in per capita consumption from 1975 to 2010?

A) Butter
B) Evaporated and condensed milk
C) Fluid milk
D) Natural cheese
E) Nonfat dry milk

7. What happened to the amount of dairy products consumed per person from 1975 to 2010?

A) It increased by 10.6 percent.
B) It increased by 11.9 percent.
C) It decreased by 10.6 percent.
D) It decreased by 11.9 percent.
E) It has not changed.

8. Which category of dairy products has the largest percentage decrease in per capita consumption from 1975 to 2010?

A) Butter
B) Cottage cheese
C) Fluid milk and cream
D) Ice cream
E) Natural cheese

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Table 2: Top 10 Dairy States in 2015

Rank based on 2015	Total Milk Production *(billion pounds)*			Total Cows *(thousand head)*			Production per Cow *(pounds)*		
	State	**2010**	**2015**	**State**	**2010**	**2015**	**State**	**2010**	**2015**
1	California	40.383	40.898	California	1,754	1,778	Colorado	23,664	25,685
2	Wisconsin	26.035	29.030	Wisconsin	1,262	1,279	Michigan	23,260	25,130
3	Idaho	12.779	14.114	New York	611	618	Arizona	23,441	24,477
4	New York	12.713	14.100	Idaho	564	585	New Mexico	24,551	24,245
5	Pennsylvania	10.734	10.805	Pennsylvania	541	530	Idaho	22,658	24,126
6	Texas	8.828	10.295	Texas	413	463	Washington	23,510	23,848
7	Michigan	8.327	10.253	Minnesota	470	460	Utah	21,400	23,146
8	Minnesota	9.102	9.466	Michigan	358	408	Nevada	22,143	23,069
9	New Mexico	7.881	7.831	New Mexico	321	323	California	23,025	23,002
10	Washington	5.901	6.606	Washington	251	277	Iowa	20,751	22,943

Use Table 2 to answer questions 9-11.

9. Total milk production in the U.S. in 2015 was 208.6 billion pounds. What percent of total production did the top 10 dairy states account for?

A) 51.3
B) 57.3
C) 68.4
D) 73.5
E) 82.5

10. How many of the top ten states for total cows showed a decrease in cow numbers from 2010 to 2015?

A) 2
B) 4
C) 5
D) 6
E) 8

11. Which state had the largest increase in production per cow in 2015 as compared to 2010?

A) California
B) Colorado
C) Iowa
D) New Mexico
E) Washington

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Questions 12-17 involve calculations of the price of milk of the four classes provided by the Federal Milk Marketing Orders. The information needed is presented ***independently*** *in each part of the problem.* ***Round ALL answers to the nearest 0.01****. You will use formulas applied in Federal Milk Marketing Orders.*

12. What is the price of butterfat?

Use the following information to make the calculation:
NASS average price for Grade AA butter = $2.105
Make allowance = $0.18
Yield factor = 1.21
Formula:

$$\boldsymbol{Butterfat\ value\ per\ lb} = (\boldsymbol{price\ of\ butter} - \boldsymbol{make\ allowance}) \times \boldsymbol{yield\ factor}$$

A) $1.59
B) $1.89
C) $2.33
D) $2.76
E) $3.14

13. What is the value of other solids?

Use the following information to make your calculation:
Dry whey price = $0.75/lb.
Make allowance = $0.22/lb.
Yield factor = 1.05
Formula:

$$\boldsymbol{Other\ solids\ value\ per\ lb} = (\boldsymbol{dry\ whey\ price} - \boldsymbol{make\ allowance}) \times \boldsymbol{yield\ factor}$$

A) $0.53
B) $0.56
C) $0.92
D) $0.97
E) $1.02

14. What is the Class III skim milk price from a producer whose milk tested 3.2% protein and 6.4% solids?

Assume the following prices:
Protein = $3.75/lb.
Other solids = $0.45/lb.
Formula:

$$\boldsymbol{Class\ III\ skim\ milk\ price\ per\ cwt} = (\%\ \boldsymbol{protein} \times \boldsymbol{protein\ price\ per\ lb}) + (\%\ \boldsymbol{other\ solids} \times \boldsymbol{other\ solids\ price\ per\ lb})$$

A) $4.17
B) $9.12
C) $12.11
D) $14.88
E) $25.44

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Problem Solving

15. What is the price per hundredweight of Class III whole milk?

Use the following data to make your calculation:

Protein content = 3.0%	Protein value = $3.75
Butterfat content = 3.6%	Butterfat value = $2.25
Other solids content = 6.0%	Other solids value = $0.50

Formula:

$$\boldsymbol{Class\ III\ milk\ price\ per\ cwt} = (\%\ \boldsymbol{protein} \times \boldsymbol{protein\ price\ per\ lb}) + (\%\ \boldsymbol{butterfat} \times \boldsymbol{butterfat\ price\ per\ lb}) + (\%\ \boldsymbol{other\ solids} \times \boldsymbol{other\ solids\ price\ per\ lb})$$

A) $19.10
B) $19.35
C) $22.35
D) $22.87
E) $32.10

16. What is the nonfat milk solids price?

Use the following information to make your calculation:
Average NASS price of nonfat dry milk = $1.95
Make allowance = $0.18
Yield factor = 0.98
Formula:

$$\boldsymbol{Nonfat\ solids\ price\ per\ lb} = (\boldsymbol{NDM\ price} - \boldsymbol{make\ allowance}) \times \boldsymbol{yield\ factor}$$

A) $1.53
B) $1.70
C) $1.73
D) $1.81
E) $2.09

17. Assuming the following utilization percentages and prices for the four classes of milk in the market during the pay period, first calculate the individual value of the four classes. What is the overall value per hundredweight (cwt) of milk from this producer?

Class	Utilization (%)	Price/cwt ($)	Value ($)
I	80	$18.50	_____
II	10	$16.50	_____
III	5	$13.50	_____
IV	5	$15.50	_____
All milk price /cwt			_____

A) $16.00
B) $16.50
C) $17.25
D) $17.90
E) $18.50

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Problem Solving

Table 3: Use the data to answer questions 18-20.

Cow	Milk/day (lb)	Fat (%)	Protein (%)	SCC (cells/ml)
1	100	3.6	3.1	250,000
2	75	3.4	3.3	100,000
3	60	3.1	2.8	400,000
4	90	4.1	3.0	50,000

18. How many total pounds of protein to the nearest tenth were produced per day by the four cows?

A) 2.5
B) 3.6
C) 10.0
D) 12.2
E) None of the above

19. Which cow produced the most pounds of fat per day?

A) 1
B) 2
C) 3
D) 4

20. What is the weighted average somatic cell count for the four cows?

A) 61,245
B) 187,692
C) 200,000
D) 800,000
E) None of the above

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