"Math is Cool" Masters – 2006-07

Sponsored by: Wenatchee Valley Clinic

6th Grade – May 19, 2007

Individual Contest

GENERAL INSTRUCTIONS applying to all tests:

- *Good sportsmanship is expected throughout the competition by all involved. Bad sportsmanship may result in disqualification.*
- *Calculators or any other aids may not be used on any portion of this contest.*
- *Unless stated otherwise:*
  - *For problems dealing with money, a decimal answer should be given.*
  - *Express all rational, non-integer answers as reduced common fractions.*
- *For fifth and sixth grade, all fractions and ratios must be reduced.*
- *Units are not necessary unless it is a problem that deals with time and, in that case, am or pm is needed. However, if you choose to use units, they must be correct.*
- *Leave all answers in terms of π where applicable.*
- *Do not round any answers unless stated otherwise.*
- *Record all answers on the colored cover sheets in the answer column only.*
- *Make sure all answer sheets have all the information filled out at the top of the sheet.*
- *Tests will be scored as a 0 if answers are not recorded correctly on the answer sheets.*
- *Blank answer sheets and answer sheets with no name will also be scored as a 0.*

INDIVIDUAL TEST - *35 minutes*

When you are prompted to begin, tear off the colored sheet and begin testing. Make sure your name and school are recorded on the answer sheet. Each problem is scored as a 1 or 0. Record your answers on the score sheet. No talking during the test. You will be given a 5 minute warning.

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6th Grade – May 19, 2007

Individual Contest

Record all answers on the colored cover sheet.

1	A is 92 larger than B, and the sum of A and B is 234. What is the value of A?
2	When a coin is flipped three times, what is the probability that there are exactly two heads? [Give your answer as a reduced common fraction.]
3	Danielle has some cookies with four layers of frosting each and some cookies with only three layers of frosting each. If she has a total of 38 cookies with a total of 120 layers of frosting, how many cookies with four layers of frosting does she have?
4	When a single marble is drawn from a bag containing two red, five green, and five blue marbles, what is the probability that it is red? [Give your answer as a reduced common fraction.]
5	What is the remainder when 182 is divided by 8?
6	What is the next term in the sequence 6, 12, 24, 48, ___ ?
7	What is the area, in square centimeters, of a circle with a diameter measuring 18 cm?
8	What is the perimeter, in centimeters, of a triangle with sides measuring 17, 41, and 46 cm?
9	What is the average of 19, 22, and 55?
10	What is the area, in square centimeters, of a rectangle with sides measuring 15 and 32 cm?
11	What is the area, in square centimeters, of a square with a perimeter of 30 cm?
12	What is the total surface area, in square centimeters, of a right circular cylinder with a base radius of 3 cm and a height of 12 cm?
13	What is the volume, in cubic centimeters, of a right circular cylinder with a base radius of 12 cm and a height of 4 cm?
14	When two cards are drawn from a standard 52-card deck [without replacing the first card], what is the probability that they are the same suit? [Give your answer as a reduced common fraction.]
15	What value(s) of g satisfy $2(4g - 3) - 3(g + 8) = -75$?
16	How many squares of any size are there in a four-by-four grid of unit squares?

17	When one card is drawn from a standard 52-card deck, what is the probability that it is a red card or a Jack?
18	When I double my age, in years, and then add 19 years, the result is 85 years. How old am I in years?
19	In how many ways can first, second, and third-place medals be awarded in a competition involving nine people, if no ties are allowed?
20	A rectangular picture measuring 13 cm by 18 cm is to be glued to a rectangular piece of paper measuring 19 cm by 24 cm so that 3 cm of paper shows on all sides of the picture. What is the area, in square centimeters, of the paper that is not covered by the picture?
21	How many diagonals can be drawn in a convex decagon (10-gon)?
22	In how many distinguishable ways can five people be seated at a round table?
23	How many distinguishable arrangements are there of the letters in the word "letters"?
24	How many positive three-digit numbers contain exactly two distinct digits (e.g. 343 or 772, but not 589 or 111)?
25	Pat can build a house in 6 weeks, while Tom can build one in 15 weeks. How many **days** would it take the two of them to build a house working together? [Assume that there are 7 work-days in a work-week.]
26	Two marbles are drawn without replacement from a bag of marbles containing 4 red, 6 green and 3 purple marbles. What is the probability both marbles are green.
27	Biff ran 4 times as fast as Eho. In fact, he ran 80 miles in 2 hours less than it took Eho to run 28 miles. How fast did Eho run?
28	Tickets on a bus were $4.00 and $6.00. A total of 45 tickets were sold and $230 earned. How many $4.00 tickets were sold?
29	A cow is tied to an external corner of a rectangular barn with sides measuring 15 and 25 m. If the cow's tether is 30 m long, what is the area, in square meters, of the region the cow can graze? [Give your answer as a reduced common fraction in terms of π.]

Challenge Questions

30	If eight "aarghs" are worth six "blahs", and ten "blahs" are worth three "crikeys", how many "crikeys" would 120 "aarghs" be worth?
31	Anne's Game Farm has only ten-point bucks and six-point bucks. If there are a total of 87 bucks with a total of 602 points between them, how many six-point bucks are there?
32	If P pizzas can be purchased for D dollars, how many **cents** would be necessary to purchase 3 pizzas?
33	When the digits of a positive two-digit number are reversed, the result is a positive two-digit number 18 greater than the original number. What is the smallest possible value of the original number?
34	If it takes two chickens three days to lay five eggs, how many eggs will nine chickens lay in fourteen days?
35	How many positive two-digit numbers contain at least one digit of 1 but not the digit2?
36	Tealah drove her car 4,240 miles last year, and her car averaged 20 miles per gallon of gas. How much, in dollars, did she spend on gas last year if gas costs $2.95 a gallon?
37	Silas buys 2 bags of potato chips and 3 boxes of pretzels for $2.35. He then buys another bag of potato chips and 2 more boxes of pretzel for $1.37. Find the cost, in dollars, of one bag of pretzels.
38	Circles A and B are concentric, and a chord of circle B that is tangent to circle A measures 14 m. What is the area, in square meters, of the region between the two circles?
39	Jay used each of the digits 1, 2, 3, 4, 5, 6, 7, 8, and 9 exactly once to write two whole numbers. These two numbers produce the largest product of any two numbers he could have written with these digits. What is the smaller of the two numbers Jay writes?
40	Biff, Eho and Frank are tossing a coin to see who can gets the first head. As soon as a head appears (even if each has not had an equal number of tosses) the game is over. If Biff tosses first, then Eho, then Frank, with the order repeated (possibly indefinitely) until the first head appears, what is the probability that Frank will win? [Express your answer as a reduced common fraction.]

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Team Multiple Choice Contest

Four married couples (Kelly & Jacob, Mary & Nick, Carla & Danny, Brenda & Ted) visit the Lake de Puddle Resort for lunch and a day of boating. The lunch menu is shown in the table on the left, and the boat rental prices in the table on the right. For the lunch menu, on any given day only one kind of each item is available (for example, only one kind of sandwich or one kind of pie).

Main Dish	Cost		**Drinks**	Cost
Chef's Salad	$2.50		Milk	$1.50
Pizza	$4.00		Soda	$___
Sandwich	$5.50			
			Dessert	
Side Orders			Cake	$2.00
French Fries	$1.00		Pie	$2.50
Bacon	$0.75			

Type of boat	Cost
Rowboat	Flat fee of $30, plus $8 per hour
Canoe	$18 for the first hour, plus $6 for each additional half-hour
Motorboat	$45 per hour plus $1.50 per mile

1	Mary ordered a chef's salad and Nick ordered 3 pieces of cake. They each had a soda. How much less did Mary's lunch cost than Nick's? A) $3.50 B) $3.65 C) $3.75 D) $4.00 E) answer not given
2	Carla and Danny together order one of everything on the lunch menu. If the average price of the 9 items they order is $2.40, what is the price of one soda? A) $1.50 B) $2.40 C) $2.00 D) $1.75 E) answer not given
3	Brenda definitely wants one main dish, one drink, and one dessert. She might have one side order, or she might not have any side order. If one possible drink is water (free), how many different lunches could Brenda order? A) 12 B) 54 C) 48 D) 18 E) answer not given
4	Kelly and Jacob plan a boat trip to Deer Glade, which is 12.5 miles away. If they rent a rowboat and travel at 5 miles per hour, how many minutes long will the one-way trip be? A) 120 B) 135 C) 150 D) 165 E) answer not given
5	Kelly and Jacob want to spend exactly an hour at Deer Glade before heading back. How much would it cost them to rent a rowboat for their trip to Deer Glade and back, assuming they row at a constant rate of 5 miles per hour? A) $54 B) $70 C) $38 D) $90 E) answer not given
6	Kelly and Jacob might rent a motorboat instead for their trip to Deer Glade and back (again spending exactly one hour at Deer Glade before returning). How much would it cost them if the motorboat's speed is a constant 25 miles per hour? A) $108.75 B) $82.50 C) $127.50 D) $90 E) answer not given

7	Ted is really fast at paddling a canoe. His average speed is 6.25 miles per hour. How much would it cost him to rent a canoe to paddle at this rate to Deer Glade and back, if he stays 30 minutes at Deer Glade before returning? A) \$60 B) \$48 C) \$24 D) \$36 E) answer not given
8	Mary and Nick rent a rowboat, Carla and Danny rent a canoe, and Brenda and Ted rent a motorboat. They each stay away for a whole number of hours (not necessarily the same for each couple). However, the bill for each couple is the same: \$54. What is the total number of hours for which the three couples rented the boats? A) 11 B) 10 C) 7 D) 8 E) not enough information
9	Each couple rents a canoe. Each canoe will have one man and one woman in it, but otherwise the 8 people get into the boats at random. What is the probability that each boat has a married couple in it? A) $\frac{1}{4}$ B) $\frac{1}{16}$ C) $\frac{1}{24}$ D) $\frac{1}{8}$ E) answer not given

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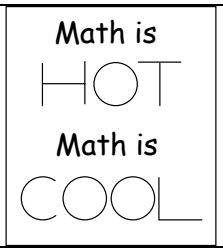
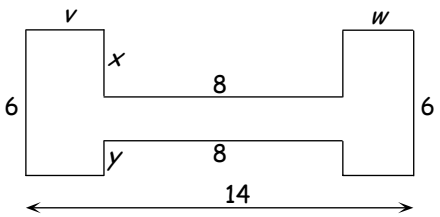
6th Grade – May 19, 2007

Team Contest

1	For how many whole-number values of x from 1 through 25 inclusive (including both 1 and 25) is x% less than $\frac{1}{x}$?
2	When Nicole designed the poster at right, she made the words **HOT** and **COOL** in capital letters using copper wire. All letters of **HOT** and **COOL** were 12 cm high and 12 cm wide (except that the **C** was 3/4 of a circle the same size as the **O**). How many cm of wire did Nicole use? 
3	I just wrote a 5-digit number that remains the same when its digits are reversed (a palindrome). What is the maximum number of 5-digit numbers that are not palindromes that I could write using those same digits?
4	The solution to the inequality $x + 1 > 9$ is $x > 8$. What is the solution to the inequality $7x - 13 \leq 4x + 17$?
5	Write the number 2007 in the smallest base for which the units digit would remain 7. Include the base in your answer as a subscript. (For example, "2007 base 10" would be written "2007_{10}".)
6	The price of pizza is based upon the area of the pizza. If a pizza with a 1-foot diameter sells for $5.00, how much, in dollars, does a pizza with a diameter of 2 feet cost?
7	The figure shown has an area of 48 square units, and all corners are square. Given that x is twice y, find the length of the vertical line segment x. 
8	My number is an odd counting number greater than 1 thousand. Its first digit is 4 times its last digit. The sum of its digits is 30, and all its digits are different. What is the smallest my number could be?
9	Aleta and Beth each have the same amount of money, all in coins (chosen from pennies, nickels, dimes, quarters, and half-dollars). The amount for each person is less than $1.00. However, they do not have any of the same type coins. (For example, if Aleta has one or more nickels, then Beth cannot have any nickels.) What is the greatest possible difference between the number of coins Aleta could have and the number of coins Beth could have?
10	An open cubical box with inside dimensions 5 inches on each edge is just filled with cubes 1 inch on each edge. How many of the 1-inch cubes are not touching either the sides or the bottom of the box?

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Relay Contest

RELAYS - 5 minutes per relay

There is no talking during this event and you must always be facing forward. Person #1 will be given an answer sheet(s) and will need to fill out the top. The proctor will hand out a strip of paper to each person. These need to be face down on your desk until it is time for the relay to start. Once the relay begins, everyone may turn over their strip of paper and begin working. You may write on the strip of paper to come up with your answer. However, when person #1 figures out his/her problem, he/she will record ***just his/her final answer*** *on the answer sheet and pass only the answer sheet back to the person behind. This continues until person #4 puts an answer on the answer sheet and gives it to the proctor. A correct answer from person #1, #2 and #3 is worth 1 point each. A correct answer from person #4 is worth 2 points making each relay worth 5 points. You will see the expression* ***TNYWG*** [Proctor: write this on the board] *which means: "the number you will get". This is where you put your teammate's answer that they pass back to you, and then you should be able to solve your question. Once the relay begins, turn over your strip of paper and* ***make sure you have the right person number****. Remember, no talking and remain facing forward to avoid being disqualified!*

	Relay #1	Answer
Person 1	Two interior angles of a triangle are 47° and 28°. What is the measure, in degrees, of the third angle?	105 [°]
Person 2	Find the smallest of the three consecutive counting numbers, such that the sum of the three numbers is TNYWG.	34
Person 3	Find the difference between TNYWG and the remainder of 149 divided by 15.	20
Person 4	Sally was TNYWG miles ahead of Steve when he started chasing her. If he caught her in 5 hours and traveled twice as fast as she traveled, how many miles did he have to go to catch her?	40 [miles]
	Relay #2	Answer
Person 1	Eho walked for 18 hours at a speed of 11/3 miles per hour, then for 12 hours at a speed of 19/6 miles per hour. How many total miles did Eho walk?	104 [miles]
Person 2	A field held cows, goats, and horses, with a total of TNYWG animals. The ratio of cows to horses was 3/8 and the ratio of cows to goats was 1/5. How many goats were in the field?	60 [goats]
Person 3	A square pyramid has a base with a side length of $\sqrt{10}$ units and a height of TNYWG units. Find the volume of the pyramid, in cubic units.	200 [un^3]
Person 4	Anne and Andy together had 1.4 x TNYWG dollars. Anne spent $20 on some CDs, and Andy spent three times that much. Now Anne has $160 more than Andy. How many dollars does Andy have now?	[$] 20

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Mental Math Contest

MENTAL MATH - 30 seconds per question

When it is time to begin, I will read the first question twice. You may not do any writing or talking while arriving at a solution. Once you have a solution, record it on the sheet in front of you. ***You may not change or cross out answers once you have written an answer down. If there are eraser marks, write-overs, or crossed out answers, they will be marked wrong.*** *Once all students have laid their pencils on the desk, another question will be asked. If a student doesn't lay his/her pencil down, the maximum wait time is 30 seconds from the second reading of the question before another question is asked. You may continue to work on a problem while the next question is being read. The value of each question is a one or zero. Each student may answer only four questions, and then another member of your team will come up, until each team member has had a turn. If your team has fewer than 4 members, missing team members will receive a zero.*

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Final Score:

KEY

School Name_____Team #_____

Proctor Name_____Room #_____ Division: ____

PERSON 1 NAME:		**1 or 0**
1.1	What is 9 squared?	81
1.2	What is the positive square root of 121?	11
1.3	How many minutes have passed between 11 o'clock am and 1:17pm?	137[min]
1.4	Joe made 60% more points at his basketball game this time than he did at his last basketball game. If he made 32 points this game, how many points did he make at the last game?	20 [pts]
PERSON 2 NAME:		
2.1	How many sides does a decagon have?	10
2.2	Jill made 8 dozen brownies. How many brownies did she make?	96 [brownies]
2.3	108 doughnuts are put into boxes with a dozen in each box. How many boxes are needed to hold the doughnuts?	9 [boxes]
2.4	The average of the first 7 numbers was 21. The average of the next 3 numbers was only 11. What was the over all average of the all the numbers?	18
PERSON 3 NAME:		
3.1	What is the area, in square units, of a square whose perimeter is 12?	9 [un^2]
3.2	What time is it 24 minutes before 7:18 pm?	6:54 pm
3.3	A hole of Frisbee golf takes ten minutes to complete. How many hours will it take to complete eighteen holes of Frisbee golf?	3 [hours]
3.4	Parking fees in Mathville are calculated on a weighted value. The first hour is weighted at 5 times the cost of each of the other hours following. What is the charge, in dollars, for 6 hours of parking if the second hour cost $1?	[$] 10.00
PERSON 4 NAME:		
4.1	A tree grows ten inches every year. If it is five feet tall, how many years has it been growing?	6 [yrs]
4.2	The number of mosquitoes in a pond doubles every day. If there are nine mosquitoes in the pond on Monday, how many mosquitoes will be in the pond on Thursday?	72 [mosq]
4.3	How many even numbers are between 20 and 40 inclusive?	11
4.4	Joe traveled at 3 kilometers per hour and 4 kilometers per hour for total of 52 kilometers in 15 hours. How far, in kilometers, did he travel at 3 kilometers per hour?	24 [km]

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May 19, 2007

6th Grade - Division 1 & 2

COLLEGE KNOWLEDGE BOWL ROUND #1

#	Problem	Answer
1	Two teams each have four players. In how many different ways can the two teams pick three players each to start the game?	16 [ways]
2	Joe gets one piece of candy on December 1st, two pieces on December 2nd, three pieces on December 3rd…and twenty-five pieces on December 25th. How many total pieces of candy does Joe get?	325 [pieces]
3	What is the remainder when 54 is divided by 7?	5
4	What is the sum of the first 5 prime numbers?	28
5	Find the value of x for the equation 2 times x plus 6 equals 18.	6
6	Jim can swim 100 yards in 35 seconds. How many minutes will it take Jim to swim 1200 yards?	7 [minutes]
7	One of the tires on Dave's bike was punctured by a nail. Dave can pump two liters of air into the tire every minute, but half a liter leaks out the hole every minute. How many minutes will it take to fill the six-liter tire?	4 [minutes]
	Extra Problem – Only if Needed	
8	What is the probability of rolling a four three times in a row while using a standard six-sided dice?	$\frac{1}{216}$

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6th Grade - Division 1 & 2

COLLEGE KNOWLEDGE BOWL ROUND #2

#	Problem	Answer
1	How many thirds are in nine and two thirds?	29
2	A drop of sap falls from a particular branch every hour and a half. If you park under this particular branch and leave your car there for one day, how many drops of sap will be on your car?	16 [drops]
3	A hotel has 260 rooms which each hold four people. However, eighty of the rooms have space for an extra cot, which will allow one more person to stay in the room. What is the maximum number of people that can stay in this hotel at one time?	1120 [people]
4	A particularly successful ant colony has 125,000 ants. If every year the population of the colony doubles, how many ants will be in the colony after three years? Express your answer in scientific notation.	1×10^7 [ants]
5	When I reverse the digits of the two-digit counting number I am thinking of, I get a number that is nine more than the original. How many numbers could I be thinking of?	8 [numbers]
6	Twenty percent of a number is eighteen. What is the number?	90
7	If 50 milligrams of sodium is 2 percent of your daily recommendation, how many grams of sodium as a decimal are you recommended to have in a day?	2.5 [grams]
	Extra Problem – Only if Needed	
8	Evaluate seven factorial.	5040

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6th Grade - Division 1 & 2

COLLEGE KNOWLEDGE BOWL ROUND #3

#	Problem	Answer
1	A train leaves Boston at 8 am headed for Philadelphia at 80 mph. Half an hour later a train leaves Philadelphia towards Boston on the same track at 70 mph. The track is 490 miles long. What time will the trains collide?	11:30 a.m.
2	Janice is counting backwards from 73 by 4's. What is the last positive number she says?	1
3	Express eleven and a third as a common fraction.	$\frac{34}{3}$
4	What is the probability of rolling a sum of seven with the roll of two regular six-sided dice?	$\frac{1}{6}$
5	Express the product of 0.5 and 0.7 as a common fraction.	$\frac{7}{20}$
6	Evaluate nine and two thirds divided by six. Write as a common reduced fraction.	$\frac{29}{18}$
7	Three consecutive integers sum to 54. What is the smallest of these numbers?	17
	Extra Problem – Only if Needed	
8	Evaluate three-sevenths divided by four-thirds.	$\frac{9}{28}$

"Math is Cool" Masters – 2006-07

6th Grade – May 19, 2007

Final Score:
KEY

First Score

School Name_____Team #_____

Proctor Name_____Room #_____

STUDENT NAME_____Division: _____

Individual Contest – Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	[A =] 163		
2	3/8		
3	6 [cookies]		
4	1/6		
5	6		
6	96		
7	81π [cm^2]		
8	104 [cm]		
9	32		
10	480 [cm^2]		
11	225/4 [cm^2]		
12	90π [cm^2]		
13	576π [cm^3]		
14	4/17		
15	-9		
16	30 [Squares]		
17	7/13		
18	33 [yrs]		
19	504 [ways]		
20	222 [cm^2]		

	Answer	1 or 0	1 or 0
21	35 [diagonals]		
22	24 [ways]		
23	1260 [ways]		
24	243 [numbers]		
25	30 [days]		
26	5/26		
27	4 [mph]		
28	20 [tickets]		
29	$1475\pi/2$ [m^2]		
30	27 [crikeys]		
31	67 [6 pt bucks]		
32	300D/P		
33	13		
34	105 [eggs]		
35	16 [numbers]		
36	[$] 625.40		
37	[$] .39		
38	49π [m^2]		
39	9642		
40	1/7		

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6th Grade – May 19, 2007

School Name_____Team #_____

Proctor Name_____Room #_____Division: _____

Final Score:
KEY

First Score

(out of 18)

Team Multiple Choice Contest – Score Sheet

TEAM MULTIPLE CHOICE - 15 minutes

This test is the only test where you will be penalized for incorrect responses. You will receive 2 points for a correct letter response, 0 points for leaving it blank and -1 point for an incorrect response. When you are prompted to begin, tear off the colored sheet, pass out a copy of the test to each team member, and begin testing. Since this is a multiple choice test, ONLY a letter response should be listed as an answer on the answer sheet.

Correct responses are worth 2 points, incorrect responses are worth -1 point and no response is 0 points.

DO NOT WRITE IN SHADED REGIONS

Answer		-1, 0 or 2	-1, 0 or 2
1	A		
2	E [$1.85]		
3	B		
4	C		
5	D		
6	C		
7	A		
8	D		
9	C		

"Math is Cool" Masters – 2006-07

6th Grade – May 19, 2007

School Name_____Team #_____

Proctor Name_____Room #_____Div: _____

Final Score:
KEY

First Score

(out of 20)

Team Contest – Score Sheet

TEAM TEST - 15 minutes

When you are prompted to begin, tear off the colored sheet and give a copy of the test to each of your team members and begin testing. Each problem is scored as a 2 or 0.

DO NOT WRITE IN SHADED REGIONS

	Answer	2 or 0	2 or 0
1	9 [values]		
2	$84 + 45\pi$ [cm]		
3	28 [numbers]		
4	$x \leq 10$		
5	3727_8 [subscript required]		
6	[$]20.00		
7	[x=] 3 [units]		
8	426,891		
9	91		
10	36 [cubes]		

"Math is Cool" Masters -- 2006-07

KEY

6th Grade – May 19, 2007

School:_____Team #_____

Proctor: _____ Room #_____Div _____

RELAY # 1

Answer for person # 1	Answer for person # 2	Answer for person # 3	Answer for person # 4
105[°]	**34**	**20**	**40 [miles]**
1 or 0	1 or 0	1 or 0	2 or 0

RELAY # 2

Answer for person # 1	Answer for person # 2	Answer for person # 3	Answer for person # 4
104 [miles]	**60 [goats]**	**200 [un^3]**	**[$] 20**
1 or 0	1 or 0	1 or 0	2 or 0