"Math is Cool" Masters – 2013-14

December 7, 2013

Total Correct: KEY

STUDENT NAME: _____ **School Name:** _____

Proctor Name: _____ Team #: _____ Room #: _____

Pre-Algebra Individual Contest – Score Sheet
DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	1/52		
2	1980 [seconds]		
3	72 [inches]		
4	BANANA		
5	17 [inches]		
6	6 [times]		
7	10 [years]		
8	$3.\overline{142857}$		
9	24 [ways]		
10	4		
11	56π [in^2]		
12	9 [square units]		
13	302.5 [miles]		
14	[x=] 12		
15	8/11		
1-15 TOTAL:			

	Answer	1 or 0	1 or 0
16	[x=] -3		
17	$2\sqrt{10}$ [units]		
18	125 [%]		
19	$\frac{-11}{3}$ or $-\frac{11}{3}$ or $\frac{11}{-3}$		
20	7/99		
21	[$] 3.60		
22	12 [segments]		
23	-10		
24	3 [cubic in]		
25	65 [fist bumps]		
26	12/25		
27	3.5 [gallons]		
28	0.5		
29	-1		
30	360		
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31	19/29		
32	576 [seconds]		
33	44 [hexagons]		
34	$\frac{3}{7750}$		
35	2		
36	$11104_{[8]}$		
37	$12-6\sqrt{2}$ [cm] or $-6\sqrt{2}+12$ or equivalent		
38	45 [ways]		
39	35/4		
40	$8\sqrt{5}$ [cm]		
31-40 TOTAL:			

PRE-ALGEBRA

"Math is Cool" Masters – 2013-14

December 7, 2013

Total Correct:

STUDENT NAME: _____ **School Name:** _____

Proctor Name: _____ Team #: _____ Room #: _____

Pre-Algebra Individual Contest – Score Sheet
DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
1-15 TOTAL:			

	Answer	1 or 0	1 or 0
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
16-30 TOTAL:			

	Answer	1 or 0	1 or 0
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
31-40 TOTAL:			

PRE-ALGEBRA

"Math is Cool" Masters – 2013-14

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December 7, 2013

7th & 8th Grade Mental Math Contest

Follow along as your proctor reads these instructions to you. Your Mental Math score sheet is on the back.

GENERAL INSTRUCTIONS applying to all tests:

- *Good sportsmanship is expected throughout the competition by all involved, both competitors and observers. Display of poor sportsmanship may result in disqualification.*
- *Calculators or any other aids may not be used on any portion of this contest.*
- *Unless stated otherwise, all rational, non-integer answers need to be expressed as reduced common fractions except in case of problems dealing with money. In the case of problems requiring dollar answers, answer as a decimal rounded to the nearest hundredth (ie, to the nearest cent).*
- *All radicals must be simplified and all denominators must be rationalized.*
- *Units are not necessary as part of your answer unless it is a problem that deals with time and in that case, a.m. or p.m. is required. 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 (name, team number, etc.) at the top of the sheet filled out.*
- *Tests will be scored as a 0 if answers are not recorded on the answer sheets.*
- *Blank answer sheets and answer sheets with no name will be scored as a 0.*

Mental Math – 30 sec per question

8 problems read orally to everyone - Approximately 8% of Individual Score - 25% of team score

When it is time to begin, the proctor 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 after completion of 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 will be asked the same eight questions. Individual scores used to determine individual placing will be determined by the sum of the Mental Math score and the Individual Test score for each individual. In addition, the top three Mental Math scores from one team will be totaled and doubled and will contribute to 25% of the team score.*

"Math is Cool" Masters – 2013-14

Sponsored by: Basic American Foods

7th & 8th Grade – December 7, 2013

Mental Math Contest

Mental Math – 30 sec per question

8 problems read orally to everyone - Approximately 8% of Individual Score - 25% of team score

When it is time to begin, the proctor 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 after completion of 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 will be asked the same eight questions. Individual scores used to determine individual placing will be determined by the sum of the Mental Math score and the Individual Test score for each individual. In addition, the top three Mental Math scores from one team will be totaled and doubled and will contribute to 25% of the team score.*

#	Problem
1	What is twenty-five percent of two hundred?
2	The counting numbers from one to five are written in a list. What is the mean of this list?
3	The product of two integers is seventy-two. What is the largest possible difference between the two integers?
4	How many miles per hour does Susan run if she can maintain a pace of one mile every twelve minutes?
5	Let 'a' represent the number of positive two-digit integers and let 'b' represent the number of positive one-digit integers. What is the value of $a - b$?
6	Elena has four red, three blue and two green jelly beans mixed up in a bowl. Without looking she chooses two from the bowl. What is the probability that both are red?
7	What is the sum of all of the prime numbers between four and fifteen?
8	A square has a diagonal of length, square root of fifty, centimeters. What is the number of square centimeters in the area of the square?

“Math is Cool” Masters – 2013-14

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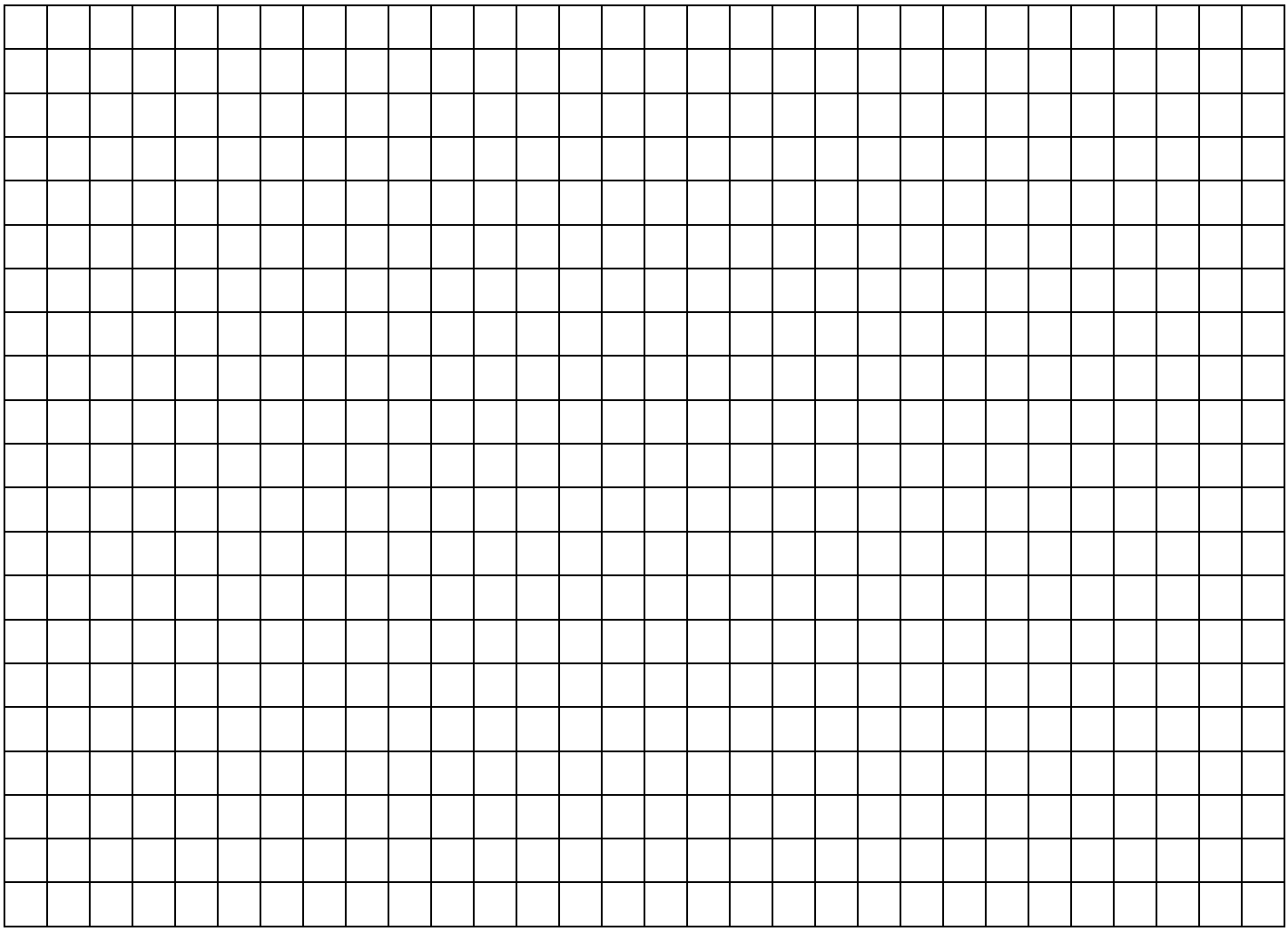
December 7, 2013

Pre-Algebra Individual Contest

Tear this cover sheet and scratch paper off and fill out the top of the colored answer sheet prior to the start of the test. The graph below is for your use, if needed.

INDIVIDUAL TEST – PRE-ALGEBRA - 35 minutes

You may NOT be seated next to anyone from your school. If you are MOVE NOW to avoid being disqualified! 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. The raw score will be 2 points for correct answers to problems 1-30 and 3 points for 31-40. Record your answers on the score sheet. No talking during the test. You will be given a 5 minute time warning.



"Math is Cool" Masters – 2013-14

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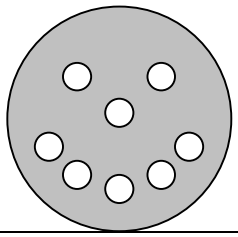
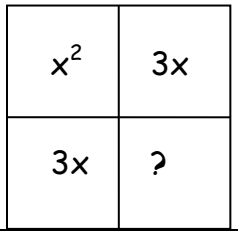
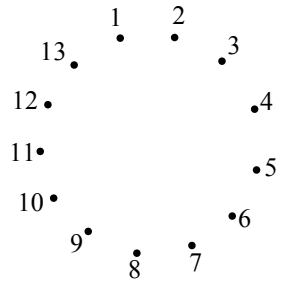
December 7, 2013

Pre-Algebra Individual Contest

	Questions 1-30: 2 points each
1	A card is drawn at random from a standard deck. What is the probability that it is the king of spades?
2	What is the number of seconds in 33 minutes?
3	What is the number of inches in the perimeter of an equilateral octagon with side length 9 inches?
4	If the letters of the alphabet were each assigned a number from 1 - 26 with A = 1, B = 2, C = 3, and so on, then the phrase MATH IS COOL could be coded as 13, 1, 20, 8, 9, 19, 3, 15, 15, 12. What word is coded by the following set of numbers? 2, 1, 14, 1, 14, 1
5	I am 5 feet 10 inches tall and Audrey is 4 feet 5 inches tall. How many inches taller am I than Audrey?
6	Rectangle ABCD has dimensions 3 cm by 4 cm. Rectangle EFGH has dimensions 8 cm by 9 cm. How many times bigger is the area of EFGH that the area of ABCD?
7	Maya is 14 and her mother is 38 years old. In how many years will Maya's mother be twice her age?
8	The decimal representation of $\frac{1}{7}$ is $0.\overline{142857}$. What is the decimal representation of $\frac{22}{7}$?
9	In how many distinct ways can the letters BARK be arranged?
10	Evaluate: $5^2 - 2 \cdot 5 \cdot 3 + 3^2$
11	The figure shown consists of one large circle and several congruent smaller circles. What is the number of square inches in the shaded region, if the radius of the larger circle is 8 inches and the radius of each of the smaller circles is 1 inch? 
12	The four rectangles shown form a larger rectangle. What is the area, in square units, of the rectangle labeled with a "?" so that the larger rectangle is a square? 
13	A train leaves station A at 8:00 am traveling due east at an average rate of 50 miles per hour. A second train leaves station A at 10:45 am traveling due west at an average rate of 60 miles per hour. As a decimal, how many miles apart are the fronts of the two trains 90 minutes after the second train leaves station A?
14	What is the value of x? $(a^3)^4 = a^3 \cdot a^3 \cdot a^3 \cdot a^3 = a^x$
15	As a common fraction, what is the ratio of prime numbers to composite numbers in the set of counting numbers 1-20?

16	What is the value of x? $3x - 11 = 8x + 4$
17	In the 3 x 8 array, the dots are evenly spaced horizontally and vertically with each dot 1 cm from the nearest neighboring dots. In simplest radical form, what is the number of units in the length of the longest segment containing exactly 3 dots, two of which are the segments endpoints?
18	If *a* is 160% of *b* and *b* is 50% of *c*, then what percent of *a* is *c*?
19	The equation of the line shown is $y = -\frac{2}{3}x - 5$. As a common fraction, what is the y-coordinate of the point on the line whose x-coordinate is -2?
20	An integer is selected at random from the set of integers from 1 to 99. What is the probability that the integer is odd and a multiple of 7?
21	Three friends agree to equally share the cost of a $27 pizza. Then two more friends join in the purchase of the pizza. If all five friends share the cost equally, how much less in dollars and cents will the original three friends pay per person?
22	A set of 13 dots are arranged and numbered as shown. A segment is drawn from point 1 to point 4, skipping points 2 and 3. Then another segment is drawn from point 4 to 7, skipping points 5 and 6. If this process of drawing segments and skipping two points is continued until every dot is the endpoint of at least one segment, what will be the total number of segments drawn? 
23	If $a @ b = 2a^2 - \frac{b}{4}$ then what is the value of 1 @ (5 @ 8)?
24	A scuba diver smurf is placed in a rectangular prism fish tank. The dimensions of the tank are 6x10x8 inches. If the tank is resting on its 6x10 inch base and the water level rises 0.05 inches, what is the number of cubic inches in the volume of the smurf?
25	Feeble Frank and Stormin' Sally are part of a 12-person soccer team. After their latest win, everyone on the team exchanges fist bumps with everyone else exactly once, except Feeble Frank and Stormin' Sally do not. How many total fist bumps occur?
26	The probability of rain on Wednesday in Sunnydale is 60%. If it rains, there's a 20% probability that Buffy will ride her bike. As a common fraction, what is the probability that it will rain on Wednesday and that Buffy doesn't ride her bike?
27	On average Carey can drive his car 30 miles per gallon of gas. Since filling the tank he has driven 195 miles which is 65% of the maximum number of miles he can drive before his car runs out of gas. As a decimal, what is the number of gallons left in the tank?
28	Consider the following data set: 6, 11, 13, 2, 8, 5 If 4 and 15 are added to the list, then, as a decimal, what is the positive difference between the resulting mean and the mean of the original data set?
29	The values of *a* and *b* are selected from the set {4, 5, 6, 7, 8, 9, 10} in order to minimize the value of the following expression. What is the value of *a* - *b*? $\sqrt{a+\sqrt{b}}$
30	What is the value of the smallest integer whose prime factorization has the pattern $a^1 \cdot b^2 \cdot c^3$, where *a*, *b* and *c* are distinct prime numbers?

Challenge Questions: 3 pts each

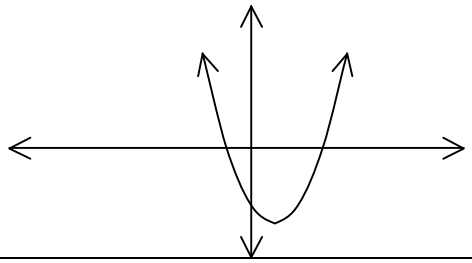
31 What is the median of the following list of numbers: $\frac{2}{3}, \frac{7}{10}, \frac{13}{20}, \frac{19}{29}, \frac{35}{54}$

32 Ben can eat one pint of ice cream in 24 minutes. Jerry can eat one pint of ice cream in 16 minutes. How many seconds would it take Ben and Jerry to eat one pint of ice cream together?

33 In the dot pattern shown each dot is 1 unit away from any of the nearest adjacent dots horizontally or diagonally. How many distinct regular hexagons can be drawn such that all of their vertices correspond with dots on the dot pattern?

34 The six faces of a 5x5x5 cm cube are painted red, blue, green, yellow, brown or purple, so that each is a different color. The cube is then divided into 1x1x1 cm cubes. Two of these smaller cubes are chosen at random. What is the probability that both of these cubes have one red face, one blue face, and four unpainted faces?

35 The equation of the parabola shown is $y = x^2 - 2x - 3$. What is the sum of the x-coordinates of the two points on the parabola with a y-coordinate of -1?



36 If the sum shown below, F represents the base-16 digit whose base-10 value is 15. Evaluate the sum and express your answer in base-8.

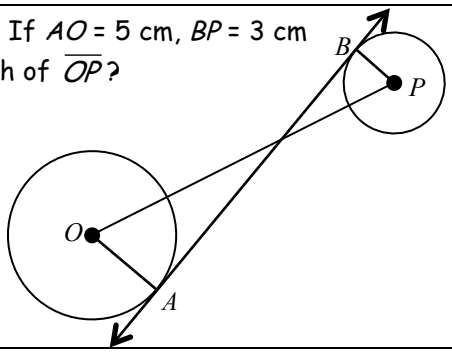
$$111_2 + 333_4 + 777_8 + FFF_{16}$$

37 What is the number of centimeters in the radius of a circle inscribed in an isosceles right triangle with legs of length 12 cm?

38 Consider the set {3, 7, 13, 19, 29, *a*, *b*} where *a* and *b* are prime numbers less than 50, $a < b$, and *a* and *b* are distinct from the other numbers in the set. In how many different ways could the numbers of the set be written as a list ascending from least to greatest?

39 In the given geometric series, as a common fraction, what is the sum of the smallest two terms which are each greater than 1? $\frac{64}{15625}, \frac{32}{3125}, \frac{16}{625}, \frac{8}{125}, \ldots$

40 $\overleftrightarrow{AB}$ is tangent to circles *O* and *P* at points *A* and *B* respectively. If *AO* = 5 cm, *BP* = 3 cm and *AB* = 16 cm, what is the number of centimeters in the length of $\overline{OP}$?



"Math is Cool" Masters – 2013-14

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7th Grade – December 7, 2013

Individual Multiple Choice Contest

USE THE FOLLOWING TABLE FOR PROBLEMS 1-3

	2013 Ford Focus FWD	2013 Dodge Dart	2013 Cadillac ATS	2013 Jeep Compass 2WD	2013 Buick Regal
Combined Miles per Gallon	30	29	23	26	22
City	26	25	19	23	19
Highway	36	36	30	30	27
Price	$20,000	$18,000	$40,000	$22,000	$33,000

These are the mileage ratings according to fueleconomy.gov for five cars each of which has a 2.0-liter, 4-cylinder engine.

1 Which model in the table has a Combined Miles per Gallon number that is equal to the mean of the Combined Miles per Gallon of all five models?

A) Ford Focus FWD B) Dodge Dart C) Cadillac ATS
D) Jeep Compass 2WD E) Buick Regal

2 Which model in the table has the smallest City to Highway ratio?

A) Ford Focus FWD B) Dodge Dart C) Cadillac ATS
D) Jeep Compass 2WD E) Buick Regal

3 Randi would like to buy one of these five cars. She estimates that she will drive the car 5400 miles on the highway and 1900 miles in the city during her first year of owning the car. Assuming a $4 per gallon price for gas and that her mileage estimate is correct, what amount would she spend to purchase and drive the most expensive option among the five cars for one year?

A) $40,280.00 B) $41,120.00 C) $42,000.00
D) $45,000.00 E) Answer not given.

USE THE FOLLOWING SCENARIO AND GRAPH FOR PROBLEMS 4-6

It takes Jonathan 5 minutes and 12 lego pieces to build a ninja and 4 minutes and 16 lego pieces to build a samurai. He has a total of 384 lego pieces and all could be used to make either a samurai or a ninja. He also has a total of 120 minutes available for playing with legos today. This scenario is modeled by the following inequalities and graph. Ordered pairs within and on the perimeter of the shaded region represent combinations of numbers of ninjas and numbers of samurais that Jonathan has enough time and enough pieces to make.

time constraint

$5n + 4s \leq 120$

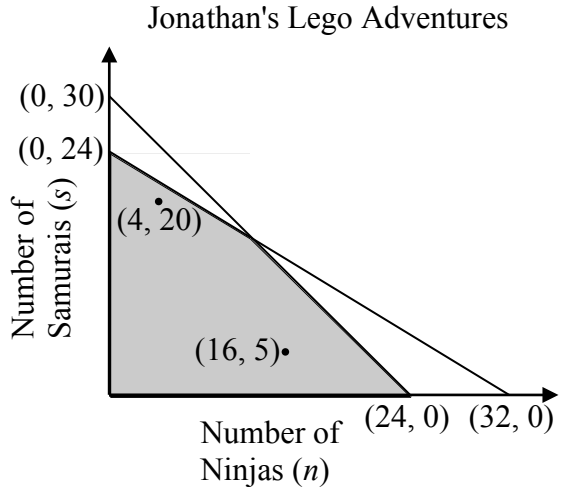
$12n + 16s \leq 384$

# of pieces constraint

$n \geq 0$

$s \geq 0$

common sense constraints (No negative number of ninjas or samurais.)



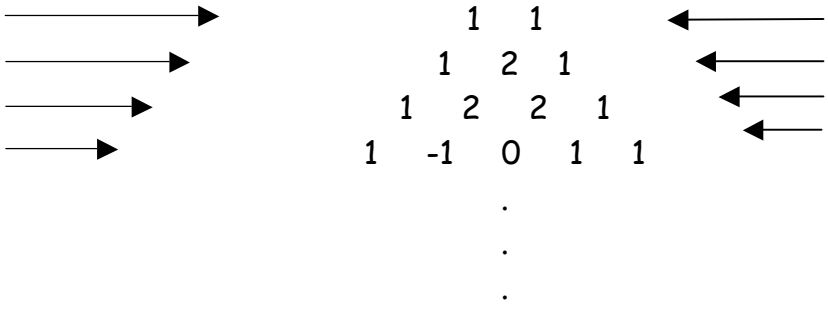
4	What is the maximum number of ninjas that Jonathan can make today? A) 36 B) 32 C) 30 D) 24 E) Answer not given.
5	What would be the maximum number of samurais that Jonathan could make, if he had an unlimited amount of lego pieces, but still only had 120 minutes available for playing with legos today? A) 24 B) 30 C) 32 D) 48 E) Answer not given.
6	What is the total number of ordered pairs of integers along the perimeter of the shaded region? A) 57 B) 55 C) 53 D) 18 E) Answer not given.

Row 1
Row 2
Row 3
Row 4

add
multiply
subtract L→R
add

USE THE FOLLOWING NUMBER PATTERN FOR PROBLEMS 7-10.

Consider the number pattern shown below. Row 1 consists of an initial 1 and a terminal 1. Row 2 consists of an initial 1, the sum of the two numbers in Row 1, and a terminal 1. Row 3 consists of an initial 1, the products of the numbers in Row 2 taken two at a time, and a terminal 1. Row 4 consists of an initial 1, the differences of the numbers in Row 3 taken two at a time from left to right, and a terminal 1. Row 5 will consist of an initial 1, the sums of the numbers in Row 4 taken two at a time, and a terminal 1. This process continues with initial and terminal 1s placed in each row and the numbers in between coming from adding, then multiplying, then subtracting, then adding, then multiplying, then subtracting, and so on, the numbers in the previous row two at a time from left to right.



7	What will be the 2nd number from the left in Row 5? A) 0 B) 1 C) 2 D) 3 E) Answer not given.
8	What is the sum of the numbers in Row 12? A) 6 B) 4 C) 2 D) -37 E) Answer not given.
9	What is the sum of all of the numbers in Rows 1-12? A) -2 B) 0 C) 11 D) 18 E) Answer not given.
10	What is the sum of the numbers in Row 16? A) 6 B) 4 C) 2 D) -390 E) Answer not given.

"Math is Cool" Masters – 2013-14

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7th Grade – December 7, 2013

Team Contest

1 Coach Beth needs to order t-shirts for the math team. Shirts-4-Less charges a $20 set-up fee plus $10 per shirt. Terrific T's charges $15 per shirt with no set-up fee. What is the minimum number of shirts she needs to order so that the total bill from Shirts-4-Less is less than the total bill from Terrific T's?

2 A palindrome is a number which looks the same when its digits are reversed. For example, 919 and 2002 are palindromes. What is the number of integers between 1000 and 2000 that are palindromes?

3 What is the price in dollars and cents of a Wii console with Sports before tax if the final price including a 9% sales tax is $141.70?

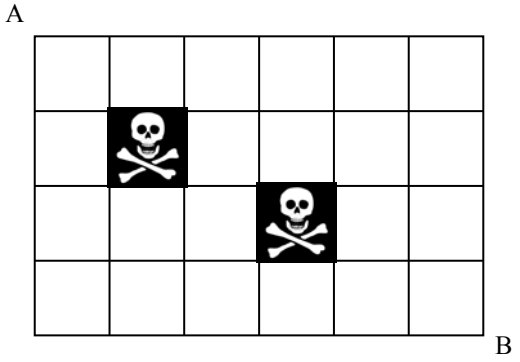
4 A positive three-digit integer is chosen at random. What is the probability that it is odd and greater than 400?

5 Each of the four rows in the table below has a pattern that can be modeled with a function rule. The function rules for the first three rows are given. In terms of *n*, what is the function rule for the fourth row?

1	2	3	4	. . . . .	*n*
3	5	7	9	. . . . .	*2n + 1*
4	12	24	40	. . . . .	*2n(n + 1)*
5	13	25	41	. . . . .	?

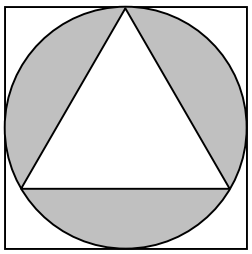
6 Today's date can be written in the form 12/07/13, where there are three two-digit numbers separated by slashes. It also has the property that the first two-digit number is a composite number, the second two-digit number represents a single-digit prime number and the third two-digit number is a two-digit prime number. In how many days will the next date composed of single- or two-digit composite/single-digit prime/two-digit prime occur?

7 How many routes are there along the grid lines from point A to point B, if you can only move right or down and you may not travel along any of the four edges or stop at any of the four corners of the squares marked with skull and crossbones?



8 Let $d_1 = 1^3 - 1^2$, $d_2 = 2^3 - 2^2$, $d_3 = 3^3 - 3^2$, . . . , $d_n = n^3 - n^2$. What is the units digit of d_{99}?

2 2 3 3 4 4

9	Equilateral ΔPQR is inscribed in circle O which is inscribed in square ABCD. If AB is 12 cm, what is the ratio of the shaded area to the area of ABCD? 
10	George has six cards with numbers on them as shown. He shuffles the cards and gives one to himself, one to Wayne, and one to Sam. What is the probability that the number on George's card is greater than both the number on Wayne's card and the number on Sam's card? ☐ ☐ ☐ ☐ ☐ ☐

"Math is Cool" Masters – 2013-14

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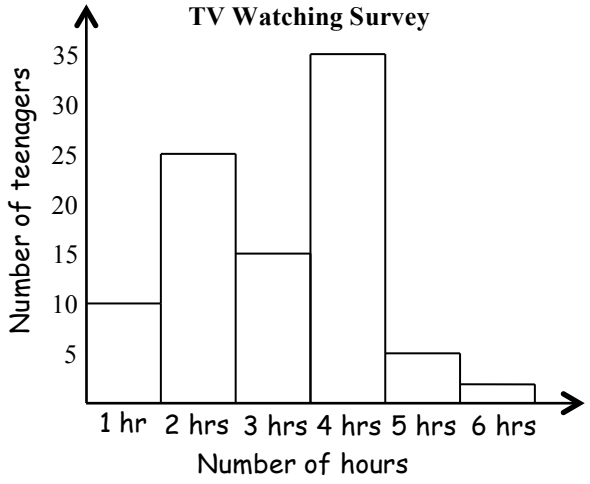
7th Grade – December 7, 2013

Pressure Round Contest

1	Let *a* represent the greatest 10-digit integer containing each of the digits 0 through 9 exactly once and let *b* represent the smallest 10-digit integer containing each of the digits 0 through 9 exactly once. What is the value of $a - b$?
2	Ninety-two teenagers were surveyed about how many hours per day of television they watch and the results are reflected in histogram shown. What is the median number of hours spent watching TV among the ninety-two teenagers? 
3	At Milehigh Middle School there are 121 students who play only soccer, only basketball, only ultimate Frisbee, a combination of two of the sports, or all three of the sports. 80 students play soccer, 30 play basketball and 35 play ultimate. If there is at least one student who plays both soccer and basketball, but not ultimate, at least one student who plays both basketball and ultimate, but not soccer, and at least one student who plays both ultimate and soccer, but not basketball, what is the largest possible number of students who could play all three sports?
4	Pythagorean triples are sets of three integers, *a*, *b* and *c*, that satisfy the equation $a^2 + b^2 = c^2$. Let *a* equal any even integer greater than 4 and let $a < b < c$. One way to generate Pythagorean triples is to let b and c be two consecutive even integers or two consecutive odd integers whose sum is $\frac{a^2}{2}$. What is the sum of the three integers in the Pythagorean triple with c = 101?
5	Jen's internet provider advertises that their service will download songs at rates up to 7 megabytes per second. When she actually uses her internet service to download songs, she observes that they download at an average rate of 343 kilobytes per second. There are 1000 kilobytes in 1 megabyte. As a common fraction, what is the ratio of the actual average download rate to the advertised maximum download rate?

"Math is Cool" Masters – 2013-14

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7th Grade – December 7, 2013

COLLEGE KNOWLEDGE BOWL ROUND #1 – SET 1

#	Problem	Answer
1	If y equals negative x squared plus ten x minus six, what does y equal when x equals three?	[y =] 15
2	A segment has endpoints with coordinates negative five comma eleven and one comma negative three. What is the product of the coordinates of the midpoint of the segment?	-8 (Accept 'negative 8' or 'minus 8')
3	The ratio of two integers is two to three. If both are positive multiples of five, what is the smallest possible sum of the two integers?	25
4	Ryan has three pennies, four nickels, five dimes, six quarters and seven half dollars. In dollars and cents, how much money does he have?	[$] 5.73 or 'five seventy-three' or '5 dollars and 73 cents'
5	How many units from the origin is the y-intercept of the line with equation four y plus three x equals twenty-four?	6 [units]
6	If 'a' equals nine, 'b' equals eight and 'abc' equals two thousand sixteen, what does 'c' equal?	28
7	What is the number of cubic centimeters in the volume of a cone with a base radius of fifteen centimeters and a height of forty millimeters?	300 pi [cm^3]
8	What is the number of degrees in the measure of the angle formed by the hands of a clock at three twenty?	20 [degrees]
9	As a decimal, what is the mean of the second, third, fifth and seventeenth positive multiples of eleven?	74.25
10	Jared has a deck of twenty cards. There are four twos, four threes, four fours, four fives, and four sixes. If he randomly draws four cards, what is the probability that he will get four of a kind?	$\frac{1}{969}$

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COLLEGE KNOWLEDGE BOWL ROUND #2 – SET 2

#	Problem	Answer
1	'C' prime is the reflection of point 'C' over the x-axis. If the coordinates of 'C' are negative two comma negative six, what is the sum of the coordinates of 'C' prime?	4
2	A standard die is rolled and a fair coin is flipped. What is the probability of rolling a three and flipping heads?	$\frac{1}{12}$
3	What is the value of x if five x minus three equals eight x plus thirty-nine?	-14
4	Betsy drives on average forty miles per hour for four hours from point A to point B. Rhonda drives on average twenty-five percent faster than Betsy. How many minutes shorter is Rhonda's drive from point A to point B than Betsy's?	48 [min]
5	What is the digit in the thousandths place when six-thirteenths is written as a decimal?	1
6	For the inequality, four to the x power is less than one thousand, what is the largest integer value of x?	4
7	What is the slope of a line perpendicular to the line whose equation is three y minus eight equals negative thirteen plus two-thirds x? Answer as a common fraction.	$-\frac{9}{2}$ or $\frac{-9}{2}$ or $\frac{9}{-2}$
8	What is the sum of the positive integer factors of thirty-six that are less than fifteen?	37
9	A rhombus has area thirty-six square centimeters and one of its diagonals is twice as long as the other. What is the number of centimeters in the length of the shorter diagonal?	6 [cm]
10	A pair of standard dice is rolled three times. The sum of the two numbers showing after each roll is recorded. What is the probability that the sum of the three sums is thirty-five?	$\frac{1}{7776}$

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COLLEGE KNOWLEDGE BOWL ROUND #3 – SET 3

#	Problem	Answer
1	What is the number of days of winter if the first day is December twenty-first, two thousand thirteen, and the last day is March nineteenth, two thousand fourteen?	89 [days]
2	Let 'a', 'b', 'c', and 'd', represent the numbers one, two, four, and five, not necessarily in that order. What is the largest value of 'a' over 'b' plus 'c' over 'd'?	7
3	What is the circumference of a circle with area one hundred pi square inches?	20 pi [inches]
4	What is the number of degrees in the measure of an interior angle in a regular nonagon?	140 [degrees]
5	What is the median of the list of prime numbers between twenty and forty?	30
6	What is the least common multiple of seventy-seven and ninety-one?	1001
7	A two-digit positive integer is selected at random. What is the probability that its digits are not the same?	$\frac{9}{10}$
8	A circle is graphed on a coordinate plane. Its center is at two comma three and there is a point on the circumference of the circle with coordinates negative six comma eighteen. What is the radius of the circle?	17
9	As a decimal, what number is two hundred fifty percent of one-third of one hundred eleven?	92.5
10	The volume of a sphere is nine hundred seventy-two pi cubic centimeters. What is the number of centimeters in the radius of the sphere?	9 [cm]

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COLLEGE KNOWLEDGE BOWL ROUND #4 – SET 4

#	Problem	Answer
1	The current on a river averages three miles per hour and a boat travels six miles with the current in an hour and a half. In miles per hour, what is the average speed of the boat without the current?	1 [mph]
2	What is the difference between the smallest three-digit prime number and the largest two-digit prime number?	4
3	What is the positive difference between a seventy-three degree angle and its complement?	56 [degrees]
4	Ben's cuckoo clock chimes every fifteen minutes, twenty-four hours a day. How many times does it chime in five days?	480 [times]
5	A lit candle melts down to eighty percent of its original eighteen centimeter height. How many additional millimeters of the candle must then melt away in order for it to reduce down to twenty percent of its original height?	108 [mm]
6	The speed of light is approximately six hundred and seventy million, six hundred and sixteen thousand, six hundred and twenty-nine miles per hour. If this number is written in scientific notation, what is the exponent that goes on the ten?	8
7	In simplest radical form, what is the number of centimeters in the side length of a square with area forty-eight square centimeters?	$4\sqrt{3}$ [cm]
8	What is the number of diagonals in a decagon?	35 [diagonals]
9	How many ways can you make exactly fourteen cents using dimes, nickels, pennies, or combinations of two or three of these coin types?	4 [ways]
10	An ant crawls along each edge of a regular tetrahedron with edge length five inches. In order to do this, the ant must crawl on at least one of the edges twice. What is the minimum possible total number of inches that the ant could crawl if it crawls along each edge at least once?	35 [inches]

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COLLEGE KNOWLEDGE BOWL ROUND #5 – SET 5

#	Problem	Answer
1	Suzanne has a pitcher that holds two point four liters of tea. If she pours three hundred fifty milliliters each for her four friends and for herself, how many milliliters will remain in the pitcher?	650 [ml]
2	Hal starts at home and he walks one kilometer south, then one kilometer west, then one kilometer south, then one kilometer west, then one kilometer south, then two kilometers west and arrives at school. What is the number of kilometers on a direct line between Hal's home and school?	5 [km]
3	What is ninety-one times twenty-three?	2093
4	Marco's deli sells sandwiches. You have a choice of four kinds of bread, seven deli meats, and six veggie toppings. Assuming you have exactly one type of bread, meat and veggie per sandwich, how many different sandwiches are possible?	168 [sandwiches]
5	A data set consists of positive integer multiples of thirteen that are less than one hundred. What fraction of these multiples are greater than fifty?	$\frac{4}{7}$
6	Sam has bowled scores of two hundred ten, two hundred five, two hundred twenty, and two hundred twenty-five. What score does he need to get in his next game in order to raise his average for the five games to two hundred twenty?	240
7	Ryan is reading a book. If every page is numbered, how many times does the digit zero appear in the first one hundred thirty-three pages?	23 [times]
8	In how many ways can the letters of the word mantissa, spelled M-A-N-T-I-S-S-A, be arranged?	10080 [ways]
9	A square with area sixteen square centimeters is inscribed in a circle. What is the number of square centimeters in the area of the circle?	8 pi [cm^2]
10	Standard form of a linear equation is 'a' x plus 'b' y equals 'c', where 'a' is greater than zero, 'a', 'b' and 'c' are integers, and the greatest common factor of 'a', 'b' and 'c' is one. What is standard form of the linear equation y equals two-thirds x plus one-fourth?	8x - 12y = -3

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COLLEGE KNOWLEDGE BOWL ROUND #6 – SET 6

#	Problem	Answer
1	Juanita's sock drawer has two blue, four yellow, six green, eight purple, and ten white socks all mixed up. If she randomly selects socks from her drawer, what is the minimum number she must select to ensure a pair whose color matches?	6 [socks]
2	A pear tree has thirty-four branches. Each branch has on average fifteen pears. All pears except the ten percent that have worms are brought to market. How many pears are brought to market?	459 [pears]
3	What is one thousand seventy-three divided by thirty-seven?	29
4	What is the value of x if x cubed equals negative sixty-four?	-4
5	The two parallel edges of a trapezoid are eleven and seventeen centimeters in length. What is the number of centimeters in the height of the trapezoid if the area is ninety-eight square centimeters?	7 [cm]
6	As a decimal, what is one hundred and one times five point five?	555.5
7	Let 'a' be the volume of a cylinder with radius five and height nine centimeters. Let 'b' be the area of a semicircle with radius one point five centimeters. What is 'a' divided by 'b'?	200
8	A triangle is constructed with two of its sides measuring six inches and ten inches. How many integer lengths are possible for the third side?	11 [lengths]
9	How many positive integer factors does nine hundred have?	27 [factors]
10	What is the number of cubic inches in the volume of a cube whose space diagonal is square root of twelve inches?	8 [in^3]

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COLLEGE KNOWLEDGE BOWL ROUND – EXTRA

#	Problem	Answer
1	As a decimal, what is the mean of the set of integers from thirteen to twenty-six?	19.5
2	Rectangle ABCD has area sixty square inches and the length of the long side is two point four times the length of the short side. What is the number of inches in the sum of the lengths of the four sides of the rectangle plus the lengths of its two diagonals.	60 [inches]
3	An urn contains thirty-two yellow marbles and twenty four green marbles. A marble is selected from the urn at random, then returned to the urn. After mixing up the marbles, a second marble is selected at random. What is the probability that the two marbles selected were the same color.	$\frac{25}{49}$ or '25 over 49' of '25 out of 49'

Final Score:

KEY

(Out of 8)

"Math is Cool" Masters -- 2013-14

School:_____ Room # _____ Team #_____

Name: _____Proctor: _____

7th & 8th Grade <u>Mental Math</u> – 30 sec per question

8 problems read orally to everyone - Approximately 8% of Individual Score - 25% of team score

When it is time to begin, the proctor 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 after completion of 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 will be asked the same eight questions. Individual scores used to determine individual placing will be determined by the sum of the Mental Math score and the Individual Test score for each individual. In addition, the top three Mental Math scores from one team will be totaled and doubled and will contribute to 25% of the team score.*

	Answer	1 or 0	1 or 0
1	50		
2	3		
3	71		
4	5 [miles per hour]		
5	81		
6	1/6		
7	36		
8	25 [square centimeters]		

Math is Cool" Masters – 2013-14

7th Grade – December 7, 2013

Final Score:

KEY

Student Name_____

Proctor Name_____Room #_____

First Score

(out of 20)

SCHOOL NAME_____ Team #_____

INDIVIDUAL MULTIPLE CHOICE - 15 minutes – 10 problems – 20% of team score

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. It is not necessary to write your personal name on the test, but you may put it at the bottom of the test so your coach will be able to give you back the correct test. This test is taken individually, but it is part of your team score, including zeros for missing team members. Your team score will be calculated by taking the mean of your four team members' scores. When you are prompted to begin, tear off the colored sheet and begin testing. ***Since this is a multiple choice test, ONLY a letter response should be indicated as an answer on the answer sheet.*** *No talking during the test.*

DO NOT WRITE IN SHADED REGIONS

	Answer	-1, 0 or 2	-1, 0 or 2
1	D		
2	C		
3	B		
4	D		
5	B		
6	E (54)		
7	A		
8	D		
9	E (10)		
10	C		

"Math is Cool" Masters – 2013-14

7th Grade – December 7, 2013

Final Score:

KEY

SCHOOL NAME_____ **Team #** _____

First Score

(out of 10)

Proctor Name_____Room #_____

Team Contest – Score Sheet

TEAM TEST - 15 minutes – 30% of team score

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 ***1 or 0****. Record all answers on the colored answer sheet.*

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	5 [shirts]		
2	10 [palindromes]		
3	[$] 130.00		
4	1/3		
5	$2n(n+1) + 1$ or $2n^2 + 2n + 1$ or equivalent		
6	1212 [days]		
7	16 [routes]		
8	8		
9	$\frac{4\pi - 3\sqrt{3}}{16}$ or $\frac{\pi}{4} - \frac{3\sqrt{3}}{16}$ or equivalent		
10	7/30		

"Math is Cool" Masters – 2013-14

7th Grade – December 7, 2013

Final Score:
KEY
First Score

Proctor Name_____Room #_____

SCHOOL NAME_____Team #_____

PRESSURE ROUND - 10 minutes – 5 problems - 5 rounds – 15% of team score

When it is time to begin, you will be handed a packet of five problems. There is a copy of the problems for each team member. Two minutes after the start of the test you are expected to submit an answer for one of the problems (it can simply be a guess). The maximum value of this answer is 1 point. In another two minutes you are expected to submit another answer to one of the four remaining problems; its maximum value is two points. This process will continue until all the problems are answered and each consecutive problem's worth will go up by one point. You must submit your answers on the colored sheets given to you. If you do not have an answer at the end of a two minute period, you must still submit an answer sheet with an identified problem number on it. Failure to do so will result in loss of points. This event is timed, and you will be given a verbal 5 second warning and told to hold your answer sheet up in the air. You may keep working as the sheets are collected. If a team answers the same question more than once, only the first answer will be scored and the other attempts will be ignored.

Pressure Round Answers

	Answer
1	8,853,086,421 or 8853086421
2	3 [hours]
3	10 [students]
4	220
5	$\frac{49}{1000}$

"Math is Cool" Masters -- 2013-14

School:_____ Room # _____ Team #_____

Name: _____Proctor: _____

Final Score:
(Out of 8)

7th & 8th Grade **Mental Math** – 30 sec per question

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	Answer	1 or 0	1 or 0
1			
2			
3			
4			
5			
6			
7			
8			

Math is Cool" Masters – 2013-14

7th Grade – December 7, 2013

Final Score:

Student Name_____

First Score

(out of 20)

Proctor Name_____Room #_____

SCHOOL NAME_____ Team #_____

INDIVIDUAL MULTIPLE CHOICE - 15 minutes – 10 problems – 20% of team score

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DO NOT WRITE IN SHADED REGIONS

Answer		-1, 0 or 2	-1, 0 or 2
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

"Math is Cool" Masters – 2013-14

7th Grade – December 7, 2013

Final Score:

SCHOOL NAME_____ **Team #** _____

First Score

(out of 10)

Proctor Name_____Room #_____

Team Contest – Score Sheet

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DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			