"Math is Cool" Masters – 2004-05

Sponsored by: American Chemical Society

5th Grade – May 14, 2005

Individual Contest

Written by Cherie Clymer

GENERAL INSTRUCTIONS

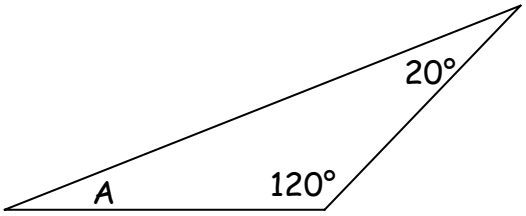
Good sportsmanship is expected throughout the competition by all involved. Bad sportsmanship may result in disqualification. Calculators may not be used on any portion of this contest. Express all non-integer answers as fractions unless stated otherwise or it is a problem dealing with money and in that case, a decimal answer should be given. 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 B 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. This test is scored as a 1 or 0. Express all non-integer answers as fractions unless stated otherwise or it is a problem dealing with money and in that case, a decimal answer should be given. For fifth & sixth grade, make sure all fractions and ratios are reduced. Units are not needed except on questions that deal with time and, in that case, a.m. or p.m. is needed. If you choose to use units, you must use them correctly. Record your answers on the score sheet. No talking during the test.

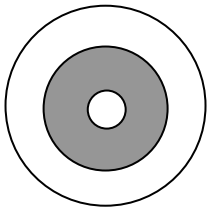
Record all answers on the colored cover sheet.

1	How many diagonals are there in a convex pentagon?
2	Find the quotient of 126 and 7.
3	Evaluate: $4 + 12 \div 4$
4	A circle has a diameter of 12. What is its area?
5	I have 56 pieces of candy to divide evenly among my 7 friends. How many pieces of candy does each of my friends get?
6	Biff did a survey of his class to find out how many gold fish are owned by his classmates. In the class of 20 classmates, 17 students didn't own any. Of the three who did, one owned 17, another 15, and the last classmate owned 12. How many total fish are owned by Biff's classmates?

7	What is the mean of the data set {8, 3, 7}?
8	The sum of three consecutive numbers is 27. What is the smallest of the three numbers?
9	Express $\frac{1+2+3+4+5}{2+4+6+8+10}$ as a common reduced fraction.
10	What is the sum of the digits of the number you find after you round 38,129,450 to the nearest 10,000?
11	A recipe calls for 3 tablespoons of sugar for every $\frac{1}{2}$ cup of flour. If Samantha has 14 tablespoons of sugar, how many cups of flour does she need to make the recipe? Write your answer as a mixed number.
12	How many counting numbers are between 5 and 20, inclusive?
13	Five people go to a movie and sit together in a row. How many different ways can they sit in a row?
14	When I divide a certain number by 6, the quotient is 7 and the remainder is 4. What is the number?
15	What's the smallest palindrome larger than 1001?
16	On the first day that I began cross-country skiing, I went 1 km. If I double the distance I ski each day, on which day did I first ski over 20 km in a single day?
17	When two six-sided dice are rolled, how many different sums are possible?
18	What is the area of a right triangle with legs of lengths 3 and 4?
19	How many degrees are in the complement of a 55 degree angle?
20	In the figure shown, what is the measure, in degrees, of angle A? 
21	If two months ago was April, what month will it be 21 months from now?
22	An item that originally cost $100.00 was discounted by 30%, but then the discounted price was raised by 30%. What is the new price of the item, in dollars?
23	Two six-sided dice are tossed. What is the probability that the sum of the numbers rolled is not divisible by 2 or 3?
24	The length and width of a rectangular prism are tripled, but the height remains the same. By what factor is the volume increased?
25	What is the common fraction that is equivalent to $.\overline{45}$?

26	What is the sum of the next two terms in the following sequence? 1, 8, 27, 64,…
27	The mean average of three numbers is 3. If two of the three numbers are 1, what is the other number?
28	A rectangular playing field is 40 yards wide and 30 yards long. How far is it diagonally across this field, in yards?
29	What is the sum of all integers that make the following inequality true? $\|x\| < 3$

Challenge Questions

30	The ratio of two supplementary angles is 5:7. What is the measure of the larger angle, in degrees?
31	Express 11011_2 as a base 10 number.
32	What is the first number that is divisible by 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10?
33	What percent of 50 divided by $\frac{1}{2}$ is 50 times $\frac{1}{2}$?
34	Mathland Middle School's math team members all participate in at least one of three other school activities: band, leadership, and track. Of the 40 members of the team, 15 are in leadership, 23 are on the track team, 4 are in both leadership and band, 6 are in both leadership and track, 3 are in band and track, and 2 students are in all three activities. How many students are in the band, total?
35	The entrance to a railroad tunnel in the Cascade mountains is in the shape of a semi-circle. Seven feet from the center of the tunnel, the height of the entrance is 24 feet. How tall is the tunnel at its center, in feet?
36	What is the volume of a cone, in cubic feet, with a height of 1 foot and a radius of $\frac{1}{4}$ foot?
37	Tom, Cherie, and Jack are running a race. They are the only people running in the race. The probability of Tom winning is $\frac{1}{2}$, the probability of Cherie winning is 1/3, and the probability of Jack winning is 1/6. The night before the race, Tom broke his foot and dropped out of the race. With Tom gone, what is the probability of Jack winning?
38	Dart players are aiming at the bulls eye as shown below. Given that all the dart players will hit the target with a dart, what is the probability their dart will hit the shaded area? The radius of the large circle is 5; the radius of the medium circle is 3, and the radius of the small circle is 1. 
39	What is the lateral surface area, in square inches, of a cylinder whose radius measures $2\frac{1}{2}$ inches and whose height is 5 inches?
40	Spiderman, Garfield, and Shrek all enter a race as a relay team. Spiderman swings through the first mile in 3 minutes and 40 seconds. Garfield crawls the second mile in 116 minutes, and Shrek jumps the last mile in 20 seconds. What was their team's average speed, in miles per hour? [Write answer as a decimal.]

"Math is Cool" Masters – 2004-05

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5th Grade – May 14, 2005

Team Multiple Choice Contest

Written by Joel Turtle

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.

A coach is examining his quarterbacks in order to find out who he should start in the state playoffs. In football, a quarterback is the player who throws the ball to his receivers. A completion is a pass that is caught, and each completion is measured for distance in terms of yards. In the following scenario, quarterbacks may gain yards only by making completions. Below is a chart comparing the three quarterbacks after the team's first 10 games.

Quarterback	Completion Percentage	Total Number of Passes Completed	Total Number of Passes	Yards per Game	Minutes per Game	Yards per Pass
Biff	68.75%	110	160	242	22	22
Eho	48%	120	250	168	42	14
John	34%	170	500	204	51	12

1	How many completed passes does Biff average per minute? A) 1/3 B) 3/4 C) 1/2 D) 5/6 E) Answer not given
2	How many yards does Biff average per minute of play? A) 6 B) 8 C) 10 D) 11 E) Answer not given
3	How many games should it take Eho to gain 1008 yards? A) 4 B) 6 C) 8 D) 10 E) Answer not given
4	Between Biff, Eho and John, what is the range of the total number of passes completed? A) 50 B) 10 C) 60 D) 115 E) Answer not given

5	What is the average number of passes John completes per game? A) 12 B) 17 C) 11 D) 19 E) Answer not given
6	If Biff gets paid $50 per pass completed, how much has he earned? A) $2,300 B) $5,500 C) $6,700 D) $8,975 E) Answer not given
7	Eho makes $100,000 plus $25 for each completed pass and $2 for each minute he plays. How much has Eho earned? A) $103,840 B) $116,790 C) $164,320 D) $183,460 E) Answer not given
8	John is paid $1,000 per game plus $5 per yard gained. How much has he made? A) $15,400 B) $13,970 C) $14,940 D) $20,200 E) Answer not given
9	If Biff throws 32 passes, how many yards would be expected to be gained? A) 318 B) 421 C) 456 D) 484 E) Answer not given

"Math is Cool" Masters – 2004-05

Sponsored by: American Chemical Society

5th Grade – May 14, 2005

Team Contest – Written by Tom Clymer

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. This test is scored as a 1 or 0. Express all non-integer answers as fractions unless stated otherwise or it is a problem dealing with money and in that case, a decimal answer should be given. For fifth & sixth grade, make sure all fractions and ratios are reduced. Units are not needed except on questions that deal with time and, in that case, a.m. or p.m. is needed. If you choose to use units, you must use them correctly.

1	Evaluate $\frac{C}{B} + A + D$ if: A = the number of inches in a yard B = the number of centimeters in a meter C = the number of seconds in an hour D = the number of days in August
2	The digits 2, 3, 5, 7, and 9 are each used once to make a two-digit number and a three-digit number. To the nearest hundredth, what is the smallest possible result when the three-digit number is divided by the two-digit number? [Write answer as a decimal.]
3	How many different sets of three people can be selected from a group of 8 people?
4	A palindromic number is one which reads the same forward and backward, such as 34643. How many positive four-digit palindromic numbers exist?
5	Two numbers add up to 469 and differ by 217. What is the larger of the two numbers?
6	A tennis tournament has forty participants. Players play games against one another, with the loser of each game being eliminated from the tournament. The tournament is over when there is only one remaining player, who is declared the winner. How many games must be played to determine the winner of the tournament?
7	The "aspect ratio" of a rectangle is its longer dimension divided by its shorter dimension. If a rectangle has an area of 675 square centimeters and an aspect ratio of 3, what is its perimeter, in centimeters?
8	What is the total surface area of the shape formed when a cube with three-centimeter edges has a cube with one-centimeter edges carved into the center of each of its faces?
9	At a school with 100 students, 48 like hot dogs, 63 like hamburgers, 53 like pizza, 26 like both pizza and hamburgers, 32 like hot dogs and pizza, and 20 like all three. If each student likes at least one of these foods, how many students like hot dogs and hamburgers but don't like pizza?
10	A five-centimeter by six-centimeter rectangle overlaps a three-centimeter by eight-centimeter rectangle in such a way that fourteen square centimeters of the three-by-eight rectangle are NOT overlapped. What is the area, in square centimeters, of the five-by-six rectangle which is not overlapped?

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5th Grade – May 14, 2005

Relay Contest

Written by Tom Tosch

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	What is the greatest common factor of 35 and 30?	5
Person 2	What is TNYWG squared?	25
Person 3	What is the smallest prime number larger than twice TNYWG?	53
Person 4	What is the remainder when TNYWG is divided by 7?	4
	Relay #2	Answer
Person 1	What is 4 + 6 x 2 – (5 – 13)?	24
Person 2	What is three-eighths of TNYWG?	9
Person 3	What is the probability of rolling a sum of TNYWG with two fair dice?	1/9
Person 4	What is the square root of the reciprocal of TNYWG?	3

"Math is Cool" Masters – 2004-05

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5th Grade – May 14, 2005

Final Score:

KEY

School Name_____Team #_____

Proctor Name_____Room #_____ Division: ____

Mental Math Contest – Written by Amanda Hochstatter

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 erase or cross out answers once you have written an answer down.*** *If there are eraser marks 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. The value of each question is a one or zero. Each student will be asked four questions, then another member of your team will come up.*

PERSON 1 NAME:		**1 or 0**
1.1	What is the difference between 321 and 189?	132
1.2	What is the probability of getting a face card in a standard deck of cards?	3/13
1.3	What is 13 squared?	169
1.4	The area of a triangle is 18. The height and base are equal. What is the height?	6
PERSON 2 NAME:		
2.1	What is two-fifths of 30?	12
2.2	Haley is 4 feet 10 inches tall. How tall is she in inches?	58 [inches]
2.3	What is three-fourths, expressed as a decimal?	0.75
2.4	There are ducks and dogs in a in a field. There are 34 legs and 12 heads. How many dogs are there?	5 [dogs]
PERSON 3 NAME:		
3.1	What is 2/3 divided by 5/6?	4/5
3.2	How many cups are in 3 ½ gallons?	56 [cups]
3.3	Suppose that A + B = 5, and 5 + B = 7. What is A?	3
3.4	How many sides does a dodecagon have?	12
PERSON 4 NAME:		
4.1	What is the sum of 3578 and 333?	3911
4.2	What time was it 32 minutes before 12:12 PM?	11:40 AM
4.3	How many feet are in a mile?	5280 [ft]
4.4	I am thinking of a number divisible by 5. It is a prime number. What is my number?	5

"Math is Cool" Masters – 2004-05

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5th Grade – May 14, 2005

Division 1 & 2

Written by Josh & Colin

COLLEGE KNOWLEDGE BOWL ROUND #1

#	Problem	Answer
1	A person running at 6 miles per hour passes a bus traveling at 30 miles per hour in the opposite direction. To the person on the bus, it seems the runner is actually going how fast, in miles per hour?	36 [mph]
2	Two positive numbers have a least common multiple of 84. If one number is 21, what is the smallest value the other number could be?	4
3	How many 3 digit numbers are there that contain a 1 and a 2 exactly once as digits?	46
4	An equilateral triangle has sides of length 6. If 3 squares with the same side length as the triangle are placed so one side of the square lines up with one side of the triangle, what will be the perimeter of the figure?	54
5	A child watching a race of bicycles and unicycles sees 20 wheels and 14 heads. How many unicycles are in the race?	8 [unicycles]
6	Compute: $20 + 12 \times 6$.	92
7	If three-fourths of a math team are girls and there are five boys on the math team, how many people are on the math team?	20 [people]
	Extra Problem – Only if Needed	
8	What is the area of a circle with circumference 6π?	9π

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5th Grade – May 14, 2005

Division 1 & 2

Written by Josh & Colin

COLLEGE KNOWLEDGE BOWL ROUND #2

#	Problem	Answer
1	Hannah and Joe are mowing their yard. It takes Hannah 10 minutes to mow the yard by herself and Joe 15 minutes to mow the yard by himself. How many minutes will it take them to mow the lawn working together?	6 [min]
2	Christina woke up at 8:32 A.M. If she went to lunch 205 minutes later, what time did she go to lunch?	11:57 A.M.
3	How many solid cubes one inch on a side are needed to make a solid cube three inches on a side?	27 [cubes]
4	What is the sum of the first 8 positive whole numbers?	36
5	A tennis ball is dropped from a height of 64 feet. Each time it bounces, it returns to one-half its height. What is the maximum height in feet it will reach after its third bounce?	8 [ft]
6	How many distinct squares with whole number side lengths can be created whose areas are between 50 and 110?	3 [squares]
7	Colin weighs 150 lbs on Earth but on the planet Tycho he weighs 50 lbs. If Philip weighs 180 lbs on Earth, how much would he weigh on the planet Tycho, in pounds?	60 [lbs]
	Extra Problem – Only if Needed	
8	Josh has 4 deck chairs, each a different color. How many different color combinations of two chairs can he choose?	6 [combin]

"Math is Cool" Masters – 2004-05

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5th Grade – May 14, 2005

Division 1 & 2

Written by Josh & Colin

COLLEGE KNOWLEDGE BOWL ROUND #3

#	Problem	Answer
1	Suzy and Dick are racing in their cars. If Suzy travels at 20 miles per hour, Dick travels at 30 miles per hour, and the course is 60 miles long, how far ahead of Dick must Suzy start if they are to finish at the same time?	20 [miles]
2	Steve takes the same amount of time to run around a square track as a circular track, and always runs at the same speed. The square track encloses an area of 100 square meters. What must the circumference of the circular track?	40 [meters]
3	Rebecca has 3 shirts, 4 pairs of pants, and 5 silly hats. If an outfit consists of one shirt, one pair of pants, and one silly hat, how many outfits can she make?	60 [outfits]
4	An odd number is subtracted from an even number, which leaves a natural number. This number is multiplied by an odd number. Is the result even, odd, or impossible to determine?	Odd
5	Compute 86 times 403.	34658
6	A party starts at 9:00 p.m. with ten people at the party. If every 10 minutes, five new people come to the party and nobody leaves, how many people are at the party at 10:30 p.m.?	55 [people]
7	If today is Wednesday, what day will it be 31 days from now?	Saturday
	Extra Problem – Only if Needed	
8	If $3x + 18 = 9 + 6x$, what does x equal?	(X=) 3

"Math is Cool" Masters – 2004-05

5th Grade – May 14, 2005

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	5 [diag]		
2	18		
3	7		
4	36π		
5	8 [pieces]		
6	44 [goldfish]		
7	6		
8	8		
9	$\frac{1}{2}$		
10	15		
11	$2\frac{1}{3}$ [cups]		
12	16		
13	120 [ways]		
14	46		
15	1111		
16	6^{th} [day]		
17	11 [sums]		
18	6 [un^2]		
19	35 [degrees]		
20	40 [°]		

	Answer	1 or 0	1 or 0
21	March		
22	[$] 91.00		
23	1/3		
24	9		
25	5/11		
26	341		
27	7		
28	50 [yards]		
29	0		
30	105 [°]		
31	27		
32	2520		
33	25 [%]		
34	13 [students]		
35	25 [feet]		
36	$\frac{1}{48}\pi$ [ft^3]		
37	1/3		
38	8/25		
39	25π [in^2]		
40	1.5 [mph]		

"Math is Cool" Masters – 2004-05

5th Grade – May 14, 2005

School Name_____Team #_____

Proctor Name_____Room #_____

Division: _____

Final Score:
KEY

First Score

(out of 18)

Team Multiple Choice Contest – Score 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	C		
2	D		
3	B		
4	C		
5	B		
6	B		
7	A		
8	D		
9	D		

"Math is Cool" Masters – 2004-05

5th Grade – May 14, 2005

School Name_____Team #_____

Proctor Name_____Room #_____

Div: _____

Final Score: KEY

First Score (out of 10)

Team Contest – Score Sheet

DO NOT WRITE IN SHADED REGIONS

	Answer	1 or 0	1 or 0
1	103		
2	2.42		
3	56 [sets]		
4	90		
5	343		
6	39 [games]		
7	120 [cm]		
8	78 [cm^2]		
9	6 [students]		
10	20 [cm^2]		

"Math is Cool" Masters -- 2004-05

KEY

5th Grade – May 14, 2005

School:_____Team #_____

Proctor: _____ Room #_____Div _____

RELAY # 1

Answer for person # 1	Answer for person # 2	Answer for person # 3	Answer for person # 4
5	**25**	**53**	**4**
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
24	**9**	**1/9**	**3**
1 or 0	1 or 0	1 or 0	2 or 0

"Math is Cool" Masters – 2004-05

Sponsored by: American Chemical Society

5th Grade – May 14, 2005

Final Score:
(Out of 16)

School Name_____Team #_____

Proctor Name_____Room #_____ Division: ____

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 erase or cross out answers once you have written an answer down.*** *If there are eraser marks 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. The value of each question is a one or zero. Each student will be asked four questions, then another member of your team will come up.*

PERSON 1 NAME:		**1 or 0**
1.1		
1.2		
1.3		
1.4		
PERSON 2 NAME:		
2.1		
2.2		
2.3		
2.4		
PERSON 3 NAME:		
3.1		
3.2		
3.3		
3.4		
PERSON 4 NAME:		
4.1		
4.2		
4.3		
4.4		

"Math is Cool" Masters – 2004-05

5th Grade – May 14, 2005

Final Score:

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			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

	Answer	1 or 0	1 or 0
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
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38			
39			
40			

"Math is Cool" Masters – 2004-05

5th Grade – May 14, 2005

Final Score:

First Score
(out of 18)

School Name_____Team #_____

Proctor Name_____Room #_____

Division: _____

Team Multiple Choice Contest – Score 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			
2			
3			
4			
5			
6			
7			
8			
9			

"Math is Cool" Masters – 2004-05

5th Grade – May 14, 2005

School Name_____Team #_____

Proctor Name_____Room #_____

Div: _____

Final Score:

First Score
(out of 10)

Team 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			