

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Individual Test**

Student Name: _____ Team #: _____

School Name: _____

Problems 1-20		2 pts each	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
Subtotal			

Problems 21-30		3 pts each	
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
Subtotal			

TOTAL		
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**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Individual Test**

written by Anna Cunningham and Constance Spoor

Put all answers on the colored answer sheet. All fraction answers must be reduced. You should leave appropriate answers in terms of π .

Problems 1 through 20 are worth 2 points each	
1	Evaluate: 25×5
2	How many sides does a trapezoid have?
3	If I can decorate one Christmas tree in 2 hours, how many hours will it take me to decorate 4 Christmas trees?
4	What is $89.3 - 7.99$?
5	What is one-fourth plus one-sixth plus one-twenty-fourth?
6	If Ron has 2 scarves, 3 sweaters, and 4 pairs of jeans, how many different possible outfits does he have? An outfit consists of a scarf, a sweater and a pair of jeans.
7	What is the square root of the quantity $49+576$?
8	What is the sum of the first 13 positive integers?
9	What is one half of 7? Express your answer as a decimal.
10	How many distinct ways can you arrange the letters in the word MOOSE?
11	Andrew and Anna are swing dancing. Andrew trips on every sixth step and Anna trips on every fourteenth step. If they both trip on the first step, how many more steps will it take until they both trip at the same time?
12	What is the circumference, in feet, of a circle with radius 13.5 inches? Express your answer as a fraction in terms of π .
13	Constance bought a bouquet of roses costing \$12.00, plus 5% tax. If she paid with \$13.00, how many ways can she receive change, using quarters, dimes, nickels and pennies?
14	A bag contains 6 leather gloves, 4 sheepskin gloves and 5 pairs of wool gloves. How many gloves must I blindly pull out of the bag in order to guarantee that I have a pair of leather gloves?
15	Evaluate: $\frac{7!}{3!}$
16	Find the 7 th term in the sequence: $a_1=2$ $a_{n+1}=a_n-5$

17	Dragons stand on four legs while basilisks have no legs at all. If Harry Potter sees 10 heads and 16 legs, how many basilisks are there?
18	Connie has the best grade in her math class, with test scores of 99, 100, and 104. Trevor has the second-best grade, with scores of 97, 93, and 95. He is very jealous and wishes to have a better grade than Connie. If the next exam is out of 200 points, what is the highest score Trevor can receive while still not having a higher overall percentage than Connie, assuming she scores 100%? In this test, it is possible to obtain unlimited extra credit.
19	What is $2\frac{3}{2}$?
20	Multiply the number of prime factors of 32 by 3!
Problems 21 through 30 are worth 3 points each	
21	What is the probability of drawing a heart or a queen from a standard deck of 52 cards?
22	This morning it was 16°F. By noon, the temperature increased by 25%. Then, in the next 6 hours, the temperature decreased by 75%. Within the last hour, the temperature has dropped by 7 degrees. How many degrees below freezing is it now, in Fahrenheit?
23	Stacey and Berta each own the same number of both frogs and parakeets. One day, they put all of their pets into one room, and counted 12 heads and 36 legs. How many frogs does Stacey own?
24	You roll two fair, 6-sided dice. What is the probability that the product of the numbers showing face-up on the dice is a prime number?
25	How many diagonals does a dodecagon have?
26	If the probability that the Sorting Hat puts a student in Gryffindor is one-fourth, what is the probability that all seven Weasley children are placed in Gryffindor house?
27	How many different three-letter sequences can you make using the letters in MOON?
28	There are 29 knuts to a sickle and 17 sickles to a galleon. How many more knuts richer than Ron Weasley is Draco Malfoy if he has 5 galleons and Ron has 4 knuts?
29	Find the surface area, in square inches, of a rectangular prism with sides of length 2 in, 1 ft and $\frac{2}{3}$ ft.
30	Anna can run 10 miles in 60 minutes. If it takes her half as long to run 5 miles, how long (in seconds) will it take her to run 30 miles?

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Algebra Test**

School Name: _____ Team #: _____

Problems 1-5		2 pts each	
1			
2			
3			
4			
5			
Subtotal			

Problems 6-10		3 pts each	
6			
7			
8			
9			
10			
Subtotal			

TOTAL		
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Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Algebra Test
 written by Catherine Tart

Put all answers on the colored answer sheet. All fraction answers must be reduced.

Problems 1 through 5 are worth 2 points each	
1	If $m=4$, $r=6$, $h=2$, $s=7$, and $a=3$, evaluate $\frac{(m \times r + h - s)}{(r + a \times m - s)}$. Leave answer as an improper fraction.
2	Solve for x : $17x-6=10x+15$
3	Prince Erik buys Ariel an aquarium for her birthday on November 12th. There are 2000 fish in the aquarium. However, she's not very good at feeding them, so the number of fish decreases by half every month. How many fish are left by Erik's birthday on March 12 th ?
4	One day Catherine bakes chocolate chip cookies. She leaves her cookies unattended for a while, during which time Trevor steals half. After she returns, she takes half the remaining and gives them to Anna. While she's giving the cookies to Anna, Trevor returns to steal half of that remaining. There are now 3 left. How many cookies did Catherine bake to begin with?
5	Catherine and Jill pass exactly 15 notes per class period- except for band in which they pass 40. If there are 6 class periods total, and 180 days in a school year, how many notes do they pass in one whole school year?
Problems 6 through 10 are worth 3 points each	
6	If $x=9$, solve for y : $y=x^2+3x+12$
7	Simplify: $\frac{a^{18}b^4c^{20}}{a^{17}b^3c^{19}} + abc$
8	The Nintendo Wii is priced at \$250. But with sales tax it is \$267.50. What is the sales tax percentage?
9	Find all values of x such that : $(x-2)^2 = 81$
10	Find the sum of all the positive integers less than 100 that are not multiples of 5.

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Algebra Test**

School Name: KEY

Team #: KEY

Problems 1-5		2 pts each	
1	19/11		
2	[x=] 3		
3	125		
4	24		
5	20,700 [notes]		
Subtotal			

Problems 6-10		3 pts each	
6	120		
7	2abc		
8	7 [%]		
9	11 AND -7		
10	4000		
Subtotal			

TOTAL		
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**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Geometry Test**

School Name: _____ Team #: _____

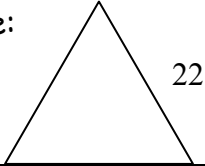
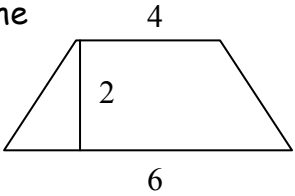
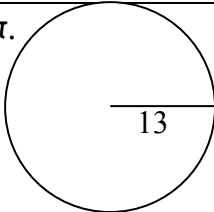
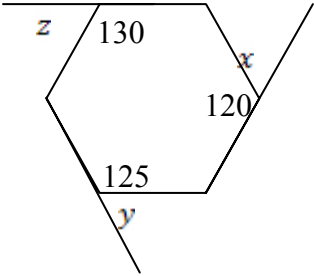
Problems 1-5		2 pts each	
1			
2			
3			
4			
5			
Subtotal			

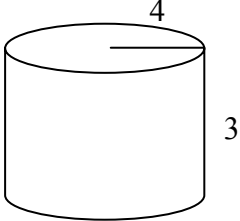
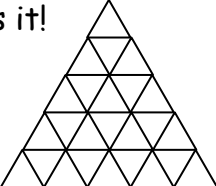
Problems 6-10		3 pts each	
6			
7			
8			
9			
10			
Subtotal			

TOTAL		
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Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Geometry Test
 written by Matt Hin

Put all answers on the colored answer sheet. All fraction answers must be reduced

Problems 1 through 5 are worth 2 points each	
1	What is the perimeter of the following equilateral triangle: 
2	Andrew is designing a new desk, and has three identical pieces of wood in the shape of trapezoids to make the top. What will be the area of Andrew's desk top if he uses all three pieces? 
3	What is the volume of a prism made of 4 cubes of edge length 5?
4	My friend has a favorite regular shape. It has n sides where $n = (360 - 90 \times 3) \div 10 - 2$, what is his favorite shape called?
5	What is the area of the circle O ? Leave answers in terms of π . 
Problems 6 through 10 are worth 3 points each	
6	What is the supplementary of the complementary of half the supplementary of the complementary of 50° ?
7	What is the sum of the measures of angles x , y and z if the three other angles have the indicated measures in degrees? 

8	<p>There is a certain quadrilateral Bertha loves dearly. She forgot the name of the shape, but she knows that it has 4 equal sides but it's not a rectangle. Her friend, Stacy, says the name after checking with a mathepedia. What does she say?</p>
9	<p>What is the volume of the cylinder? Leave answers in terms of π.</p> <div style="text-align: right; margin-right: 100px;">  </div>
10	<p>Quick! Count the number of triangles in Matt's card castle before the mean and evil Ryan destroys it!</p> <div style="text-align: center;">  </div>

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Geometry Test**

School Name: KEY

Team #: KEY

Problems 1-5		2 pts each	
1	66		
2	30		
3	500		
4	Heptagon (7) or Septagon		
5	169π		
Subtotal			

Problems 6-10		3 pts each	
6	160°		
7	165		
8	Rhombus		
9	48π		
10	48		
Subtotal			

TOTAL		
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**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round	1	2	3	4	5
Question #					
Points	0 or 3	0 or 4	0 or 5	0 or 6	0 or 7
				Total	

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round	1	2	3	4	5
Question #					
Points	0 or 3	0 or 4	0 or 5	0 or 6	0 or 7
				Total	

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 1

Question #	Answer

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 1

Question #	Answer

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 2

Question #	Answer

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 2

Question #	Answer

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 3

Question #	Answer

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 3

Question #	Answer

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 4

Question #	Answer

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 4

Question #	Answer

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 5

Question #	Answer

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round**

School Name: _____ Team #: _____

Round # 5

Question #	Answer

Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round
written by Andrew Reusch

Put all answers on the colored answer sheet. All fraction answers must be reduced. The first answer submitted is worth 3 points, the second 4 points, ..., and the Fifth answer is worth 7 points. You may turn in your answers in any order but each question may only be answered once!

1	Which is largest in surface area: A) a cube with side length 6, B) a cylinder with radius of 3 and a height of 5, or C) a rectangular prism with side lengths 6,8, and 10?
2	What is the sum of all of the even numbers from 2 to 200?
3	How many integer values of x exist such that x^2+6 is less than 42?
4	Anna and Jill are running a race. Anna runs 5 laps of a track every minute, and Jill runs 3 laps every minute. If Anna gives Jill a 3 minute head start how many more laps will Anna have run than Jill after Jill has been running for 10 minutes?
5	Robert has 4 standard decks of cards (each having 52 cards) that are all mixed together in one giant pile. What is the probability that he will draw 2 kings in a row without replacement?

Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team Pressure Round

School Name: KEY

Team #: KEY

1	C
2	10,100
3	11
4	5
5	$5/897$

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team "Who Wants to be a Mathematician"**

School Name: _____ Team #: _____

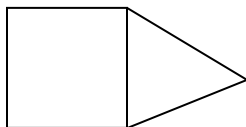
Problems 1-4		1 pt each		
1				
2				
3				
4				
Problems 5-8		2 pts each		
5				
6				
7				
8				
Problems 9-11		3 pts each		
9				
10				
11				
Problem 12		4 pts		
12				

TOTAL	
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Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
"Who Wants to be a Mathematician"
 written by Catherine Tart

Put all answers on the colored answer sheet. Answers left blank will not be scored; any wrong answer will result in no further answer being scored. Be careful, check your work and don't guess!

Problems 1 through 4 are worth 1 point each	
1	Harry's favorite geometric shape has four sides. What is it? A) circle B) triangle C) trapezoid D) pentagon
2	Mulan has been kidnapped by the Huns! She is stranded on the other side of the Great Wall of China. She climbs up 15 feet during the day and slides down 5 feet during the night. If the Great Wall is 50 feet tall, how many days will it take for her to get out? A) 4 B) 6 C) 5 D) 7
3	Harry is running away from #4 Privet Drive to #12 Grimmauld Place which is x miles away, and it takes him 12 minutes to get there at a speed of 10 mph. How far away is #12 Grimmauld Place from #4 Privet Drive in miles? A) 1 B) 2 C) 3 D) 4
4	What is $\left(\frac{6-5}{2}\right)^2 + 2$? A) $9/4$ B) 2 C) $16/9$ D) $4/9$
Problems 5 through 8 are worth 2 points each	
5	Five hundred snakes are on a plane. If Samuel eliminates one snake every 5 minutes, how many snakes were left at the end of a 3-hour flight? A) 448 B) 450 C) 464 D) 472
6	Peter's bicycle wheel has a radius of $\frac{3}{\pi}$ meters. If it turns 150 times in 3 hours, what is its average speed in meters per hour? A) 200 B) 250 C) 300 D) 350
7	Aaron is swimming alone. When he swims, his entire body is under water. If the water level in the 6 yd by 4 yd pool is $1/2$ an inch higher when Aaron is swimming than when nobody is swimming, how many cubic feet are in Aaron's body? A) 5 B) 6 C) 9 D) 10

8	Concrete is made of 4 parts rock to 1 part sand to 1 part water. If 144 gallons of concrete are used in a project, how many gallons of water were used to make the concrete? A) 20 B) 21 C) 23 D) 24
Problems 9 through 11 are worth 3 point each	
9	Anna runs 20 miles north, 15 miles west, 14 miles south and finally 7 miles east. How many miles is she from her starting point? A) 9 B) 10 C) 11 D) 12
10	What is the area of the following figure, formed by a square and an equilateral triangle with side length 4?  A) $16 + 4\sqrt{3}$ B) $16 + \sqrt{2}$ C) $16\sqrt{2}$ D) $16\sqrt{3}$
11	Bikes, trikes and cars are being sold. The number of bike wheels and trike wheels is 28. The number of trike wheels and car wheels is 40, and there are 50 total wheels. How many trikes are there? A) 5 B) 3 C) 12 D) 6
Problem 12 is worth 4 points	
12	Matt is drinking pop so he can build a pyramid out of empty pop cans, one can on top, two in the next row, etc. If he drinks 360 mL total, how many rows are in his pyramid? Each can contains 10 mL A) 5 B) 6 C) 8 D) 9

**Mount Rainier Math Invitational
Sixth Grade - January 26, 2007
Team "Who Wants to be a Mathematician"**

School Name: **KEY** Team #: **KEY**

Problems 1-4		1 pt each		
1	C			
2	C			
3	B			
4	A			
Problems 5-8		2 pts each		
5	C			
6	C			
7	C			
8	D			
Problems 9-11		3 pts each		
9	B			
10	A			
11	D			
Problem 12		4 pts		
12	C			

TOTAL	
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Mount Rainer Math Invitational
January 26, 2007
Sixth Grade Puzzle Answers

- 1) Let s_n be the number of ways of tiling an $n \times 1$ board. Clearly, $s_1=1$, $s_2=2$. With $n \geq 3$, you must use at least 2 objects. The one on the left can either be a square leaving an $(n-1) \times 1$ board, or a domino leaving a $(n-2) \times 1$ board. So s_n is the Fibonacci sequence. 1, 2, 3, 5, 8, 13, 21.
- 2) not (i). There might be people in math class who aren't in band, and some of those people might not play instruments.
not (ii). We know that everyone in band plays an instrument, but we don't know about anyone else.
(iii) is true. Everyone in band is in math, and everyone in math knows the half-angle formulas.
(iv) is true. Everyone in band is in math class, and everyone in band can play an instrument. Since at least one person is in band, at least one person in math class can play an instrument.
- 3) The only numbers with an odd number of factors are perfect squares (convince yourself of this!)

We know that $40 \times 40 = 1600$ is a little too big. We can try $39 \times 39 = 1521$ and then $38 \times 38 = 1444$. 38×38 is less than 1500 and nothing more than 38 can work, so 1444 is the answer.

Mount Rainer Math Invitational
January 26, 2007
Sixth Grade Puzzles

1) How many ways can I tile a 7 by 1 board with "squares" (1 by 1 tiles) and "dominoes" (2 by 1 tiles)?

2) The following statements are true of Warren G. Harding High School:

- a. Every class has at least one student.
- b. Everyone in band class can play an instrument.
- c. Everyone in math class knows the half-angle formulas.
- d. Everyone in band class is also in math class.
- e. There are classes other than math and band.

Which of the following statements are also necessarily true of Warren G. Harding High School?

- (i) Everyone in math class can play an instrument.
- (ii) Everyone that can play an instrument is in math class.
- (iii) Everyone in band class knows the half-angle formulas.
- (iv) At least one person in math class can play an instrument

3) What is the largest number less than 1500 having an odd number of factors?