WTN
Math Meet

5th & 6th Grade
Practice Test

Please keep these practice tests in a file
for reuse in upcoming years!

Mega Math Meet

May 2002

sponsored by

Whitewater TAG Network

School_____ Name_____

Event 1 **Computation (Calculators not allowed.)** **18 Minutes**

1. Directions: Put each answer in the space provided. If an answer is a fraction, give it in reduced form; if it is a decimal, give it correctly to two decimal places.

a) (8/56) x _____ = 2. (2 points)

b) (1.02/.17) x 6 = _____. (2 points)

c) (8/9) / _____ = 4/3. (2 points)

d) 18 x .2 = _____ x 9 x (.1). (2 points)

e) (2 points)

1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 - 18 - 16 - 14 - 12 - 10 - 8 - 6 - 4 - 2 = _____

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Event 1 **Computation (Cont.)** **12 Minutes**

2. We will define the persistence of a number this way:

Take a number, for example 969. Now multiply the digits together: so you multiply 9 x 6 x 9 and get 486. Now multiply those digits together and you get 192; then those digits multiplied together give 18; and finally multiplying the digits of 18 together gives 8. Thus we could write the results as a sequence: 969, 486, 192, 18, 8. Since there are four multiplications that occur before you get to a single digit number, we say that 969 has persistence four.

Four each of the given numbers, show the sequence of successive multiplications that finally gives a single digit. (The number of spaces provided may be more than you need.)

a. (3 pts) 481, _____, _____, _____.

Thus 481 has persistence _____.

b. (3 pts) 986, _____, _____, _____.

Thus 986 has persistence _____.

c. (3 pts) 707, _____, _____, _____.

Thus 707 has persistence _____.

d. (3 pts) What is the largest number with persistence zero?

Answer:_____

Total points (22 possible)_____

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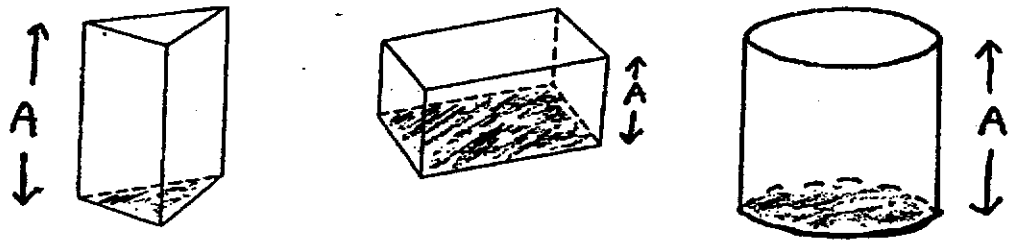
School_____ Name_____

Event 2 **Volumes of Prisms (Calculators allowed.)** **12 Minutes**

A prism is a three-dimensional object whose base and top are identical figures joined by straight sides. Below you see a triangular prism, a rectangular prism, and a circular prism, also called a cylinder.

In the sketches, A stands for the altitude of the prism; so A measures how tall the prism is. The base is the shaded figure which forms the bottom of the prism.



Here is the formula for the volume of a prism:

volume of a prism = area of the base x altitude.

Also recall these basic formulas for area:

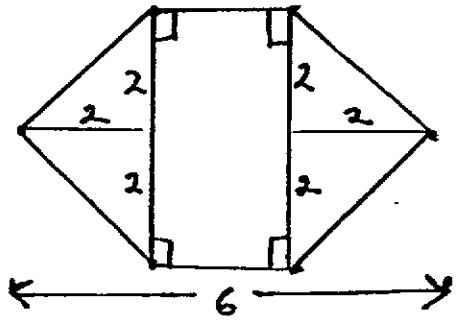
Area of a rectangle = length x width;

Area of a triangle = ½ x base x height;

Area of a circle = π x radius x radius.

You may use $\pi = 3.14$ in your calculations.

1. Find the area of the hexagon with dimensions as given. (4 points)
Assume dimensions are inches.



Answer:_____ (square inches)

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Event 2 **Volumes of Prisms (Cont.)** **12 Minutes**

2. A 12-inch high candle is to be made with the hexagon from Problem 1 as a base. In other words, the candle will be a hexagonal prism! What is its volume? (4 points)

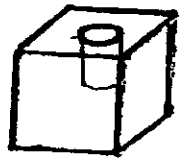
Answer:_____ (cubic inches)

3. A candle maker has melted down an old candle and has 200 cubic inches of wax. She wants to make a 5-inch high round candle (a cylinder). What should the radius of the base be? Circle the answer that is closest. (4 points)

a. 2.25 inches b. 3.55 inches c. 4.15 inches

4. A shop sells a plastic candle holder that is a cube with a hole in it for the candle. (See picture below.) The cube is 4 x 4 x 4 (each dimension is in inches) and the hole for the candle is 2 inches deep and has a 2-inch radius. What is the volume in cubic inches of the plastic candle holder? Circle the answer that is closest. (4 points)

a. 56 cubic inches b. 47 cubic inches c. 39 cubic inches



5. The candle maker wants to melt down a 10-inch high cylindrical candle and then make four new identical cylindrical candles. If each of the new candles is also to be 10 inches high, then the radius of each of the new candles must be (circle your choice of answer) (4 points)

a. ½ of the radius of the original candle;

b. 1/4 of the radius of the original candle;

c. 1/16 of the radius of the original candle.

Total points _____ (20 possible)

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School_____ Name_____

Event 3 **Means and Medians (Calculators are allowed.)** **12 Minutes**

We are often interested in collections of numbers, or data. For example, the heights, in inches, of 7 different students could give the following set of numbers:

{41, 42, 42, 42, 46, 47, 49}

The median number in the set is the middle number when the numbers are arranged from lowest to highest. Or we could explain it this way: if the numbers are listed in order from left to right, as they are above, then there are exactly as many numbers to the left of the median as there are to the right of the median.

In the set above, the median number is 42, since it is the 4th number in a list of 7 numbers arranged in order.

1. What is the median of the list of 11 numbers in set A? (2 pts)

   A = {1, 1, 3, 3, 4, 5, 5, 5, 5, 5, 8} Answer:_____

2. Suppose there is a set, B, of 101 numbers, each number is either 1, or 3, or 4, and this is how many of each you have: (2 pts)

   Set B has twenty 1's, fifty 3's, and thirty-one 4's.

   What is the median of set B? Answer:_____

3. Someone makes a new set of numbers by taking the numbers in Set A (see problem 1) and adding the number 20 to each of them. Call this new set, Set C. What is the median number in Set C? (2 pts)

   Answer:_____

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Event 3 **Means and Medians (Cont.)** **12 Minutes**

We are also interested in the mean of a set of numbers; this is the same as the average of the numbers. To calculate the mean of a set of numbers, add all the numbers up and then divide by the number of numbers you added. So, for example, in the set of heights of students

{41, 42, 42, 42, 46, 47, 49}, the mean would be found this way:

(41 + 42 + 42 + 42 + 46 + 47 + 49) / 7 = 44.14, to two decimal places.

4. Find the mean of the set A of Problem 1. (2 pts)

Answer:_____ (two decimal places)

5. Find the mean of the set B of Problem 2. (2 pts)

Answer:_____ (two decimal places)

6. Find a number, N, so that the set of numbers (3 pts)

{41, 42, 42, 42, 46, 47, 49, N} has mean exactly equal to 47.

Answer:_____ (two decimal places)

Total points _____ (13 possible)

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Event 4 **Mental Math (Calculators not allowed.)** **12 Minutes**

Answers Only

No Scratch Work

Permitted

Answers

(2 points each)

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

Total points _____ (20 possible)

1.  **= 18**

and $\ast + \ast + \ast = 12$

What is  $+ \ast =$ _____

2. $3 - 2 + 5 - 4 + 2 + 2 =$ ___

3. $5420 + 50 + 300 =$ _____

4. 25% of 300 = _____

5. $7 + (9 \div 9) \div 8 =$ _____

6. $\frac{3 \times 3 \times 3}{9 + 9 + 9} =$ _____
(reduce to lowest terms)

7. $9\ (6 \times 100) =$ _____

8. 15% of 300 = _____

9. One thousand is
ten sets of _____

10. $2 + 1 + 3 + 5 - 9 + 7 =$ _____

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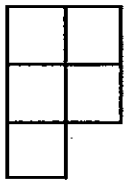
Event 5 **Team Problem Solving** **20 minutes**

SHAPES AND STANDARD FILLINGS

A shape is a collection of boxes. Here is an example of a shape:



If a shape has n boxes, then a standard filling of the shape is a filling of the boxes with each of the numbers 1, 2, 3, . . ., n such that:

* Numbers in boxes increase as you go from left to right in each row, **and**

* Numbers in boxes increase as you go from top to bottom in each column.

Examples:

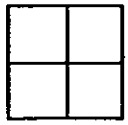
A) Here are two standard fillings of the same shape:

1	2
3	4
5	

1	3
2	5
4	

B) Here is an example of a filling that is not standard. (Make sure you see why it isn't standard!)

3	1
5	4
2	

C) In all, there are two different standard fillings of this shape: 

Here are the two possible standard fillings for the given shape:

1	2
3	4

1	3
2	4

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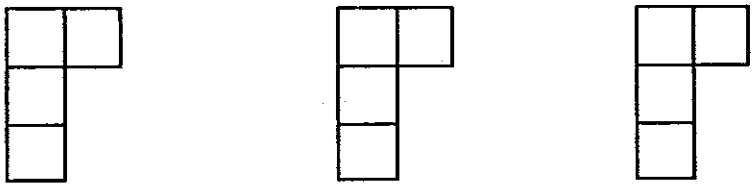
Event 5 **Team Problem Solving (Cont.)** **20 minutes**

PROBLEMS

1. There are exactly thee standard fillings of the shape below. Write the different standard fillings in the empty shapes that are provided. (10 points)



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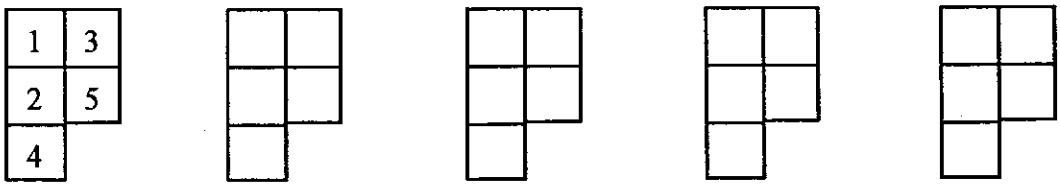
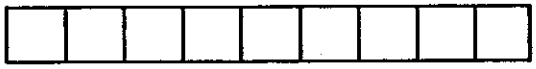
2. There are exactly five standard fillings of the shape below. One of the standard fillings is given for you. Write the remaining four different standard fillings in the empty shapes that are provided.



(10 points)

In problems 3-5, you are given a shape for each problem. Find the total number of different standard fillings of the given shape. On scratch paper you will probably have to draw many copies of the shape and try many different fillings until you are sure that you have found the correct total number of different standard fillings of the given shape.

3. (10 points)



How many different standard fillings are there of this shape?: _____

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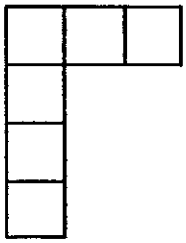
Event 5 **Team Problem Solving (Cont.)** **20 minutes**

4. (10 points)



How many different standard fillings are there of this shape?:_____

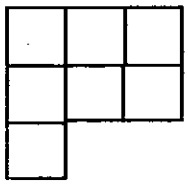
---

5. (10 points)

How many different standard fillings are there of this shape?:_____

---

6. (10 points) Consider the following shape:



Circle the correct answer:

The number of standard fillings of this shape is

a. between 0 and 5.
b. between 6 and 10.
c. between 11 and 15.
d. 16 or greater.

Total Points:_____ (60 Possible)

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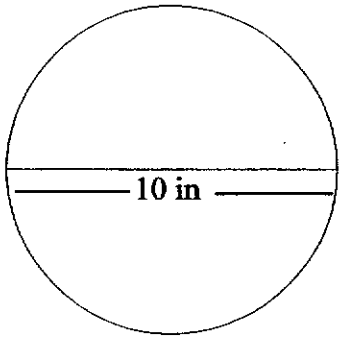
Event 5 **Team Problem Solving (Cont.)** **20 minutes**

MORE PIZZA THAN YOU'D CARE TO EAT

The term "*n*-inch pizza" describes a circular pizza with a diameter of *n* inches. Recall that: The radius of a circle is the distance between the center and a point on the circle. The diameter of a circle is twice the radius.

Example:



A 10-inch pizza

The area of a circle with radius r is $A = \pi \times r \times r$, where π is a special number that is approximately equal to 3.14: $\pi \approx 3.14$.

The area of a rectangle with length L and width W is $A = L \times W$.

PROBLEMS

1. Find the area of a 10-inch pizza: (5 points)

_____ square inches (round to one decimal place)

2. Your friend has a rectangular pizza 8 inches wide and 14 inches long. You want to make a circular pizza with the same area as your friend's pizza. You should make a (5 points)

_____ - inch pizza. (Round to the nearest inch.)

3. You buy a 16-inch pizza for $13.99. What is the cost per square inch of pizza? (5 points)

_____ cents per square inch. (Round to the nearest cent.)

4. Is it a better deal to buy a 12-inch pizza for $9.99 or a 16-inch pizza for $13.99? (10 points)

It is better to buy the _____ - inch pizza.

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Team_____

Event 5 **Team Problem Solving (Cont.)** **20 minutes**

5. A 14-inch pizza costs 10 cents per square inch.

   a. What is the total cost? (5 points)

   $_____ (Round to the nearest cent.)

   b. The width of a rectangular pizza is 6 inches. Find the length if the rectangular pizza is to have the same area as the 14-inch pizza. (10 points)

   _____ inches (Round to the nearest inch.)

   c. The width of a rectangular pizza is 6 inches. Rectangular pizza costs 7 cents per square inch. Find the length if the rectangular pizza is to cost $14.00. (10 points)

   _____ inches (Round to the nearest inch.)

6. A circular pizza costs $12.99 and costs 10 cents per square inch. The radius of the pizza is (10 points)

   _____ inches (Round to the nearest inch.)

TOTAL POINTS:_____ (60 POSSIBLE)

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Event 5 **Team Problem Solving (Cont.)** **20 minutes**

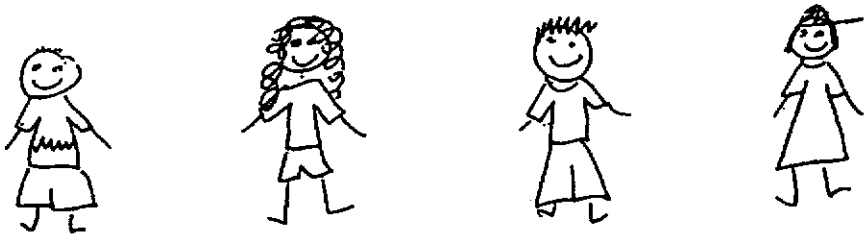
LINE ARRANGEMENTS

You get a camera for your birthday and you decide to take a picture of your friends standing in a line.

1. Suppose you have four friends you want to take a picture of. You could line them up this way:

Elena Lucy Charles Paul

or this way:



Paul Elena Charles Lucy

or some other way.

How many different ways could you line up your four friends?

(Go to next page.)

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Event 5 **Team Problem Solving (Cont.)** **20 minutes**

1. a. First, how many ways are there <u>if Elena is at the furthest left</u>?
Obviously, the first arrangement shown is one such way, but how many total arrangements are there with Elena at the furthest left?

Answer: _____ (5 points)

b. Now, how many ways are there <u>if Paul is at the furthest left</u>?

Answer: _____ (5 points)

c. How many total ways of arranging four friends in a line?

Answer: _____ (10 points)

2. How many ways could you line up **five** friends?

Answer: _____ (10 points)

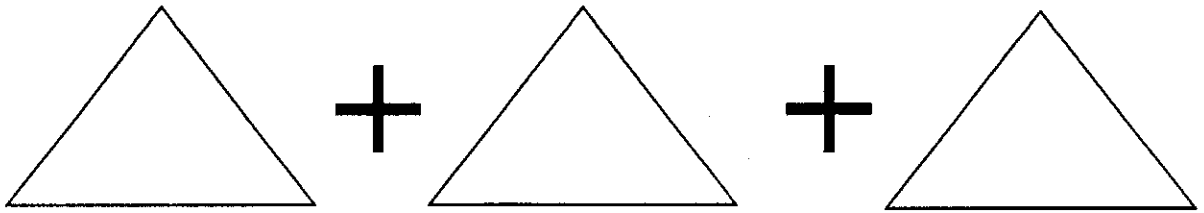
3. How many ways could you line up **six** friends?

Answer: _____ (10 points)

4. How many ways could you line up **n** friends?

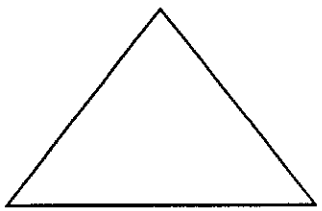
Answer: _____ (10 points)

_____ TOTAL POINTS

1.  **= 18**

and

✳ + ✳ + ✳ = 12

What is  + ✳ = _____

2.

$$3 - 2 + 5 - 4 + 2 + 2 = \_\_\_\_$$

3.

$$5420 + 50 + 300 = \_\_\_\_\_$$

4.

25% of 300 = _____

5.

7 + (9 ÷ 9) ÷ 8 = _____

6.

$$\frac{3 \times 3 \times 3}{9 + 9 + 9} = \_\_\_\_\_$$

(reduce to lowest terms)

7.

$$9\ (6 \times 100) = \_\_\_\_\_$$

8.

15% of 300 = _____

9.

One thousand is
ten sets of _____

10.

$$2 + 1 + 3 + 5 - 9 + 7 = \_\_\_\_\_$$

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a) (8/56) x 14 = 2. (2 points)

b) (1.02/.17) x 6 = 36. (2 points)

c) (8/9) / 2/3 = 4/3. (2 points)

d) 18 x .2 = 4 x 9 x (.1). (2 points)

e) (2 points)

1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 - 18 - 16 - 14 - 12 - 10 - 8 - 6 - 4 - 2 = 10

Mega Math Meet **May 2002** **Name** Key
Whitewater TAG Network

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Event 1 **Computation (Cont.)** **12 Minutes**

2. We will define the persistence of a number this way:

Take a number, for example 969. Now multiply the digits together: so you multiply 9 x 6 x 9 and get 486. Now multiply those digits together and you get 192; then those digits multiplied together give 18; and finally multiplying the digits of 18 together gives 8. Thus we could write the results as a sequence: 969, 486, 192, 18, 8. Since there are four multiplications that occur before you get to a single digit number, we say that 969 has persistence four.

Four each of the given numbers, show the sequence of successive multiplications that finally gives a single digit. (The number of spaces provided may be more than you need.)

a. (3 pts) 481, 32, 6, _____.

Thus 481 has persistence 2.

b. (3 pts) 986, 432, 24, 8.

Thus 986 has persistence 3.

c. (3 pts) 707, 0, _____, _____.

Thus 707 has persistence 1.

d. (3 pts) What is the largest number with persistence zero?

Answer: 9

Total points (22 possible)_____

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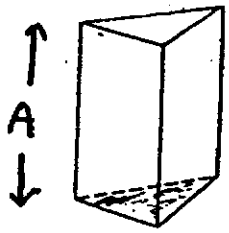
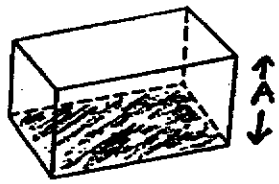
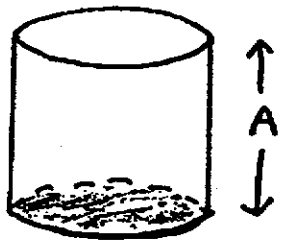






Here is the formula for the volume of a prism:

volume of a prism = area of the base x altitude.

Also recall these basic formulas for area:

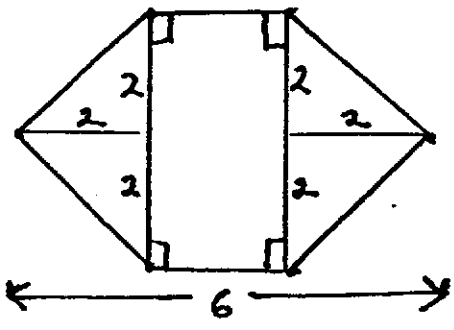
Area of a rectangle = length x width;

Area of a triangle = ½ x base x height;

Area of a circle = π x radius x radius.

You may use π = 3.14 in your calculations.

1. Find the area of the hexagon with dimensions as given. (4 points)
Assume dimensions are inches.



Answer: 16 (square inches)

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Event 2 **Volumes of Prisms (Cont.)** **12 Minutes**

2. A 12-inch high candle is to be made with the hexagon from Problem 1 as a base. In other words, the candle will be a hexagonal prism! What is its volume? (4 points)

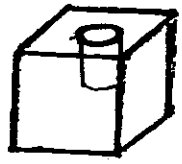
Answer: 192 (cubic inches)

3. A candle maker has melted down an old candle and has 200 cubic inches of wax. She wants to make a 5-inch high round candle (a cylinder). What should the radius of the base be? Circle the answer that is closest. (4 points)

a. 2.25 inches (b. 3.55 inches) c. 4.15 inches

4. A shop sells a plastic candle holder that is a cube with a hole in it for the candle. (See picture below.) The cube is 4 x 4 x 4 (each dimension is in inches) and the hole for the candle is 2 inches deep and has a 2-inch radius. What is the volume in cubic inches of the plastic candle holder? Circle the answer that is closest. (4 points)

a. 56 cubic inches b. 47 cubic inches (c. 39 cubic inches)



5. The candle maker wants to melt down a 10-inch high cylindrical candle and then make four new identical cylindrical candles. If each of the new candles is also to be 10 inches high, then the radius of each of the new candles must be (circle your choice of answer) (4 points)

(a.) ½ of the radius of the original candle;

b. 1/4 of the radius of the original candle;

c. 1/16 of the radius of the original candle.

Total points _____ (20 possible)

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{41, 42, 42, 42, 46, 47, 49}

The median number in the set is the middle number when the numbers are arranged from lowest to highest. Or we could explain it this way: if the numbers are listed in order from left to right, as they are above, then there are exactly as many numbers to the left of the median as there are to the right of the median.

In the set above, the median number is 42, since it is the 4th number in a list of 7 numbers arranged in order.

1. What is the median of the list of 11 numbers in set A? (2 pts)

   A = {1, 1, 3, 3, 4, 5, 5, 5, 5, 5, 8} Answer: 5

2. Suppose there is a set, B, of 101 numbers, each number is either 1, or 3, or 4, and this is how many of each you have: (2 pts)

   Set B has twenty 1's, fifty 3's, and thirty-one 4's.

   What is the median of set B? Answer: 3

3. Someone makes a new set of numbers by taking the numbers in Set A (see problem 1) and adding the number 20 to each of them. Call this new set, Set C. What is the median number in Set C? (2 pts)

   Answer: 25

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Event 3 **Means and Medians (Cont.)** **12 Minutes**

We are also interested in the mean of a set of numbers; this is the same as the average of the numbers. To calculate the mean of a set of numbers, add all the numbers up and then divide by the number of numbers you added. So, for example, in the set of heights of students

{41, 42, 42, 42, 46, 47, 49}, the mean would be found this way:

(41 + 42 + 42 + 42 + 46 + 47 + 49) / 7 = 44.14, to two decimal places.

4. Find the mean of the set A of Problem 1. (2 pts)

Answer: 4.09 (two decimal places)

5. Find the mean of the set B of Problem 2. (2 pts)

Answer: 2.91 (two decimal places)

6. Find a number, N, so that the set of numbers (3 pts)

{41, 42, 42, 42, 46, 47, 49, N} has mean exactly equal to 47.

Answer: 67 (two decimal places)

Total points _____ (13 possible)

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Event 4 **Mental Math (Calculators not allowed.)** **12 Minutes**

Answers Only

No Scratch Work

Permitted

Answers
(2 points each)

$\Delta + * = 10$

1) $\Delta = 6$ $* = 4$

2) 6

3) 5770

4) 75

5) 1

6) 1

7) 5400

8) 45

9) 100

10) 9

Total points _____ (20 possible)

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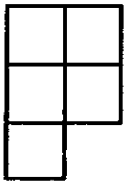
Event 5 **Team Problem Solving** **20 minutes**

SHAPES AND STANDARD FILLINGS

A shape is a collection of boxes. Here is an example of a shape:



If a shape has n boxes, then a standard filling of the shape is a filling of the boxes with each of the numbers 1, 2, 3, . . ., n such that:

* Numbers in boxes increase as you go from left to right in each row, **and**

* Numbers in boxes increase as you go from top to bottom in each column.

Examples:

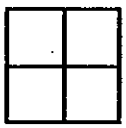
A) Here are two standard fillings of the same shape:

1	2
3	4
5	

1	3
2	5
4	

B) Here is an example of a filling that is not standard. (Make sure you see why it isn't standard!)

3	1
5	4
2	

C) In all, there are two different standard fillings of this shape: 

Here are the two possible standard fillings for the given shape:

1	2
3	4

1	3
2	4

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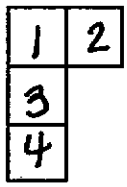
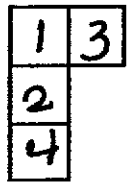
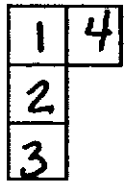
Event 5 **Team Problem Solving (Cont.)** **20 minutes**

PROBLEMS

1. There are exactly thee standard fillings of the shape below. Write the different standard fillings in the empty shapes that are provided. (10 points)







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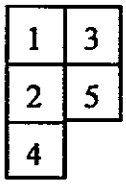
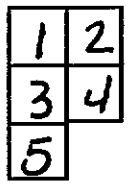
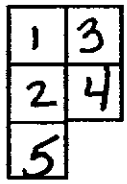
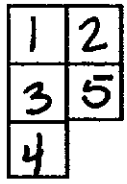
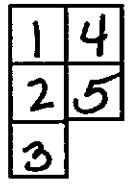
2. There are exactly five standard fillings of the shape below. One of the standard fillings is given for you. Write the remaining four different standard fillings in the empty shapes that are provided.











(10 points)

In problems 3-5, you are given a shape for each problem. Find the total number of different standard fillings of the given shape. On scratch paper you will probably have to draw many copies of the shape and try many different fillings until you are sure that you have found the correct total number of different standard fillings of the given shape.

3. (10 points)

How many different standard fillings are there of this shape?: one

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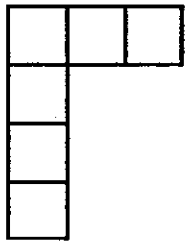
Event 5 **Team Problem Solving (Cont.)** **20 minutes**

4. (10 points)



How many different standard fillings are there of this shape?: 10

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5. (10 points)

How many different standard fillings are there of this shape?: 5

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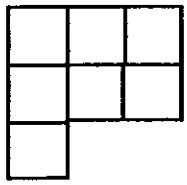
6. (10 points) Consider the following shape:



Circle the correct answer:

The number of standard fillings of this shape is

a. between 0 and 5.
b. between 6 and 10.
c. between 11 and 15.
(d.) 16 or greater.

Total Points:_____ (60 Possible)

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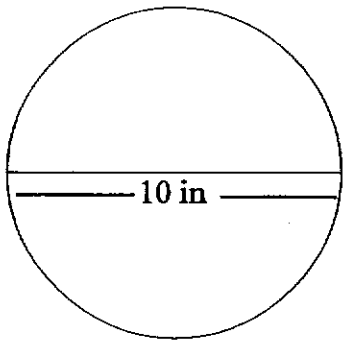
Event 5 **Team Problem Solving (Cont.)** **20 minutes**

MORE PIZZA THAN YOU'D CARE TO EAT

The term "*n*-inch pizza" describes a circular pizza with a diameter of *n* inches. Recall that: The radius of a circle is the distance between the center and a point on the circle. The diameter of a circle is twice the radius.

Example:



A 10-inch pizza

The area of a circle with radius r is $A = \pi \times r \times r$, where π is a special number that is approximately equal to 3.14: $\pi \approx 3.14$.

The area of a rectangle with length L and width W is $A = L \times W$.

PROBLEMS

1. Find the area of a 10-inch pizza: (5 points)

   78.5 square inches (round to one decimal place)

2. Your friend has a rectangular pizza 8 inches wide and 14 inches long. You want to make a circular pizza with the same area as your friend's pizza. You should make a (5 points)

   12 - inch pizza. (Round to the nearest inch.)

3. You buy a 16-inch pizza for $13.99. What is the cost per square inch of pizza? (5 points)

   7 cents per square inch. (Round to the nearest cent.)

4. Is it a better deal to buy a 12-inch pizza for $9.99 or a 16-inch pizza for $13.99? (10 points)

   It is better to buy the 16 - inch pizza.

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Event 5 **Team Problem Solving (Cont.)** **20 minutes**

5. A 14-inch pizza costs 10 cents per square inch.

   a. What is the total cost? (5 points)

   $ 15.39 (Round to the nearest cent.)

   b. The width of a rectangular pizza is 6 inches. Find the length if the rectangular pizza is to have the same area as the 14-inch pizza. (10 points)

   26 inches (Round to the nearest inch.)

   c. The width of a rectangular pizza is 6 inches. Rectangular pizza costs 7 cents per square inch. Find the length if the rectangular pizza is to cost $14.00. (10 points)

   33 inches (Round to the nearest inch.)

6. A circular pizza costs $12.99 and costs 10 cents per square inch. The radius of the pizza is (10 points)

   6 inches (Round to the nearest inch.)

TOTAL POINTS:_____ (60 POSSIBLE)

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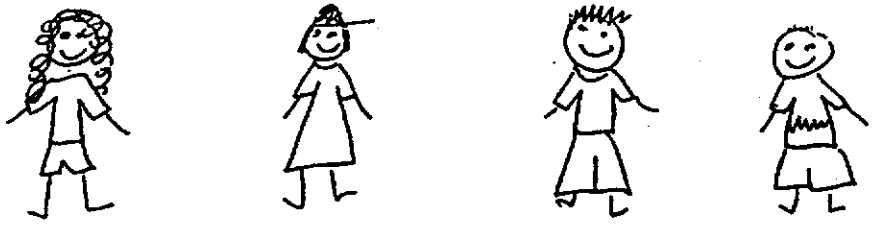
Event 5 **Team Problem Solving (Cont.)** **20 minutes**

LINE ARRANGEMENTS

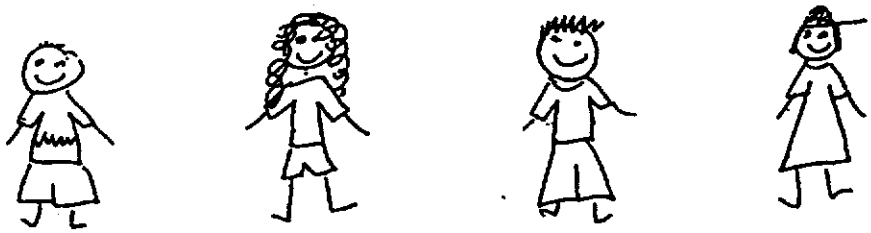
You get a camera for your birthday and you decide to take a picture of your friends standing in a line.

1. Suppose you have four friends you want to take a picture of. You could line them up this way:



Elena Lucy Charles Paul

or this way:



Paul Elena Charles Lucy

or some other way.

How many different ways could you line up your four friends?

(Go to next page.)

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Event 5 **Team Problem Solving (Cont.)** **20 minutes**

1. a. First, how many ways are there <u>if Elena is at the furthest left</u>?
Obviously, the first arrangement shown is one such way, but how many total arrangements are there with Elena at the furthest left?

Answer: 6 (5 points)

b. Now, how many ways are there <u>if Paul is at the furthest left</u>?

Answer: 6 (5 points)

c. How many total ways of arranging four friends in a line?

Answer: 24 (10 points)

2. How many ways could you line up **five** friends?

Answer: 120 (10 points)

3. How many ways could you line up **six** friends?

Answer: 720 (10 points)

4. How many ways could you line up **n** friends?

Answer: n! 20 ~~(10~~ points)

_____ TOTAL POINTS
60 possible