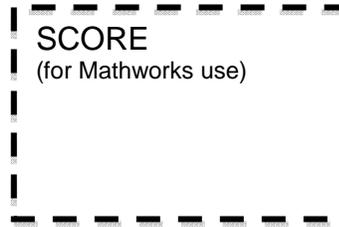


Mathworks at Texas State University  
**Mathworks Math Contest**  
For Middle School Students  
November 2, 2011



**COVER SHEET**

Student **First Name:** \_\_\_\_\_ **Last Name:** \_\_\_\_\_

Current Grade in School: \_\_\_\_\_

Home Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Home Phone: (\_\_\_\_\_) \_\_\_\_\_

E-mail Address: \_\_\_\_\_

School Name: \_\_\_\_\_

School Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Teacher: \_\_\_\_\_

Check Math Courses Taken:

Pre-Algebra       Algebra 1       Algebra 2       Geometry

Student Birth date (MM/DD/YYYY): \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Gender:  Male       Female

Are you a U.S. Citizen or Permanent Resident?  Yes       No

Return Completed Test by November 9th to:

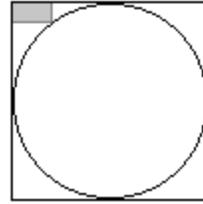
**Mathworks**  
**ASBS 110**  
**Texas State University**  
**601 University Drive**  
**San Marcos, TX 78666**

**Test Directions**

- 15 problems
- 120 minutes (2 hours)
- NO calculators allowed
- Show all your work and how you obtained each answer
- Clearly mark your answers (circle or box)
- Use additional paper as needed.
- Do your best and good luck!

- 1) If the remaining part of the day is  $\frac{4}{3}$  of the part of the day that has passed, how many hours of the day are left?
- 2) A banker filled 6 boxes with money totaling \$600, each with \$1 more than the previous. How much money was placed in the third box?
- 3) Julio's teacher asks the class to write down a list of positive integers between 20 and 50 such that no two numbers on the list have a prime factor in common. How many numbers are in the largest possible list meeting this requirement?

- 4) In the figure, the rectangle at the corner measures 3 cm by 6 cm.  
What is the radius of the circle in cm?

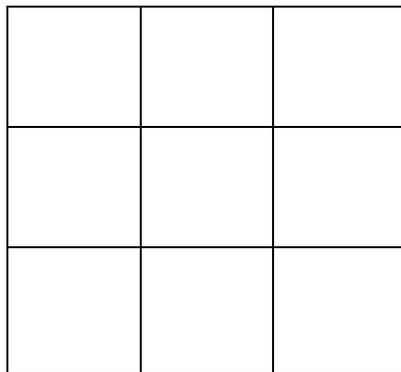


- 5) Let  $\overline{AB}$  and  $\overline{CA}$  be two-digit numbers. Suppose  $\overline{AB} \times 4 = \overline{CA}$ . Find  $A + B + C$ .

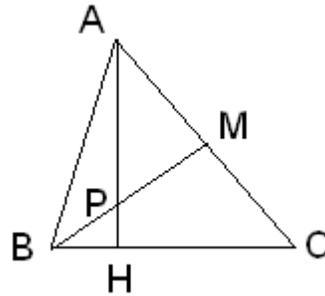
- 6) How many of the factors of 630,000 are divisible by 20?

7) Kate exercises on a treadmill for exactly 1 hour, some of the time running at 7mph and some of the time walking at 3mph. The treadmill registers that she has covered 6.6 miles. How much further must she run if she wants to run a total of 7 miles, not counting the distances she walked?

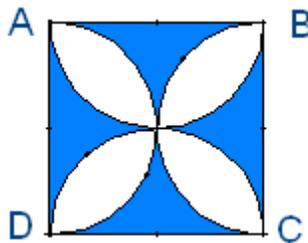
8) In how many ways can the integers 1-9 be written in the cells of the 3x3 grid, one number per cell, if no two adjacent cells can both contain odd numbers?  
[Cells are adjacent if they share an edge.]



- 9) Triangle ABC has  $AB = 7$ ,  $BC = 8$  and  $AC = 9$  units. H is a point of BC so that AH is an altitude and M is the midpoint of AC. Segment MB intersects segment AH at point P. What is the ratio of BP to PM?



- 10) Square ABCD has sides of four units and semicircles are drawn with their centers at the midpoints of the sides. What is the area of the shaded region in terms of  $\pi$ ?



11) Mary is placing colored beads on a string. She begins with a red, white and blue bead in that order. She continues with 1 red, 2 white and 3 blue beads. Keeping the same color order she places 1 red, 3 white and 6 blue beads on the string. In general she follows the pattern that each set of red, white and blue beads will consist of 1 red bead,  $n$  white beads and  $\frac{n(n+1)}{2}$  blue beads. When she places the 2012<sup>th</sup> blue bead on the string what is the total number of beads on the string?

12) Let  $ABC$  be a right triangle and  $D$  be a point of hypotenuse  $BC$  so that  $AD$  is an altitude. Suppose  $AB/AD = 5/2$ . Find  $AC/AD$ .

13) Let  $x$  be an integer. If  $\left(\sqrt{x + \frac{1}{2}\sqrt{2011}} - \sqrt{x - \frac{1}{2}\sqrt{2011}}\right)$  is an integer, find  $x$ .

14) Trapezoid ABCD has base  $AB = 14$  and base  $CD = 30$ . A segment  $EF$  is parallel to the bases and divides the trapezoid into two equal areas. What is the length of  $EF$ ?

15) How many paths are there from point A to point B, if a path must follow the horizontal and vertical segments, no segment can be traversed twice, and no horizontal segment can be traversed in the right-to-left direction?

