

Skyview Invitational Games for Mathematical Achievement  
Speed Math– 2005 ROUND 1

Name \_\_\_\_\_  
Division (circle one)      Mu      Alpha      Theta

Score: \_\_\_\_\_  
Verify: \_\_\_\_\_

Instructions: Write all answers in EXACT form in the box. Anything outside the answer box will be disregarded. Leave all answers in terms of  $\pi$  and reduced radicals. Express all fractions in improper form reduced to lowest terms. Make sure you write your answer in the correct box. You will have 15 minutes.

1. The angles of a triangle are in the ratio 4:5:6. The largest angle in degrees is:
2. Which is larger:  $\log_3\left(\frac{1}{9}\right)$  or  $\log_4\left(\frac{1}{13}\right)$ ?
3. How many diagonals can be drawn in a convex decagon?
4. How many prime numbers are between 0 and 50?
5. If the diameter of a circle is increased by 20%, then the area of the circle is increased by what percent?
6. How many two digit numbers contain at least one three?
7. The 89 term product  $\tan(1^\circ)\tan(2^\circ)\tan(3^\circ)\dots\tan(87^\circ)\tan(88^\circ)(\tan 89^\circ)$  equals?
8. Write  $\sin(3x)$  in terms of  $\sin(x)$
9. The complex number  $i$  is a root of the equation  $x^4 + 2x^3 - 3x^2 + 2x - 4 = 0$ , where  $i = \sqrt{-1}$ . What is the largest real root?
10. The sum of the third and fourth terms in a sequence of consecutive integers is 47. The sum of the first five terms of the sequence is?
11. If  $\log_7(x^2) = \log_3 9$ , Then  $|x| = ?$
12. If  $4^x - 4^{x-1} = 24$ , then  $(2x)^x = ?$
13. The number 1254 in base 7 is equivalent to 5k3 in base 9, where k is the nines digit. The value of k is?
14. If the vertices of a quadrilateral have coordinates (2,4), (0,0), (8,0), (8,4), find the area of the quadrilateral in square units
15. The graph of  $y = \frac{x^2 - 1}{x}$  has how many horizontal or slant asymptotes?
16. The number of solutions in positive integers of  $x + 2y = 12$  is?
17. Determine the radius of the circle defined by  $x^2 + y^2 + 4x - 14y = 9$
18. The sum of two real numbers is 8.5; their product is 17.5. What is the smaller number?
19. Two bullet trains at a distance  $d$  miles are approaching each other on the same track. The first is moving at 80 miles per hour. The second is moving at 5280 feet per second. They collide after 1 day. What is  $d$ ?
20. A faucet is filling a tub at 7 liters per second. The drain empties it at 120 liters per minute. How long does it take to fill a 100 liter tub in seconds (if never, write “never”)?

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13.
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15.
16.
17.
18.
19.
20.



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Speed Math ANSWERS– 2005 ROUND 1

The key is below. Overlay, mark incorrect answers, and count the number of correct  
The number correct is the score. Multiple forms of each answer is possible, they are  
indicated. In addition, the units for each answer (always optional) are given in parentheses  
Accept an answer giving the units

~~Score: \_\_\_\_\_  
Verify: \_\_\_\_\_~~

72 or 72 degrees or $72^\circ$	1.
$\log_4 \frac{1}{13}$	2.
35 (diagonals)	3.
15 (prime numbers)	4.
44 or 44%	5.
18	6.
1	7.
$3 \sin x - 4 \sin^3 x$ or $-4 \sin^3 x + 3 \sin x$	8.
$-1 + \sqrt{5}$ or $\sqrt{5} - 1$	9.
115	10.
7	11.
$25\sqrt{5}$	12.
8 or $k=8$	13.
28	14.
1 (asymptote)	15.
5 (solutions)	16.
$\sqrt{62}$	17.
$\frac{7}{2}$	18.
(d=) 88320 (miles)	19.
20	20.