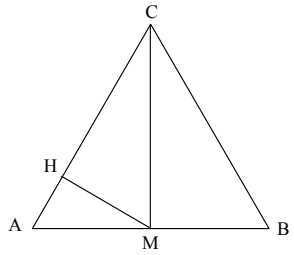
## Who Wants to Be a Mathematician – New Orleans

Contest Problems, as recorded by J.A.White
Friday 1/5/2007

### *Game 1*

1. Who is the National Football League team for New Orleans? (choices not recorded)
2. What is the sum of the coordinates for the intercepts of the line $2x - 3y = 6$?
   a. -5
   b. -1
   c. 1
   d. 5
3. Which of the following mathematicians was born in India?
   a. Archimedes
   b. Euclid
   c. Pythagoras
   d. Ramanujan
4. $\cos^{-1}\left(-\frac{1}{2}\right) =$
   a. $\pi/6$
   b. $\pi/3$
   c. $2\pi/3$
   d. $5\pi/6$
5. Suppose $a$ is 1 followed by $m$ zeros and $b$ is 1 followed by $n$ zeros. Than $a^b$ is followed by
   a. $m^n$ zeros
   b. $mb$ zeros
   c. $an$ zeros
   d. $b^n$ zeros
6. How many real solutions (for x) are there to the equation $e^x - e^{-x} = 5$?
   a. None
   b. One
   c. Two
   d. More than two
7. How many three-digit numbers have the property that the hundreds digit times the tens digit equals the ones digit?
   a. 10
   b. 15
   c. 25
   d. More than 25
8. Let ABC be an equilateral triangle with M the midpoint of segment AB and let segment MH be an altitude of triangle AMC. What is the length of HC divided by the length of AH?
   a. $\sqrt{3}$
   b. 2
   c. 3
   d. $2\sqrt{3}$




### *Answers*

1. Saints
2. c
3. d
4. c
5. b
6. b
7. d (32, by my count)
8. c

### *Game 2*

1. What is the major river closest to New Orleans?
   a. Amazon
   b. Nile
   c. Mississippi
   d. Flied River (and Onions)
2. What is the domain of $g(x) = \sqrt{3 - x}$?
   a. $(-\infty, 3)$
   b. $(-\infty, 3]$
   c. $(3, \infty)$
   d. $[3, \infty)$
3. Triangle ABC is an isosceles triangle. If the measure of angle A is 100º, what is the measure of angle C?
   a. 40º
   b. 45º
   c. 50º
   d. It can't be determined from the information given
4. A state's license plates consist of two digits (0-9) followed by two letters (A-Z) followed by two digits (also 0-9). How many such license plates read the same backwards and forwards?
   a. 100
   b. 260
   c. 2600
   d. $26^2 10$
5. What is the ones (units) digit of $99\pi$?
   a. 1
   b. 2
   c. 9
   d. 0
6. What is the range of the function $e^{\tan^{-1} x}$?
   a. an open interval $(a,b)$ where $a$ and $b$ are positive numbers
   b. a closed interval $[a,b]$ where $a$ and $b$ are positive numbers
   c. an open interval $(a,\infty)$ where $a$ is a non-negative number
   d. a closed interval $[a,\infty)$ where $a$ is a non-negative number
7. Which of the following mathematicians is famous for the legend of summing the numbers from 1 to 100 in an elementary classroom?
   a. Pierre de Fermat
   b. Carl Friedrich Gauss
   c. John Nash
   d. Isaac Newton
8. Which of the following functions could have a domain that is not a subset of the intersection of the domain of $f$ and the domain of $g$?
   a. $f + g$
   b. $f \cdot g$
   c. $f \circ g$
   d. All of the above must have domains contained in the intersection of the domain of $f$ and the domain of $g$

### *Answers*

1. c
2. b
3. a
4. c
5. a
6. a
7. b
8. c

### *Two-grand prize question*

Let $\oplus$ stand for the (binary) operation of averaging. Under what circumstances does $(x \oplus y) \oplus z = x \oplus (y \oplus z)$?

   a. If and only if y = 0
   b. If and only if x = z
   c. If and only if the average of x and z is an integer
   d. If and only if the average of x and y is an integer

### *Two-grand prize answer*

b