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Pi Day Challenge

Directions: Solve as many of the problems as you can. You must show your work; don't just "plug it in" to your calculator or say you "looked it up." Don't be discouraged if you can only solve one or two problems; just try as many as you can. Please submit them to Mrs. Grasel in 43D by Friday, March 7. Prizes will be awarded to top scorers.

1. Albert Einstein was born on March 14, 1879. To celebrate his 60th birthday, his friend gives him a 20-inch pie (i.e. the diameter is 20 inches). Albert eats a third of the pie, his wife Mileva eats a quarter, his first son Hans Albert eats a fifth, and his second son Eduard eats a sixth. How much pie remains uneaten, in square inches? (3 points)
2. The inhabitants of Pi Land have names that are made up of digits rather than letters. Each person's name is a unique ten-digit anagram of 3141592653 (no two people have the same name). For example, one person's name could be 1439155623. What is the maximum possible population of Pi Land? (4 points)
3. William Jones first suggested using the Greek letter π to denote the ratio of the circumference of a circle to its diameter in *Synopsis Palmariorum Matheseos*, published in 1706. If Pi Day were to be celebrated then on March 14, 1706, what day of the week would it fall on? (Assume that the current Gregorian calendar was already in use then. You are given that March 14, 2008 falls on a Friday; work backwards from that date.) (5 points)
4. Find $\cos \frac{\pi}{5}$ or $\cos 36^\circ$ without a calculator. (8 points)
5. Find $\sin \frac{2\pi}{7} + \sin \frac{4\pi}{7} - \sin \frac{\pi}{7}$ without a calculator. (10 points)

Sponsored by WHS Math Club. Written and typeset in L^AT_EX by Tony Jin.

