MATHEMATICS PROBLEM 146

A *palindrome* is a word (level, radar, eve), phrase or sentence (Able was I ere I saw Elba. A man, a plan, a canal, Panama.), or a number (21012, 6776, 81233218) which reads the same forward or backward.

How many prime numbers are palindromes with an even number of digits? State whether there are infinitely many or state the specific number of them. Give reasons which verify your answer.

Each midshipman submitting a correct solution with a correct explanation to Problem 146 by noon Friday 4 March 2005 will be recognized as a solver on the next problem. Submit solutions to Prof. Wardlaw at mathprob@usna.edu (please no attachments!) or via his Math Dept mailbox in Preble Hall, second deck.

Correct solutions to Math Problem 145 were submitted by Midshipmen Allessandro M. Bove, Gabriel Campion, Alex P. James, Matthew D. Melton, Stephen S. McMath, Daniel C. Ryan, and Lacey L. Savoie, and by Professor Mark D. Meyerson.

A solution to Math Problem 145 is on the back of this page and is posted on the Math Dept bulletin board on the second floor of Preble Hall across from the stairs

MATHEMATICS PROBLEM 145

How many different ways can a cube be colored if each face is painted either blue or gold? (Two cubes of the same size have the same coloring if one of them can be rigidly moved so that corresponding faces of the two have the same color. That is, the two cubes cannot be distinguished from one another by their colorings.)

Solution. There are ten ways to color the faces of the cube with the two colors blue and gold. We count them as follows:

<u>6 blue and 0 gold</u>: 1 way.

<u>5 blue and 1 gold</u>: 1 way.

<u>4 blue and 2 gold</u>: 2 ways, 1 with the 2 gold faces opposite one another and 1 with the two gold faces sharing an edge.

<u>3 blue and 3 gold</u>: 2 ways; 1 with 2 gold faces opposite one another with the third sharing an edge with each of the other two gold faces and 1 with all 3 gold faces sharing a vertex.

<u>2 blue and 4 gold</u>: 2 ways, 1 with the 2 blue faces opposite one another and 1 with the two blue faces sharing an edge.

<u>1 blue and 5 gold</u>: 1 way.

<u>0 blue and 6 gold</u>: 1 way.