MATH 6
WINTER PROBLEMS

Please do one of the following problems over the winter break. See you in January!

1. (Cube Problem) Given a cube of side length 2, and two opposite corners A and B of this cube,
   (a) Determine the distance from A to B *(hint: you'll need the Pythagoras Theorem)*
   (b) Determine the length of the shortest path from A to B that does not go through the interior of the cube (such a path will travel along the faces of the cube)
   (c) Given a shortest path from A to B as in part (b), let M be intersection of this path with an edge of the cube (such a path will only intersect one edge of the cube, not including at points A and B). Determine the area of triangle $\triangle AMB$.

2. (Arithmetic Sequence Problem) Let a_n be an arithmetic sequence with positive common difference $d_a > 0$. Let b_n be an arithmetic sequence such that $b_n^2 < a_n$ for all positive integers n. Prove that $d_b = 0$.