Problems
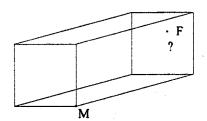
1.(a) A rectangular room has dimensions 1×1×2. An ant is at one corner of the room and must reach the diametrically opposite corner by crawling along the walls, floor or ceiling of the room. What is his shortest path?

(b) Same as (a) except the room has dimensions 1×1×k where k can be any positive number. Find the shortest path for each possible value of k.

2. A rectangular room has dimensions 1×1×2. Two ants, who are not on very good terms, have positioned themselves so they are as far apart as possible, where distance, of course, is measured as "crawling distance" along floor, walls or ceiling. Where are they and how far apart are they?

3. A rectangular room has dimensions 12×12×24. That is, the floor and ceiling and both the side walls are 12×24 and the two end walls are 12×12. In the room there are two ants, a male and a female. The male ant is on the floor at one of the corners.

Now the female has positioned herself to be as far as possible from the male. That is, she has located herself at a point so that the male will take the longest possible time to get to her, given that he has to crawl along the walls, floor or ceiling of the room and will (of course) choose his path so that he gets to the female in the shortest possible time.

The question is: where is the female?

Well there's an obvious answer—the diametrically opposite corner. That's certainly the point which is farthest from the ant "as the crow flies." But an ant is not a crow .