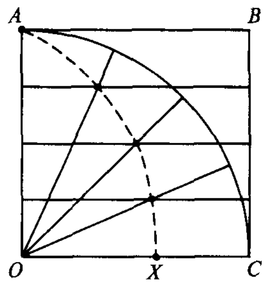


the dotted line shown in the diagram and some particular intersection points are illustrated. If the edge of the square is 1 unit in length then it can easily be shown, using limits, that the length of OX is $2/\pi$.

'Buffon's Needle' is the name given to a famous experiment which can give a probabilistic estimation for the value of π. A 'needle' (assumed uniform) is randomly dropped onto a set of parallel lines. If the distance between the lines is equal to the length of the needle then it can be shown, using integral calculus, that the probability that the needle crosses a line is $2/\pi$.

The intuitive similarity between these two situations would suggest that the identical result is hardly a coincidence. However, the similarity is hard to define precisely. There is a 'feeling' that the quadratrix is in some sense a dynamic representation of the needle experiment; but how exactly? The situation appears to suggest that I can obtain the Buffon result by 'mapping' to the quadratrix (which is an easier problem to solve) and finding the length of OX. But it is not clear (at least to me) why the length of OX can *represent the probability* of the needle crossing the parallel lines. Can any reader help to clarify?

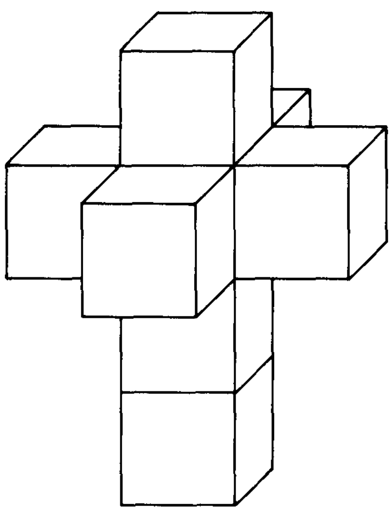
Yours sincerely,

FRANCIS LOPEZ-REAL

Bedford College of Higher Education, Bedford

Space filling with identical symmetrical solids: a footnote to 69.14

DEAR EDITOR,



What might be called a "solid Latin cross" consists of 8 connected cubes, with 4-fold rotational symmetry about the axis of the long arm, the whole having point-group tetragonal symmetry. (Does this solid have 30 faces or 12, I wonder?) I have found that space can be filled, without voids, by this solid. Readers may like to consider

(a) how to do it, and

(b) what is the symmetry group of the resulting space pattern.

R. H. MACMILLAN

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Airy's paradox

DEAR EDITOR

George Biddell Airy (1801–1892) held two Cambridge professorships in his 20s and 30s before being Astronomer Royal at Greenwich for many decades of the 19th century. He was a major figure of the period, showing considerable skill and ability in mathematics, most of the physical sciences, and also engineering. However, it is his prowess as a self archivist that is of interest here. During his lifetime, he prepared his manuscripts and had them bound up in several volumes each year. This vast collection is now held in the Greenwich Observatory Archives (currently preserved at Hertmonceux Castle). They reveal his unintentional gift for logic. His desire to preserve everything was so extreme that he even made notes on blotting paper, and then wrote on the blotting paper which volume it should be kept in. He would write out the instructions for the binding of the volumes, and the instructions themselves are the first thing that one finds preserved in many of these volumes. But best of all, he would sometimes go around the Observatory, and on finding an empty box, insert a piece of paper saying 'Empty box' and thereby falsify its description! This last achievement deserves, in my proposal, the name of 'Airy's paradox'.

Yours sincerely,

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Problem corner

Solutions are invited to the following problems. They should be addressed to Graham Hoare at Dr. Challoner's Grammar School, Chesham Road, Amersham, Bucks HP6 5HA, and arrive not later than 25 January, please.

69.G (C. Tripp). Find a 'simple' formula for $\sum_{r=0}^{n} \binom{n}{r}^3$. ('Littlewood's teaser').

In a footnote to an article entitled, "Newton and the attraction of a sphere', which appeared in the July 1948 issue of the *Gazette*, J. E. Littlewood tantalisingly states that "there is a formula!" However, a simple exact formula has eluded the efforts of Colin Tripp and two of his colleagues,

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