IDEA 73

A SURFACE AREA PROBLEM

I first met this idea in an ATM workshop with Barbara Ball. I have subsequently used the problem on many occasions.

Students will need access to linking cubes and isometric dot paper.

The idea is based upon making shape, initially, from linking cubes.

The problem uses 5, then 6, 7 and 8 cubes and considers what different surface areas are possible.

The value of this problem lies in the fact that students are likely to see a 'nice' pattern emerging based upon shapes made from 5, 6 and 7 cubes. However, when 8 cubes are made a 'hole' appears in the data and this is, I feel, a useful way of demonstrating to students that mathematics does not always follow nice neat patterns.

There is, of course, an explanation about why the hole appears in the data with 8 cubes and inviting students to try to explain why this happens will be a suitable challenge.

IDEA 74

TANGENTS

This idea is taken from *Inclusive Mathematics 11–18*, (Continuum, 2002, pp. 117–18).

Using 2cm-square grid paper ask students draw a dozen or so right-angled triangles, keeping, in the first instance, to the grid lines.

Students then complete a table as below, where the angles are measured with a protractor.

*O*pposite length	*a*djacent length	Measured angle	The ratio *o*:*a* as a fraction	The ratio *o*:*a* as a decimal
5	2	68°	$\frac{5}{2}$	2.5
1	3	18°	$\frac{1}{3}$	0.333
3	4	37°	$\frac{3}{4}$	0.75
3	2	56°	$\frac{3}{2}$	1.5
etc.	etc.	etc°.	etc.	etc.

Students can share information, perhaps by several people writing their answers on the board/screen to provide opportunities for observation and discussion.

Once plenty of information is available students can rearrange the data in terms of angle sizes going from smallest to largest.

Further questions are:

- What happens to the ratio between the 'opposite' and 'adjacent' sides as the angle increases?
- What happens to the angle as the ratio increases?
- What is special about those angles where the ratio is 1?
- Can we find an angle whose ratio is –1?
- What happens as the measured angle approaches 90°?
- What happens to the ratio for angles greater than 90° and less than 180°?
- What does the graph of angle plotted against the decimal ratio look like?