Two views

I expect questions to arise at the ATM Local Branch meetings. I expect to have time to share in exploring mathematical questions with others and to question my teaching approaches. However, a recent experience has caused me to consider more deeply the way in which questions are posed.

Last autumn Simon Morgan invited the group to ‘make whatever interesting closed-up shape you like’ using giant, colourful equilateral triangles as faces and to share our findings using a table and axes already drawn on the whiteboard – see photograph below. Initially, I was simply aware of the lovely triangles we had been given to work with and was pre-occupied by the artistic qualities of the 3-dimensional shapes emerging around the room.

The open-ended nature of the task allowed me time to consider my own thoughts and questions about which kinds of shapes might be possible. As time went on my attention was taken by the table of results and echoes of lessons I had taught focusing on Euler’s formula came to mind. This observation shook me as my investigations suddenly seemed to close in on a pre-set trajectory.

As I began to reconsider what the activity might be offering, my attention was abruptly taken by the slightly raised voices behind me. Alf and Mike were energetically discussing the fact that for a shape with eight faces they could see 13 and 15 edges respectively. I had not expected this and the question ‘How many edges are there for this shape?’ – see photograph opposite – immediately sprung to mind. I counted 13 edges and was perplexed that Mike still insisted there were 15. I recounted and recognised that I did not know whether an edge was simply a straight line or not? My thoughts raced back to the original task that Simon had proposed – was it an open question about edges and vertices, was it a closed request to look at Euler’s formula, or was it a question at all?

Discussions about teaching approaches were going on around me and I realised that, for me, the beauty in this activity was not just the shapes themselves, but in the ambiguity of the original ‘question’. Simon had not stipulated how many triangles could be used to form a face, or whether the shapes should be convex or concave. While I am happy that all language may be open to interpretation, as I teach and observe others teaching I am now aware that deliberate ambiguity can prove energising. I am poised to attend the next ATM Local Branch meeting this week and questions will arise, but how?

Kathryn Vaughan is secretary of the Avon branch of ATM and works at Bath Spa University.
Thoughts on triangles

I go to local ATM meetings partly to disrupt my ‘understandings’ of mathematics. I place understanding in quotations because I find it an increasingly unhelpful concept when working with others on teaching, or learning, mathematics, with its connotations of an all or nothing experience, of something you ‘get’ or ‘hold’, of something fixed, and the hidden implication that there are ‘descamisado’ – as Dick Tahta once wrote – the shirtless who never get it. In truth we always have some understanding – again quoting Dick – and conversely even our most ‘thorough’ understanding is open to revision and re-interpretation.

We were building shapes made by tying together equilateral triangles – side lengths roughly 3 feet! – and what an extraordinary difference compared to working at the scale of, say, ATM MATs. Mike and I built the shape below and got the answers 15 and 13 for the number of edges.

![Diagram of equilateral triangles]

We realised our disagreement centred around the line AB – one edge or two? Mike: an edge is made by joining two faces, AB is made by two sets of two faces, hence it is two edges (AM and MB). Me: AB is a straight line, hence one edge. And then another wonderful moment as someone else offered that perhaps the issue we were discussing centred on what we meant by a vertex – and in particular whether point M counts as a vertex. Two previously unquestioned ‘understandings’ disrupted ...

Apart from the joy of such re-workings and awarenesses, I know that in the classroom they mean I can literally hear more of what students say when they are discussing edges or vertices; I become more alert to differences in what is said, and more alert to opportunities to work with these differences as they arise, which for me is at the heart of doing mathematics together.

I want to thank Simon Morgan for bringing his amazing triangles and offering such a rich space within which to work!

Alf Coles is Head of Mathematics and Director of Specialism at Kingsfield School, South Gloucestershire.

Editor’s comment

If you are reading this Journal you are most likely to be a member of ATM. The Association exists for, and is run by, its members. So, as a member when did you last attend a branch meeting? – are you aware where your nearest branch is – and how to contact them? I know our working lives are hectic, there seems to be fewer hours in the day, the ‘job’ is ever-more stressful, electronic communication has revolutionised life – even though we are all ‘slaves’ to e-mail – put simply, ‘how do I find the time?’ Well, there is something about face-to-face contact, and simply doing mathematics – at your own level – with fellow practitioners. How else do we re-charge the batteries that fuel our passion for mathematics? – how else do you get the ‘buzz’ – face a new mathematical challenge, or a new ‘take’ on an old theme?

I admit that I do get something of a ‘buzz’ from conference, but I am not always able to be there – the local branch can more than make up in terms inspiration, shared ideas, shared problems and concerns, contemporary issues and themes – surely I don’t need to continue.

Branch meetings are so much more than the ‘grass roots’ of the association – it can be a powerhouse of inspiration and creativity.

So, why not contact your local branch, or the one nearest you? – If you find there is no branch in your locality why not establish one? – just contact us and we will do all we can to help with the process. I feel confident in saying – ‘You will not be disappointed.’
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