THE MATHEMATICAL
ASSOCIATION OF VICTORIA

MATHS TREATS

BY LUCIANA THE POSSUM

KATE SMITH-MILES

Kate felt good about maths at school but did not love it until Year 12 when she had an inspiring teacher. In Year 9 there was a revolving door of maths teachers and she worked through the textbook with friends. The way her Year 12 teacher talked about mathematics and 'elegant moments' encouraged Kate to see the beauty and potential of mathematics and inspired a change from journalism to mathematics at university. Kate Smith-Miles is a Professor of Applied Mathematics at The University of Melbourne.

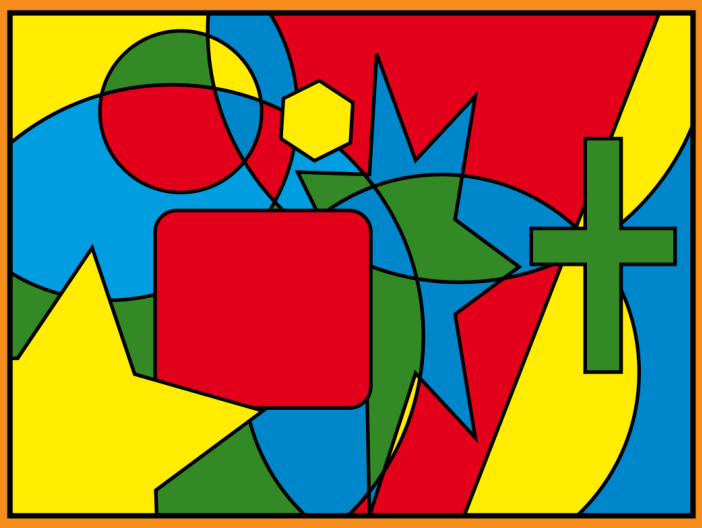
THE TRAVELLING SALESMAN PROBLEM

Kate remembers her mother's frustration in congested car traffic when she was in Year 12. Then in third-year university, a lecturer mentioned that a particular equation was used for modelling traffic flow. This triggered Kate to become interested in mathematics which could help her 'make a difference in the world somewhere'. She admires the way a hard mathematics problem can be transformed into a simpler form, solved, and then taken back again.

ACTIVITY

Choose five towns on the map of Victoria. Try to find the shortest route between them, visiting each town and returning to the original town. What strategies did you use? What would you do if there were 20 towns to visit, or 100 towns? Compare your strategies to those described on some of the internet links.

THE FOUR COLOR MAP THEOREM



In the 1800s it was proved that only five colours were needed to colour a map (regions with a common boundary, not a corner). Then, in 1976, two mathematicians used a computer to prove that only four colours are needed. This was the first computer-based mathematical proof.

ACTIVITY

Can you apply the four-colour theorem to a map of Australia or the USA, or another map? What difficulties did you face? Create your own map. Colour the vertices so that no two connected vertices have the same colour. Colour the regions so no two adjacent regions are the same colour. One application of this is large scale timetabling where each vertex represents a group of people (e.g. a class), edges connect groups which have some people in common and each colour represents a time period. A correct colouring creates a clash free timetable.

REFERENCES AND FURTHER READING

ABOUT KATE

http://katesmithmiles.wixsite.com/home

https://cosmosmagazine.com/mathematics/australian-woman-wins-major-prize-for-mathematics

http://monash.edu/science-stories/story/exploring-the-answers/

Myth-busting mathematics www.youtube.com/watch?v=IgsDI2CaRg4

Optimisation in the Darkness of Uncertainty https://vimeo.com/292038454

OPTIMISATION AND FOUR COLOR MAP THEOREM

Search Wikipedia for operations research, mathematical optimization (with a 'z'), 'travelling salesman problem' and 'four color theorem'.

www.youtube.com/watch?v=SC5CX8drAtU

www.theguardian.com/travel/2016/oct/21/worlds-longest-pub-crawl-maths-team-plots-route-between-every-pub-in-uk

www.mike-holden.org.uk/foucol.html

Activity: www.kleemans.ch/four-color-theorem-map-solver

IMAGES: Leadbeater possum - Steve Kuiter, Map - Pixabay, Four color - Wikipedia