

The Mystic Rose, Gradients and Perpendicular Lines

- 1) On your dot paper draw an axis such that x and y go from 0 to 7.
- 2) Plot the coordinates (2,0) (5,0) (7,2) (7,5) (5,7) (2,7) (0,5) (0,2)
- 3) You should have formed an irregular octagon. DO NOT join the coordinates together yet!
- 4) Your task is to investigate the number of DIFFERENT gradients that can be found by joining together the vertices of this octagon. You MUST write down the gradient of each line that you find numerically and explain any patterns that you see in the numbers.

HINTS: try to be systematic about how you do this...

- a) You might like to use colour to show the lines that have the same gradient. I decided for my investigation to use the same colour for both negative and positive gradients with the same fractional answer.
- b) You might like to draw separate diagrams that show the gradients that share similar characteristics.
- c) You might like to draw a table

Extension

- 5) Highlight the sets of perpendicular lines. What do you notice about the gradients of these lines? Does your hypothesis always work for perpendicular lines? Can you explain why?
- 6) Given any set of **any** 8 coordinates that form an irregular octagon, how could you find the different gradients just by looking at the coordinates? Try to answer this with numbers first and then try to generalise using algebra...
- 7) What happens if we change the criteria so that we start with a set of 6 coordinates that form an irregular hexagon...