

Part II

You may attempt not more than **THREE** questions from this part, and you are advised to spend about **80 minutes** on it.

You may choose not more than **TWO** of your three questions from Part IIA and not more than **TWO** from Part IIB.

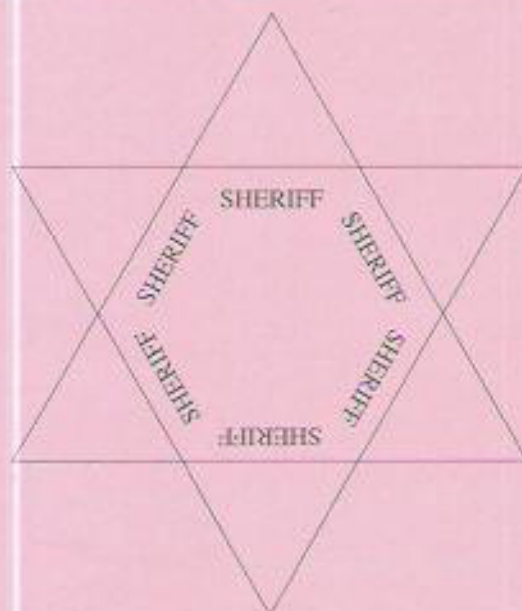
Each question carries 15% of the marks for the whole examination, and an indication of the allocation of marks within each question is given beside the question.

Part IIA

Do not attempt more than two questions from Part IIA.

Question 12

The following diagram shows an imaginary American sheriff's badge.



The points of the badge are to be coloured, each either gold or silver.

- (a) By using the Cycle Index Theorem, find the number of equivalence classes of such colourings. [6]
- (b) By applying Pólya's Theorem, list all the colourings, using G for gold and S for silver. [6]
- (c) If three colours are available, and the central hexagon must be coloured differently from any of the points, how many equivalence classes of colourings are there? [3]