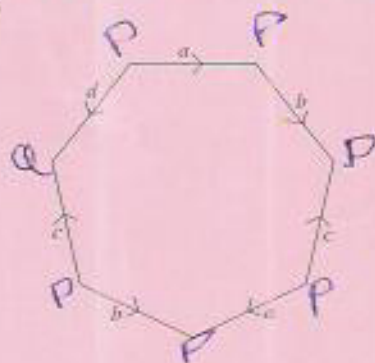


Question 9

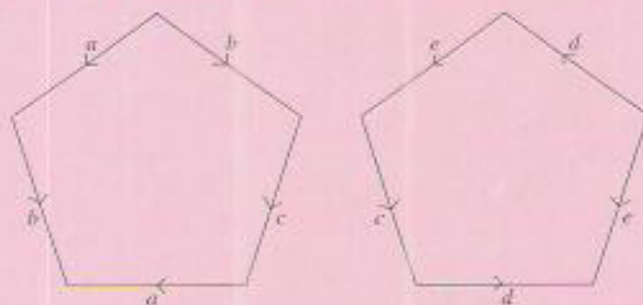
- (i) Draw a copy of the polygon below on your answer sheet, and, by making the identifications shown, label each vertex. Hence determine χ (the Euler characteristic) and β (the number of boundary components) for the corresponding surface, and explain why it is not orientable by drawing a Möbius band on your copy of the figure. Hence write down the surface as a connected sum of copies of \mathbb{RP}^2 and D^2 .



[3]

- (ii) By changing the direction of exactly one edge obtain an orientable surface, and draw this on your answer sheet. Hence, by making the identifications shown on your new sketch, label each vertex, and for this new surface determine χ (the Euler characteristic) and β (the number of boundary components). Hence write down the surface as a connected sum of copies of S^2 , T^2 and D^2 .
- (iii) Draw a copy of the polygons below on your answer sheet, and by making the identifications shown label each vertex. Hence determine χ (the Euler characteristic) and β (the number of boundary components) for the corresponding surface, and determine if it is orientable or not. Hence write down the surface as a connected sum of copies of S^2 , T^2 , \mathbb{RP}^2 and D^2 .

[4]



[4]

a b c⁻¹ a .