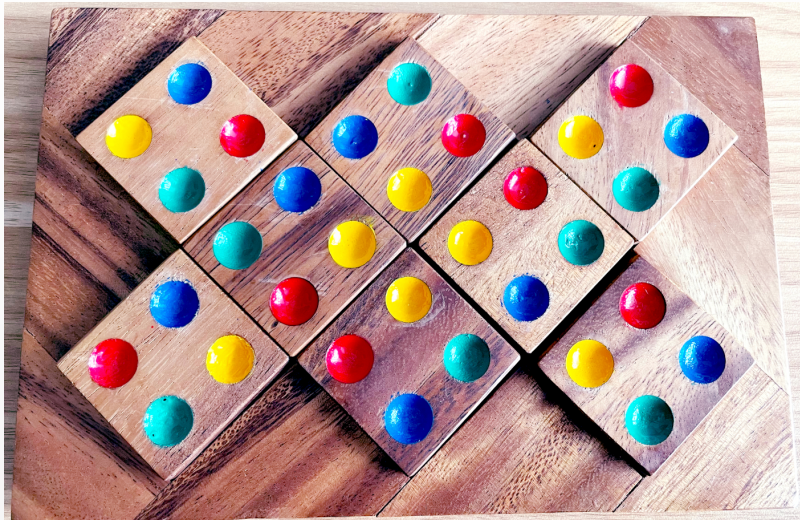


Symmetries of a square

Peter Rowlett

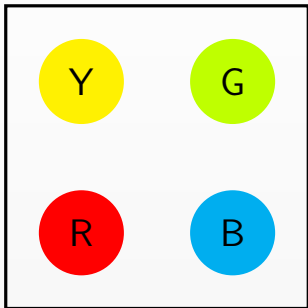
Sheffield Hallam University

Colour match puzzle

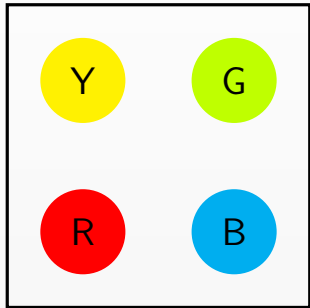


Symmetries of a square tile

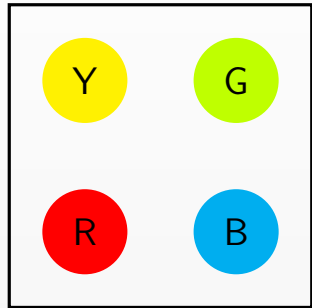
How many symmetries does a square tile like this have?



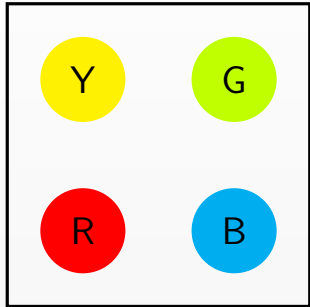
Symmetries of a square tile



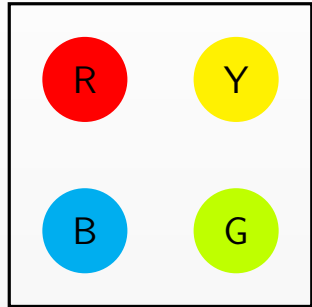

do
nothing
(iden-
tity)
→



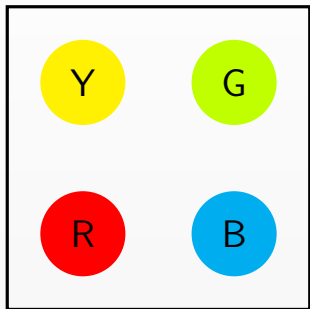
Symmetries of a square tile




rotate
 90°



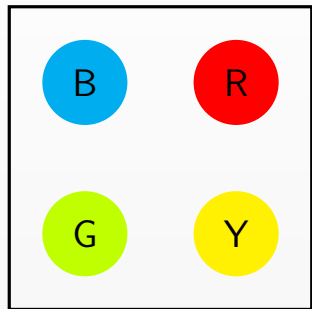
Symmetries of a square tile



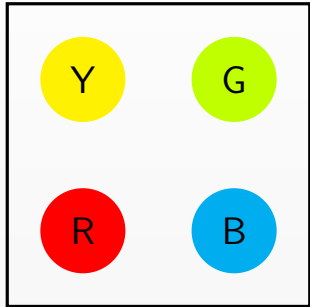
rotate
 180°



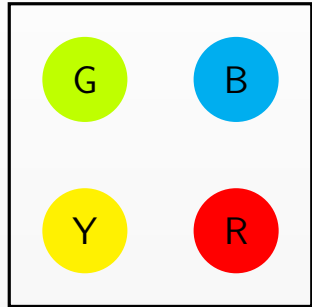
A curved arrow indicating a 180-degree rotation from the initial state to the final state.



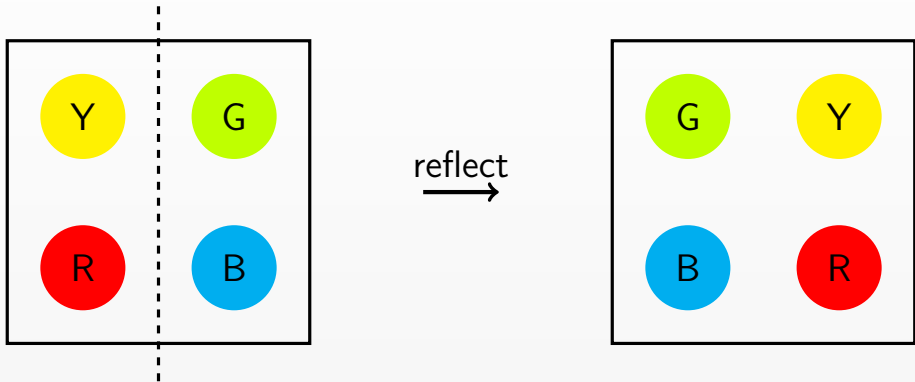
Symmetries of a square tile



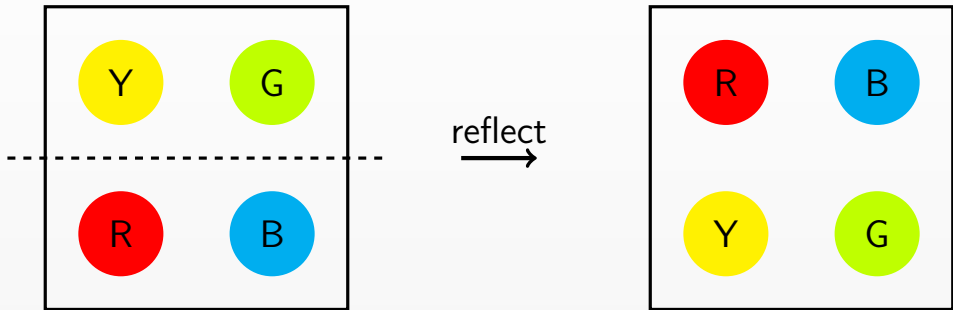
rotate
 270°



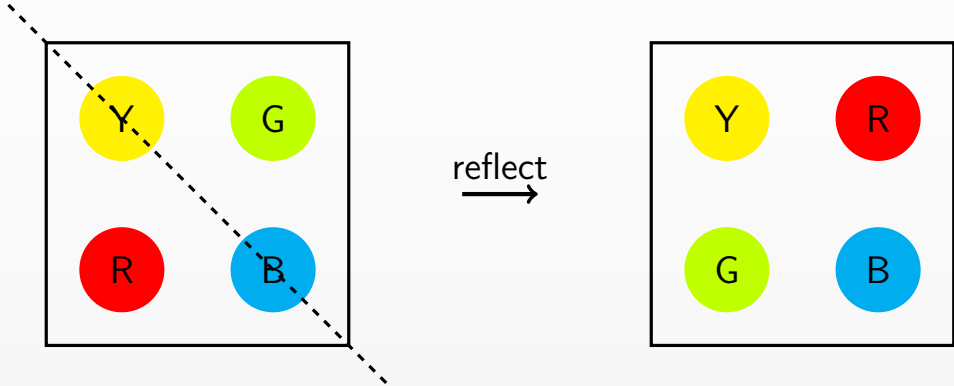
Symmetries of a square tile



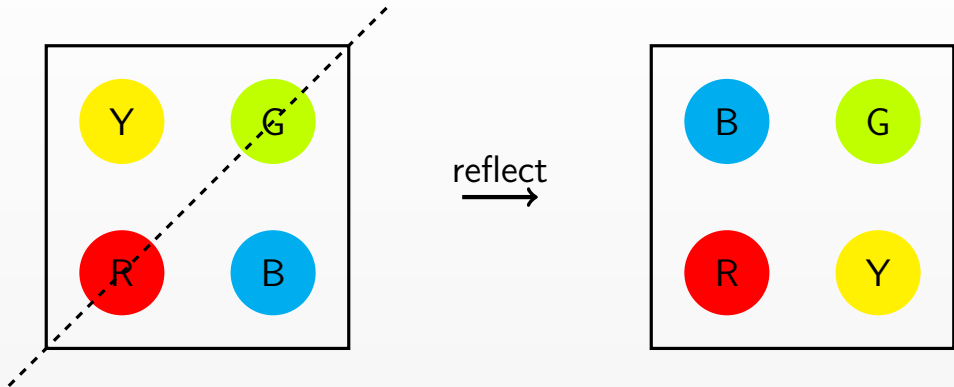
Symmetries of a square tile



Symmetries of a square tile

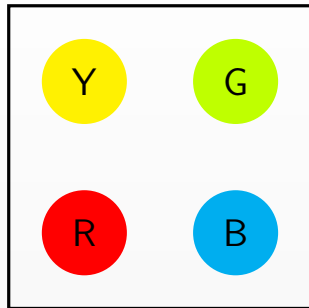


Symmetries of a square tile



How many different tiles are there?

- ▶ There are 4 colours for each dot and 4 dots, so $4^4 = 256$?
- ▶ But each colour is used only once each, so $4! = 24$?
- ▶ But are they all different?



Different tiles

