

## Quiz 2

1. There are 7 books to be placed on a shelf: 4 history books, 2 science book, and a fantasy book.

(a) How many ways are there to place the 7 books on the shelf?

$$7! = 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5,040$$

$\uparrow$              $\uparrow$   
 choices    choices  
 for        for  
 first     2nd  
 book     book     etc...

(b) How many ways if the science books need to be to the left of the history books, and the history books need to be to the left of the fantasy book?

$$2! * 4! * 1! = 2 * 24 * 1 = 48$$

$\uparrow$                      $\uparrow$   
 arrange            arrange  
 2 books            4 books

(c) How many ways are there to place the 7 books on the shelf if the history books need to stay together and the science books need to stay together?

$$48 * 3! = 48 * 6 = 288$$

$\uparrow$                      $\uparrow$   
 keep books        pick the order  
 together         of history, science  
 as above         & fantasy