Your Turn

How many ways can one French poster, two mathematics posters, and three science posters be arranged in a row on a wall if:

a) the two mathematics posters must be together on an end?
b) the three science posters must be together?
c) the three science posters cannot all be together?

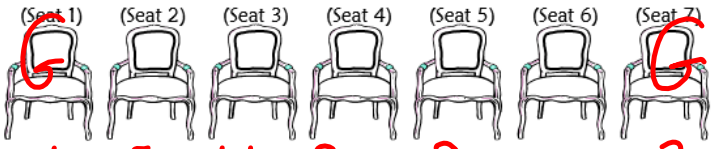
Solution

Example 5a

Arrangements Requiring Cases

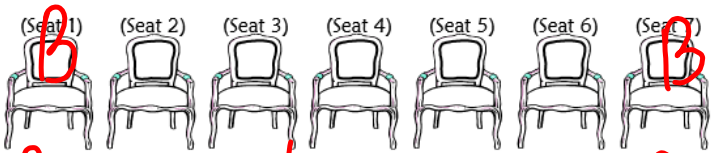
To solve some problems, you must count the different arrangements in cases. For example, you might need to determine the number of arrangements of four girls and three boys in a row of seven seats if the ends of the rows must be either both female or both male.

Case 1: Girls on Ends of Rows Arrangements



$4 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 3 = 1440$

Case 2: Boys on Ends of Rows



$3 \cdot 5! \cdot 2 = 720$

Total number of arrangements = Case 1 + Case 2 = $1440 + 720 = 2160$

Example 5b

Using Cases to Determine Permutations

How many different 3-digit even numbers greater than 300 can you make using the digits 1, 2, 3, 4, 5, and 6? No digits are repeated.

greater 300

end(even) 2, 4, 6

Solution

When determining the number of permutations for a situation in which there are restrictions, you must first address the choices with the restrictions.

Case 1: Numbers That Are Even and Start With 3 or 5

2	4	3

3 or 5 — 2, 4 or 6

$= 24$

Case 2: Numbers That Are Even and Start With 4 or 6

2	4	2

4 or 6 — 2, 4 or 6 but one used

$= 16$

total: 40

Your Turn

How many 4-digit odd numbers can you make using the digits 1 to 7 if the numbers must be less than 6000? No digits are repeated.

Solution

Case 1: Numbers That Are odd **and Start With** 1, 3, 5

180

Case 2: Numbers That Are odd **and Start With** 2, 4

160