

A selection of problems involving probability and counting:

**Suppose eight boys are standing in line. Six girls are to join the line, but no two girls may stand side by side. - b – g – b – g is ok, and it's also ok if two boys stand side by side. In how many ways may these boys and girls arrange themselves in a line?**

# Handshake problem

Suppose 15 good friends walk into a room. They are all glad to see one another and since it is summer and not flu season, they all shake hands. How many handshakes occur?

Give the expansion of this binomial:

$$(2a - b)^7$$

Consider the expansion of the polynomial shown below. A first question we might ask is how many terms are in the polynomial? Second, what is the sum of all the coefficients? Third, what is the sum of all the exponents? Somewhere in this poly is a term where  $a$  is raised to the 7<sup>th</sup> power. Find the coefficient and power of  $b$  in that term.

$$(a + b)^{24}$$

Consider rolling two dice. If two dice are rolled, what is the probability their sum is eight?

A 5 card hand is drawn from a standard deck of cards. What is the probability of drawing exactly 3 hearts and 2 clubs in this hand?

Birthday problem. How large does a group need to be in order for the chance of two individuals to have the same birthday (month and day, not necessarily the year) to be 0.5 or greater (more than 50%)?



