1) (15 points) From among 11 people, a 5 person committee is to be chosen.
   a) How many possible committees are there?
   b) Suppose that, in addition, once the committee is chosen, the committee will elect a President and Vice-President from among its 5 members. How many “committees with officers” can be chosen (in this case, the same 5 people, but with different officers, is a different “committee with officers.”)

   a) There is no order to a committee, so there are \(C(11,5) = 462\) possible committees.

   b) First choose the committee members in \(C(11,5) = 462\) ways. The second task is to elect 2 of the 5 committee members for P and VP. Here, order matters, so there are \(P(5,2) = 20\) ways. The total number of “committees with officers” is then, by the multiplication principle, \(462 \cdot 20 = 9240\).

2) (15 points) The student council at MU is made up of four freshman, five sophomores, six juniors, and seven seniors. A yearbook photographer would like to line up three council members from each class for a picture. How many different pictures are possible if each group of classmates stands together?

   Order counts in this problem, in several ways. The order in which we have the classes arranged counts, and within each class, the order that we arrange the people in the picture counts.

   First, order the 4 classes in \(P(4,4) = 4! = 24\) ways. Then order 3 of the 4 freshman in \(P(4,3) = 24\) ways, order 3 of the five sophomores in \(P(5,3) = 60\) ways, order 3 of the six juniors in \(P(6,3) = 120\) ways, and order 3 of the seven seniors in \(P(7,3) = 210\) ways.

   Using the multiplication principle, there are

   \[P(4,4) \cdot P(4,3) \cdot P(5,3) \cdot P(6,3) \cdot P(7,3) = 24 \cdot 24 \cdot 60 \cdot 120 \cdot 210 = 870,912,000\]

   possible pictures (as you found by doing the practice HW in section 5.6).