Permutations, Sets, and Venn Diagrams

Use "permutation notation" where possible. You can use the \( n \text{P}_r \) button on your calculator to save time.

1. How many ways can a president and vice-president be selected in a class of twelve students?
2. In how many ways can Kayla, Benjamin, Savannah, Anthony, William, and Alyssa stand in line?
3. Danielle, Connor, and Isaac ran in a race. In how many different orders can they finish the race?
4. Assuming no repetition of letters:
   a) How many permutations can you make from the letters A through F?
   b) How many permutations can you make from the letters A through I?
   c) How many permutations can you make from the letters D, V, C, and P?
5. How many two digit numbers can you make by arranging the numbers 2, 1, 7, 5, 9, and 4?
6. How many ways can a president and vice-president be selected in a class of sixteen students?
7. Find the number of arrangements of the word:
   a) PENCIL
   b) BEETS
   c) DINOSAUR
8. Find the number of 4 letter words that can be created from the word GRAPHITE.
9. A twelve-volume library of different books numbered from 1 to 12 is to be placed on a shelf. How many out-of-order arrangements of these books are there?
10. Mei is trying to choose a new phone number and needs to choose the last four digits of the number. Her favourite digits are 2, 5, 6, 8, 9. Each digit can be used at most once.
    a) How many permutations are there that would include four of her favourite digits?
    b) How many of these would be odd?
    c) How many of these would end with the digit 2?
11. A regional park system rates its 20 golf courses in increasing order of difficulty as bronze, silver, or gold. There are only two gold courses, and twice as many bronze as silver. If a golfer decides to play a round at a silver or gold course, how many selections are possible?
12. The 14 universities of interest to a high school senior include 6 that are expensive (tuition more than $20,000 per year), 7 that are far from home (more than 200 km away), and 2 that are both expensive and far from home. If the student decides to select a college that is not expensive and within 200 miles of home, how many selections are possible?
13. Last year, Mr. Gordon took a survey of his grade 12 students. From a total of 62 students, 33 were male, 12 owned a car lowered for racing, and 15 had at least one ticket for a driving violation. 8 males drove a lowered car, 4 students with a lowered car had at least one ticket, and 10 students with at least one ticket were male. 2 students were male, drove a lowered car, and had received at least one ticket. How many students were female, drove a normal car, and had no tickets?