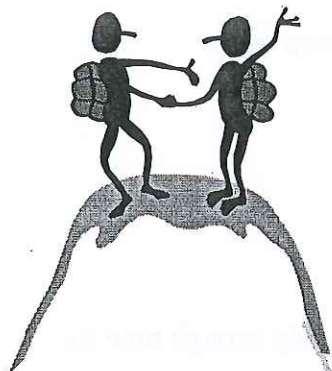## Mountain Climber

Start at the BOTTOM of the mountain. Solve the problems as you climb UP the mountain.

Identify the following as Permutations, Combinations or Counting Principle problems.
(no need to solve)

1. You want to get a cell phone and you must decide on the right plan. If there are 10 different phones, 6 different calling plans and 3 different texting plans, how many different plans could you pick from if you can choose one phone, one calling plan and one texting plan?

    Counting Principle

2. How many different ways can a director select 4 actors from a group of 20 actors to attend a workshop on performing in rock musicals? ↳ *need any 4 actors*

    Combinations

3. A popular brand of pen is available in three colors (red, green or blue) and four tips (bold, medium, fine or micro). How many different choices of pens do you have with this brand?

    Counting Principle

4. A book club offers a choice of 8 books from a list of 40. In how many ways can a member make a collection? ↳ *need any 8 books*

    Combinations

5. The model of the car you are thinking of buying is available in nine different colors and three different styles (hatchback, sedan, or station wagon). In how many ways can you order the car?

    Counting Principle

6. In a race in which six automobiles are entered and there are not ties, in how many ways can the first four finishers come in?

    ↳ *put cars in particular places*   *Permutations*

Find the number of combinations

7. There are 12 standbys who hope to get on your flight to Hawaii, but only 6 seats are available on the plane. How many different ways can the 6 people be selected?

    $$_{12}C_6 = \frac{12!}{6!(12-6)!} = \frac{12!}{6!\,6!} = \boxed{924}$$

8. You are on your way to Hawaii (Aloha) and of 15 possible books your parents say you can only take 10. How many different collections of 10 books can you take?

$$_{15}C_{10} = \frac{15!}{10!(15-10)!} = \frac{15!}{10!\,5!} = \boxed{3003}$$

9. An election ballot asks voters to select three city commissioners from a group of six candidates. In how many ways can this be done?

$$_{6}C_{3} = \frac{6!}{3!(6-3)!} = \frac{6!}{3!\,3!} = \boxed{20}$$

Find the number of possibilities (you must show the set up).

10. Seven bands have volunteered to perform at a benefit concert, but there is only enough time for four of the bands to play. How many lineups are possible?

$$_{7}P_{4} = \frac{7!}{(7-4)!} = \frac{7!}{3!} = \boxed{840}$$

11. Suppose you are asked to list, in order or preference, the three best movies you have seen this year. If you saw 10 movies during the year, in how many ways can the three best be chosen and ranked?

$$_{10}P_{3} = \boxed{720}$$
$$= \frac{10!}{(10-3)!} = \frac{10!}{7!}$$

12. The company Sea Esta has ten members on its board of directors. In how many different ways can it elect a president, vice-president, secretary and treasurer?

$$_{10}P_{4} = \frac{10!}{(10-4)!} = \boxed{5040}$$
$$= \frac{10!}{6!}$$

13. The ski club with ten members is to choose three officers captain, co-captain & secretary, how many ways can those offices be filled?

$$_{10}P_{3} = \frac{10!}{(10-3)!} = \boxed{720}$$
$$= \frac{10!}{7!}$$

Evaluate each permutation or combination (you must show the set up) :

14. $_{8}C_{5} \cdot {_{7}C_{3}} = \frac{8!}{5!(8-5)!} \cdot \frac{7!}{3!(7-3)!} = \frac{8!}{5!\,3!} \cdot \frac{7!}{3!\,4!} = \frac{8\cdot7\cdot6\cdot5!}{5!\cdot3!} \cdot \frac{7\cdot6\cdot5\cdot4!}{3!\cdot4!} = \frac{8\cdot7\cdot6}{3\cdot2} \cdot \frac{7\cdot6\cdot5}{3\cdot2} = \boxed{1960}$

15. $_{7}P_{7} = \frac{7!}{(7-7)!} = \frac{7!}{0!} = 7! = 7\cdot6\cdot5\cdot4\cdot3\cdot2 = \boxed{5040}$

16. $_{8}C_{3} = \frac{8!}{3!(8-3)!} = \frac{8!}{3!\cdot5!} = \frac{8\cdot7\cdot6\cdot5!}{3!\cdot5!} = \frac{8\cdot7\cdot6}{3\cdot2} = \boxed{56}$

17. $_{7}P_{3} = \frac{7!}{(7-3)!} = \frac{7!}{4!} = \frac{7\cdot6\cdot5\cdot4!}{4!} = 7\cdot6\cdot5 = \boxed{210}$