Pre-Calculus CP 1 – 9.6 ICE
Combinations & Permutations

Name: KEY

1. You have 10 packages of M&Ms and 15 packages of Skittles. In how many ways can you pick 8 and have 3 be M&Ms?

$$_{10}C_3 \cdot {}_{15}C_5 = 120 \cdot 3003 = 360,360$$

M&M Skittles

2. In how many ways can you line up the letters in the word "REARRANGE"

$$\frac{9!}{3!2!2!} = 15,120$$

3. A password consists of 3 digits, repetition is not allowed, followed by 2 letters, repetition is allowed. What is the total number of possible passwords?

$$\underset{d}{10} \cdot \underset{d}{9} \cdot \underset{d}{8} \cdot \underset{\ell}{26} \cdot \underset{\ell}{26} = 486,720$$

4. Forty students apply for a scholarship awarded by the headmaster. One is for \$5000, one is for \$1000, and the last is for \$500. In how many ways can the recipients be selected?

$$\underset{5k}{40} \cdot \underset{1k}{39} \cdot \underset{.5k}{38} = {}_{40}P_3 = 59,280$$

5. In how many ways can ten students from a class of twenty line up?

$${}_{20}P_{10} = 6.704 \times 10^{11}$$

6. You are ordering a new bike. You have 5 wheel choices, 3 color choices and 2 seat choices. How many possible bikes can you design?

$$\underset{w}{5} \cdot \underset{c}{3} \cdot \underset{s}{2} = 30$$

7. In how many ways can you arrange six items on a circular display?

$$(6-1)! = 5! = 120$$

8. In how many ways can the batting order for the 9 starting players in a baseball game be announced?

$$\underline{9}\ \underline{8}\ \underline{7}\ \underline{6}\ \underline{5}\ \underline{4}\ \underline{3}\ \underline{2}\ \underline{1}$$

$$9! = 362,880$$

9. DS Pizza Shop offers 4 different cheeses and 10 different pizza toppings. How many ways can you order a pizza with 1 type of cheese and 2 different toppings?

$${}_4C_1 \cdot {}_{10}C_2 = 4 \cdot 45 = 180$$

10. In how many ways can 3 brunettes and 3 blonds be seated in a line if hair color must alternate?

B B B B B B = 36

B B B B B B = 36

OR

+ = 72

11. A student relations committee of a college consists of 2 administrators, 3 faculty members, and 5 students. 4 administrators, 8 faculty members and 20 students are eligible to serve. How many different committees are possible?

$${}_4C_2 \cdot {}_8C_3 \cdot {}_{20}C_5$$

$$= 6 \cdot 56 \cdot 15504 = 5,209,344$$

12. How many different 9 letter words can be formed from the letters in the word ECONOMICS?

$$\frac{9!}{2!2!} = 90,720$$

13. A combination lock displays 50 numbers. To open it, you turn to a number then rotate clockwise to the 2nd number, then counterclockwise to the third number. How many different combinations are there?

$$50 \cdot 50 \cdot 50 = 50^3 = 125,000$$

14. How many four digit numbers can be formed if the first digit cannot be zero,

a. if repeated digits are not allowed?

$9 \cdot 9 \cdot 8 \cdot 7 = 4{,}536$

b. if repeated digits are allowed?

$9 \cdot 10 \cdot 10 \cdot 10 = 9{,}000$

15. A bag contains 15 red balls and 10 white balls. 5 balls are selected. In how many ways can the 5 balls be drawn from the total of 25 balls,

a. if all 5 balls are red?

$_{15}C_5 \cdot {}_{10}C_0 = 3{,}003$

b. if 3 are red and two are white?

$_{15}C_3 \cdot {}_{10}C_2 = 20{,}475$

c. if at least four are red balls?

$\underbrace{{}_{15}C_4 \cdot {}_{10}C_1}_{4 \text{ red}} + \underbrace{{}_{15}C_5 \cdot {}_{10}C_0}_{5 \text{ red}} = 16{,}653$