Due tomorrow (work from yesterday & today):

14.1 part 1 and part 2

#17-20, 21-35odd, #41-81odd, 91

(put both assignments on same sheet of paper)

From yesterday: 14.1 part 1

31. Combination Lock A combination lock has 60 different positions. To open the lock, the dial is turned to a certain number in the clockwise direction, then to a number in the counterclockwise direction, and finally to a third number in the clockwise direction. If successive numbers in the combination cannot be the same, how many different combinations are possible? $60 \cdot 59 \cdot 59 = 208{,}860$

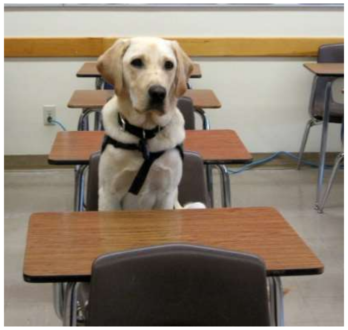
successive numbers cannot be the same

2nd number cannot be the same as the first number

3rd number cannot be the same as the second number, but can match the first number

Notes: 14.1 (part 2)

permutation: an arrangement of items in a certain order where items *cannot be repeated*
(students sitting in a row of desks)



The number of permutations of n objects is n! ***(place 6 students in 6 desks → 6!= 720)***

P(n, r): the number of permutations of **n** objects taken **r** at a time. $P(n, r) = \dfrac{n!}{(n-r)!}$

place 6 of 8 students in 6 desks → P(8, 6)

combination: the order of the items is <u>not</u> a consideration and items *cannot be repeated* (a combination pizza or a committee of people)

$$C(n, r) = \frac{n!}{r!(n-r)!}$$

Binomial coefficient: for $(a+b)^n$

$$\binom{n}{r} = \frac{n!}{r!(n-r)!}$$

How many different arrangements can you make using th**e letters WOW?**

three??

OWW
WOW
WWO

OR six??

OW_1W_2 OW_2W_1
W_1OW_2 W_2OW_1
W_1W_2O W_2W_1O

Answer:
3 different arrangements

Distinguishable Permutations

(linear arrangements where you remove the repetitions from the total count)

Distinguishable Permutations:

The number of permutations of **n** objects of which **p** are alike, **q** are alike, and **r** are alike :

$$\frac{n!}{p!q!r!\,etc.}$$ ←divide by the repetitions

Example#1: Waikiki has $\frac{7!}{2!3!}$ arrangements,

which is a total of 420 different permutations.

Due tomorrow (work from Mon & Tue):

14.1 part 1 and part 2

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(put both assignments on same sheet of paper)

41–52 ■ Counting Permutations These exercises involve counting permutations.

41. Seating Arrangements Ten people are at a party.

(a) In how many different ways can they be seated in a row of ten chairs? $10! = 3,628,800$

(b) In how many different ways can six of these people be selected and then seated in a row of six chairs? $P(10,6)=151,200$

Set up problem using proper notation, then ok to use calculator to find P(n, r) and C(n, r)

PERMUTATIONS AND COMBINATIONS

Math ◄ ◄ PROB, then choose option 2 or 3 to calculate P(n,r) or C(n,r)

Example: try calculating P(7,3) to see if you get 210 and/or try C(7,3) = 35

41–52 Counting Permutations These exercises involve counting permutations.

$$P(n, r) = \frac{n!}{(n-r)!}$$

41. **Seating Arrangements** Ten people are at a party.

(a) In how many different ways can they be seated in a row of ten chairs?

Answer

53–60 Distinguishable Permutations These exercises involve distinguishable permutations.

53. **Arrangements** In how many ways can two blue marbles and four red marbles be arranged in a row?

$$\frac{n!}{p!q!r!\text{etc.}}$$

(toss out the repetitions)

Answer

61–74 Combinations These exercises involve counting combinations.

61. **Committee** In how many ways can a committee of three members be chosen from a club of 25 members?

$$C(n, r) = \frac{n!}{r!(n-r)!}$$

Answer

A mix of all techniques!

75–90 Counting Principles Solve these exercises by using the appropriate counting principle(s).

GUIDELINES FOR SOLVING COUNTING PROBLEMS

1. **Fundamental Counting Principle.** When consecutive choices are being made, we use the Fundamental Counting Principle.
2. **Does Order Matter?** When we want to find the number of ways of picking r objects from n objects, we need to ask ourselves, "Does the order in which we pick the objects matter?"

   If the order matters, we use permutations.

   If the order doesn't matter, we use combinations.