Activity 12-21: **Combinations** Name:

Katniss, Rue, Peeta, Thresh, Foxface, Cato, Clove, Glimmer, Marvel

Total number of people	**People picked**	**Written mathematically** ${}_nC_r$	**Number of ways to pick them**	**How to solve mathematically**
1	1			
2	1			
2	2			
3	1			
3	2			
3	3			
4	1			
4	2			
4	3			
4	4			
5	1			
5	2			
5	3			
5	4			
5	5			

1.	Say that we had 10 people to pick from in the front of the room. How many people would we select to give us the least number of combinations?	
2.	From #1, how many people would we select to give us the most number of combinations?	

Activity 12-22: **Combinations** Name:

An arrangement or listing in which order is not important is called a **combination**.

Example: Mr. Mangham is giving away 3 movie tickets. There are 7 different students with Mangham's Most Wanted slips from which Mr. Mangham will draw. How many possible ways can Mr. Mangham pick the 3 winners for the prizes?

A quick way to find the number of combinations is to divide the number of permutations, ${}_7P_3$, by the number of orders 3 students can be drawn, 3!.

$$\text{Number of ways} = \frac{7 \bullet 6 \bullet 5}{3 \bullet 2 \bullet 1} = \frac{210}{6} = 35 \text{ ways}$$

${}_nC_r$ means the number of combinations of n things taken r at a time.

$${}_{\text{n}}\text{C}_{\text{r}} = \frac{{}_{\text{n}}P_r}{\text{r!}}$$

Find each value.

1.	${}_4C_2$		2.	${}_5C_3$		3.	${}_6C_2$	
4.	${}_8C_3$		5.	${}_6C_4$		6.	${}_7C_7$	
7.	${}_{15}C_6$		8.	${}_{15}C_7$		9.	${}_{15}C_8$	

Determine whether each situation is a permutation or a combination.

10.	Annie taking 2 drinking glasses from 6 on a shelf	
11.	Finnick placing 6 different drinking glasses on a shelf	
12.	President Snow taking 4 cards from a 52-card deck	
13.	A mutt choosing 3 numbers from 1 to 9	
14.	A mockingjay making a 3 digit number with each digit between 1 and 9 and each digit only used once	

Solve.

15.	How many ways can you choose four toy soldiers from a collection of sixteen toy soldiers?	
16.	How many different five-card hands are possible using a 52-card deck?	
17.	How many combinations of four textbooks can be chosen from eight textbooks in a locker?	
18.	How many different "double features" (two-film showings) can be chosen from a collection of twelve films?	
19.	How many ways can 5 children line up to get on the school bus if Jenny always gets third?	
20.	Write your own interesting word problem which can be solved by a combination.	

Activity 12-23: **Permutations and Combinations** Name:

Write the appropriate permutation or combination expression and then solve. You may use a calculator.

1.	How many ways can 6 students' desks be arranged in a row?		
2.	How many ways can 2 students choose one baseball card each from 18 baseball cards that are a reward for their hard work?		
3.	How many ways can 10 students line up for lunch?		
4.	How many ways can you choose 4 CDs from a stack of 8 CDs?		
5.	How many ways can 3 pairs of shoes be chosen from 8 pairs?		
6.	How many ways can 9 runners be arranged on a 4-person relay team?		
7.	The Ft. Worth Zoo has 23 animals it can take on visits to schools. How many ways can the zoo choose 9 animals for a trip to Durham Intermediate?		
8.	There are 15 dancers in a championship competition. How many ways can the top 3 finishers be arranged?		
9.	In the Daytona 500 the cars start in 11 rows of 3. How many ways can the front row be made from the field of 33 race cars?		
10.	How many ways can you make a sandwich by choosing 4 of 10 ingredients?		
11.	How many ways can 11 photographs be arranged on the wall?		
12.	How many ways can you make a batting order in baseball (9 players) from a team of 16?		
13.	How many ways can 3 cookie batches be chosen out of 6 prize-winning batches?		
14.	Which situation represents a permutation? A. Selecting six marbles from a jar B. Awarding first and second place C. Putting three coins in a purse D. Selecting two candidates from a group of 16		
15.	Which situation represents a combination? A. Five people in lime to buy tickets B. 7 people running for chair and vice-chair C. First and second place in a race D. Choosing team of 3 people from a group of 10		