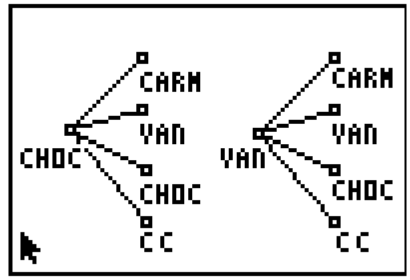
Too Many Choices!

Name ________________________

Class ________________________

Problem 1 – Exploring the Fundamental Counting Principle

Jayden is choosing a cake for his birthday. He can choose 1 flavor of cake from 2 choices (chocolate and vanilla) and 1 flavor of frosting from 4 choices (chocolate, vanilla, caramel, cream cheese). How many different cakes does he have to choose from?



One possible diagram is given at the right.

- Draw a different diagram to solve the same problem.

- What multiplication sentence represents this problem?

Jess has 3 pairs of pants and 5 shirts. She wants to make an outfit from one pair of pants and one shirt.

- Determine how many different outfits she can make.

- What method of did you use?

- How many outfits can Jess make?

- What multiplication sentence represents this problem?

Tiana is choosing an entrée and a side dish for her dinner. There are *m* entrée choices and *n* side dish choices.

- Write a formula to find how many different dinners Tiana can choose from.

Try These:

1. An ice cream store sells 31 flavors. For how many days can you purchase a different two-scoop cone every day? (Assume the two scoops must be different and a strawberry/vanilla is different from a vanilla/strawberry.)

2. A license plate consists of 3 digits followed by 2 letters. How many different license plates exist? (**Note**: Assume that the first digit of the license plate can be zero.)

Problem 2 – Exploring Permutations

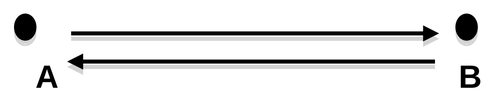
An **arrow** is a straight line that connects two points and has a direction. This means that the arrow from point A to point B is a different from the arrow from B to A.

Investigate the number of arrows between points as the number of points changes. For example, there are 2 arrows between 2 points, as shown.

Find the number of arrows between 3, 4, and 5 points. You may draw a diagram to help compute the number of paths (arrows). Record your results in the table.

Number of Points	Number of Arrows
2	2
3	
4	
5	
6	
7	

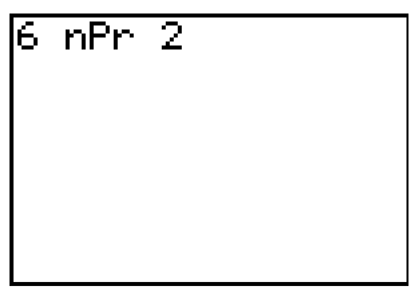
- What pattern do you notice?



- Predict the number of arrows for 6 and 7 points.
- What formula do you think can be used to find the number of arrows between *n* points?
- How is this formula similar and different from that in Problem 1?

Discuss permutations with your class. Then, use the **nPr** command (**MATH > PRB > nPr**) to confirm the number of arrows for 6 and 7 points.

Note: You will need to enter the number of points, choose the **nPr** command, and then enter the number of points each arrow connects (2).



Try These:

1. There are 9 players who are arranged in a batting order for a softball game. How many different batting orders are there?
2. In a senior class, 6 people are running for office. If a slate of officers has a president, a vice president and a secretary, how many different slates of officers are there?
3. Sixteen runners are in a cross-country race. In how many different ways can they place 1^{st}, 2^{nd}, and 3^{rd}?

Problem 3 – Exploring Combinations

In Question 2 above, 3 officers were chosen from a pool of 6 people (a, b, c, d, e, and f). Instead of choosing three officers, we now choose three committee members. The table below shows different ways the same committee could be selected. The first column shows all the ways the committee made up of **a**, **b**, and **c** could be selected. The second column shows all the ways the committee made up of **b**, **c**, and **d** could be selected.

Possible Committee 1	Possible Committee 2	Possible Committee 3
abc	bcd	
acb	bdc	
bac	cbd	
bca	cdb	
cab	dbc	
cba	dcb	

- How many ways can each possible committee be selected?
- Predict how many ways a committee made up of **c**, **d**, and **e** could be selected. List each way in the third column.
- Determine the number of 3-person committees formed from 6 people. How does this number relate to the number of slates of 3 officers?

An **edge** is a straight line that connects two points and does **not** have direction. This means that the edge from point A to point B is the same as the edge from B to A.

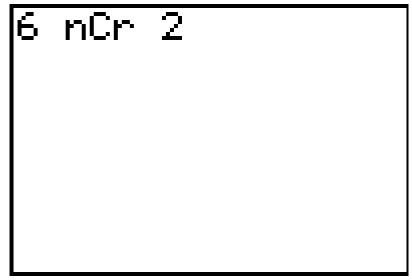
Investigate the number of edges between points as the number of points changes.

- How does the number of edges compare to the number of arrows?

Number of Points	Number of Arrows	Number of Edges
2	2	1
3	6	
4	12	
5	20	
6	30	
7	42	

- What formula do you think can be used to determine the number of edges for *n* points?

- Predict the number of edges will be for 6 and 7 points.



Use the **nCr** command (**MATH > PRB > nCr**) to confirm the number of edges for 6 and 7 points.

Try These:

1. There are 12 players on a basketball team. How many starting line-ups can be made using 5 players, assuming that the order in which they are chosen does not matter?

2. How many 5-card hands can be dealt from a standard deck of 52 cards?

3. How many committees of 3 Republicans and 3 Democrats can be made from the U.S. Senate if there are 42 Republicans, 57 Democrats, and 1 Independent in the Senate?