# FOM 12 Combinatorics Project

For the project for this unit, you will be analyzing a topic of interest using combinatorics. The topic you choose could be anything from sports to anime, school life to dance, or video games to art. You will be in groups of 3, so make sure that everyone in the group agrees on the topic. You will be creating questions related to your topic of interest that can be solved using combinatorics, then explaining how the answers to those questions could be used in a practical or meaningful way.

**Part 1 – Introduction**

- Introduce the topic of your project (***Before you finalize your topic, check-in with me!***)
- Tell me why you are interested in the topic and how you **all** decided to choose the topic
- Include any other background information that would help me understand the rest of the project

**Part 2 – Questions and Calculations**

- Create 6 questions related to your topic of interest that can be solved using combinatorics. If you make a question with multiple parts, each part counts as one of the 6 questions as long as it involves another calculation
- As a part of your 6 questions, you must include at least:
    - 2 calculations involving permutations
    - 2 calculations involving combinations
    - 3 calculations involving restrictions
    - 1 permutation calculation that has repetitions (duplicates)
    - 1 calculation that has "at least" or "at most"

  *NOTE: a calculation that includes permutations, duplicates and restrictions counts in each of those categories.*
- Make sure to include a variety of easy and hard questions! You need to include harder questions to receive full marks on calculation portion of the project.

**Part 3 – Conclusion**

- Reflect on the questions you created and solved related to combinatorics
- Explain why the answers to these questions would be useful or would help someone working on your topic of interest. Make sure to address each question.
- Be creative and think about how the answers to your questions could be used in a practical or meaningful way.

The format of your project is up to you. You could create a poster, PowerPoint, written report or anything else you think would be appropriate. You will have 10 minutes to present your project to me as a group (not in front of the class). Make sure that whatever format you choose shows your mathematical work clearly and includes everything asked for in the instructions.

| | Novice (Pink) | Developing (Yellow) | Proficient (Blue) | Advanced (Green) |
|---|---|---|---|---|
| Critical Thinking: Calculations | Calculations are not present or mostly done incorrectly | Calculations are present, but many calculations include major errors. Most questions are only moderately difficult. | Calculations are present. Only a few calculations include minor errors. Project includes some easier and harder questions. | Calculations are shown with evidence and justification that is clear to the reader. Project includes many harder questions that might go beyond the scope of the course. |
| Communication: Layout and Organization | There is no evidence of organization for the project | Some evidence of organization is present. The project is difficult to understand at times due to a lack of coherency | Organization of the project is present, and the content can be understood | Organization enhances the content in the project, making it clear to the reader how the different parts are related |
| Communication: Analysis of Questions | Evidence of analysis related to questions created is not present in the project | Evidence of analysis is limited or superficial at times. Analysis is only provided for some of the questions created. | Evidence of analysis is present for all questions and demonstrates understanding of combinatorics applications | Evidence of analysis is incorporated throughout the project for all questions. Analysis demonstrates deep understanding of combinatorics applications. |
| Personal and Social: Personal Connections | Students do not provide evidence of personal connections to the topic of the project | Students provide limited evidence of personal connections to the topic of the project. | Students show evidence throughout of personal connections to the topic of the project | Students show evidence throughout the project of personal connections to the topic, including perspectives from all 3 group members. |

## Project Checklist

- Introduction
  - Introduce topic and provide background information
  - Explain why you are all interested in the topic
  - Include information about each group member was involved in choosing the topic
- Calculations
  - 2 calculations involving permutations
  - 2 calculations involving combinations
  - 3 calculations involving restrictions
  - 1 calculation that has repetitions (duplicates)
  - 1 calculation that has “at least” or “at most”
  - Include a variety of questions that are both easier and harder
- Conclusion
  - Explain how the answers to your questions could be used in a practical or meaningful way

# Project Self and Peer Assessments

- I can take ownership of my goals, learning and behavior
- I contribute to group activities that make my classroom, school and community a better place.
- I can identify how my actions and the actions of others affect my community

| | Novice (Pink) | Developing (Yellow) | Proficient (Blue) | Advanced (Green) |
|---|---|---|---|---|
| Working with Others | Rarely listen to, shares with, and supports the efforts of others. Often is not a good team player | Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team player | Usually listen to, shares with, and supports the efforts of others. | Listens to, shares with and supports the efforts of others. Actively tries to keep people working well together |
| Focus on Task | Rarely focuses on the task and what needs to be done. Lets others do the work | Focus on the task and what needs to be done some of the time. Requires other group members to remind this person to stay on task | Focuses on the task and what needs to be done most of the time. | Consistently stays focused on the task and what needs to be done. Very self-directed and takes on a leadership role. |
| Preparedness and Time Management | Often forgets materials, rarely ready to work, and requires others to adjust responsibilities because of poor time management | Usually brings materials to work but is often not ready to work right away. Tends to procrastinate, but eventually gets work done | Almost always brings materials needed to class and is ready to work. They get their work done, though they might procrastinate at times | Brings all materials needed and comes ready to work. Uses time well to get work done, and helps others manage time to meet deadlines. |

I will also be observing during class time to see how groups are working together. You will complete a copy of this when you hand in your project for yourself and each other group member.