

## Poker Game

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# Exemplars

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## Poker Game

### Suggested Grade Span

6-8

### Task

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### Alternate Versions of Task

#### More Accessible Version:

Every week 5 friends met to have dinner. If they meet at 1 of 5 restaurants, during 1 of 7 nights of the week, at either 6:00 or 7:00, how many different place, day and time combinations are possible?

#### More Challenging Version:

Every week 5 friends met for a card game. They used a table with 6 chairs. Eventually, they realized that they had chosen a different seating arrangement each week and had exhausted every possibility. How long had the friends played together? If they started their card games the first day of the new year, on what date would they have exhausted the possibilities?

### Context

This is a problem that can be used to reinforce students' understanding of combinations. For students who have not been widely exposed to combinations, it offers an excellent opportunity for learning good problem-solving strategies. They can start with a smaller number of cases to find the pattern and generalize to the larger case.

### What This Task Accomplishes

This is a good example of a task that encourages students to try and simplify, to find the general pattern needed to solve the larger problem.

### What the Student Will Do

Students can solve this problem using a diagram, but unless they are able to make the connection to combinations, they will stop before they find the solution. Some students will

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begin with a simpler pattern, two players and three chairs, for example. They will then go on to generalize to five players and six chairs.

## Time Required for Task

60 minutes

Assuming students are not able to solve this problem algorithmically, this problem should take about one hour to solve and document.

## Interdisciplinary Links

This problem can be tied to social studies units that examine relationships between individuals and groups.

## Teaching Tips

If students are given this problem before the study of combinations, they will have a better understanding and appreciation of the algorithm. This is also a good opportunity to help students develop problem-solving strategies by starting with a more simple case to understand a more complex problem.

## Suggested Materials

- Paper
- Pencil for diagramming

## Possible Solutions

The answer is 720 weeks found by multiplying  $6 \times 5 \times 4 \times 3 \times 2 = 720$ .

### More Accessible Version Solution:

5 restaurants x 7 nights of the week x 2 times = 70 different combinations

### More Challenging Version Solution:

$720 \div 52$  weeks in a year = 13 years and 44 weeks

44 weeks into the 14th year would be the first week of November.

Using this information, the correct solution needs to be determined based on the date the student uses as the “first day of the new year.”

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## Task Specific Assessment Notes

### Novice

The student employs a strategy, multiplying  $6 \times 5$  to get 30, that cannot lead to a correct solution.

### Apprentice

The student employs a strategy that leads in the appropriate direction, recognizing that all elements, six chairs and five players are involved in the solution, but instead of multiplying s/he adds them. This leads to an incorrect solution.

### Practitioner

The Practitioner has an effective strategy, very well communicated using words and diagrams to solve the problem. S/he begins with a smaller number of players and chairs and extends the pattern to find the solution.

### Expert

The student has a deep understanding of the problem, including the ability to work from a smaller solution to the larger case. What distinguishes this solution is that the Expert is able to make the mathematical extension to  $N$ ,  $N-1$ ,  $N-2$  etc. This is an elegant solution.