Ramsey numbers	Season Episode Time frame	2 20 2 periods

Prerequisites : Basic notions and vocabulary about graphs.

Objectives :
- Introduce the concept of a complete graph.
- Modelize a problem using graphs.
- Discover the concept of Ramsey numbers.

Materials :
- *Beamer.*

1 – A party problem

1 period

The following problem is introduced :

> You're organising a party. Some of the guests will know each other, while others won't. For the sake of simplicity, we admit that the relation of knowing each other is symmetric.
>
> What is the least number of guest to invite so that at least m people will mutually know each other, or at least n people will be complete strangers ?

Some simple examples are studied with the whole class :
- $m = 2$ and $n = 2$;
- $m = 3$ and $n = 2$;
- $m = 2$ and $n = 3$;
- $m = 2$ and $n \in \mathbf{N}$;

Then, students have to stand up and work in groups in the problem with $m = 3$ and $n = 3$.
If there is enough time, the problem with $m = 4$ and $n = 3$ can be tackled too.

2 – Turning it into a graph problem

1 period

The class is asked to modelize this problem with the use of graph.
Hints can be given by the teacher :
- What will be the vertices of the graph ?
- How to symbolize the fact the people will know each other or not ?

The concepts of complete graph and Ramsey number are introduced, along with the official notations K_n and $R(m, n)$. A quick biography of Ramsey is given.
The proof of the fact that $R(3, 3) = 6$ is given.