Analysing a game

Primary Lesson Plan

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Source
Working Mathematically: Investigations
Kevin Olssen (ed.)

Learning area
Mathematics

Level
Upper primary

Description
The students play a game called 'Limit 2' and analyse their moves in order to establish a winning strategy. The subtraction game in this activity is one of a number of games in a unit called 'Analysing games' in the above publication. Other games in the unit that are played and analysed are:

- Addition games
- Games with factors

Purpose
To encourage the students to use all the strategies of working mathematically in the context of a game.

Duration
1 or 2 sessions

Possible outcomes
In relation to *Mathematics — a curriculum profile for Australian schools*, work on this activity could lead to the achievement of outcomes in the following strands:

- **Working mathematically**
  Investigating
  Conjecturing
  Using problem solving strategies
  Applying and verifying
  Using mathematical language
- **Number**
  Applying number
  Mental computation

Materials required
20 counters for each pair of students

Procedure

1 Introduction
Introduce 'Limit 2' by playing it a few times with different students and describing the rules to the class as the game progresses.
Rules:

- Take turns to pick up one or two counters.
- You must pick up something and the limit is two.
- The person who takes the last counter wins.

It is good tactics for the teacher to deliberately lose on most occasions. Any multiple of three is a winning number; therefore, avoid leaving a multiple of three after any move.

2 Students look for a way to win
Each pair receives a set of 20 counters and plays the game several times.
Ask the students, 'Can you work out how to win?'
Sometimes it is useful to ask questions that will help students to focus their thinking.

- What must you leave after your last move if you are to win?
- To be sure of this, what must you leave on your second-last move?
- To be sure of this, what must you leave on your third-last move?
- Can you see a pattern?

3 Students test their winning strategies on similar games
Extend the game to 'Limit 3' (Pick up 1, 2 or 3), 'Limit 4' and so on. Students test their winning strategies on these further games.

4 Students explain the winning strategies
Pairs of students explain winning strategies to the class. Students find that speaking mathematically is quite a demanding task. Discussion of the strategies used helps them to develop this skill.

Extension

For students who quickly establish winning strategies, challenge them with: Is there a general strategy for all 'Limit' games?' Then pose the problem: 'What about 'Limit 3' in reverse: last move loses? How can you win that?

Related resources

Working Mathematically: Investigations, is one of a number of products of the Mathematics Curriculum and Teaching Program of Curriculum Corporation. The following products are relevant to the teaching of mathematics in primary and secondary schools:

- *Working Mathematically: Space*, an interactive CD-ROM
- *Maths Task Centre Kit*
- *Chance and Data*, a set of books, computer disks and video