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# The development of inductive thinking

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## Abstract

This article proposes to bring some information about possible ways to develop the capacity for inductive thinking that are exemplified in the series of mathematics textbooks for children from 6th to 9th grades published in the Czech Republic.

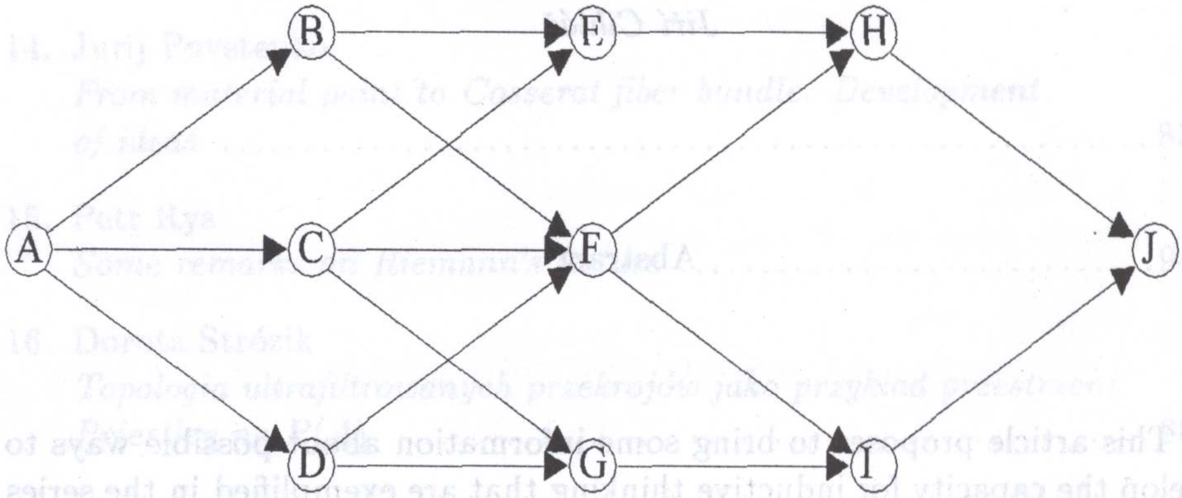
When we try to develop inductive thinking of students in lower secondary school, we accentuate especially:

1. The capacity to order the objects of our investigation (it is not necessary the linear ordering).
2. The capacity to find the connections among the simpler objects and the more complicated ones.
3. By means of these connections to find the qualities of (very) complicated objects, which ,,we cannot see in evidence".
4. The capacity to find and formulate the general regularity for all objects.

Let me mention three possible ways to realize our topic.

1. Extension of the paths

We can ask our students: How many paths from $A$ to $J$ are there in the picture?



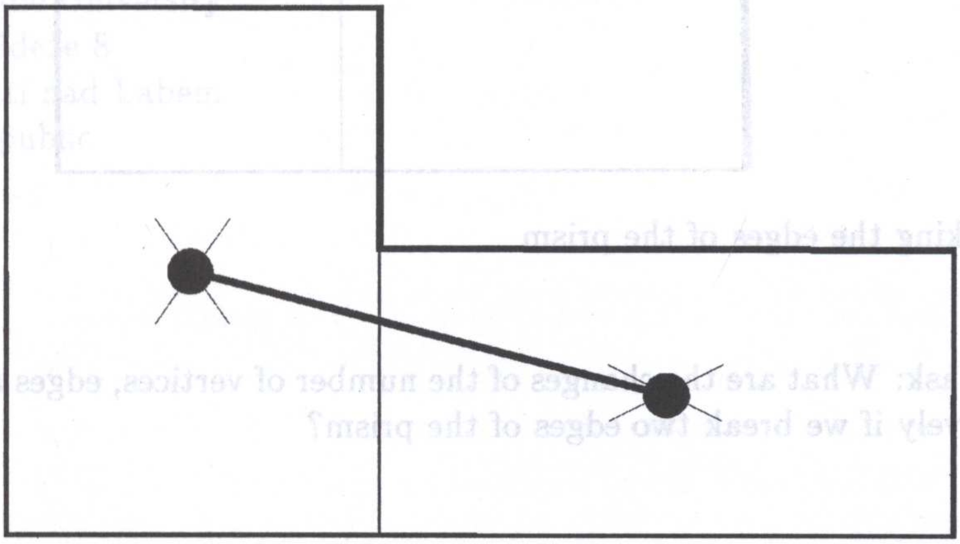

The students fill in the following table step by step and formulate ,,the rule of the sum" in the end.

| Start → Finish | The paths | The number of the paths |
|---|---|---|
| $A \to B$ | | 1 |
| $A \to C$ | | 1 |
| $A \to D$ | | 1 |
| $A \to E$ | $A \to B \to E,\ A \to C \to E$ | 2 |
| $A \to F$ | $A \to B \to F,\ A \to C \to F,\ A \to D \to F$ | 3 |
| $A \to G$ | $A \to C \to G,\ A \to D \to G$ | 2 |
| $A \to H$ | | 5 |
| $A \to I$ | | 5 |
| $A \to J$ | | 10 |

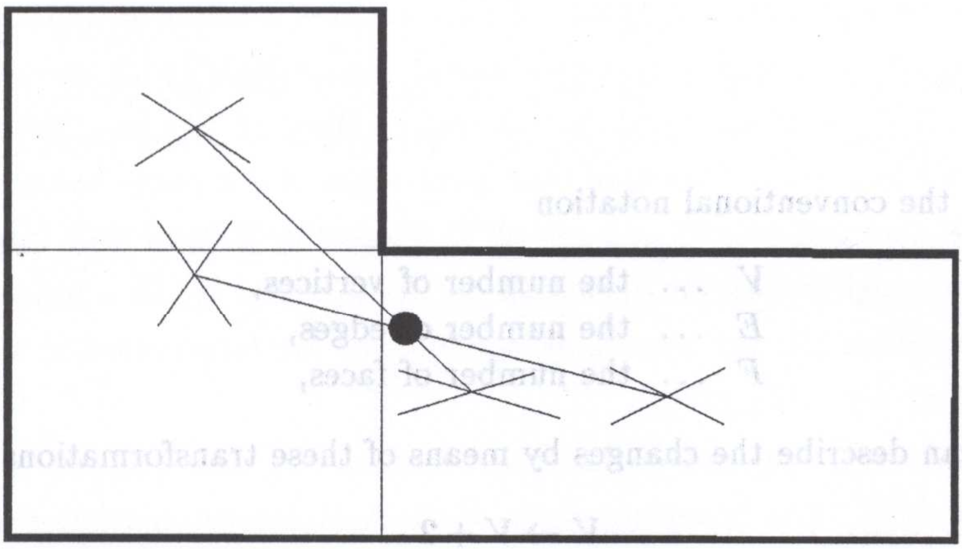
In my opinion it is better for the students to discover this rule in general form before meeting with Pascal's triangle.

2. Looking for the centre of gravity

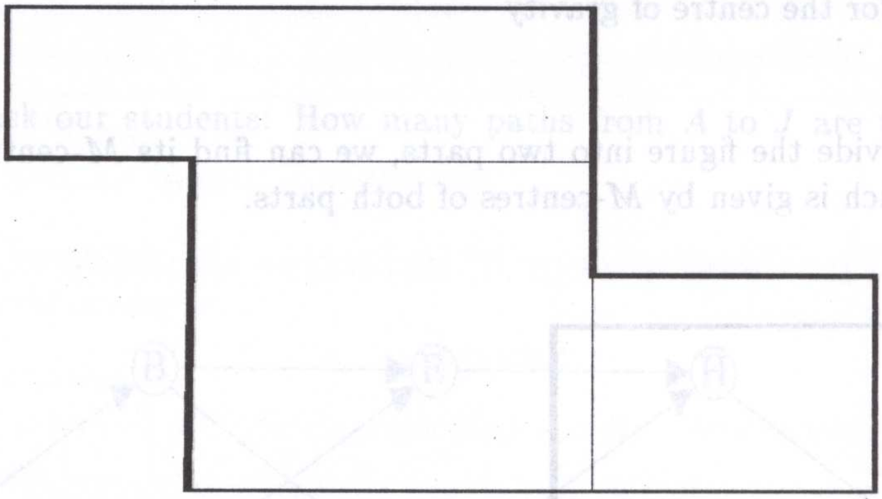
When we divide the figure into two parts, we can find its $M$-centre on the segment which is given by $M$-centres of both parts.



If the figure is divided into two rectangles by two different ways, we can find its $M$-centre very easily:



This case is useful when we are looking for the $M$-centre of the figure which is divided into three rectangles, and so on.



### 3. Breaking the edges of the prism

We can ask: What are the changes of the number of vertices, edges and faces respectively if we break two edges of the prism?

Using the conventional notation

$V$ ... the number of vertices,
$E$ ... the number of edges,
$F$ ... the number of faces,

students can describe the changes by means of these transformations:

$$V \to V + 2$$
$$E \to E + 3$$
$$F \to F + 1$$

It is very interesting for students that

$$V - E + F = const$$

We can also solve a similar problem: What are the changes of $V, E, F$ if we break one edge of the pyramid?

It is clear that we can investigate many more other transformations which change the configuration of the solid.

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