

## Task pool "Problem-solving tasks":

### Overview:

Grade level: 2 <sup>nd</sup> -3 <sup>rd</sup>	Grade level: 3 <sup>rd</sup> -4 <sup>th</sup>
Task A1: Sequential numbers – Version I	Task B1: Figured number – Version II
Task A2: Coin task	Task B2: Straight lines & surfaces
Task A3: Triangle-Task	Task B3: Chessboard
Task A4: Magic square – 3x3	Task B4: Einstein puzzle (or magic square 4x4)

### Grade level: 2<sup>nd</sup>-3<sup>rd</sup>

#### Task A1: Sequential numbers – Version I

- (1) Find all plus problems involving sequential numbers<sup>1</sup> where the result is not greater than 20.
- (2) Why is that all of them?

Source: Kira (*undated*) Reihenfolgezahlen. <https://kira.dzlm.de/node/136>; Based on: Schwätzer & Selter (2000, note here with 25 as the maximum sum)

#### Task A2: Coin task

How can you put down a sum of money of exactly 31 cents if you only have 10 cent, 5 cent and 2 cent coins available? Enter all the possibilities!

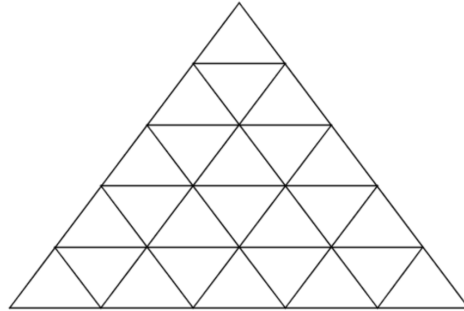
Source: Bruder & Collet (2011). Problemlösen lernen im Mathematikunterricht. p. 59, based on PISA 2006, p. 177.

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<sup>1</sup> Sequential numbers are defined here as the sum of consecutive numbers, such as  $1+2+3$  or  $4+5+6+7$ .

### Exercise A3: Triangle-Task

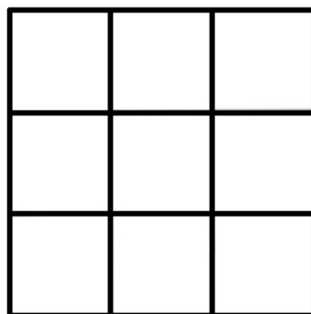
Take a close look at the figure. It consists of many triangles. How many triangles can you find in the figure?



Adapted from: Janott, S. (2021). Probleme lösen zum Lerngegenstand machen. Münster: WTM-Verlag. p. 86.

### Task A4: Magic squares – 3x3

The cells of a 3x3 square must be filled in with the natural numbers from 1 to 9 so that the sum of the numbers in each row, column and diagonal is the same. Each number from 1 to 9 may only be used once!



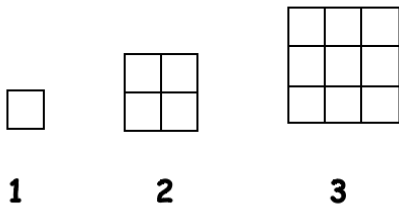
**Note:** The task can also be done with a 4x4 square with the numbers from 1 to 16 (increased level of difficulty - then: grade level 3 - 4).

Source: Heinrich, F.; Jerke, A. & Schuck, L.D. (2018). Lernangebote für problemorientierten Mathematikunterricht in der Grundschule. Offenburg: Mildenberger Verlag, p. 144.

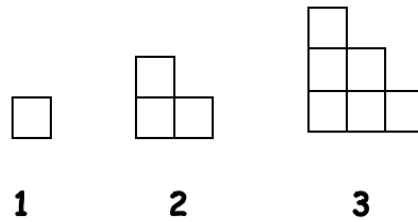
**Grade level: 3rd-4th grade**

**Exercise B1: Figured number – Version II**

(a.) Square numbers



(b.) Triangular numbers

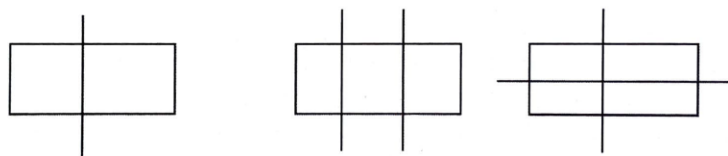


Determine the 20th consecutive number! How many boxes does it consist of? Give reasons for your solution.

Source: Smirek, A. (n.d.) Figurierte Zahlenfolgen. <https://kira.dzlm.de/problemlösen-co/prozessbezogene-kompetenzen-fördern/zahlen-und-operationen/figurierte-zahlenfolgen>.

**Task B2: "Straight lines & surfaces"**

You have a rectangle. If you draw a straight line through the rectangle, you get two areas. If you draw two straight lines through the rectangle, you get three or four areas (see the following pictures):

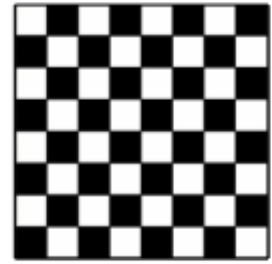


Try to get as many areas as possible if you have three and four straight lines!

Source: Fritzlär, T. & Heinrich, F. (2016). Across the river with Fibonacci. A. In: Kuzle, B. Rott & Cadez, T. *Problem Solving in the Mathematics Classroom. Perspectives and Practices from Different Countries*. p. 85-97.

### Task B3: Chessboard

Peter loves playing chess. He loves playing chess so much that his thoughts revolve around the game even when he's not playing. He recently asked himself how many squares there are on a chessboard.

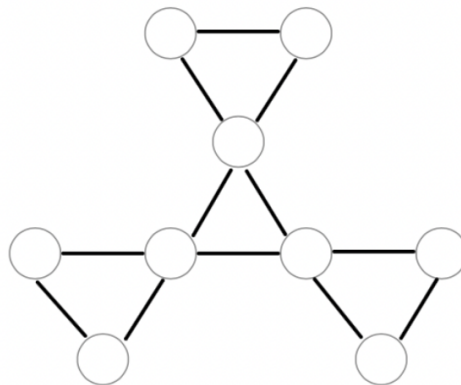


Try to answer Peter's question!

Source: Mason, Burton & Stacey (2008). Mathematisch denken. Mathematik ist keine Hexerei. p. 20. Illustration from: : Lange (2009) Auswahl von Aufgaben für eine explorative Studie zum Problemlösen, p. 2.

### Task B4: Einstein puzzle

The numbers from 1 to 9 should be distributed across the figure so that the sums of the triangles are equal!



Source: Bruder & Collet (2011). Problemlösen lernen im Mathematikunterricht, p. 73.

## **Literature:**

- Bruder, R. & Collet, C. (2011). *Problemlösen lernen im Mathematikunterricht*. Berlin: Cornelsen.
- KIRA (undated). *Reihenfolgezahlen*. <https://kira.dzlm.de/node/136>.
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- Heinrich, F.; Jerke, A. & Schuck, L.-D. (2018). *Lernangebote für problemorientierten Mathematikunterricht in der Grundschule*. Offenburg: Mildenerger Verlag.
- Janott, S. (2021). *Problemlösen zum Lerngegenstand machen. Eine Studie im Mathematikunterricht der Grundschule*. Münster: WTM.
- Lange, D. (2009). Auswahl von Aufgaben für eine explorative Studie zum Problemlösen. *Beiträge zum Mathematikunterricht 2009*. Oldenburg. Verfügbar unter: <https://eldorado.tu-dortmund.de/handle/2003/31352>.
- Mason, J.; Burton, L. & Stacey, K. (2008): *Mathematisch denken - Mathematik ist keine Hexerei*. München: Oldenbourg. 5., überarbeitete Auflage.
- PISA-Konsortium Deutschland (Hrsg.) (2006). *PISA 2003. Untersuchungen zur Kompetenzentwicklung im Verlauf eines Schuljahres*. Münster: Waxmann
- Schwätzer, U., & Selter, C. (2000). Plusaufgaben mit Reihenfolgezahlen - eine Unterrichtsreihe für das 4. bis 6. Schuljahr. *Mathematische Unterrichtspraxis*, (2), 28- 37.
- Smirek, A. (o.D.) *Figurierte Zahlenfolgen*. <https://kira.dzlm.de/problemlösen-co/prozessbezogene-kompetenzen-fördern/zahlen-und-operationen/figurierte-zahlenfolgen>.