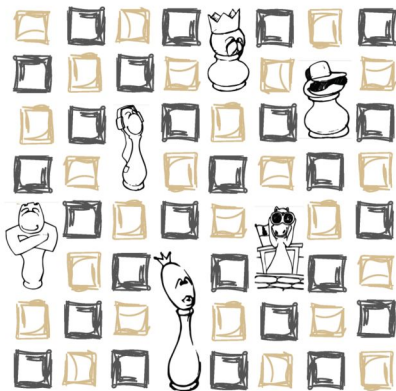


MÁRK SZÁVIN

# THE BOARD BUDDIES IN LOGIQLAND



**DEVELOPING STEM SKILLS**

**A handbook for parents and teachers**

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First Edition



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## Preface

Children of the Z and Alpha generations will face many new challenges in the future, and most of them will pursue careers that do not even exist today. The primary purpose of this book is to introduce games and exercises that develop creative thinking and thus enable children to tackle and solve unexpected, complex problems confidently.

We choose chess as a medium which we find to be easily accessible for children. Problems arising on the chessboard are universal, so the skills can be more easily transferred to other domains where they can be used successfully. The development of mathematical logic, generalization, and thinking in systems is enormously helpful for grasping the essentials of STEM domains.

There are five chapters in the book: spatial skills, logic, problem-solving, mathematics on the chessboard, and algorithmic thinking. Along with the appendix, teachers and parents will get enough material for more than one school term. To use this book, one would only need to be familiar with the move of the chess pieces.

All games and puzzles have been tried with children of different ages and abilities. The reader will receive an extensively tested material. Diagrams were made with our proprietary LogiQ Board, and all of them are attached in digital format. These can be loaded to the editor and are ready to use. Read more about the digital content in Appendix C.

Board Buddies is the first in the series of similar books. In this series, we are building upon the author's own teaching practice, while utilizing the decade-long experience of LearningChess in the field of online teaching.

## LogiQ Board - Unleash your creativity

LogiQ Board is a versatile teaching tool (<https://learningchess.net/logiq-board>). Thanks to the wide variety of graphical elements, LogiQ Board can be used for creating exercises, puzzles, problems, or designing new board games. Use it creatively to design fantasy worlds on the chessboard. There is an extensive array of innovative elements on the board to capture and maintain the attention of children. Also, the instantly loadable and modifiable files make lesson preparation easy and significantly reduce the workload of the teacher.

For the successful use of Board Buddies, both the teacher and the children should be familiar with the chessboard and the move of the chess pieces. The reader can find a hand-on summary of necessary chess basics in Appendix B. Complete our Board Buddies online course (<https://learningchess.net/board-buddies>) to get to grips with these chess basics.

## How to use this book

The primary purpose of this book is to encourage logical thinking as opposed to the development of competitive chess skills. The emphasis is on enhancing specific skills like classifying, evaluating and analytical thinking. The reader will find recommendations about the age of the target group as well as difficulty levels for each game and puzzle. These can be only referential since 'average child' is rather an abstract term. If a parent or teacher sees it fit certain puzzles can be presented even to a four-year-old child. The problems can be tackled alone, in pairs or in small groups. All games are designed for two players.

The most efficient way to use the book is to introduce new games and puzzles to the children with the recommended hints and instructions.

We used a scale of one to five black kings to indicate the difficulty level of the games and puzzles with five kings being the hardest level. We have also added the target age to every task. For example:

**Level:** 

**Age:** 7+

The variants that follow each exercise may change the level of difficulty or alter the goal of the original game. The content enriched with these variants can span over multiple school terms. The book complements traditional skill development methods in core subjects. The material can be used in mathematics lessons and various extracurricular activities as well.

**Every minute spent on skill development is a minute well spent.**

Technical requirements:

- PCs with internet access for working alone or in small groups
- projector or smart board for larger groups
- LogiQ Board access

### **About the author**

Márk Szávin is a chess and logic teacher, author of various chess textbooks, and also classical music teacher and performer. He is a co-developer and instructor of a countrywide educational project in Hungary, initiated by the Eszterházy University of Eger. He is an ECU chess trainer and a competitive chess player. Since 2017, Mark is the educational consultant of LearningChess. Mark tested every game and puzzle in his own lessons, and he uses the exercises on a daily basis.

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## **Dedication**

To my grandfather György Sarlós,  
with whom I played my very first games of chess when I was 5.

## Spatial skills

Spatial orientation is something we use in the most diverse situations. The reader has to follow the current line until the end and then jump to the beginning of the next line. Reading a map, planning routes, following the instructions of an assembly guide all require spatial awareness.

In most board games, spatial relations are important since these can affect the outcome of the game. Sometimes small piece moves can reverse the evaluation of the position.

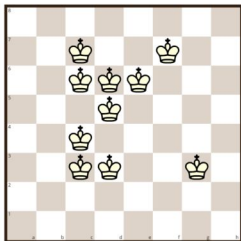
The connection between dyslexia and spatial skill disorders is widely researched. Improving spatial skills may lessen reading difficulties.

### Puzzle: Puzzling Letters

**Level:** ♔

**Age:** 7+

Ask children the name the chess piece that appears in the puzzle. Tell them that the initial of this piece is to be written on the chessboard. The letter has to be constructed in the given number of moves.





### Instruction for children

Kevin decided to learn to write. He invited some of his friends from other boards to create the first letter of his name. The little kings, however, frolicked and did not want to go to their assigned squares. Kevin said: "Algorita just called. If you can't get to your assigned square in three steps, we'll miss the afternoon ice cream." Having heard the warning, they all panicked and started to run around aimlessly. Kevin and his friends are counting on you! Help them to unlock the capital letter K in three moves.

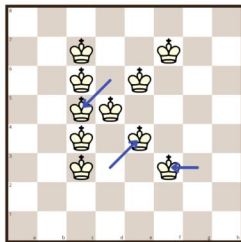
### Guidelines

Remind the children how the king moves in chess. You may need to draw the letter first on the board. Challenge the learners by asking them to solve the problem without actually moving the kings.

### Areas of development

abstraction  
planar orientation  
pattern recognition  
analytical and synthetic thinking

#### solution



### Variations

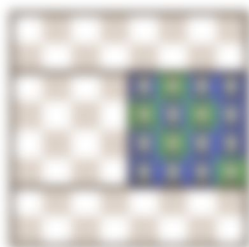
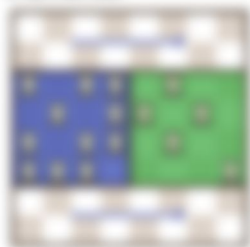
Game for groups of four children: Every group chooses a secret password of four letters. Every member of the group creates a puzzle for one letter of the password. The groups swap places to find out the passwords of other groups.

# Problem 1: The 3D Chessboard

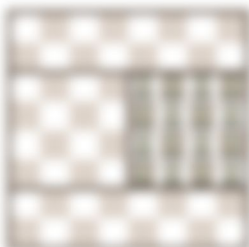
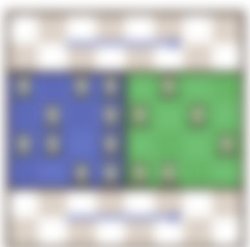
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Page: 1/1

The 3D Chessboard is a 3D version of the classic 8x8 chessboard. It is a 3x3x3 cube, where each of the 27 small cubes is a 3x3x3 sub-cube. The small cubes are arranged in a 3x3x3 grid, and each small cube is a 3x3x3 sub-cube. The small cubes are arranged in a 3x3x3 grid, and each small cube is a 3x3x3 sub-cube.



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## How to use the book

### Part 1

#### Chapter 1

The book is divided into two main parts. The first part is the 'Introduction' which is divided into two sections. The first section is 'The Introduction' and the second section is 'The Introduction'. The second part is the 'Main Body' which is divided into two sections. The first section is 'The Main Body' and the second section is 'The Main Body'.

### Part 2

The second part of the book is the 'Main Body' which is divided into two sections. The first section is 'The Main Body' and the second section is 'The Main Body'.

The third part of the book is the 'Conclusion' which is divided into two sections. The first section is 'The Conclusion' and the second section is 'The Conclusion'.

### Part 3

The third part of the book is the 'Conclusion' which is divided into two sections. The first section is 'The Conclusion' and the second section is 'The Conclusion'.

### Part 4

#### Chapter 2

#### Chapter 3

#### Chapter 4

#### Chapter 5

#### Chapter 6

#### Chapter 7

#### Chapter 8

#### Chapter 9

#### Chapter 10

#### Chapter 11

#### Chapter 12

#### Chapter 13

#### Chapter 14

#### Chapter 15

#### Chapter 16

#### Chapter 17

#### Chapter 18

#### Chapter 19

#### Chapter 20





The following table shows the relationship between the number of hours a person works and the amount of money they earn. The number of hours a person works is the independent variable, and the amount of money they earn is the dependent variable. The relationship between the two variables is linear, and the slope of the line is 15. This means that for every hour a person works, they earn 15 dollars more.



# www.ck12.org

The following table shows the relationship between the number of hours a person works and the amount of money they earn. The number of hours a person works is the independent variable, and the amount of money they earn is the dependent variable. The relationship between the two variables is linear, and the slope of the line is 15. This means that for every hour a person works, they earn 15 dollars more.

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#### Summary

The first part of the paper is a review of the literature on the topic of the paper. The second part is a description of the methodology used in the study. The third part is a discussion of the results of the study. The fourth part is a conclusion.

The results of the study show that there is a significant relationship between the variables of the study. The results also show that there is a significant difference between the groups of the study. The results also show that there is a significant difference between the groups of the study.

#### References

Author, A. (Year). Title of the paper. Journal Name, Volume, Pages.

#### Summary

The second part of the paper is a description of the methodology used in the study. The third part is a discussion of the results of the study. The fourth part is a conclusion.

## Logic

Thinking logically is a complex process but it can be divided into simpler elements. Playing certain games may help develop these elements. Comparative reasoning is one of the main building blocks of logical thinking.

The ability to think in abstract terms evolves gradually between the age of seven and twelve. Playing games that require comparative reasoning can assist developing abstraction.

Image description:  
A small, blurry image of a game board or card.

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A small, blurry image of a game board or card.



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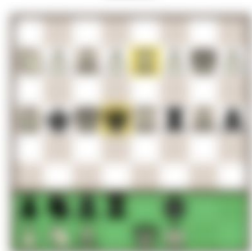
### Question

Which of the following is a characteristic of a good leader? (Select all that apply.)

### Answer

- Communicates effectively
- Is a good listener
- Is a good team player
- Is a good role model

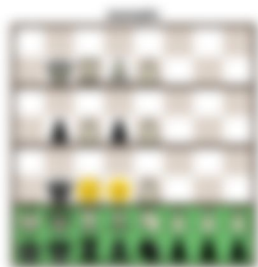
### Question



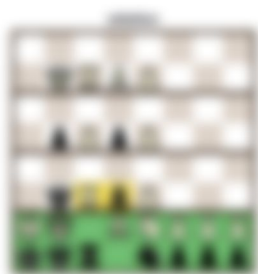
Which of the following is a characteristic of a good leader? (Select all that apply.)

### Answer

Which of the following is a characteristic of a good leader? (Select all that apply.)



White to move. What is the best move for White? (The answer is not a check.)

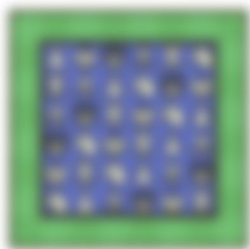




## QUESTION

Consider the following two-dimensional lattice of spins.

Figure 1



## Wiederholungsfrage

### Wiederholungsfrage

#### Wiederholungsfrage

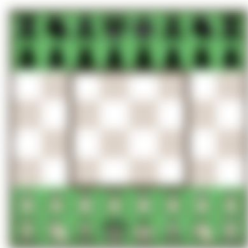
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Wiederholungsfrage

Wiederholungsfrage

Wiederholungsfrage

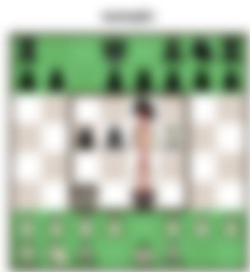
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## Wiederholungsfrage

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The chessboard is a 3D rendering of a chessboard with a green top and bottom border and a tan and white checkered center. Chess pieces are visible on the board, including a red king in the center and a black king on the left. The image is slightly blurred.

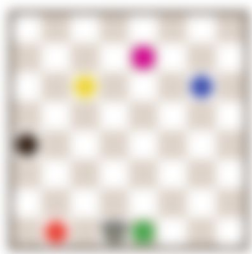
## Problem solving

One of the most important things we can teach children is problem solving skills. There exist many problem solving strategies such as trial and error, dividing the problem into smaller, easier elements, or reverting to a problem that has already been solved. Sometimes it is easier to start from the desired result and work backwards to the original problem.

In any case it is useful to be aware of these strategies and apply them systematically. If we encourage children to use problem-solving strategies consciously, they will adopt these and learn to apply them in many different problem domains.

**Problem solving**  
The problem is to find a path from the start to the goal.  
The solution is to use a search algorithm.

The problem is to find a path from the start to the goal.  
The solution is to use a search algorithm.



**Problem solving**  
The problem is to find a path from the start to the goal.  
The solution is to use a search algorithm.



### Question

Question: Which of the following is not a type of network? (Select all that apply.)

- ☐ A network of people who are connected by a common interest.
- ☐ A network of people who are connected by a common location.
- ☐ A network of people who are connected by a common goal.

### Answer/Explanation

Answer: A network of people who are connected by a common location.

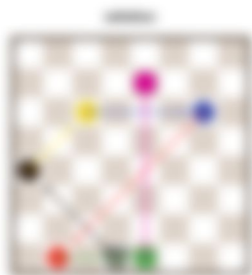
### Question

Question: Which of the following is not a type of network? (Select all that apply.)

Answer: A network of people who are connected by a common location.

Question: Which of the following is not a type of network? (Select all that apply.)

Answer: A network of people who are connected by a common location.



## Puzzle: The Flood

Level: ♔ ♕ ♖

Age: 7+

Move the chess pieces around to capture the flag with the knight. No piece is allowed to touch the water. Complete the task in the least possible number of moves.



### Instruction for children

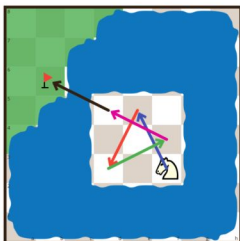
*Hally, the horse is in trouble!  
Help him get to the other side.*

*LogiQ Land is an adventurous place  
and Hally doesn't like to be stuck in a maze.  
But this time his luck might have run out  
as he cannot swim as well as a trout.  
A flood came in while they all slept at night  
but there is a patch of land in his sight.  
If you help Hally's friends all move around  
he can safely get to the land that he found.*

## Guidelines

The children may need to be eased into this puzzle with a few simpler questions. For example, you can ask this introductory question: how can the knight reach a square which is diagonally two squares away? On an empty board, this takes four moves. Next, the puzzle can be presented with the knight only.

In the original problem children who find it challenging to remember the solution should arrange the actual pieces in a line in the order of their moves. In this line the knight should be omitted. Having rehearsed the sequence of moves with the aid of this line of chess pieces, the solution should be written down: K-N-R-R-N-B-N-Q-K-N and jump to the flag.



## Areas of development

planning

problem solving (dividing and reducing the problem)

sequential thinking

## Variations

Adding more pieces and using a larger area makes the puzzle too complex and it may not be straight forward to find the optimal solution. It is better to use other small portions of the board with an area under ten squares and make variations this way.

## Game Description

Year: 1998

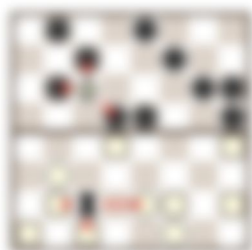
Open:

The opponent's strategy was to capture the king. In the first stage, the king was captured in the second stage, in the third stage, the king was captured and the king was captured in the third stage.

The king was captured in the second stage, in the third stage, the king was captured in the second stage. The king was captured in the second stage, in the third stage, the king was captured in the second stage.

The king was captured in the second stage, in the third stage, the king was captured in the second stage. The king was captured in the second stage, in the third stage, the king was captured in the second stage.

Game:





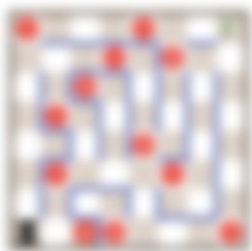
## Mathematics on the Chessboard

Using the value of the chess pieces is a simple and well-known way to connect the game with the domain of mathematics. Let's see what LogiQ Land can do to enrich this theme.

The basic foundations of mathematical logic, set and graph theory, geometry and combinatorics are best laid with building bricks of inspirational games. It is important to start easy with simple concepts, then gradually allow more and more challenging ideas to seep into our mathematical plays.

Game: **Chess**  
Level: **Beginner**  
Age: **7+**

The chessboard is a square grid of 8x8 squares. The squares are colored in a checkerboard pattern of light and dark squares. The pieces are placed on the squares.



Gameplay rules:

The game is played on a chessboard. The pieces are placed on the squares. The path is a continuous line of blue squares. The pieces move along the path. The king moves from e1 to e2. The queen moves from d1 to d2. The rook moves from a1 to a2. The bishop moves from c1 to c2. The knight moves from b1 to b2. The pawns move from a2 to a3, b2 to b3, c2 to c3, d2 to d3, e2 to e3, f2 to f3, g2 to g3, and h2 to h3. The path is a continuous line of blue squares. The pieces move along the path. The king moves from e1 to e2. The queen moves from d1 to d2. The rook moves from a1 to a2. The bishop moves from c1 to c2. The knight moves from b1 to b2. The pawns move from a2 to a3, b2 to b3, c2 to c3, d2 to d3, e2 to e3, f2 to f3, g2 to g3, and h2 to h3.

### Problem

Consider a square grid of size  $n \times n$ . The grid is divided into four quadrants. The top-left quadrant is white, the top-right quadrant is green, the bottom-left quadrant is red, and the bottom-right quadrant is blue. The grid is divided into four quadrants by a horizontal line and a vertical line. The grid is divided into four quadrants by a horizontal line and a vertical line. The grid is divided into four quadrants by a horizontal line and a vertical line.

### Input

The input consists of a single integer  $n$ , representing the size of the grid. The input consists of a single integer  $n$ , representing the size of the grid. The input consists of a single integer  $n$ , representing the size of the grid.

### Output

The output consists of a single integer  $n$ , representing the size of the grid. The output consists of a single integer  $n$ , representing the size of the grid. The output consists of a single integer  $n$ , representing the size of the grid.



## Topic: The Balance of Trade

Topic: 貿易

Topic:

Topic: The balance of trade is the difference between the value of exports and imports.



## Definition: The Balance

The balance of trade is the difference between the value of exports and imports.

The balance of trade is the difference between the value of exports and imports.

The balance of trade is the difference between the value of exports and imports. The balance of trade is the difference between the value of exports and imports.

## Example:

Example: The balance of trade is the difference between the value of exports and imports. The balance of trade is the difference between the value of exports and imports. The balance of trade is the difference between the value of exports and imports.

## Key Words:

Balance

Balance of trade

Balance



Figure 1

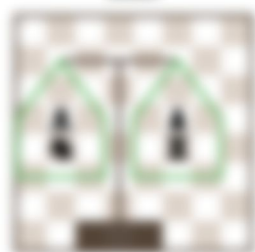
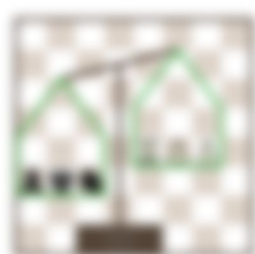


Figure 2

Figure 2: A diagram showing a balance scale on a checkered background. The scale is tilted to the right, indicating it is unbalanced. The right pan is lower than the left pan. The right pan contains a single green triangular weight with a black silhouette of a person. The left pan contains three green triangular weights, each with a black silhouette of a person. The scale's base is a solid brown rectangle.

Figure 3



00000

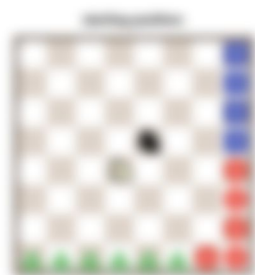


## Game 10: Chess

Game 10: Chess

Page 10

Chess is a board game for two players. The board is an 8x8 grid of squares. Each square is either white or black. The pieces are moved around the board. The goal is to capture the opponent's king. The game is played on a board that is 8 squares wide and 8 squares high. The pieces are moved around the board. The goal is to capture the opponent's king. The game is played on a board that is 8 squares wide and 8 squares high.



## Game 11: Chess

Chess is a board game for two players. The board is an 8x8 grid of squares. Each square is either white or black. The pieces are moved around the board. The goal is to capture the opponent's king. The game is played on a board that is 8 squares wide and 8 squares high. The pieces are moved around the board. The goal is to capture the opponent's king. The game is played on a board that is 8 squares wide and 8 squares high.

## Game 12: Chess

Chess is a board game for two players. The board is an 8x8 grid of squares. Each square is either white or black. The pieces are moved around the board. The goal is to capture the opponent's king. The game is played on a board that is 8 squares wide and 8 squares high. The pieces are moved around the board. The goal is to capture the opponent's king. The game is played on a board that is 8 squares wide and 8 squares high.

## Game of Connect Four

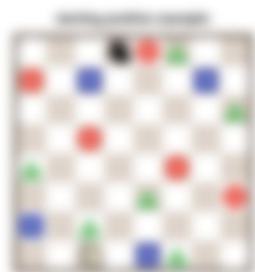
Game of Connect Four

Connect Four is a two-player connection game in which the

players take turns dropping

pieces into a seven

column.



## Game of Connect Four

Connect Four is a two-player connection game in which the players take turns dropping pieces into a seven column. The first player to get four of their pieces in a row, column, or diagonal wins the game. If all seven columns are filled and no player has reached four in a row, the game is a draw.

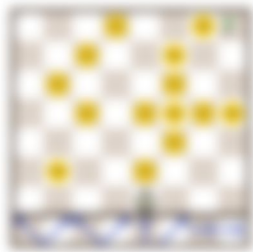
## Simple Algorithms

An algorithm is a sequence of rules to follow when solving a problem or completing a task. Following set rules is what computers are good at, but algorithms can also be found in more mundane places such as cooking recipes, flatpack furniture assembly instructions, various games and even in the simple process of getting dressed. With carefully planned instruction children will naturally absorb the concepts of searching, sorting, operator precedence and mapping cases. They can also learn how to pair objectives with resources.

This skill development can be supported by playing enjoyable games and puzzles that subtly teach children the fundamental principles of computation.

Image: Chessboard with yellow pieces

Image: Chessboard with yellow pieces



### QUESTION 10 (10%)

What is the correct order of the steps for creating a new document in Microsoft Word? (Select all that apply.)

1. Click the "File" tab.

2. Click the "New" button.

3. Select a template.

4. Click the "OK" button.

What is the correct order of the steps for creating a new document in Microsoft Word? (Select all that apply.)

1. Click the "File" tab.

2. Click the "New" button.

3. Select a template.

4. Click the "OK" button.

### QUESTION 11 (10%)

What is the correct order of the steps for creating a new document in Microsoft Word? (Select all that apply.)

1. Click the "File" tab.

2. Click the "New" button.

3. Select a template.

4. Click the "OK" button.

### QUESTION 12 (10%)

What is the correct order of the steps for creating a new document in Microsoft Word? (Select all that apply.)

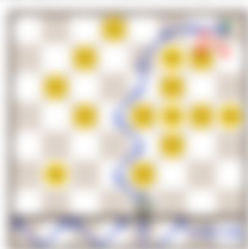
1. Click the "File" tab.

2. Click the "New" button.

3. Select a template.

4. Click the "OK" button.

What is the correct order of the steps for creating a new document in Microsoft Word? (Select all that apply.)



### QUESTION 13 (10%)

What is the correct order of the steps for creating a new document in Microsoft Word? (Select all that apply.)

1. Click the "File" tab.

2. Click the "New" button.

3. Select a template.

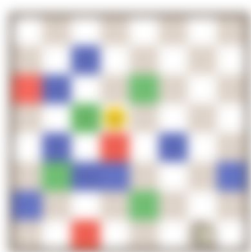
4. Click the "OK" button.

## How to Play the Game

### How to Play the Game

#### How to Play

The game is played on a 10x10 board. The board is divided into four quadrants, each of which is further divided into four smaller quadrants. The board is divided into four quadrants, each of which is further divided into four smaller quadrants. The board is divided into four quadrants, each of which is further divided into four smaller quadrants.



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## How to Play the Game

### How to Play

#### How to Play

#### How to Play

#### How to Play

### Question

What is the value of the square that is the center of the board? The value is the sum of the values of the squares that are adjacent to it. The value of the center square is 10. What is the value of the square that is the center of the board?

Figure 1



Figure 2





## Game: Smart Steps

Level: ♖ ♗ ♘ ♙ ♚ ♜

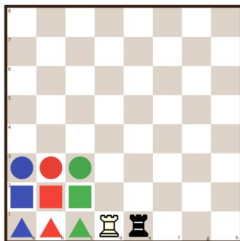
Age: 8+

This game is very similar to the Race game discussed earlier. In the first phase of the game, the players take turns to put a shape on a square of their choice. In order to make the game more interesting, the players choose where to put the opponent's rook on the board. Now the second phase begins. The players move with their rooks in turn. Each player has to follow the restrictions of the scroll:

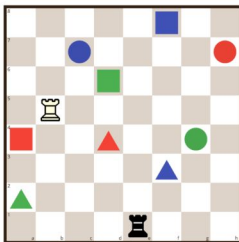
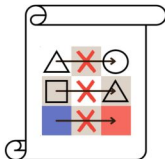
- A rook cannot capture a circle after a triangle.
- It is forbidden to capture a triangle following the capture of a square.
- Neither players can move from a blue shape to a red one.

The goal is to collect as many points as possible. The rooks cannot capture or jump over each other. It is not possible to jump over the shapes. It is not necessary to make a capture in every move.

**position before the game:**



sample starting position:



### Instruction for children

*Tiduj, the evil fairy set up traps all over LogiQ Land. Roxy and Rosa volunteered to break the spells and pick up the traps. Like many times before, Algorita gave them a scroll to help. Roxy and Rosa have turned their task into an exciting game! They agreed that whoever picks up more traps would be the winner. Some basic rules were obeyed: both Roxy and Rosa can move to empty squares, but not to the square where the other rook is standing. In order to avoid falling into the traps set up by Tiduj they also carefully followed the instructions on Algorita's scroll.*

### Guidelines

It is rewarding to plan ahead to avoid dead ends and save some moves. The player should check if his opponent's last move was legal. It is worth revising the restrictions a few times before the game begins. After playing a few rounds, let children come up with their own set of rules.

### Areas of development

working memory  
planning  
sequential thinking  
sustained mental focus

### Variations

This game is also playable with two knights or queens. Teleportation points can be added with pairs of flags of the same color. The piece moving to a flagged square will advance to the square with a flag of the same color.

## **Acknowledgements**

I would like to express my thanks to Rita Atkins, Anna Kassis and Patrick Stephens for their help with the English version. Also, I would like to thank Zsuzsanna Windisch for her valuable comments from a pedagogical point of view. Special thanks to the team of LearningChess for their continuous help and assistance. Finally, I am grateful for my wife Ágnes Szávin-Pósa for her persistent support.

# Appendix A

## 17 additional puzzles and games

17 additional puzzles and games

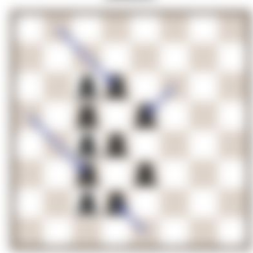
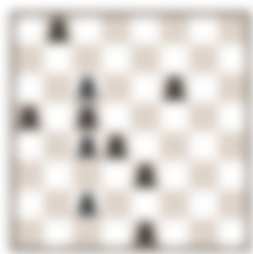




Figure 1

Figure 1 shows the initial position of the chess game. The pieces are arranged on the board as follows:

White pieces:

King: e1

Queen: d1

Rooks: a1, h1

Bishops: c1, f1

Knight: b1

Pawns: a2, b2, c2, d2, e2, f2, g2, h2

Black pieces:

King: e8

Queen: d8

Rooks: a8, h8

Bishops: c8, f8

Knight: b8

Pawns: a7, b7, c7, d7, e7, f7, g7, h7

Figure 1 shows the initial position of the chess game. The pieces are arranged on the board as follows:

White pieces:

King: e1

Queen: d1

Rooks: a1, h1

Bishops: c1, f1

Knight: b1

Pawns: a2, b2, c2, d2, e2, f2, g2, h2

Black pieces:

King: e8

Queen: d8

Rooks: a8, h8

Bishops: c8, f8

Knight: b8

Pawns: a7, b7, c7, d7, e7, f7, g7, h7

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Pawns: a2, b2, c2, d2, e2, f2, g2, h2

Black pieces:

King: e8

Queen: d8

Rooks: a8, h8

Bishops: c8, f8

Knight: b8

Pawns: a7, b7, c7, d7, e7, f7, g7, h7

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Bishops: c1, f1

Knight: b1

Pawns: a2, b2, c2, d2, e2, f2, g2, h2

Black pieces:

King: e8

Queen: d8

Rooks: a8, h8

Bishops: c8, f8

Knight: b8

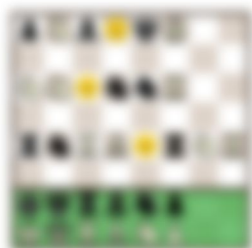
Pawns: a7, b7, c7, d7, e7, f7, g7, h7

Figure 1

The figure shows two chessboard diagrams illustrating a sequence of moves. The top diagram shows a chessboard with a yellow piece on e4 and a black piece on d4. The bottom diagram shows the chessboard after a move, with the yellow piece on d4 and the black piece on e4.

Figure 1

Figure 1



## Figure 1

The figure shows a 10x10 grid of squares. The top row is labeled with the letters A through J. The left column is labeled with the numbers 1 through 10. The squares are colored in a checkerboard pattern, with alternating light and dark squares. The top-left square (A1) is light. The bottom-right square (J10) is dark.

The figure shows a 10x10 grid of squares. The top row is labeled with the letters A through J. The left column is labeled with the numbers 1 through 10. The squares are colored in a checkerboard pattern, with alternating light and dark squares. The top-left square (A1) is light. The bottom-right square (J10) is dark.

## Figure 2

Figure 2

Figure 2 shows a 10x10 grid of squares. The top row is labeled with the letters A through J. The left column is labeled with the numbers 1 through 10. The squares are colored in a checkerboard pattern, with alternating light and dark squares. The top-left square (A1) is light. The bottom-right square (J10) is dark.

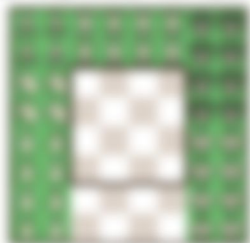


Figure 2 shows a 10x10 grid of squares. The top row is labeled with the letters A through J. The left column is labeled with the numbers 1 through 10. The squares are colored in a checkerboard pattern, with alternating light and dark squares. The top-left square (A1) is light. The bottom-right square (J10) is dark.



Figure 2 shows a 10x10 grid of squares.

Figure 2

Figure 2 shows a 10x10 grid of squares.



Figure 1

Figure 1 shows the results of the proposed method for the first two images. The first image is a chessboard.

The second

image is a chessboard.

The third





Figure 1

Figure 1 shows the initial state of the game board. The board is a 10x10 grid with alternating light and dark squares. The pieces are arranged as follows:

White pieces:

King: e1

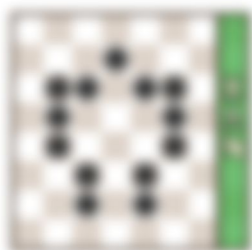


Figure 2

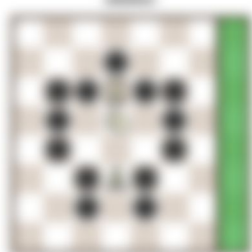




Figure 11

Two examples of the proposed algorithm applied to the 2D case. The algorithm is applied to the 2D case. The algorithm is applied to the 2D case. The algorithm is applied to the 2D case.

Figure 11 (continued)

Figure 11

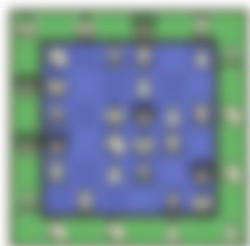


Figure 12

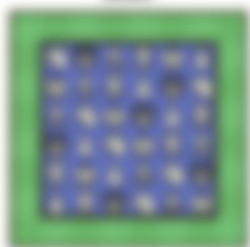


Figure 10  
 A balance scale with a green pan on the left and a yellow pan on the right.  
 The green pan contains 4 black cubes and 1 white cube.  
 The yellow pan contains 1 black cube and 1 white cube.



Figure 11



# Figure 10

Figure 10: A diagram illustrating a simple model of a tree structure. The tree has a root node (A) and two children (B and C). Node B has two children (D and E), and node C has two children (F and G). The nodes are represented by colored circles: A (blue), B (red), C (yellow), D (blue), E (red), F (yellow), and G (blue).

Figure 10: A diagram illustrating a simple model of a tree structure.

Figure 10: A diagram illustrating a simple model of a tree structure.

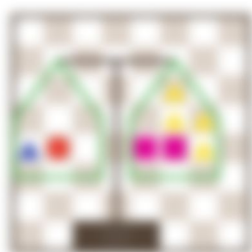


Figure 10: A diagram illustrating a simple model of a tree structure. The tree has a root node (A) and two children (B and C). Node B has two children (D and E), and node C has two children (F and G). The nodes are represented by colored circles: A (blue), B (red), C (yellow), D (blue), E (red), F (yellow), and G (blue).



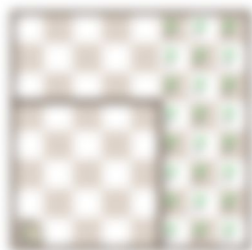
## Answer

The number of ways to select 3 balls with the same color is equal to the number of ways to select 3 balls with different colors. The number of ways to select 3 balls with the same color is equal to the number of ways to select 3 balls with different colors. The number of ways to select 3 balls with the same color is equal to the number of ways to select 3 balls with different colors. The number of ways to select 3 balls with the same color is equal to the number of ways to select 3 balls with different colors.

The number of ways to select 3 balls with the same color is equal to the number of ways to select 3 balls with different colors.

## Answer: 1000000

1000000









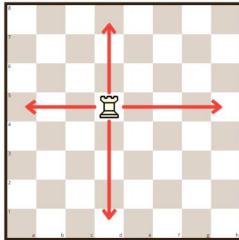


## Appendix B

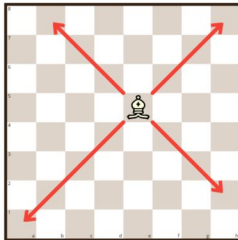
### Moves and values of the chess pieces

Here the reader can find all the chess basics necessary for this book.

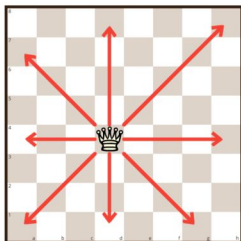
Rooks move on vertical files and horizontal ranks. They can move any number of squares if there are no obstacles.



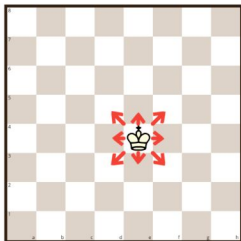
Bishops move on diagonals. They can move any number of squares provided there are no obstacles. A diagonal always consists of squares of the same color. Therefore, a bishop can never leave the color it stands on. This is why we can talk about light-squared and dark-squared bishops.



Queens move vertically, horizontally and diagonally. They can move any number of squares if there are no obstacles.



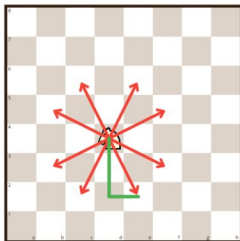
A king can move to any adjacent square. It can move like a queen, but only to a distance of a single square.



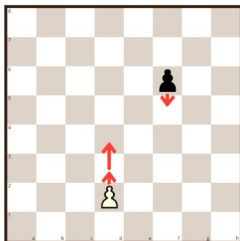
The knight may also be called a 'horse' since many children find that name amusing. The knight's move is L-shaped. This may confuse children who have not learned this letter. Here is an alternative way to describe the knight's move:

The knight always moves away two squares from its starting square. It accomplishes this by one straight and one diagonal move.

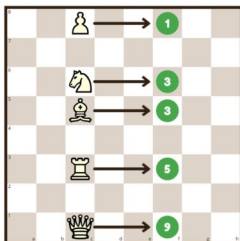
The knight is the only piece that can jump over empty squares and other pieces regardless of what stands between the target square and knight.



White pawns stand on the 2nd rank while black pawns stand on the 7th rank in the starting position. White pawns can only move towards the 8th rank, and black pawns only towards the 1st rank. Pawns can advance two squares from their starting position. Afterwards they can only advance a single square.



The unit of piece value is the value of a pawn. The more agile the chess pieces are, the more their value tends to be. See the next diagram for the value of the chess pieces. The kings have no value because they cannot be captured and also because they are invaluable in a game of chess!



## Characters of the book

All chess pieces have names in the book:

White pawn	Peter
Black pawn	Paul
White Knight	Halley
Black Knight	Harper
White Bishop	Benji
Black Bishop	Bob
White Rook	Roxy
Black Rook	Rosa
White Queen	Queenie
Black Queen	Quiana
White King	Kevin
Black King	Kaleb

The alliterative names add wittiness and fun to the instructions. We recommend using the names consistently.

In the instructions for children there appear two additional characters. Algorita, the good fairy, usually gives some guidance, while Tiduj, her evil and envious counterpart, tries to make the Board Buddies' life more complicated.



# Appendix C

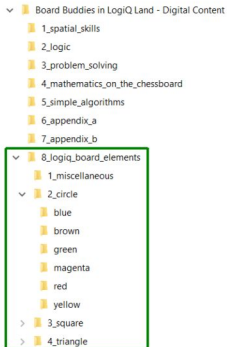
## How to use the digital content

### Games and puzzles of the five chapters and Appendices A, B

The digital files are arranged according to the chapters of the book. Each puzzle and game can be loaded to the [LogiQ Board](#) and are ready to use. After starting the LogiQ Board in a browser, click the Load button, and select a file.

### Printable LogiQ Board elements

All games and puzzles can be played on an actual chessboard. To make that easier, the graphical elements are also included in a printable version as PNG files.



To find a certain shape, open the **8\_logiq\_board\_elements** folder. To use a red, numbered circle for example, select **circle** → **red** and find the right number. Once the right elements are selected, just copy them directly to a printable document. It is worth paying attention to the size of the squares of the actual chessboard when scaling the graphical elements.