

Sokoban

Sokoban^[b] is a puzzle video game series in which the player pushes boxes in a warehouse to get them onto storage locations. The game is viewed from a top-down perspective. Boxes can only be pushed, never pulled, and only one box can be pushed at a time. The principal challenge is planning moves correctly to avoid causing a deadlock, a situation where a box or the player becomes permanently trapped, making the puzzle unsolvable.

Hiroyuki Imabayashi created the first *Sokoban* game as a hobby in 1981; his company, Thinking Rabbit, commercially released the first enhanced version in 1982. Between that first release and 2000, Thinking Rabbit and its licensed partners developed new titles for various platforms. The series made its international debut in 1988 with the U.S. release *Soko-Ban*. In 2001, Falcon, a Japanese software company, acquired the *Sokoban* rights, becoming the series' main developer and licensor. Since then, new titles have been published either by Falcon under the Thinking Rabbit brand or by licensed partners.

Over its history, the series has sold over 4.1 million copies worldwide, with more than 40 official games released across various platforms. Reviewers have highlighted the game's simplicity, its addictive and challenging nature, and the level of thought required.

Due to the creation of numerous clones, the name "Sokoban," a registered trademark, has become genericized to describe the genre. The series has inspired thousands of custom puzzles, as well as Sokoban-like games. Its puzzle concept of pushing boxes to clear a path or to move them to targets has also appeared in other video games. Furthermore, Sokoban puzzles have been studied in the fields of computational complexity and artificial intelligence.

Gameplay

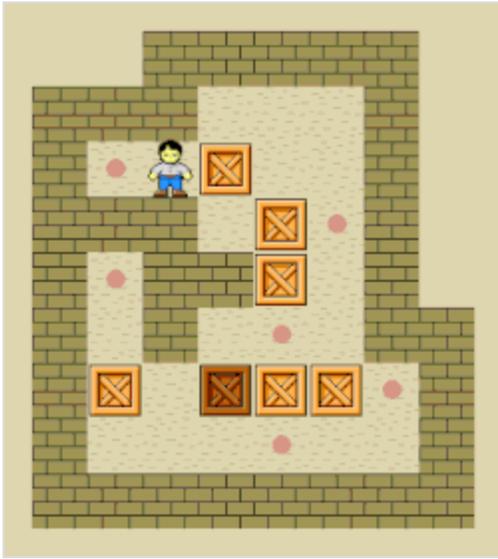
Sokoban takes place in a warehouse viewed from above and composed of walls and floor squares. A floor square may be empty, occupied by the player, or occupied by a box. Some floor squares are storage locations. The number of storage locations equals the number of boxes. The objective of the

Sokoban



Sokoban official fan kit banner

Genre	<u>Puzzle</u>
Developers	<u>Thinking Rabbit</u> <u>ASCII</u> <u>Itochu</u> <u>Unbalance</u> Falcon Other
Publishers	<u>Thinking Rabbit</u> <u>ASCII</u> <u>Itochu</u> <u>Unbalance</u> Other
Creator	Hiroyuki Imabayashi
Platforms	Various
First release	<i>Sokoban</i> 1982 ^[a]
Latest release	<i>The Sokoban</i> 2021



The puzzles in *Sokoban* require the player to push boxes to designated spots (shown as red dots in the animation) in the game world.

puzzle is to push all boxes onto storage locations.^[1]

The player can move one square at a time, either horizontally or vertically, onto an empty floor square.^[2] Boxes and walls block the player's movement, but the player can walk up to a box and push it to an empty square directly beyond it. If a box is pushed against a wall or another box, it does not move. Pulling boxes is not possible.^[3]

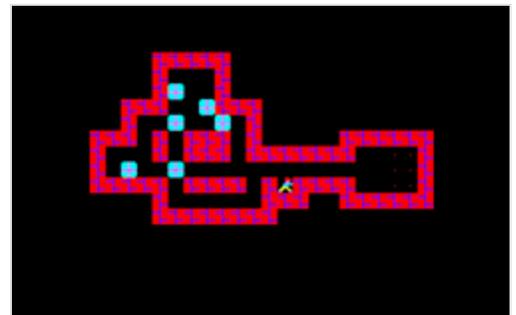
Sokoban requires players to plan several moves ahead and consider all possible outcomes.^[4] Careless moves could leave a box permanently trapped against a wall or another box,^[2] stuck in a dead end,^[5] or permanently prevent access to boxes that still need to be moved.^{[6]:38} Any such situation creates a deadlock that makes the puzzle unsolvable, regardless of future moves,^[7] unless the player undoes enough steps.^[8]

History

In 1981, Hiroyuki Imabayashi created the first *Sokoban* game for the NEC PC-8001 as a hobby, featuring text-based graphics and five original levels.^{[9]:136–137} The core mechanic was inspired by Hudson Soft's 1980 game *Aldebaran #1* for the MZ-80K,^[10] where players pushed luggage to block radiation.^[11] Imabayashi envisioned a warehouse setting where incorrect box placement could make further progress difficult or even impossible, and designed levels that proved challenging even for his friends.^[12] At the time, his wife's parents owned a record store with a small computer section. A salesman who saw the game suggested it had commercial potential.^{[9]:137[13][12]}

Imabayashi later ported the game to the NEC PC-8801, enhancing the graphics and expanding it to twenty levels.^{[9]:137} He founded Thinking Rabbit in 1982,^[12] and *Sokoban* was released as its first commercial title in December of that year.^{[14]:3} Certain sources indicate different timelines: one states that both the company and the game debuted in June 1983,^{[15]:128} while another states that *Sokoban* was released in May 1983 and the company was incorporated in June 1983.^{[9]:136}

In August 1983, the Japanese magazine *PC Magazine* published *Sokoban Extra Edition* as a type-in program with ten new puzzles, developed by Thinking Rabbit on request.^[16] In 1984, Thinking Rabbit released *Sokoban 2*, which included a puzzle editor.^[17] Throughout the 1980s, new titles appeared on various Japanese platforms, including home computers such as the MSX and PC-9801, and consoles like the Famicom, Sega SG-1000, Sega Mega Drive, and Game Boy.^{[14]:112[18]} These releases were either developed by Thinking Rabbit or by other companies under license agreements.^[12] In 1987, Spectrum HoloByte in California licensed *Sokoban* from Japan's ASCII, adapted the MSX version for IBM PC,



First level of *Sokoban* for the NEC PC-8801, designed by Hiroyuki Imabayashi.

Apple II, and Commodore 64, added features for the U.S. market, and released it as *Soko-Ban* in early 1988.^{[19][20]} The official series^[21] continued in Japan during the 1990s with new titles for the Super Famicom, Windows, Macintosh, and PlayStation.^[18]

Around 2000, Thinking Rabbit became inactive but remained a legal entity.^[11] In 2001, the Japanese software company Falcon acquired the copyrights for *Sokoban*,^[22] becoming the official developer and licensor, and in 2003, trademarked the name "Sokoban".^[23] From 2004 to 2007, Falcon developed several titles for Japanese mobile phones.^{[24][25]} In 2011, Falcon trademarked the name "Thinking Rabbit".^[26] Between 2015 and 2018, Falcon developed five *Sokoban* titles for Windows and the smartphone game *Sokoban Touch* (2016), all of which were published by Falcon under the Thinking Rabbit brand.^{[18][27]} In 2018, Falcon developed three *Sokoban* titles for Japanese digital terrestrial television broadcasters.^[28] In 2021, Unbalance both developed and published an official title, *The Sokoban*, for the Nintendo Switch^[29] and PlayStation 4.^[30]

Games

In total, more than 40 official *Sokoban* games have been released on various platforms, primarily in Japan but also internationally.^[18] Although *Sokoban* is defined by its "very simple" rules and no more,^[3] certain official titles introduce additional mechanics:

- The PlayStation version of *Ultimate Sokoban* (究極の倉庫番) features themed stages with unique mechanics: boxes that must be stored in an arrangement that completes an electrical circuit; ghosts disguised as boxes that disappear upon storage; and underwater boxes that float unless touched periodically or stored.^[31]
- Two titles have variant game modes: *Sokoban Special of Tears* (涙の倉庫番スペシャル) includes a mode where the player can use tools such as ropes,^{[32]:98} and *Sokoban Legend: Land of Light and Darkness* (倉庫番伝説 光と闇の国) offers a mode in which the player must push enemies into holes and push puppets onto magic circles.^[33]
- One title deviates from the warehouse keeper mechanic: *Power Sokoban* (Power倉庫番) is an action-puzzle game in which the player shoots orbs and fills holes with rocks.^[34]

The following table lists titles in the *Sokoban* series.^{[18][14]:112}

Title	Release	Platform	Developer	Publisher	Region
<i>Sokoban</i> (倉庫番)	1982-1983	NEC PC-8801 NEC PC-6001mkII NEC PC-8001mkII Fujitsu FM-7 Sharp MZ-2000 Sharp X1	Thinking Rabbit ^[35]	Thinking Rabbit	Japan
<i>Sokoban Extra Edition</i> (倉庫番 [番外編]) ^[16]	1983	NEC PC-8801	Thinking Rabbit ^[16]	PC Magazine ^[16]	Japan
<i>Sokoban 2</i> (倉庫番2)	1984	NEC PC-9801 NEC PC-8801 NEC PC-6001mkII NEC PC-8001mkII Fujitsu FM-7 Sharp X1 MB-S1	Thinking Rabbit ^[35]	Thinking Rabbit	Japan
<i>Sokoban</i> (倉庫番) (ROM pack)	1984	MSX	ASCII ^[36]	ASCII	Japan
<i>Sokoban Toolkit</i> (倉庫番ツールキット) (Tape pack)	1984	MSX	Seiji Nishikawa ^[37]		
<i>Sokoban</i> (倉庫番)	1985	Game Pocket Computer	Epoch ^[38]	Epoch	Japan
<i>Sokoban</i> (倉庫番)	1985	SG-1000	Sega ^[39]	Sega	Japan
<i>Sokoban Special of Tears</i> (涙の倉庫番スペシャル)	1986	Famicom Disk System	ASCII ^[40]	ASCII	Japan
<i>Soko-Ban</i>	1988	IBM PC Commodore 64 Apple II	Spectrum HoloByte ^[19]	Spectrum HoloByte	North America
<i>Sokoban Perfect</i> (倉庫番 Perfect)	1989	NEC PC-9801	Thinking Rabbit ^[41]	Thinking Rabbit	Japan
		NEC PC-8801	Thinking Rabbit ^[42]		
		Sharp X68000	Thinking Rabbit ^[43]		
		Sharp X1	Thinking Rabbit ^[44]		
		FM Towns	Thinking Rabbit ^[45]		
		MSX2	Micro Cabin ^[46]	Micro Cabin	
<i>Sokoban</i> (倉庫番) <i>Boxxle</i> ^{NA}	1989	Game Boy	Atelier Double ^{[47][48]}	Pony Canyon ^{JP} FCI ^{NA}	Japan, North America
	1991 ^{NA}				

Title	Release	Platform	Developer	Publisher	Region
<i>Sokoban 2</i> (倉庫番2) <i>Boxxle II</i> ^{NA}	1990	Game Boy	Atelier Double ^{[49][50]}		
	1992 ^{NA}				
<i>Sokoban Deluxe</i> (倉庫番 Deluxe)	1990	<u>Namco System 1</u>	<u>Namco</u> ^[51]	Namco	Japan
The Greatest Sokoban in History (史上最大の倉庫番) <i>Shove It! The Warehouse Game</i> ^{NA}	1990	<u>Sega Genesis</u>	<u>NCS</u> ^{[52][53]}	Masaya ^{JP} DreamWorks ^{NA}	Japan, North America
<i>Sokoban</i> (倉庫番)	1990	<u>Game Gear</u>	Riverhill Soft ^[54]	Riverhill Soft	Japan
<i>Sokoban World</i> (倉庫番World) <i>Boxyboy</i> ^{NA}	1990 1991	<u>TurboGrafx-16</u>	<u>Media Rings</u> ^{[55][56]}	Media Rings ^{JP} <u>NEC</u> ^{NA}	Japan, North America
<i>Sokoban Revenge</i> (倉庫番 Revenge)	1991	NEC PC-9801	Thinking Rabbit ^[57]	Thinking Rabbit	Japan
<i>Sokoban Revenge SX-68K</i> (倉 庫番リベンジ SX-68K)	1993	Sharp X68000	Thinking Rabbit ^[58]	<u>Sharp</u> ^[58]	Japan
<i>Super Sokoban</i> (Super倉庫番)	1993	Super Famicom	<u>Pack-In- Video</u> ^[59]	Pack-In-Video	Japan
<i>Sokoban for Windows</i> (倉庫番 for Windows)	1995	Windows	<u>Itochu</u> ^[60] <u>Outback</u> ^[60]	Itochu	Japan
<i>Sokoban for Macintosh</i> (倉庫 番 for Macintosh)	1996	Macintosh	<u>Itochu</u> ^[61] <u>Outback</u> ^[61]		
<i>Ultimate Sokoban</i> (究極の倉庫 番)	1996	PlayStation	Thinking Rabbit ^[62]		
<i>Sokoban Basic</i> (倉庫番ベーシ ック)	1997	PlayStation	<u>Outback</u> ^[63]		
<i>Sokoban Selection</i> (倉庫番セ レクション)	1997	Windows	<u>Itochu</u> ^[64] <u>Outback</u> ^[64]		
	1997	Macintosh	<u>Itochu</u> ^[65] <u>Outback</u> ^[65]		
<i>Sokoban Special 102</i> (倉庫番 スペシャル102)	1998	Windows	<u>Itochu</u> ^[66] <u>Outback</u> ^[66]		
<i>Ultimate Sokoban</i> (究極の倉庫 番)	1998	Windows	<u>Itochu</u> ^[67] <u>Outback</u> ^[68]	Itochu	Japan
<i>Sokoban Basic 2</i> (倉庫番ベー シック2)	1998	PlayStation	Soft Office ^[69] Thinking Rabbit ^[69]	Unbalance	Japan

Title	Release	Platform	Developer	Publisher	Region
<i>Power Sokoban</i> (Power倉庫番)	1999	Super Famicom	Atelier Double ^{[70][71]}	<u>Nintendo</u>	Japan
<i>Sokoban Legend: Land of Light and Darkness</i> (倉庫番伝説 光と闇の国)	1999	Game Boy	<u>J Wing</u> ^[33]	J Wing	Japan
<i>Sokoban: Guide to Difficult Puzzles</i> (倉庫番 難問指南)	1999	PlayStation	Thinking Rabbit ^[72] Three D ^[72]	Unbalance	Japan
	2000	Windows	Unbalance ^[73]		
<i>Sokoban</i> (倉庫番)	2000	Windows	Unbalance ^[74]		
<i>Sokoban First Step</i> (倉庫番ファーストステップ)	2004	<u>EZweb</u>	Falcon ^[24]	<u>Square Enix</u>	Japan
<i>Sokoban Perfect</i> (倉庫番パーフェクト) (1/2/3)	2004	EZweb			
<i>Sokoban First Step</i> (倉庫番ファーストステップ)	2004	<u>i-mode</u>	Falcon ^[25]	<u>Dwango</u>	Japan
<i>Sokoban Perfect</i> (倉庫番パーフェクト) (1-1/1-2/1-3/2-1/2-2/2-3/3-1/3-2/3-3)	2004-2005	i-mode			
<i>Konami Wai Wai Sokoban</i> (コナミワイワイ倉庫番)	2007	i-mode	<u>Konami</u> ^[75]	Konami	Japan
<i>Sokoban Perfect Plus A-side</i> (倉庫番パーフェクト プラス A面)	2015	Windows	Falcon ^[76]	Thinking Rabbit	Japan
<i>Sokoban Perfect Plus B-side</i> (倉庫番パーフェクト プラス B面)	2015	Windows			
<i>Sokoban First Step Plus</i> (倉庫番ファーストステップ プラス)	2016	Windows	Falcon ^[77]		
<i>Sokoban Revenge Reprint</i> (倉庫番リベンジ 復刻版)	2016	Windows	Falcon ^[78]		
<i>Sokoban Touch</i>	2016	<u>Android</u> <u>iOS</u>	Falcon ^[28]	Thinking Rabbit	Worldwide
<i>Sokoban Smart</i> (倉庫番スマート)	2018	Windows	Falcon ^[79]	Thinking Rabbit	Japan
<i>Chukyo-kun no Sokoban</i> (チュウキョ〜くんの倉庫番)	2018	Digital terrestrial television	Falcon ^[28]	<u>Chukyo Television</u>	Japan

Title	Release	Platform	Developer	Publisher	Region
<i>Dayon no Sokoban</i> (だよんの倉庫番)	2018	Digital terrestrial television		Miyagi Television	
<i>Kumojiro no Sokoban</i> (くもじろーの倉庫番)	2018	Digital terrestrial television		Nippon Television	
<i>Minna no Sokoban</i> (みんなの倉庫番) ^{JP} <i>The Sokoban</i>	2019 ^{JP}	Nintendo Switch PlayStation 4	Unbalance ^[28]	Unbalance	Japan
	2021				Worldwide

Reception

The first *Sokoban* title became a bestseller in Japan, with over 25,000 copies sold by July 1984.^{[80][35][81]} Junji Tanaka wrote that the first level of the PC-8801 version perplexed puzzle enthusiasts upon release.^{[14]:4} Titles for Japanese home computers, such as the NEC PC-9801 and Sharp X1, were said to have sold more than 100,000 copies combined.^[82] The MSX version alone, published by ASCII, sold over 400,000 copies and was considered a commercial success.^{[19][83]} The U.S. release, *Soko-Ban*, sold over 50,000 copies by mid-September 1988.^[19] By 2018, Chukyo Television Broadcasting reported that the series had sold over 4.1 million copies worldwide since its 1982 release.^[84]

Reviewers often emphasized the game's addictive nature. In 1983, *Micomgames* staff remarked that players would find it difficult to stop playing *Sokoban*.^[4] In 1988, Roy Wagner of *Computer Gaming World* suggested that anyone trying the US version, *Soko-Ban*, would likely remain absorbed for an extended period.^[8] The *Computer Entertainer* newsletter described the game as "fascinating" and "almost impossible to stop playing".^[85] In its console reviews, *Computer and Video Games* magazine called *Sokoban* for Game Boy "an infuriatingly addictive little title" and said its appeal was "not far off" from *Tetris*.^[86] In 1990, *Famicom Winning Guide* recognized *Sokoban* as a staple puzzle game, citing its difficulty, depth, and continued presence across multiple platforms.^[87]

Commentators often highlighted one or more aspects of the game: its simplicity, the level of thought it required of players, or its challenging nature. *Micomgames* staff described the first *Sokoban* title as simple yet requiring deep thought comparable to playing *Go* or *Shogi*.^[4] The 1988 book *Video Games: Complete Collection of TV Games* described *Sokoban* as a pure computer-based puzzle game with a logic akin to Japanese disentanglement puzzles.^{[15]:189} It stated that while the game appears simple, the boxes are "cleverly" arranged; some levels require moving other boxes for twenty moves just to shift a single target box one space.^{[15]:189} In 1989, writing for *MSX Magazine*, a reviewer cited *Sokoban* as the representative example of a purely logic-based puzzle, distinguishing it from puzzles that incorporate action elements such as enemies or time pressure, and those involving elements of chance.^[88] *Family Computer* magazine's *All Catalog* supplement described *Sokoban* for Game Boy as great due to the simplicity of its gameplay,^{[32]:199} and *Computer and Video Games* magazine staff described it as one of the Game Boy's "simple but effective puzzle games."^[86] Reviewers for the German magazine *Happy Computer* praised *Soko-Ban* as a brilliant logic puzzle that kept players thinking without pressure and recommended that players carefully observe a level before moving a

box,^[89] and in *Computer Gaming World*, Wagner summarized it as "very playable and mentally challenging."^[8] In *Game Player's* magazine, Tom R. Halfhill reviewed *Shove It!* for the Sega Genesis, noting it was challenging and would require players to plan their moves carefully,^[90] and reviewing *Boxxle* for Game Boy, he stated that it required careful planning or plenty of trial and error (usually both).^[91] He later commented on *Boxyboy* for the TurboGrafx-16 that while the initial rooms were not difficult, players would eventually encounter one that "seems impossible."^[92]

The series faced occasional criticism for a lack of variety. Tom R. Halfhill wrote that the puzzles in *Shove It!* were "essentially the same",^[90] and noted that in *Boxxle*, variation was limited to crate count, placement, and room shape.^[91] Reviewing *Boxyboy*, he described it as "virtually identical" to the others, concluding that all three games required players to enjoy solving the same type of puzzle repeatedly.^[92]

Legacy

The 1988 book *Video Games: Complete Collection of TV Games* credits *Sokoban* with sparking a "puzzle game boom" in the Japanese personal computer market starting in 1983 and continuing for a time.^{[15]:189} In the decades since, numerous clones have been created,^[93] and the term "Sokoban," a registered trademark,^[23] has become genericized to describe the genre.^[94] Thousands of Sokoban puzzles exist beyond the official releases, ranging in difficulty and often freely available online.^{[95][96]} Puzzles resembling *Sokoban*, involving pushing boxes or similar obstacles to the correct targets, have been present in gaming,^[97] particularly in 1980s and 1990s action-adventure games with grid-based movement.^[98] *The Legend of Zelda* series and titles such as *Adventures of Lolo* (1989) and *LIT* (2009) incorporate Sokoban-style elements into their gameplay;^[97] for example, *The Legend of Zelda: A Link to the Past* (1991) has a puzzle in which blocks must be arranged to clear a path to a treasure chest.^[98] *Resident Evil 2* (1998) includes a puzzle similar to *Sokoban* in which two statues must be pushed onto corresponding marked floor areas, with the correct matching inferred.^[98] Additionally, Sokoban-like games such as *Sokomania 2* (2014) introduce new mechanics, including switches and conveyor belts.^[97]

Research

The computational problem of solving Sokoban puzzles has been studied using computational complexity theory, and is known to be NP-hard^{[99][100]} and PSPACE-complete.^{[101][102]} Solving non-trivial Sokoban puzzles is difficult for computers because of the high branching factor (many legal pushes at each turn) and the considerable search depth (many pushes needed to reach a solution).^{[103][104]} Even small puzzles can require lengthy solutions.^[105]

Sokoban puzzles provide a challenging testbed for developing and evaluating automated planning techniques.^[106] The first documented automated solver, Rolling Stone, was developed at the University of Alberta. It employed a conventional search algorithm enhanced with domain-specific techniques such as deadlock detection.^{[6]:139–140[107]} A later solver, Festival, introduced the FESS search algorithm and became the first automatic system to solve the standard XSokoban benchmark, a suite of ninety puzzles with a ten-minute per-puzzle time limit that had eluded a complete solution for more than twenty years.^{[108][109]} Despite these advances, Sokoban puzzles that have been solved

by humans are beyond the reach of state-of-the-art solvers.^{[96][110][111]} Humans solve such instances by breaking down puzzles into subproblems,^{[6]:40} recognizing patterns and exceptions, and drawing on learning from prior puzzles.^{[6]:62}

See also

- Logic puzzle
- Sliding puzzle
- Transport puzzle
- Motion planning



Notes

- 1982 is the official year, though 1983 is also reported in certain sources; see § History.
- Japanese: 倉庫番, Hepburn: *Sōko-ban*; lit. 'warehouse keeper'^[1]

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External links

- [Official Sokoban site \(https://www.sokoban.jp/\)](https://www.sokoban.jp/) (in Japanese)
 - [The University of Alberta Sokoban page \(https://webdocs.cs.ualberta.ca/~games/Sokoban/\)](https://webdocs.cs.ualberta.ca/~games/Sokoban/)
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