

Tangram

The **tangram** (Chinese: 七巧板; pinyin: *qīqiǎobǎn*; literally: "seven boards of skill") is a dissection puzzle consisting of seven flat shapes, called *tans*, which are put together to form shapes. The objective of the puzzle is to form a specific shape (given only an outline or silhouette) using all seven pieces, which may not overlap. It is reputed to have been invented in China during the Song Dynasty,^[1] and then carried over to Europe by trading ships in the early 19th century. It became very popular in Europe for a time then, and then again during World War I. It is one of the most popular dissection puzzles in the world.^{[2][3]} A Chinese psychologist has termed the tangram "the earliest psychological test in the world", albeit one made for entertainment rather than for analysis.^[4]



Like most modern sets, this wooden tangram is stored in the square configuration.

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Etymology

The origin of the word 'tangram' is unclear. The '-gram' element is apparently from Greek γράμμα ('written character, letter, that which is drawn'). The 'tan-' element is variously conjectured to be Chinese *tan* 'to extend' or Cantonese *tan* 'Chinese'.^[4]

History

Reaching the Western world (1815–1820s)

The tangram had already existed in China for a long time when it was first brought to America by Captain M. Donaldson, on his ship, *Trader*, in 1815. When it docked in Canton, the captain was given a pair of author Sang-Hsia-koi's tangram books from 1815.^[5] They were then brought with the ship to Philadelphia, where it docked in February 1816. The first tangram book to be published in America was based on the pair brought by Donaldson.



A caricature published in France in 1818, when the tangram craze was at its peak. The caption reads: " 'Take care of yourself, you're not made of steel. The fire has almost gone out and it is winter.' 'It kept me busy all night. Excuse me, I will explain it to you. You play this game, which is said to hail from China. And I tell you that what Paris needs right now is to welcome that which comes from far away' "

The puzzle eventually reached England, where it became very fashionable.^[5] The craze quickly spread to other European countries.^[5] This was mostly due to a pair of British tangram books, *The Fashionable Chinese Puzzle*, and the accompanying solution book, *Key*.^[7] Soon, tangram sets were being exported in great number from China, made of various materials, from glass, to wood, to tortoise shell!^[8]

Many of these unusual and exquisite tangram sets made their way to Denmark. Danish interest in tangrams skyrocketed around 1818, when two books on the puzzle were published, to much enthusiasm.^[9] The first of these was *Mandarinen* (About the Chinese Game). This was written by a student at Copenhagen University, which was a non-fictional work about the history and popularity of tangrams. The second, *Det nye chinesiske Gaadespil* (The new Chinese Puzzle Game), consisted of 339 puzzles copied from *The Eighth Book of Tan*, as well as one original!^[9]

One contributing factor in the popularity of the game in Europe was that although the Catholic Church forbade many forms of recreation on the sabbath, they made no objection to puzzle games such as the tangram.^[10]

Second craze in Germany (1891–1920s)

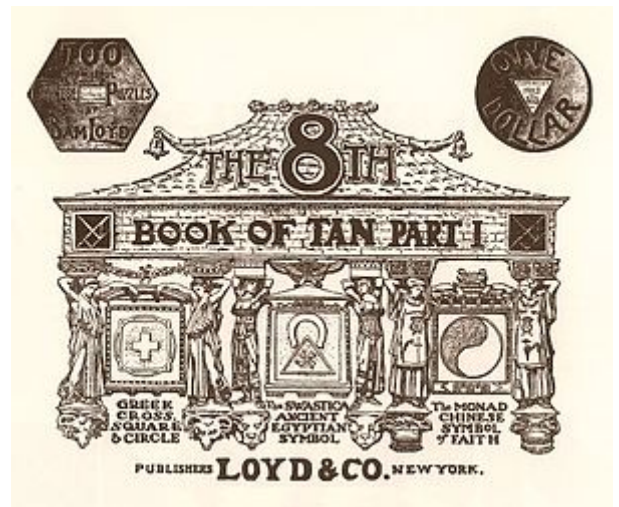
Tangrams were first introduced to the German public by industrialist Friedrich Adolf Richter around 1891.^[11] The sets were made out of stone or false earthenware,^[12] and marketed under the name "The Anchor Puzzle".^[11]

More internationally, the First World War saw a great resurgence of interest in tangrams, on the homefront and trenches of both sides. During this time, it occasionally went under the name of "The Sphinx" an alternative title for the "Anchor Puzzle" sets.^{[13][14]}

Paradoxes

A tangram paradox is a dissection fallacy: Two figures composed with the same set of pieces, one of which seems to be a proper subset of the other.^[15] One famous paradox is that of the two monks, attributed to Dudeney, which consists of two similar shapes, one with and the other missing a foot.^[16] In reality, the area of the foot is compensated for in the second figure by a subtly larger body. Another tangram paradox is proposed by Sam Loyd in *The 8th Book of Tan*:^[17]

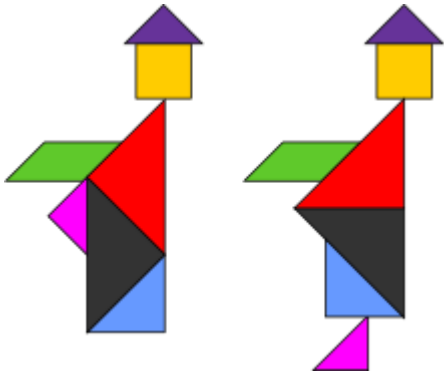
The puzzle was originally popularized by *The Eighth Book Of Tan*, a fictitious history of the tangram, which claimed that the game was invented 4,000 years prior by a god named Tan. The book included 700 shapes, some of which are impossible to solve.^[6]



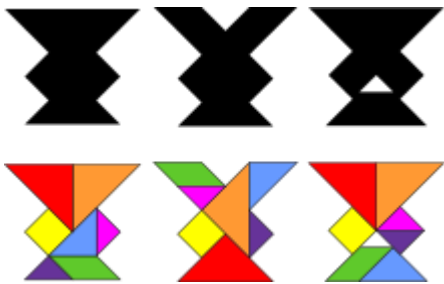
Cover art from *The 8th Book of Tan*, by Sam Loyd, a spoof of the puzzle's history that began the tangram craze in the Western World

The seventh and eighth figures represent the mysterious square, built with seven pieces: then with a corner clipped off, and still the same seven pieces employed.^[18]

The two monks paradox – two similar shapes but one missing a foot:



The Magic Dice Cup tangram paradox – from Sam Loyd's book *The Eighth Book of Tan*^[19] (1903). Each of these cups was composed using the same seven geometric shapes. But the first cup is whole, and the others contain vacancies of different sizes. (Notice that the one on the left is slightly shorter than the other two. The one in the middle is ever-so-slightly wider than the one on the right, and the one on the left is narrower still.)^[20]



Clipped square tangram paradox – from Loyd's book *The Eighth Book of Tan*^[19] (1903):

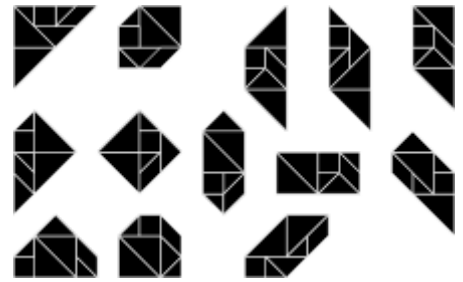


Number of configurations

Over 6500 different tangram problems have been created from 19th century texts alone, and the current number is ever-growing.^[21] Fu Traing Wang and Chuan-Chin Hsiung proved in 1942 that there are only thirteen convex tangram configurations (config segment drawn between any two points on the configuration's edge always pass through the configuration's interior, i.e., configurations with no recesses in the outline).^{[22][23]}

Pieces

Choosing a unit of measurement so that the seven pieces can be assembled to form a square of side one unit and having area one square unit, the seven pieces are:



The 13 convex shapes matched with tangram set

- 2 large right triangles (hypotenuse 1, sides $\frac{\sqrt{2}}{2}$, area $\frac{1}{4}$)
- 1 medium right triangle (hypotenuse $\frac{\sqrt{2}}{2}$, sides $\frac{1}{2}$, area $\frac{1}{8}$)
- 2 small right triangles (hypotenuse $\frac{1}{2}$, sides $\frac{\sqrt{2}}{4}$, area $\frac{1}{16}$)
- 1 square (sides $\frac{\sqrt{2}}{4}$, area $\frac{1}{8}$)
- 1 parallelogram (sides of $\frac{1}{2}$ and $\frac{\sqrt{2}}{4}$, area $\frac{1}{8}$)

Of these seven pieces, the parallelogram is unique in that it has no reflection symmetry but only rotational symmetry, and so its mirror image can be obtained only by flipping it over. Thus, it is the only piece that may need to be flipped when forming certain shapes.

See also

- Egg of Columbus (tangram puzzle)
- Mathematical puzzle
- Ostomachion
- Tiling puzzle

References

1. Jiannong Shi (2 February 2004). Robert J. Sternberg, ed. *International Handbook of Intelligence* (https://books.google.com/books?id=qbnLJI_L6MMC&pg=PA330). Cambridge University Press. pp. 330–331. ISBN 978-0-521-00402-2
2. Slocum, Jerry (2001). *The Tao of Tangram*. Barnes & Noble. p. 9. ISBN 978-1-4351-0156-2
3. Forbrush, William Byron (1914). *Manual of Play* (<https://books.google.com/?id=FpoVAAAAIAAJ&pg=PA315&dq=%22The+Anchor+Puzzle%22#v=onepage&q=%22The%20Anchor%20Puzzle%22&f=false>) Jacobs. p. 315. Retrieved 2010-10-13.
4. *Oxford English Dictionary* 1910, s.v. (<http://www.oed.com/view/Entry/197515>)
5. Slocum, Jerry (2003). *The Tangram Book*. Sterling. p. 30. ISBN 9781402704130
6. Costello, Matthew J. (1996). *The Greatest Puzzles of All Time*. New York: Dover Publications. ISBN 0-486-29225-8
7. Slocum, Jerry (2003). *The Tangram Book*. Sterling. p. 31. ISBN 9781402704130
8. Slocum, Jerry (2003). *The Tangram Book*. Sterling. p. 49. ISBN 9781402704130
9. Slocum, Jerry (2003). *The Tangram Book*. Sterling. pp. 99–100. ISBN 9781402704130
10. Slocum, Jerry (2003). *The Tangram Book*. Sterling. p. 51. ISBN 9781402704130
11. waeber, sarcone &. "Tangram the incredible timeless 'Chinese' puzzle 2" (<http://www.archimedes-lab.org/tangramagicus/pagetang1.html>) www.archimedes-lab.org
12. *Treasury Decisions Under customs and other laws, Volume 25* (<https://books.google.com/?id=MeUWAQAIAAJ&pg=PA1421&lpg=PA1421&dq=%22The+Anchor+Puzzle%22>) United States Department Of The Treasury. 1890–1926. p. 1421. Retrieved September 16, 2010.
13. Wyatt (26 April 2006). "Tangram – The Chinese Puzzle" (<http://www.bbc.co.uk/dna/h2g2/alabaster/A1423595>). BBC. Retrieved 3 October 2010.
14. Braman, Arlette (2002). *Kids Around The World Play!* (<https://books.google.com/?id=fNnoxIfJg5UC&printsec=frontcover&dq=Kids+Around+The+World+Play!>). John Wiley and Sons. p. 10. ISBN 978-0-471-40984-7. Retrieved September 5, 2010.
15. *Tangram Paradox* (<http://mathworld.wolfram.com/TangramParadox.html>), by Barile, Margherita, From MathWorld – A Wolfram Web Resource, created by Eric W Weisstein.
16. Dudeney, H. (1958). *Amusements in Mathematics*. New York: Dover Publications.
17. *The 8th Book of Tan* (<http://www.tangram-channel.com/the-eighthbook-of-tan-by-sam-loyd-page-1/>) (1903).

18. Loyd, Sam (1968). *The eighth book of Tān – 700 Tangrams by Sam Loyd with an introduction and solutions by Peter Van Note*. New York: Dover Publications. p. 25.
19. *The Eighth Book of Tān*, page 1 (<http://www.tangram-channel.com/the-eighthbook-of-tan-by-sam-loyd-page-1/>)
20. "The Magic Dice Cup" (<https://www.futilitycloset.com/2011/04/02/the-magic-dice-cup/>) 2 April 2011.
21. Slocum, Jerry (2001). *The Tao of Tangram*. Barnes & Noble. p. 37. ISBN 978-1-4351-0156-2
22. Fu Traing Wang; Chuan-Chih Hsiung (November 1942). "A Theorem on the Tāngram". *The American Mathematical Monthly*. **49** (9): 596–599. doi:10.2307/2303340 (<https://doi.org/10.2307/2303340>) JSTOR 2303340 (<https://www.jstor.org/stable/2303340>)
23. Read, Ronald C. (1965). *Tangrams : 330 Puzzles* New York: Dover Publications. p. 53. ISBN 0-486-21483-4

Further reading

- Anno, Mitsumasa. *Anno's Math Games* (three volumes). New York: Philomel Books, 1987. ISBN 0-399-21151-9 (v. 1), ISBN 0-698-11672-0 (v. 2), ISBN 0-399-22274-X (v. 3).
- Botermans, Jack, et al. *The World of Games: Their Origins and History How to Play Them, and How to Make Them* (translation of *Wereld vol spelletjes*). New York: Facts on File, 1989. ISBN 0-8160-2184-8
- Dudeney, H. E. *Amusements in Mathematics* New York: Dover Publications, 1958.
- Gardner, Martin. "Mathematical Games—on the Fanciful History and the Creative Challenges of the Puzzle Game of Tangrams", *Scientific American* Aug. 1974, p. 98–103.
- Gardner, Martin. "More on Tāngrams", *Scientific American* Sep. 1974, p. 187–191.
- Gardner, Martin. *The 2nd Scientific American Book of Mathematical Puzzles and Diversions* New York: Simon & Schuster, 1961. ISBN 0-671-24559-7.
- Loyd, Sam. *Sam Loyd's Book of Tāngram Puzzles (The 8th Book of Tān Part I)*. Mineola, New York: Dover Publications, 1968.
- Slocum, Jerry, et al. *Puzzles of Old and New: How to Make and Solve Them* De Meern, Netherlands: Plenary Publications International (Europe); Amsterdam, Netherlands: ADM International; Seattle: Distributed by University of Washington Press, 1986. ISBN 0-295-96350-6
- Slocum, Jerry, et al. *The Tangram Book: The Story of the Chinese Puzzle with Over 2000 Puzzles to Solve* New York: Sterling Publishing Company 2003. ISBN 9781402704130

External links

- [Past & Future: The Roots of Tāngram and Its Developments](#)
 - [Turning Your Set of Tāngram Into A Magic Math Puzzle](#) by puzzle designer G. Sarcone
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