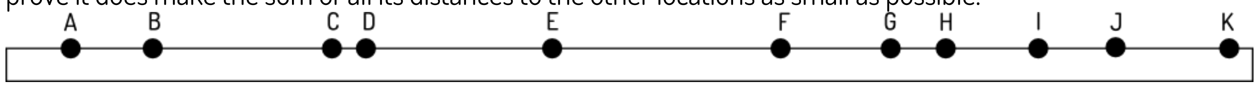
martinGardner

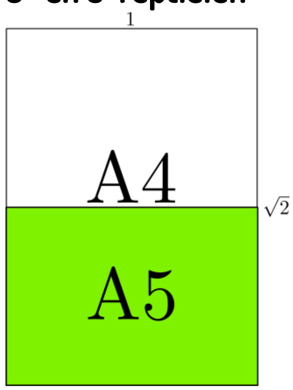
Lavinia Seeks a Room

The line in the figure below represents University Avenue in a small college town where Lavinia is a student. The spots labeled A through K are buildings along the avenue in which Lavinia's eleven best friends are living.
Lavinia has been living with her parents in a nearby town, but now she wants to move to University Avenue. She would like a room or an apartment at a location L on the street that minimizes the sum of all its distances from her eleven friends. Assuming that a place is available at the right location, specify where Lavinia should live and prove it does make the sum of all its distances to the other locations as small as possible.



Uit: The Last Recreations: Hydras, Eggs, and Other Mathematical Mystifications (1997)

3- en 5-reptielen



Iedereen weet dat de verhouding van de afmetingen bij een blad in A4-formaat zo gekozen is dat de helft van een A4 een A5 is waarvan de verhouding van de afmetingen dezelfde is: een gelijkvormige rechthoek dus. Zie figuur waar je die verhoudingen kan aflezen. Ga nu zelf of zoek naar
(1) Een driehoek die je in drie gelijke delen kan delen die gelijkvormig zijn met de oorspronkelijke driehoek.
(2) Een driehoek die je in vijf gelijke delen kan delen die gelijkvormig zijn met de oorspronkelijke driehoek.
Tip: zoek naar een rechthoekige driehoek.

Uit: The Unexpected Hanging, and Other Mathematical Diversions (1961)

Fifty Miles an Hour

A train goes 500 miles along a straight track, without stopping, completing the trip with an average speed of exactly 50 miles per hour. It travels, however, at different speeds along the way. It seems plausible that nowhere along the 500 miles of track is there a segment of 50 miles that the train traverses in precisely one hour.
Prove that this is not the case.

Uit: The Last Recreations: Hydras, Eggs, and Other Mathematical Mystifications (1997)

Een speciale som

Wat heeft deze symbolische som te maken met het getal pi?

SIX + SIX + SIX = NINE + NINE

Uit: The Magic Numbers of Dr. Matrix (1985)

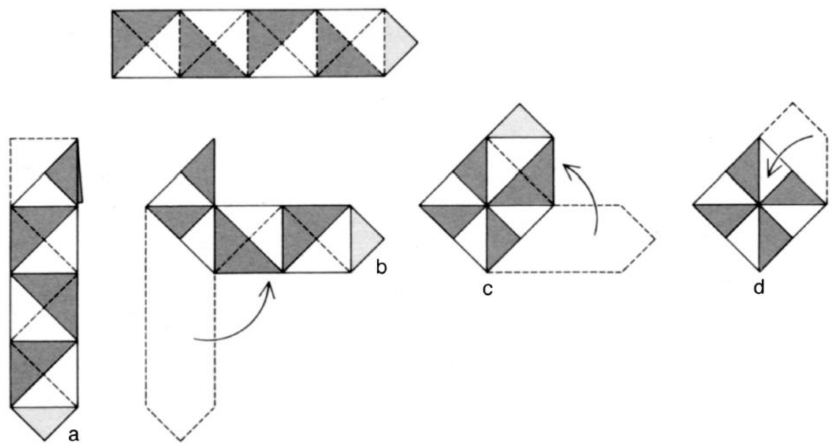
The first black ace

A deck of 52 playing cards is shuffled and placed face down on the table. Then, one at a time, the cards are dealt face up from the top. If you were asked to bet in advance on the distance from the top of the first black ace to be dealt, what position (first, second, third, . . .) would you pick so that if the game were repeated many times, you would maximize your chance in the long run of guessing correctly?

Uit: Wheels, Life, and Other Mathematical Amusements (1983)

Schapen en geiten

Knip uit ruitjespapier uit, en kleur zoals op de bovenste figuur. Voor- en achterkant hebben dezelfde kleur alsof de inkt door het papier door gaat. Maak eerst plooien volgens de streepjeslijnen. Vouw dan zoals in a, b, c, d en lijm vast (in d:
Glue the tab to the bottom leaf of the triangle).

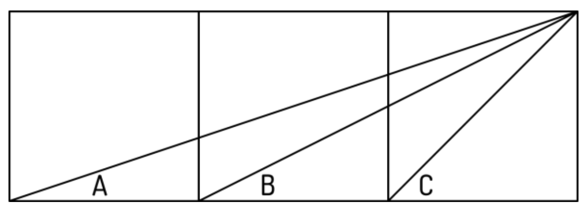


By folding only along precreased lines, change the paper to a square of the same size that is all white on one side and all black on the other. In other words, separate the sheep from the goats.

Uit: Wheels, Life, and Other Mathematical Amusements (1983)

Three squares

Using only elementary geometry (not even trigonometry), prove that angle C in the figure equals the sum of angles A and B.



Uit: Mathematical Circus (1979)

The three cards

Three playing cards, removed from an ordinary bridge deck, lie face down in a horizontal row. To the right of a King there's a Queen or Queens. To the left of a Queen there's a Queen or Queens. To the left of a Heart there's a Spade or Spades. To the right of a Spade there's a Spade or Spades.

Name the three cards. Uit: Mathematical Magic Show (1977)

The poisoned glass

"Mathematicians are curious birds," the police commissioner said to his wife. "You see, we had all those partly filled glasses lined up in rows on a table in the hotel kitchen. Only one contained poison, and we wanted to know which one before searching that glass for fingerprints. Our laboratory could test the liquid in each glass, but the tests take time and money, so we wanted to make as few of them as possible. We phoned the university and they sent over a mathematics professor to help us.
He counted the glasses, smiled and said:
" 'Pick any glass you want, Commissioner. We'll test it first.'
" 'But won't that waste a test?' I asked.
" 'No,' he said, 'it's part of the best procedure. We can test one glass first. It doesn't matter which one.' "
"How many glasses were there to start with?" the commissioner's wife asked.
"I don't remember. Somewhere between 100 and 200."
What was the exact number of glasses? (It is assumed that any group of glasses can be tested simultaneously by taking a small sample of liquid from each, mixing the samples and making a single test of the mixture.)

Uit: Mathematical Carnival (1975)

Professor on the escalator

When Professor Stanislaw Slapenarski, the Polish mathematician, walked very slowly down the down-moving escalator, he reached the bottom after taking 50 steps. As an experiment, he then ran up the same escalator, one step at a time, reaching the top after taking 125 steps. Assuming that the professor went up five times as fast as he went down (that is, took five steps to every one step before), and that he made each trip at a constant speed, how many steps would be visible if the escalator stopped running?

Uit: The Second Scientific American Book of Mathematical Puzzles and Diversions (1961)

Littlewood's Footnotes

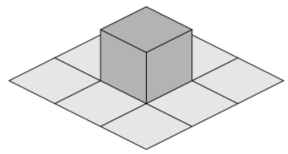
The English mathematician J. E. Littlewood, commenting on this topic in his A Mathematician's Miscellany, recalls three footnotes that appeared at the end of one of his papers. The paper had been published in a French journal. The notes, all in French, read:

1. I am greatly indebted to Prof. Riesz for translating the present paper.
2. I am indebted to Prof. Riesz for translating the preceding footnote.
3. I am indebted to Prof. Riesz for translating the preceding footnote.

Assuming that Littlewood was completely ignorant of the French language, on what reasonable grounds did he avoid an infinite regress of identical footnotes by stopping after the third footnote?

Uit: The Unexpected Hanging, and Other Mathematical Diversions (1961)

Wrapping a cube

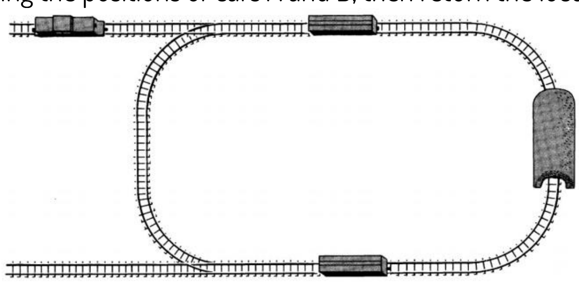


A square of paper three inches wide is black on one side and white on the other. Rule the square into nine one-inch squares. By cutting only along the ruled lines, is it possible to cut a pattern that will fold along the ruled lines into a cube that is all black on the outside? The pattern must be a single piece, and no cuts or folds are permitted that are not along the lines that divide the sheet into squares.

Uit: New Mathematical Diversions from Scientific American (1966)

A switching puzzle

The efficient switching of railroad cars often poses frustrating problems in the field of operations research. The switching puzzle depicted in the figure is one that has the merit of combining simplicity with surprising difficulty. The tunnel is wide enough to accommodate the locomotive but not wide enough for either car. The problem is to use the locomotive for switching the positions of cars A and B, then return the locomotive to its original spot.



Each end of the locomotive can be used for pushing or pulling, and the two cars may, if desired, be coupled to each other.

The best solution is the one requiring the fewest operations. An "operation" is here defined as any movement of the locomotive between stops, assuming that it stops when it reverses direction, meets a car to push it or unhooks from a car it has been pulling. Movements of the two switches are not counted as operations. A convenient way to work on the puzzle is to place a penny, a dime and a nickel on the illustration and slide them along the tracks, remembering that only the coin representing the locomotive can pass through the tunnel. In the illustration, the cars were drawn in positions too close to the switches. While working on the problem, assume that both cars are far enough east along the track so that there is ample space between each car and switch to accommodate both the locomotive and the other car.

No "flying switch" maneuvers are permitted. For example, you are not permitted to turn the switch quickly just after the engine has pushed an unattached car past it, so that the car goes one way and lthe engine, without stopping, goes another way.

Uit: New Mathematical Diversions (1966)