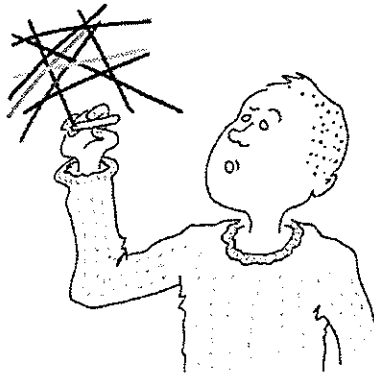




This brainteaser was written by Derrick Niederman.

A problem encountered early in life by the great mathematician and physicist Joseph Fourier was to draw 17 lines that intersect in precisely 101 points. Can you find a way to do it?

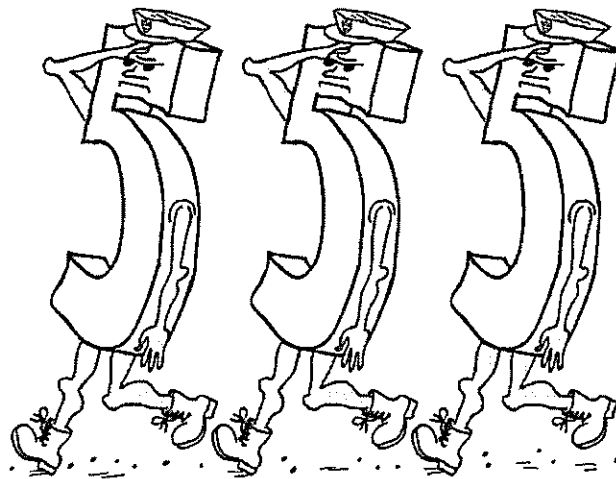


(Fourier was able to find four families of solutions to this problem.)



This brainteaser was written by Derrick Niederman.

What is the smallest positive integer that, when multiplied by 7, yields a product in which all of the digits are 5's?



(Can you find the answer without a calculator?)



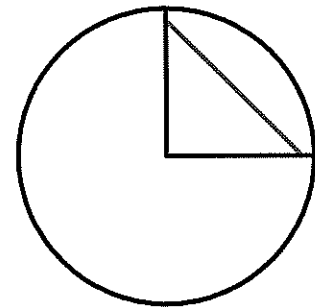
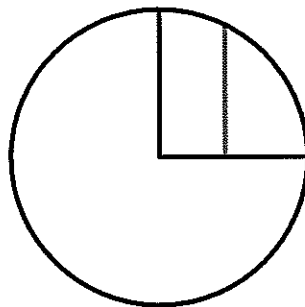
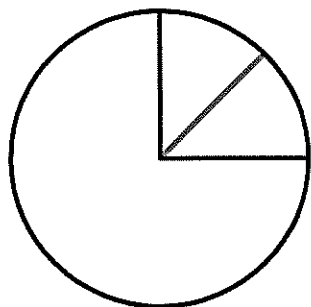
This brainteaser was written by Derrick Niederman.

Which decade in the 21st century will contain no year that is divisible by 11?



This brainteaser was written by Derrick Niederman.

In the diagram below, three different line segments each divide a quarter-circle into two regions of equal area. Rank those three segments from shortest to longest.





This brainteaser was written by Derrick Niederman.

What is the smallest positive number that can be represented as a sum of consecutive positive integers in six different ways? (The number by itself counts as one such sum.)

$$n = x + (x + 1) + (x + 2) + \dots$$

For instance, 9 can be written as a sum of consecutive integers in three different ways:

$$9$$

$$4 + 5$$

$$2 + 3 + 4$$



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This brainteaser was written by Derrick Niederman.

What is the smallest positive number with exactly ten positive integer divisors?

And what is the next one after that?



Puzzle provided by Kordemsky: *The Moscow Puzzles* (Dover)

Equations to solve in your head:

$$6,751x + 3,249y = 26,751$$

$$3,249x + 6,751y = 23,249$$

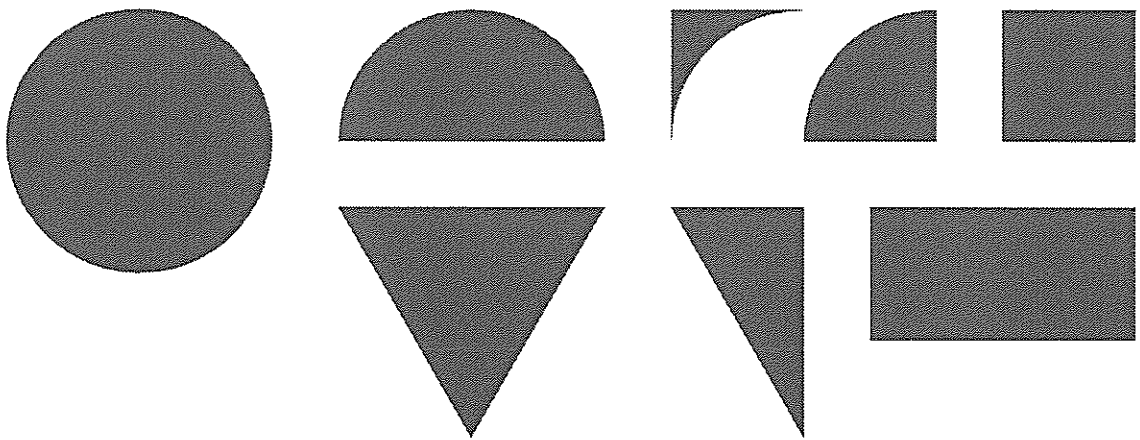
Is this a joke? Not if you can multiply the first equation by 6,751 and the second by 3,249 in your head, and not if you use a second, simpler method.



This brainteaser was written by Patrick Vennebush.

How do I love thee? Let me build the ways!

Make a heart using any of the shapes below. You can change their size, but you cannot change their shape. And you can use a shape more than once.



Can you make a heart with just three shapes? What about five? Six? Ten? How many different hearts can you make?

Plus or Minus

When two fractions have different denominators, first find the least common denominator. Rewrite the fractions with that denominator then add or subtract. If possible, simplify the answer.

Find the sum of or difference between each pair of fractions. Simplify if necessary.

1. $\frac{1}{3} + \frac{3}{4} =$

7. $\frac{5}{8} - \frac{1}{3} =$

2. $\frac{1}{6} + \frac{1}{3} =$

8. $\frac{9}{10} - \frac{1}{5} =$

3. $\frac{4}{9} - \frac{1}{3} =$

9. $\frac{3}{5} - \frac{1}{2} =$

4. $\frac{4}{5} + \frac{3}{9} =$

10. $\frac{3}{4} + \frac{7}{8} =$

5. $\frac{2}{3} + \frac{4}{9} =$

11. $\frac{1}{7} + \frac{2}{3} =$

6. $\frac{9}{5} - \frac{2}{3} =$

12. $\frac{3}{10} + \frac{3}{4} =$

Write About It: Explain how to find the least common denominator of two fractions.



This brainteaser was written by Julia Zurkovsky.

How do I love thee? Let me plot the ways!

A heart is drawn on a coordinate plane by plotting the following points and connecting them:

- The coordinates of the points are (n, n) , $(n - 3, n + 3)$, $(n - 6, n)$, $(n - 9, n + 3)$, $(n - 12, n)$, $(n - 12, n - 3)$, $(n - 6, n - 9)$, and $(n, n - 3)$.
- The coordinates of one point are $(2, 14)$.
- All coordinates are positive integers.

What is the value of n ?



This brainteaser was written by Julia Zurkovsky.

How do I love thee? Let me graph the ways!

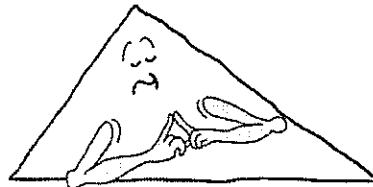
Can you come up with one or more equations to graph a heart on the coordinate plane? The equations can be rectangular, polar, or parametric.

Bonus: Can you shift your heart so the graph or its interior includes the point $(2, 14)$?



This brainteaser was written by Derrick Niederman.

What is the smallest integer that can be the hypotenuse of two different right triangles, each of which has legs whose lengths are also integers?





This brainteaser was written by Derrick Niederman.

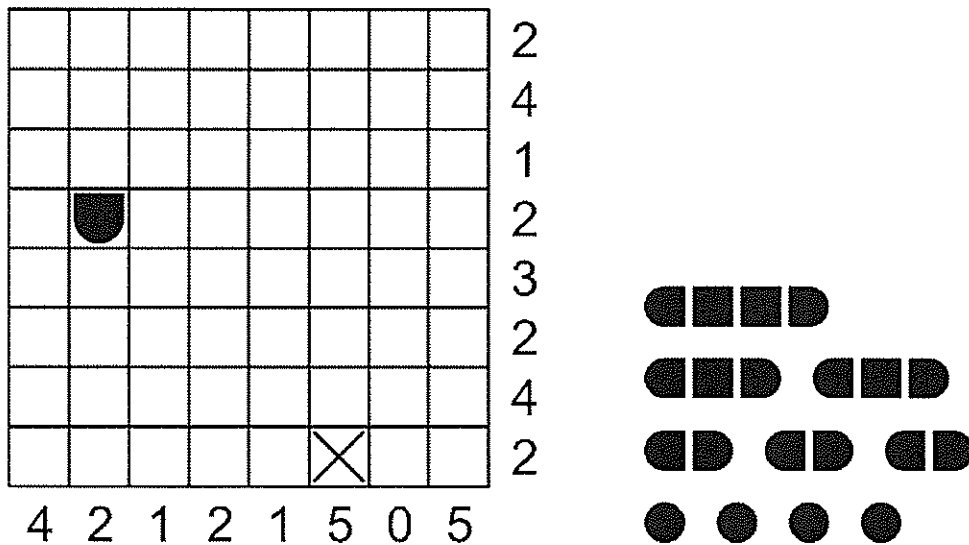
In 2008, September and December both began on a Monday. But every year, there are two months that do not begin on the same day of the week as any other month. What are those two months?

December						
Su	M	T	W	Th	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			



This brainteaser was written by Patrick Vennebush.

The 8×8 grid below represents an ocean with a hidden fleet of ships. Ten ships are hidden within the grid — 1 battleship, 2 cruisers, 3 destroyers, and 4 submarines.



Each ship may be oriented horizontally or vertically within the grid such that no ship touches another ship, not even at a corner. The numbers along the right and bottom of the grid show how many squares in each row and column are occupied by ship segments. As a start, one square in the grid shows the location of one end of a ship, and the X indicates a square that contains only water (no ship).

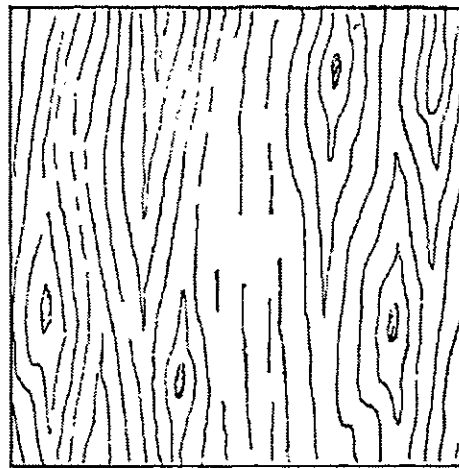
Can you determine the location of all 10 ships?

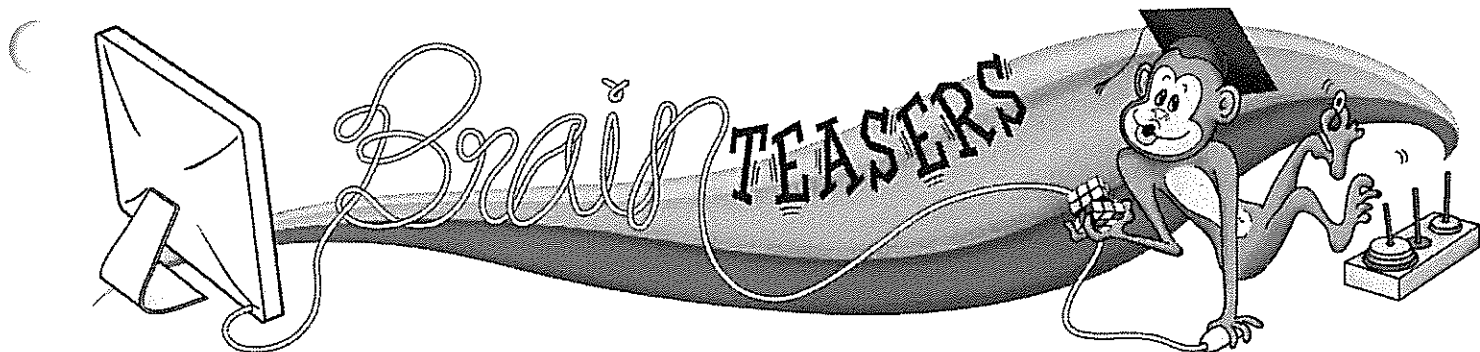


Puzzle provided by Kordemsky: *The Moscow Puzzles* (Dover)

A plywood sheet is 45 by 45 inches. What is the approximate diameter of the log the sheet was made from?

The diameter d of a circle equals c/π , where c is the circumference, but please do not make a mistake. The diameter of the log is not $45/\pi$.





Puzzle provided by Kordemsky: *The Moscow Puzzles* (Dover)

Wheels *A*, *B*, *C*, and *D* are connected with belts as shown. If wheel *A* starts to rotate clockwise as the arrow indicates, can all 4 wheels rotate? If so, which way does each wheel rotate?

Can all the wheels turn if all 4 belts are crossed?
If 1 or 3 belts are crossed?

