1. Place letters in the empty squares to get 11 words reading across and down.

   O U S
   T I
   L A D I D A
   D T T

2. Al, Bob, Cal, Dot, and Ed all bought items from the mail-order magazine. Al & Bob paid $150, Bob & Cal paid $200, Cal & Dot paid $170, Dot & Ed paid $210, and Ed & Al paid $100. How much did each person spend?

3. Multiplying my age by 6 then subtracting 6 produces the same result as subtracting 7 from my age then multiplying by 7. How old am I?

4. In how many ways can 4 apples be distributed among 4 people - A, B, C, and D?

5. Arrange the number 1 to 9 in the boxes below so that each line of 3 boxes sums to 14. 3 numbers have already been placed.

6. Divide the following figure in half by adding 2 toothpicks.

7. What number should replace the question mark?

8. Place numbers 1 to 15 in the white circles so that the distance from 1 to 2, 2-3, 3-4 and so on progressively increase each time.

9. What do these 7 words have in common?

   commerce, canoodle, funnel, recessive, bottom, steering, serrated

10. What well-known seven word phrase can be made simply using the letters that appear in MISANTHROPE?

11. Arrange the numbers 0 to 9 in the circles so that no two consecutive numbers are connected by a straight line.

12. In a game, you are forced to choose a warrior to fight against. All the warriors are waiting with their swords sheathed. One has a straight sword, another has a helical sword, a third has a semicircular sword, while the last has a wavy sword. Which one should you pick?
1. There are six different ways to put 2 dots in a 4-square L shape. Arrange the 6 pieces in a 4x6 rectangle so that the 12 dots are connected. You may flip the pieces over.

2. A superstitious pool player didn’t like 8-balls, so he had a 16-ball specially made. When he racked the balls up, he always arranged them so that the each ball was the difference of the 2 balls above it. Can you find the arrangement he used?

3. Japanese yen are made of aluminum, and circuit boards contain copper. Match these elements with the product they are found in.
   - Americium (Am), Bismuth (Bi), Cerium (Ce), Magnesium (Mg), Neodymium (Nd), Polonium (Po), Rhodium (Rh), Titanium (Ti), Tungsten (W), Zirconium (Zr)
   - a. Antistatic brush
   - b. Earbud speaker magnet
   - c. Firestarter bar
   - d. Lightbulb
   - e. Flashbulbs
   - f. Optical reflector
   - g. Safe shotgun shot
   - h. Tennis racket
   - i. Smoke detector
   - j. Lighter flint

4. What is the highest number of pieces a round cake can be cut into with 5 straight vertical cuts?

5. “Reforestation” has the apt anagram “A ton o’ fir trees.” The letters of the word are used to give a clue for the word itself. Find the word clued by each of the following apt anagrams.
   - Is abc’s Blah! Mess!
   - A bar, etc. Deem as minor
   - i.e. Talon Go in, top star
   - Evade it! I call a miscount

6. A piece of land has two corners missing. Can you indicate on the gridlines how the land can be divided into 4 pieces with identical size and shape?

7. A metal dealer bought a golden cube, 10 cm on each side, with a mass of 19.3 kilograms. The density of gold is 19.3 grams per cubic centimeter. It turned out that the cube wasn’t gold. How was the dealer fooled?

8. By multiplying the digits of 679, it takes 5 steps to get to a single figure (679 6×7×9 = 378 3×7×8 = 168 1×6×8 = 48 4×8 = 32 3×2 = 6). What are the smallest numbers for which it takes 3 and 4 steps?

9. 19 = T₂+T₃+T₄ or T₁+T₂+T₅,
   4₁ = T₂+T₄+T₇ or T₄+T₄+T₆,
   4₂ = T₂+T₂+T₈ or T₃+T₅+T₆,
   4₃ = T₁+T₃+T₈ or T₁+T₆+T₆.

What is B₁? Hint: Triangles.
“Here we are at a square table, facing north, south, east, and west, and having the names North, South, East, and West. But none of us has a name that matches the direction we face,” said the man facing north.

“That’s an interesting observation,” Mr. East said, turning to his right. “Don’t you agree, Mr. South?” Where is everyone sitting?

The numbers below are connected when they differ by 1 or 5. What is the fewest possible number of line crossings?

What 2-syllable words starting with L, M, N, O, and P all rhyme with one another?

Add the letters of PRIMATE to the puzzle below so that a chess king could move one square at a time to spell out the phrase “One man’s meat is another man’s poison.”

What do these words have in common?
BALL  LEST  MUSS  POT  TUN

In a 2-player game, each person may remove 1, 2, or 3 coins, but not the same number as the previous player. Whoever takes the last coin or coins wins. If the game starts with 9 coins and it is your turn first, how many should you remove to guarantee a win?

The 12 matches shown make 1 square and 4 triangles. Move the matches so that they make 3 squares and 8 triangles.

What do these words have in common: poll, hock, dock, stifle, flank, withers, crest, cannon, muzzle, chestnut, croup, shank.

In the squares below, which is the greater angle? A+B, or C?

On my broken calculator with keys + - ÷ × =, the only functional number is 7. How can I get 34 to appear in the readout?

Match each country with its national or symbolic bird.

1. Australia   a. bald eagle
2. Bahamas    b. blackbird
3. Canada    c. common loon
4. Germany    d. dodo
5. India    e. emu
6. Japan    f. greater flamingo
7. Mauritius  g. green pheasant
8. Sweden    h. black-bill magpie
9. South Korea  i. blue peafowl
10.United States   j. white stork

On a worn, 39 cm ruler, the only marks remaining are at 0, 8, 15, 17, 20, 21, 31, and 39. What is the shortest distance that cannot be measured between 2 marks?

What do these 12 words have in common: poll, hock, dock, stifle, flank, withers, crest, cannon, muzzle, chestnut, croup, shank.

In the squares below, which is the greater angle? A+B, or C?
1. The water hyacinth is a fast-growing weed, able to double the size of its colony every 2 weeks. A square meter colony of is in a 1-square-kilometer lake. How long does it take to cover the lake?

2. On the map below, the route ABCDEFGHA is an example of a cycle, a journey that ends at the starting point, without reusing any road. ABCDA, BCFGB, CDEF, DEHAD, EFGHE, and GHABG is a set of these cycles that uses every road exactly twice, except for road DG, a new road. Find a set of cycles that uses each road exactly twice.

3. Place words zero, one, two, three, four, five, six, seven, eight, nine, and ten into the puzzle below. The words may read horizontally, vertically, or diagonally. TWO and SEVEN have already been placed.

4. Club member numbers are on transparent badges. Two badges are overlaid, making what looks like 89. Neither badge has 8 or 9, but the sum of the badges is 89. What are the numbers?

5. The letter triple "azz" occurs twice in razzmatazz. What words contain each of the following triples twice?

ach ama ant ard ckt eno hua igh mat ono osc own phi rac tic tor und utt

6. In the diagram below, each circle's inflow equals its outflow. For example, with the circle at the bottom left, the inflow of 19+6 equals the outflow of 25. In addition, all of the flows are different numbers, from 1 to 30. Accordingly, enter the missing values.

7. Where are each of the following created by the body, and where are they removed? All answers are in the box below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Created in</th>
<th>Removed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>blood cells</td>
<td></td>
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<tr>
<td>gastric acid</td>
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<td>insulin</td>
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<td>spleen</td>
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<tr>
<td>bone marrow</td>
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</tbody>
</table>

8. In a foot race, Abe was neither first nor last. Cal beat Doug, Bruce beat Abe, Abe beat Ed but was beaten by Cal, and Doug beat Bruce. Who was last?

9. Raoul asked his brother's wife's mother-in-law's only husband's only daughter to join him and his wife for lunch. What relation is she to Raoul?

10. Move 1 shape to obtain a symmetric figure.
1. On my puzzle shelf, Will Shortz is before Sam Loyd and after Henry Dudeney. Nob Yoshigahara is between Martin Gardner and Dudeney. Also, Gardner is directly before Shortz. What is the order of my puzzle books?

2. In a triangular garden, 4 plants are in a row. Add 6 more plants to make 5 rows of 4 plants. Each plant must be in one of the square plots.

3. One bag of potatoes weighs 30kg plus 1/4 of its weight. Another bag weighs 32kg plus 1/5 of its weight. Which bag is heavier?

4. Divide the shape into two identical pieces.

5. 16 golfers (A to P) play in foursomes over five days. After the first day, they decide on groups for the following days. Fill out the rest of the schedule below so the each golfer plays once each day, and plays just once with every other golfer. Starting hint: on day 5, golfer D cannot play with A, B, or C.

<table>
<thead>
<tr>
<th>day1</th>
<th>day2</th>
<th>day3</th>
<th>day4</th>
<th>day5</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABCD</td>
<td>GIP</td>
<td>M</td>
<td>IN</td>
<td>G</td>
</tr>
<tr>
<td>EFOH</td>
<td>N</td>
<td>FOD</td>
<td>EJ</td>
<td>JOB</td>
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<td>IJKL</td>
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<td>PLH</td>
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<td>AM</td>
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<tr>
<td>MNOP</td>
<td>DK</td>
<td>NK</td>
<td>B</td>
<td>CF</td>
</tr>
</tbody>
</table>

6. You have 15 true coins and 1 fake coin, which is heavier or lighter than the others. With 2 weighings on a balance scale, how do you determine whether the fake coin is heavier or lighter?

7. At a party, each guest had 1/2 a bowl of rice, 1/3 of a bowl of rice, and a 1/4 of a bowl of meat. There are 65 bowls. How many guests were there? (Sun Tsu Suan-Ching, 4th century AD)

8. Place the dominoes on the right into the blank areas in the puzzle so that every row and column contains the dots 1-8.

9. Substitute the numbers 1-9 for the letters a-i to make this equation correct.

\[
\frac{a}{bc} + \frac{d}{ef} + \frac{g}{hi} = 1
\]

Hint: g>d>a, and ef>bc>hi.

The words “determinable” and “bewilderment” share most letters, a and w being the only ones unique to each. Match up the words below that differ by a single letter.

californium  centenarian
groundwater  guttersnipe
infomercial  kitchenware
maintenance  necessarily
parentheses  pretentious
screenplays  spreadsheet
undergrowth  windcheater

3256 has the consecutive pairs 32, 24, 45, and each is the product of single digits (4×8, 5×5, and 7×8). Arrange the digits of 1-9 so that every consecutive pair is the product of single digits.

In the 6×6 grid, insert 12 X’s so that no 3 X’s appear in any column, row, or diagonal.

On 7 different business trips, 15 travellers are put into rows 5 to 9, seats A to C. But none of these 15 ever wind up sitting in the same row. How? Hint: look at problem 1.
1. Which triangle has the greater area? (1 Figure4_Triangles.svg)

2. Three colored cups in a line each have a prominent feature.
   a) blue is left of love.
   b) logo is left of blue.
   c) name is left of love.
   d) gray is left of pink.

   Where is each cup?

3. If 75% of girls are righthanded, 75% long-haired, and 75% brown-eyed, what is the minimal percentage of right-handed, long-haired, brown-eyed girls?

4. In the fractions 19/95, deleting the 9’s gives 1/5. Usually, such a deletion results in the wrong answer, but here it is correct. A longer example is 124/217 = 4/7. In the fractions below, add digits to the blanks so that deletion still gives the right answer.

   \[
   \frac{3}{8} = \frac{1}{2} = \frac{1}{2}
   \]

5. A number with 6 different digits can be input into either keypad below so that every digit horizontally, vertically, or diagonally adjacent to the previous one. If the last digit is lowest than the 1st, what is the number?

6. What do these words have in common?
   pussycat, quagmire, taxicab, bathtub

7. You have 12 kilos of nails and a large 2-pan balance. How can you measure out 9 kilos of nails?

8. Remove the letters EPIC from WIRELESS COMPUTING, and rearrange the remaining letters to form a sport.

9. Add the letters to the word PERCENT and rearrange to form a new word indicated by the clue.
   HIATAL (like this)
   Answer: PARENTHETICAL.

10. There are 6 ways to put 2 holes in an L-tetromino. Place the 6 holey tetrominoes into the figure on the bottom.

11. In lottery A, 6 balls drawn from a bag of 14 consecutively numbered balls have to match the 6 numbers on the ticket. In lottery B, 5 balls drawn from a bag of 15 consecutively numbered balls have to match the 5 numbers on the ticket. Which lottery offers the better odds of winning?

12. A 5-digit number has digits whose sum is 35. Can it be a square?

13. You have 13 different weights labeled from 1 to 13 grams. One of them weighs slightly more or less than its label. With three weighings on a balance scale, identify the inaccurate weight, and whether it is heavier or lighter.
1. In the puzzle below, join each letter pair (AA, BB, etc.) by moving 1 square at a time, horizontally or vertically, so that each shape is 6 squares long and fits together with the rest.

2. What movie genre has 4 consecutive letters of the alphabet in order? What theatre job has the same property?

3. Ali owes Brian a drink. Brian owes Carlo two drinks. Carlo owes Dmitri three drinks. Dmitri owes Ali four drinks. How can the drink debts be settled in the simplest fashion?

4. How many words of 4 or more letters can you make from MACHINE? Rules: each letter may be used only once per word, no hypens, no accents, no proper names.

5. A tour joins up dots in a loop with straight lines. An example of a longest tour is shown here.

For each set of 12 points, find the longest tour.

6. A three letter word related to auctions has an odd property. In CAPITAL letters, it is up/down symmetric. In lowercase letters, it is left/right symmetric. What is it?

7. 23 coins can be packed tightly into a square. How many lines go through the centers of 3 or more coins? Is it possible to pick 7 of these lines to go through the centers of all 23 coins?

8. The repeated digital sum, or digital root of 6788 is 2. (6+7+8+8=29 -> 2+9=11 -> 1+1=2). What is the digital root of the 180-digit number 1011213...96979898, made from the numbers 10 to 99?

9. Match these actors with their birth names.


10. Water at 50° C and 90° C is in 5 liter and 6 liter containers. A 3 liter container is available. How can some 70° C water be obtained?

11. He is noble, He is rare. He can lift you in the air. He will change your timbre, free. So I ask you, who is He?

12. The 9-digit number 2^29 has 9 different digits. Which digit is missing? Hint: The repeated digit sums of 16, 32, 64, and 128, are 7, 5, 1, 2.
1. A garden path loops back to the starting square (S), and crosses itself nine times in the numbered squares. If you follow the path, and count off every other number, the sequence will be 1, 2, 3, 4, 5, 6, 7, 8, 9. All but the two black squares are visited.

2. HAVE A LITTLE FAITH IN ME -- what amazing property does this song title have?

3. With a rubber band, you can make a 5-pointed star with one hand. If the band touches 5 digits, the answer is easy. How can it be done with the band touching just 3 fingers?

4. A person claims that they can instantly count how many paperclips are in a large pile. How can the person be quickly tested?

5. What do these words have in common: buy, bring, catch, fight, seek, teach, think?

6. All the digits occur once in the sum \(7/98 + 4/56 = 3/21\). Find two more sums with the same property, using final fractions \(4/39\) and \(5/48\).

7. Fill in missing letters with a 12-letter word to get 6 words reading across.

   E A T E R
   S R I S E
   F E R A L
   H A I L U T
   D E V E L O P
   A P P L A

8. Benjamin Franklin Goodrich, usually called B. F. Goodrich, was an industrialist whose company still makes tires. If the letters “aiinnnor” are struck out from his full name, what remarkable thing remains?

9. The three 3×4 office areas need to be divided into 6 different shapes, each with area 6 and with extra cubical walls following the grid lines. How can this be done?

10. The six cubical offices above now need to be fit into the 6×6 area. How?

11. Fill in the blanks to get English words and phrases.

   domi___re_ (controlled)
   _do_ ___mi_re (video editor)
   _re_ ___mi_ (peace)
   mi___ re___do_ (mutt)
   _re_ _____mid o___ (Egypt wonder)

12. What do these companies have in common: Citigroup, Ford, Kellogg, Macy’s, Qwest, Ryder, Sprint-Nextel, AT&T, Visa, and United States Steel?

13. In the game of battleships, a 1×4 battleship and other ships are placed on a 10×10 grid. The opponent calls out shots and tries to sink the ships. What is the minimum number of shots needed to guarantee a hit on the battleship?

14. Add numbers 3 to 9 to the figure below so that each line adds to 14.
1. Make a closed loop by joining the black dots with straight lines of different lengths.

2. Divide the below 11×15 rectangle into 9 squares.

3. In the below shape, how many similar copies of the same shape can be found?

4. Fill in the blanks with letters from the roman numerals MDCLXVI:
   _____ _eta__ (very colorful)
   _nse_t__a__ (bug killing)
   _n_a_st__ (simple)
   __e_n_t_a__ (For Bush, W)
   _en_______ (Caesar quote)
   ___e_an__us__ (hot jazz)
   __e_B_e__e (famed director)
   a____e_o_v_n_st (e.g., Dear Abby)
   we___ers_f_e_ (portfolio quality)
   he_a_e___a__g_t (F in FACE)
   ___e_e_a__e__ne (often used leeches)

5. What type of clock has the most moving parts?

6. You take a bowl of soup from a microwave, and turn right. To you, which way does the soup turn?

7. What is the resulting word if you remove the first and last sounds of the word QUARANTINE?

8. A 5×13 piece of carpet has a hole at the center. Divide it along the grid lines into 4 pieces that together can make an 8×8 square.

9. With 5 straight lines, draw through all but two points in the 4×4 grid, without lifting your pen, ending up where you started. Do not go outside the given oval.

10. The hour hand of a watch is exactly on a second mark, and is exactly 18 second marks ahead of the second hand. What time is?

11. In dvxndfurtgdwifoduglnfsimvgrfxtolig
   nwemupqsekroventnjxekplqwusorjrm
   bkhvtpbpqkhxksuwjchacapaqch,
   there is 1 character between each of 4 a's, 2 characters between the 4 b's, 3 between c's, and so on up to 24 characters between the four x's. Do the same with numerals in triplicate, so that there is one digit between the three 1's, 2 digits between the three 2's, and so on. Some digits have been given for you.

12. Finish the second square, so that for any pair of numbers 1 to 16, the chosen pair will be in a row, column, or main diagonal in exactly one of the two squares. Hint: Sum 34.

On, I fly. Off, I float. What am I?

A certain collectible card game has 1 of 50 rare cards in each booster pack. About how many booster packs would be needed to get a complete set of the 50 rare cards? Hint: The solution is helped by the sequence 1/1 + 1/2 + 1/3 + 1/4 + ... .
1. A chess king can move one space in any direction. Show how a king can make a tour of all 21 squares in the board below, with no direction being repeated in any row or column.

```
  * * * *
  * * * *
  * * * *
  * * * *
```

2. Fill in each blank with a number from 0 to 3. Numbers can be re-used.
   __ Number of blanks with a digit < 2.
   __ Number of blanks with a digit = 2.
   __ Number of blanks with a digit > 2.

3. Put numbers 0-9 in the circles so that each line adds to 13.

```
  7  2  4
  9  5  1  6  3  8
  7  2
```

4. Match the beverage with its notable ingredient
   1. Absinthe   a. 130 herbs
   2. Advocaat   b. agave
   3. Ale        c. almond
   4. Amaretto   d. anise
   5. Baijiu     e. apple
   6. Bourbon   f. barley
   7. Chambord   g. cherry
   8. Chartreuse h. corn
   9. Cider      i. egg
  10. Gin       j. honey
  11. Kvass     k. juniper
  12. Limoncello l. lemon
  13. Maraschino m. orange
  14. Mead      n. raspberry
  15. Nocino    o. rice
  16. Ouzo      p. rye
  17. Rum       q. sorghum
  18. Sake      r. sugarcane
  19. Tequila   s. walnut
  20. Triple sec t. wormwood

5. Fibonacci (F) and Lucas (L) get a next term by adding the previous two. What is the rule for F×L?

6. Which is larger, the light area or the dark area?

7. The letters of some phrases can be arranged to make two animals, such as "summer vacation" = "marmoset + vicuna", or "bratmobile" = "mole + rabbit." Rearrange the letters of each of the below phrases to make two well known animals.

   seesaw   hired goons
   XY plane  pack animal
   hay rake  moneymaker
   pillbug   parole board
   war chest Mornay sauce
   town gate morning breath
   Lois Lane health inspector

8. Roulette will double a bet made on red or black, 20/38ths of the time. If you want a 99% chance of being $1 ahead after a series of bets, how much should you be prepared to lose, 1% of the time? How should you bet?

9. In a tiled rectangle, a fault line is a straight line all the way across so that the figure could be divided into two rectangles. An old puzzle is to tile a 5×6 rectangle with 1×2 dominoes without fault lines. Tile the 9×9 square below with 1×3 trominos without any fault lines.

```
  7  4  9
  3  9  2  8  5  6
  7  4  3
  2  8  6  9  1
  6  3  8
  4  1  2  8  9  7
  9
  1  3  4
```

10. In 1599, Galileo called the arc formed by a point on a moving circle a cycloid, and determined that the area under this curve was equal to three circles. He hardly used any math, though. How did he do it?
1. The Plan of Heijo-Kyo (The Ancient City of Nara), is shown below, with the lines indicating streets and alleys. The Imperial Palace is one square. Divide the rest of the city into the fewest number of squares.

2. What do these words and names have in common: bar, cur, Einstein, franc, gall, German, Nobel, sod, Thor, titan, zircon?

3. Arrange seven points so that for any three chosen, two of them will 1 cm apart.

4. Match each delicious item with the primary producer. 1) Côte d'Ivoire 2) India 3) Indonesia 4) Madagascar 5) United States. a) cinnamon b) cocoa c) ginger d) strawberry e) vanilla.

5. A chess king starts at S and ends at E, eventually moving once from every square in the shaded region. The arrows indicate direction of movement. No arrow is repeated in any row or column.

6. Add math symbols to 1, 7, and 7 to make 5.

7. In which figure is the sum of circle diameters the greatest?

8. Match these symbols to their names: 1 ÷, 2 /, 3 |, 4 †, 5 \. a) pipe, b) oblique, c) obelus, d) virgule, e) solidus.

9. There are over 500 rectangles in the cornerless square below. First, determine how many rectangles there are, then remove 30 of the toothpicks so that none of the rectangles remain.

10. Who are these people, and where might they be found: George Spelvin, Alan Smithee, Tommie Atkins, and Richard Roe.

11. Match these symbols to their names: 1 ÷, 2 /, 3 |, 4 †, 5 \. a) pipe, b) oblique, c) obelus, d) virgule, e) solidus.

12. Fill in the circles so that each line has the numbers 1 to 6, and so that no two circles have the same two digits.

13. Add the letters A-Z so that 10 words read across and down. Across clues: like some broth, uneasiness, offers too much, search for water, Cairo locale, fox, Prague resident, uneven.

14. On the Rhind Papyrus in 1680 BC, Ahmes mentioned that some of the math problems he been tasked to copy were really old, even back then. Here's one of them: A quantity added to a quarter of that quantity become 15. What is the quantity?
For several years, I’ve been doing the puzzle column for the Japan Airlines in-flight magazine, Skyward. I hope you’ve enjoyed seeing them.

Ed Pegg Jr

www.mathpuzzle.com
demonstrations.wolfram.com
mathworld.wolfram.com
numb3rs.wolfram.com
www.recmath.org

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For more than 30 years, it was believed that squares with sides 1-23 could not be packed in a 66×66 square. Shigeyoshi Kamakura solved it in 2004. Match his feat. Squares with side 3 and 6 have been placed for you, along with all the holes in the solution. Every fifth line from the edges is darkened as a solving aid.
A feather

It is 8:24. The hour hand can be exactly on a second mark only when the second hand is at 12.