

Hints

One hint for each of the 110 puzzles in *The Puzzles of Henry Dudeney*, numbered as in the book. A hint says where to look; it never gives the answer. Solutions are in the book, in Dudeney's own words.

Part I • Money, Markets and Legacies

- 1. A Post-Office Perplexity** — A crown is sixty pence. Let the number of twopenny stamps be your unknown; everything else follows from it, and only one whole-number choice leaves a remainder that twopence-halfpenny stamps can make up.
- 2. The Widow's Legacy** — Measure everyone in 'widow's shares'. A daughter is two of them and a son is six; count how many shares the whole family holds. Do not be alarmed when the answer refuses to be a round number of pence.
- 3. The Two Aeroplanes** — The two percentages are taken of two different cost prices, not of the £600. Work out what each machine cost before it was sold.
- 4. A Deal In Apples** — Try the possible 'prices per dozen' in turn. The original number of apples must divide a shilling's worth neatly, and so must the number after two more were thrown in.
- 5. The Broken Coins** — Count the three coins in pence first. The same fraction of every coin is lost, so the same fraction of the total is lost — and you know the total that remains.
- 6. The Costermonger's Puzzle** — Five more oranges for the same ten shillings after a fourpence-a-hundred reduction: write the count before and after as ten shillings divided by the two prices, and look for the pair of prices that differ by exactly fourpence.
- 7. The Coinage Puzzle** — Hawkhurst's complaint is the hint. A magic square of whole numbers with sum fifteen must carry its 2 in a corner; this florin is not in a corner. So some cells must hold sums that are not whole shillings — think about which coins make halves and quarters.
- 8. The Grocer And Draper** — Count the cuts, not the pieces. A roll cut into forty-eight one-yard lengths does not need forty-eight cuts.

Part II • Ages, Clocks and Journeys

- 9. Their Ages** — Two-digit ages whose digits are reversed differ by nine times the difference of the digits, and their sum is eleven times the sum of the digits. The 'one-eleventh' then almost solves itself.
- 10. Mother And Daughter** — Add the same unknown number of years to both ages and set the mother's to three times the daughter's.
- 11. Heard On The Tube Railway** — Draw the family tree. 'My mother's mother-in-law' is a grandmother on one particular side, and the gentleman is her son.
- 12. What Was The Time?** — Call the time since noon x hours. The time until noon tomorrow is then $24 - x$. Add a quarter of one to half of the other and demand that the result equals x .
- 13. The Railway Station Clock** — The hands lie along a diagonal of a wall 71 ft 9 in by 10 ft 4 in, and point opposite ways. Find the angle that diagonal makes with the horizontal; then find the one moment after two o'clock when the hands are opposite each other at that angle. Fractions of a minute are unavoidable.
- 14. Average Speed** — Average speed is total distance over total time. Pick any distance you like for the one-way trip and time both legs.

15. **The Two Trains** — After they meet, each train still has to cover the distance the other has already run. The ratio of the times after meeting is the square of the ratio of the speeds.
16. **Drawing Her Pension** — Up at a mile and a half an hour and down at four and a half: for every mile of hill the two legs together take a fixed time. Six hours buys how many such miles?
17. **Donkey Riding** — Write the four quarter-mile times as unknowns, then translate each of the three observations into an equation. You will find that only the last two quarters can be pinned down separately.
18. **The Passenger's Fare** — Mr. Tompkins was in the car for half of the total mileage, and for that half he shared the cost of the car equally with Mr. Smithers.

Part III · Digits, Numbers and Magic Squares

19. **Digits And Squares** — The top number is between 100 and 333, since tripling it must still give three digits. Its first digit is 1, 2 or 3, and the three numbers together must use every digit from 1 to 9 exactly once — so no zeros, and no repeats across rows.
20. **Odd And Even Digits** — Whole numbers cannot do it — the two sums differ by an odd amount. A single simple fraction on each side, built from the digits themselves, closes the gap.
21. **The Three Groups** — Fix the two-digit (or one-digit) multiplier first and think about which digits its product could end in. Dudeney says nine answers exist; the one people miss has a 2 in it and a product under 4,400.
22. **Digital Multiplication** — The two products must be equal, so one multiplication is a rearrangement of the other's factors. Start from the required sum of digits and work backwards to products whose digits are all small — or all large.
23. **Queer Multiplication** — An eight-digit number times 6 gives a nine-digit number, so the number begins with 1. Its last digit times 6 must end in a digit not already used. Trial is expected, but the first and last digits cut it down sharply.
24. **Digital Square Numbers** — A nine-digit pandigital number has digit sum 45, so it is divisible by 9 and its square root is divisible by 3. The smallest candidate root is just above the square root of 123,456,789; the largest just below the root of 987,654,321.
25. **The Labourer's Puzzle** — Read the labourer's words with a lawyer's care: 'twice as deep' means the total will be three times the present depth. The man's height fixes the rest.
26. **Curious Numbers** — You need $n + 1$ and $n/2 + 1$ both square. Write $n + 1 = a^2$ and $n/2 + 1 = b^2$; eliminating n gives a relation between a and b of the kind that has infinitely many solutions, each generating the next.
27. **A Printer's Error** — You want a four-digit number that equals its first digit raised to its second, times its third raised to its fourth. The bases and exponents are all single digits, which leaves very few products of the right size.
28. **A Question Of Definition** — The two phrases describe an area and a shape respectively. Ask which of them says anything about shape.
29. **Simple Multiplication** — Multiplying by 3 and dividing by 2 is multiplying by three-halves. Moving a leading 3 to the end multiplies the remainder by 10 and adds 3. Set the two equal and solve the resulting long-division pattern digit by digit.
30. **A Problem In Squares** — Express five square feet in square inches and look for three squares in arithmetical progression with that common difference. The whole-number case has a known family of solutions; the fractional cases scale the same idea.

- 31. Two New Magic Squares** — ‘Associated’ means that cells symmetric about the centre pair off with a constant difference (or ratio). Build the dividing square from the subtracting one by replacing each number n with a fixed base raised to the power n .
- 32. The Troublesome Eight** — Read the conditions exactly as printed. Dudeney did not say ‘a different whole number’.
- 33. Card Magic Squares** — Scale the given square: if a magic square is multiplied through by a constant, or has a constant added to every cell, it stays magic. Cards only go up to ten, so choose the constants with care.

Part IV · Cutting and Fitting

- 34. The Haberdasher’s Puzzle** — The four pieces hinge into a chain. Two of the cuts start from the midpoints of two sides; the third and fourth are perpendiculars dropped from a midpoint and from one other carefully chosen point onto the same line.
- 35. Two Crosses From One** — One whole cross survives, cut out of the middle of the original. The four leftover pieces are congruent and swing round to form the second cross; the cuts run at forty-five degrees to the arms.
- 36. The Folded Cross** — Two folds bring the four arms on top of each other. After that, one straight cut through all the layers at once produces four identical pieces.
- 37. An Easy Dissection Puzzle** — The figure is a square plus half a square, which is one and a half squares — or twelve of a small triangle. Twelve divides by four.
- 38. An Easy Square Puzzle** — Five pieces of the same area make a square whose side is the square root of five times a unit, so the square’s side is the diagonal of a 1-by-2 rectangle. Four pieces fit round the edge; the fifth is cut once.
- 39. The Chocolate Squares** — Twenty squares into four equal squares means each new square has five cells, so its side is the diagonal of a 1-by-2 rectangle. One such square can be found whole inside the slab.
- 40. The Joiner’s Problem** — Three pieces are enough. The two cuts start from the same point, the midpoint of the long top edge, and run to the corners of the notch.
- 41. The Potato Puzzle** — Every new cut should cross every earlier cut, and no three cuts should pass through the same point. Count how many new pieces each cut can add under that rule.
- 42. The Wizard’s Cats** — The three circles need not be concentric, and they may cross the big circle’s interior freely. Think of each cat as needing its own cell, and let the circles overlap to make the cells.
- 43. The Cushion Covers** — Two squares from a five-by-five: the areas must be $25 = 9 + 16$, so you want a three-by-three and a four-by-four. Each is made from two pieces, and the pattern must run continuously across the join.
- 44. Mrs. Perkins’s Quilt** — Thirteen by thirteen. Squares of side 6, 6 and 7 can occupy three corners; the leftover L-shaped strip is the real puzzle, and eight small squares finish it. Dudeney says eleven is the least.
- 45. Another Linoleum Puzzle** — Count the unit squares in the figure; the total is a perfect square, which tells you the side of the answer. Then look for two matching staircase cuts.
- 46. The Cardboard Box** — Multiply the areas of two faces and divide by the third: what dimension is left, and how many times?
- 47. How To Draw An Oval** — The compasses are ordinary. The paper need not be flat when you draw.
- 48. The Crescent Puzzle** — Let the radius of the large circle be x . The two widths give two segments of the same line through the centre C , and a power-of-a-point relation ties them to x .

- 49. The Eight Sticks** — Every stick lies flat on the table — none rests on another. Sticks have thickness; the puzzle is really about how thick they are.
- 50. The Cone Puzzle** — Write the cylinder's volume in terms of the height at which you cut, using similar triangles for the radius, and find the height that makes it greatest. Dudeney calls the rule simple because the answer is a neat fraction of the altitude.
- 51. The Six Sheep-Pens** — Twelve matches, six equal pens. The pens need not be squares — think of a shape whose triangles share sides.
- 52. The Spider and the Fly** — Unfold the room into a flat net of cardboard and draw a straight line from spider to fly. There are several ways to unfold it; the shortest line uses walls you would not expect the spider to visit.

Part V · Counters, Routes and Crossings

- 53. The Twenty-One Trees** — Symmetry is the way in. A regular pentagon or a star with points on several concentric rings gives many lines through five points; Dudeney offers two arrangements.
- 54. The Twelve Mince-Pies** — Seven rows of four from twelve pies means some pies lie on three rows at once. The four you move should land on the existing lines' crossing points.
- 55. The Educated Frogs** — Ten jumps is the minimum, and the empty tumbler must end at number 7. Work out which colour must move first by counting how far each frog has to travel.
- 56. The Eight Engines** — Only one point is ever empty, so every move slides an engine into the gap. Decide which engine is the immobile one by asking which position is already correct, then plan the gap's tour.
- 57. The Ten Apples** — Draughts-style captures need a straight line of apple, apple, empty. The single transfer you are allowed at the start should create exactly that.
- 58. The Twelve Pennies** — Each move passes over two coins and lands on a third. Notice that moving a coin removes it from the ring, so 'passing over two' gets easier as pairs form.
- 59. The Union Jack** — Count the points where an odd number of lines meet. A single stroke can start and end at odd points but cannot pass through one, so plan the one stroke to leave out as little as possible.
- 60. The Dissected Circle** — Every change of direction starts a new stroke, so count the corners on the star and the arcs on the circle. The star can be drawn without lifting the pencil; the rest costs a few strokes more.
- 61. A Puzzle For Motorists** — Draw the outer pairs first and keep each route hugging its own side of the figure; the inner pairs then have to thread the gaps that are left.
- 62. The Diamond Puzzle** — Count the readings by working inward: from any D there are two ways to reach an I, and from each I two ways to the next letter, until the middle letter forces a return path of the same kind.
- 63. The Voters' Puzzle** — Every reading passes through the single central V. Count the ways of spelling the first half from an outside letter into the V, then square the count, because the second half is the first half run backwards.
- 64. The Honeycomb Puzzle** — Look for a T on the outside, then for an H next to it, and the saying about a cup will suggest itself.
- 65. Crossing The Stream** — The boat carries 150 pounds: two boys, or one adult, or a boy and the dog. Each adult must cross alone, and someone light must bring the boat back every time.
- 66. Five Jealous Husbands** — The boat holds three. Send wives first, bring the boat back with wives, and never leave a wife on either bank with men unless her own husband is there. Dudeney's subtlety is about who rows the empty-ish boat.

- 67. New Measuring Puzzle** — Three quarts in each small measure. The four-quart and five-quart measures can produce a one-quart difference between them; use it to carve out threes, and keep a table of all four vessels.
- 68. The Keg Of Wine** — After each drawing, the fraction of wine left is multiplied by the same factor. Two drawings leave half the keg wine, so that factor squared is one half.
- 69. A Packing Puzzle** — Balls pack more tightly in staggered rows than in a plain grid. Fit rows along the 22.8-inch side, let alternate rows hold one ball fewer, and then stagger the layers as well.
- 70. The Eleven Pennies** — Read ‘leave nine’ as a description of a heap, not of the table.

Part VI · Combinations, Games and the Chessboard

- 71. King Arthur’S Knights** — Seven seats round a table. On each evening, write the two neighbours of every person and cross them off for later; Arthur wants Beleobus two seats away and Galahad opposite.
- 72. A Puzzle For Card-Players** — Fix player A at one table every evening and let the other eleven letters rotate cyclically. If one evening’s tables work, the rotation supplies the rest.
- 73. A Tennis Tournament** — Four couples, two courts, three days. Never let a wife meet her own husband on either side of the net, and let each person face and partner each other person just once.
- 74. Painting The Die** — Place the 1 anywhere: six choices. The 6 is then forced. Count the choices left for the 2, then for the 3, and multiply.
- 75. An Acrostic Puzzle** — How many ordered pairs of letters are there, including a letter paired with itself?
- 76. Lions And Crowns** — Four congruent pieces, each with one lion and one crown. The pieces need not be squares; look for a shape that can be rotated a quarter turn about the centre.
- 77. The Four Lions** — One lion in each row and column is a permutation of four things; there are twenty-four of them, but rotations and reflections group them into classes. Count the classes.
- 78. The Eight Queens** — Start from the twelve fundamental solutions and check each for three queens on any diagonal-ish line — not just the chess diagonals but lines of slope two, or one half. Only one survives.
- 79. The Coloured Counters** — Solve the colours first as a five-by-five diagonal Latin square, then the numbers with a different step, and superimpose. Steps of two and three round the rows work well.
- 80. The Forty-Nine Counters** — Seven letters and seven numbers, each once in every row, column and every diagonal line. Use two different cyclic shifts, one for letters and one for numbers, chosen so that no shift equals one or six.
- 81. The Rook’S Tour** — Sixteen moves. Each move should sweep as long a line as the untouched squares allow, and the tour must return to its own square, which means turning an even number of times.
- 82. The Star Puzzle** — Fourteen strokes with turns only on stars; oblique lines are allowed. Use the long diagonals to strike out several stars in one stroke and save the short moves for the ends.
- 83. Setting The Board** — Multiply the arrangements of each colour’s eight pawns and paired pieces — and then ask whether the board itself can be turned.
- 84. Counting The Rectangles** — A rectangle is fixed by choosing two of the nine vertical lines and two of the nine horizontal lines. Count the squares separately by size.
- 85. Ancient Chinese Puzzle** — Three moves, each piece once: the king must move, so his move cannot be the mating move. Let the rooks take turns.

- 86. The Five Dominoes** — Keep the dominoes in proper sequence and make both totals six. The double-blank is your friend; list the chains systematically by their end values.
- 87. The Pebble Game** — Work backwards from the end: with a few pebbles left, which counts can the player to move turn into a win? Then note that the number you already hold, odd or even, changes what ‘winning’ means.
- 88. Noughts and Crosses** — Try to force a win as the first player against your own best defence, and notice what a corner reply does to a centre opening.

Part VII · Tales from Canterbury and Elsewhere

- 89. The Reve’s Puzzle** — With three stools this is the Tower of Hanoi and the count is a power of two less one. The fourth stool lets you park a small pile out of the way; decide how big that parked pile should be.
- 90. The Pardoner’s Puzzle** — Fifteen straight roads through sixty-four towns, starting at the black one: this is a rook’s tour in disguise. Long sweeps down whole columns, and turns at the edges.
- 91. The Miller’s Puzzle** — Try to keep the middle three sacks in place and rearrange the outer ones; the answer moves only five sacks and makes a number under 200 in the middle.
- 92. The Wife of Bath’s Riddles** — Both riddles turn on a word that can be read two ways — and on who else is in the room.
- 93. The Tapiser’s Puzzle** — One hundred and sixty-nine is thirteen squared, so the finished square is thirteen by thirteen. Two staircase pieces and one small rectangle do it; make the small piece as small as the pattern allows.
- 94. The Puzzle of the Squire’s Yeoman** — Nine arrows on a chequered sign with none in line: three arrows move one square each to a neighbour. Look for the arrows that currently block others’ diagonals.
- 95. The Weaver’s Puzzle** — Four congruent pieces that each hold a lion and a castle: the shape is a stepped one rotated a quarter turn about the centre, and no cut may touch an emblem.
- 96. The Shipman’s Puzzle** — Ten courses joining five islands, each used once, starting and ending at the home island: count the routes round the pentagon systematically, and remember that direction matters.
- 97. The Ploughman’s Puzzle** — Fifteen rows of four from sixteen trees. Place some trees at the intersections of the rows you already have, so that each new tree lies on several lines at once.
- 98. The Friar’s Puzzle** — Partitions of 500 into at most four parts, order ignored. Count the ways for one bag, then two, then three, using each as a running total for the next; or trust Dudeney’s figure and check a small case such as twenty pennies by hand.
- 99. The Donjon Keep Window** — Eight lights with all sides equal in a window a foot on each side: the lights are triangles, and the window that holds them is not the shape you first assumed.
- 100. Crossing the Moat** — The boat has no oars, but it has a rope, and the jester has arms.
- 101. The Chalked Numbers** — One boy is looking particularly pleased with himself. What happens to his number if he turns round?
- 102. Making a Flag** — Two pieces only, and no rose may be cut. Look for a stepped cut that lets the right-hand piece drop by one ‘tooth’.
- 103. The Primrose Puzzle** — Eight letters placed by jumping; the second and eighth letters, and the fourth and sixth, will swap places in the reading, so choose an English flower whose spelling survives that.
- 104. The Two Errand Boys** — At the first meeting the two boys together have covered the whole distance once; at the second, three times. Compare what the slower boy has done in each case.

- 105. On the Ramsgate Sands** — Thirteen children have twelve possible hand-partners each, and each ring uses two of them. Six rings would use them all; Dudeney gives a systematic way to write the six.
- 106. Cutting a Wood Block** — The block is eight by four by three and three-quarters; the pieces are two and a half by one and a half by one and a quarter. Which dimension of the block is not a multiple of any piece dimension?
- 107. A Wonderful Village** — The valley is a red herring. Ask how far away the sun is at noon compared with sunrise — for any place on Earth.
- 108. A Calendar Puzzle** — The Gregorian calendar repeats every 400 years, and the first day of a century (1 January of a year ending in 01, or of a year ending in 00 — Dudeney does not say which) falls on only some weekdays. Work through one full 400-year cycle.
- 109. Jack And The Beanstalk** — Look at the direction in which the beanstalk twines. Real runner beans have a preference.
- 110. Placing Halfpennies** — Coins an inch across, each exactly an inch from the previous one, none touching, all inside 5 by 3. A zigzag lets you place more than a straight run; Dudeney gets thirteen.