

Deducequest — Activity Book

A Spark & Anvil activity book — puzzles, questions, and fun from Deducequest.

Write in the book, circle your answers, and check the Answer Key at the back.

1. code-breaking feedback

Circle the correct answer

1. Secret code: R G B Y. Your guess: R B G Y. How many pegs are EXACT (right colour AND right spot)?
(A) 0 (B) 3 (C) 1 (D) 2
2. Secret code: R G B Y. Your guess: R B G Y. How many are MISPLACED (right colour, WRONG spot)?
(A) 2 (B) 0 (C) 1 (D) 3
3. Secret code: R R G B. Your guess: G R R B. How many pegs are EXACT (right colour AND right spot)?
(A) 2 (B) 3 (C) 1 (D) 0
4. Secret code: R R G B. Your guess: G R R B. How many are MISPLACED (right colour, WRONG spot)?
(A) 2 (B) 0 (C) 3 (D) 1
5. Secret code: B L U E. Your guess: B L U E. How many pegs are EXACT (right colour AND right spot)?
(A) 1 (B) 4 (C) 2 (D) 0
6. Secret code: R G B. Your guess: Y Y Y. How many pegs are EXACT (right colour AND right spot)?
(A) 0 (B) 3 (C) 2 (D) 1

Write the answer

7. Secret code: R G B. Your guess: G R B. How many pegs are EXACT (right colour AND right spot)?

Answer: _____

8. Secret code: R G B. Your guess: G R B. How many are MISPLACED (right colour, WRONG spot)?

Answer: _____

9. Secret code: R G B Y. Your guess: G R Y B. How many pegs are EXACT (right colour AND right spot)?

Answer: _____

10. Secret code: R G B Y. Your guess: G R Y B. How many are MISPLACED (right colour, WRONG spot)?

Answer: _____

Match each question to its answer

1. Secret code: Y Y R G. Your guess: Y R Y G. How many pegs are EXACT (right colour AND right spot)? →

2. Secret code: Y Y R G. Your guess: Y R Y G. How many are MISPLACED (right colour, WRONG spot)? →

3. Secret code: B R B R. Your guess: R B R B. How many pegs are EXACT (right colour AND right spot)? →

4. Secret code: B R B R. Your guess: R B R B. How many are MISPLACED (right colour, WRONG spot)? →

5. Secret code: G O G. Your guess: G G O. How many pegs are EXACT (right colour AND right spot)? →

(A) 4

(B) 2

(C) 2

(D) 1

(E) 0

2. elimination

Circle the correct answer

11. The secret is a colour: red, blue, or green. Clue: "It is NOT red." What colours remain?

(A) red, blue, green (B) blue or green (C) red only (D) red or blue

12. A number is 1, 2, 3, or 4. Clue: "It is even." Which remain?

(A) 1 or 3 (B) 2 only (C) 1, 2, 3, 4 (D) 2 or 4

13. A pet is a cat, dog, or fish. Clue 1: "not a fish." Clue 2: "it barks." The pet is:
(A) a fish (B) a dog (C) cannot tell (D) a cat
14. A code digit is 1-6. Clue: "greater than 3 and even." The digit is:
(A) 4 or 6 (B) 5 (C) 2 (D) 3 or 4
15. Three suspects: Ann, Bo, Cy. Clue: "The culprit's name has 2 letters." Who is it?
(A) Ann or Bo (B) Bo or Cy (C) Ann only (D) Cy only
16. A shape is a circle, square, or triangle. Clue: "It has straight sides." Which remain?
(A) circle only (B) square or triangle (C) circle or square (D) all three

Write the answer

17. A number is 10-20. Clue 1: "even." Clue 2: "digits add to 6." The number is:
Answer: _____
18. Best next question to narrow 8 equally likely codes fastest:
Answer: _____
19. A card is a number 1-9. Clue: "odd and greater than 6." The card is:
Answer: _____
20. You have 4 possible codes left and one guess rules out 3 of them. After that guess you have:
Answer: _____

Match each question to its answer

1. A fruit is apple, banana, or cherry. Clue: "it is yellow." The fruit is: →
2. A digit is 0-9. Clue 1: "not 0." Clue 2: "less than 3." Which remain? →
3. Eliminating impossible options is powerful because: →
4. Suspects: red, blue, green, yellow hats. Clue: "not warm-coloured (not red/yellow)." Who remains? →
5. A 2-digit code has a first digit that is 1, 2, or 3. Clue: "first digit is prime." First digit is: →
- (A) banana
(B) blue or green
(C) 1 or 2
(D) 2 or 3
(E) the truth must be among whatever is left
-

3. code-breaking feedback

Circle the correct answer

21. Secret: 1234. Guess: 1243. How many BULLS (right digit, right place)?
(A) 2 (B) 1 (C) 3 (D) 0
22. Secret: 1234. Guess: 1243. How many COWS (right digit, wrong place)?
(A) 1 (B) 0 (C) 3 (D) 2
23. Secret: 1234. Guess: 4321. How many BULLS (right digit, right place)?
(A) 3 (B) 1 (C) 2 (D) 0
24. Secret: 1234. Guess: 4321. How many COWS (right digit, wrong place)?
(A) 0 (B) 2 (C) 1 (D) 4
25. Secret: 1357. Guess: 1357. How many BULLS (right digit, right place)?
(A) 2 (B) 1 (C) 0 (D) 4
26. Secret: 1234. Guess: 5678. How many BULLS (right digit, right place)?
(A) 1 (B) 2 (C) 3 (D) 0

Write the answer

27. Secret: 1234. Guess: 1256. How many BULLS (right digit, right place)?
Answer: _____
28. Secret: 1234. Guess: 1256. How many COWS (right digit, wrong place)?
Answer: _____
29. Secret: 2468. Guess: 8642. How many COWS (right digit, wrong place)?
Answer: _____
30. Secret: 135. Guess: 153. How many BULLS (right digit, right place)?
Answer: _____

Match each question to its answer

1. Secret: 135. Guess: 153. How many COWS (right digit, wrong place)? →
2. Secret: 7890. Guess: 7809. How many BULLS (right digit, right place)? →
3. Secret: 7890. Guess: 7809. How many COWS (right digit, wrong place)? →
4. Secret: 4321. Guess: 1234. How many BULLS (right digit, right place)? →
5. Secret: 4321. Guess: 1234. How many COWS (right digit, wrong place)? →
- (A) 2
(B) 2
(C) 2
(D) 0

4. logic grid

Circle the correct answer

31. In a logic grid, each person matches exactly ONE item. If a ✓ is placed for "Ann-red", every OTHER cell in Ann's row and red's column becomes:

- (A) another ✓ (B) × (impossible) (C) blank forever (D) ✓

32. Three kids (Ann, Bo, Cy) each like one colour (red, blue, green). Ann=red, Bo=blue. Cy likes:

- (A) blue (B) green (C) cannot tell (D) red

33. If "Bo-dog" is × and Bo has only two pets left (cat, fish), and "Bo-cat" is also ×, then Bo has:

- (A) a fish (B) cannot tell (C) a dog (D) a cat

34. A grid has 4 people and 4 hats. Each person wears exactly one hat and each hat is worn once. This is a:

- (A) many-to-many matching (B) random pairing (C) one-to-one matching (D) one-to-many matching

35. If placing a ✓ at "Cy-blue" forces a × at "Ann-blue", that's because:

- (A) the grid is wrong (B) Ann dislikes blue for fun (C) blue is not allowed (D) each colour belongs to only one person

36. You have a 3×3 grid. After you fill 2 correct ✓s (in different rows and columns), the third ✓ is:

- (A) still a free choice (B) forced (only one cell left) (C) impossible (D) two cells

Write the answer

37. A × in a cell means:

Answer: _____

38. Filling the grid with ×s for impossible pairs helps because:

Answer: _____

39. 4 friends, 4 sports, one each. Ann≠tennis, Ann≠soccer, Ann≠golf. Ann plays:

Answer: _____

40. In a solved logic grid, each row has exactly:

Answer: _____

Match each question to its answer

1. If a column already has its ✓, any remaining blank cell in that column must be: →
 2. Logic grids work because of the rule: →
 3. You see a row with three Xs and one blank (4-item grid). The blank must be: →
 4. A grid clue "Ann is NOT the tallest" lets you place a: →
 5. Why complete BOTH the row and column when you place a ✓? →
- (A) X in Ann-tallest
(B) ✓
(C) each item pairs with exactly one other, once
(D) the ✓ rules out the whole row AND column
(E) X
-

5. logic grid

Circle the correct answer

41. Clue A: "Ann sits next to Bo." Clue B: "Bo is in seat 2." Combining them, Ann is in:
(A) seat 1 or seat 3 (B) cannot tell (C) seat 4 only (D) seat 2
42. Clue A: "The winner wore red." Clue B: "Ann wore blue." Therefore:
(A) Ann wore red (B) cannot tell (C) Ann did not win (D) Ann won
43. Clue A: "The oldest owns a cat." Clue B: "Bo owns a dog." So Bo is:
(A) a cat owner (B) not the oldest (C) the oldest (D) cannot tell
44. Clue A: "Cy is taller than the swimmer." So Cy is:
(A) cannot tell (B) the shortest (C) not the swimmer (D) the swimmer
45. Clue A: "Red is either Ann's or Bo's." Clue B: "Ann likes green." So red is:
(A) Cy's (B) Bo's (C) Ann's (D) nobody's
46. Clue A: "The doctor is not Ann." Clue B: "The doctor is not Cy." With 3 people (Ann, Bo, Cy), the doctor is:
(A) cannot tell (B) Cy (C) Ann (D) Bo

Write the answer

47. Clue A: "Bo scored higher than Ann." Clue B: "Cy scored higher than Bo." Rank highest to lowest:
Answer: _____

48. Clue A: "The prize is in box 1 or 2." Clue B: "The prize is not in an odd-numbered box." Prize is in:

Answer: _____

49. Why is cross-referencing two clues powerful?

Answer: _____

50. Clue A: "Ann–Monday X." Clue B: "The Monday person plays chess." Ann does NOT:

Answer: _____

Match each question to its answer

1. Clue A: "Exactly one of Ann/Bo lied." Clue B: "Ann told the truth." So: →

2. Clue A: "The tallest plays basketball." Clue B: "Ann is the tallest." So Ann: →

3. Combining "X is left of Y" and "Y is left of Z" tells you the order: →

4. Clue A: "The cat owner lives in house 3." Clue B: "Bo lives in house 3." So Bo: →

5. If clue A rules out 2 options and clue B rules out a different 2 (of 4 total), together they leave: →

(A) plays basketball

(B) owns the cat

(C) 0 options — a contradiction, OR you must re-check

(D) Bo lied

(E) X, Y, Z (left to right)

6. picture logic

Circle the correct answer

51. A row of 5 cells has the clue "5". How many cells are filled?

(A) 4 (B) 5 (all of them) (C) 0 (D) 3

52. A row of 5 cells has the clue "0" (or blank). How many are filled?

(A) 1 (B) 0 (none) (C) 2 (D) 5

53. A row of 5 with clue "4": how many cells are filled in TOTAL?

(A) 3 (B) 1 (C) 4 (D) 5

54. A row of 5 with clue "4". The run can start at cell 1 or 2. Which cells are ALWAYS filled?

(A) only cell 1 (B) cells 2, 3, 4 (the overlap) (C) none for certain (D) all 5

55. A row of 3 with clue "1 1" (two runs of 1 with a gap). The only arrangement is:

(A) blank, filled, filled (B) all filled (C) filled, filled, blank (D) filled, blank, filled

56. In a nonogram, the numbers on a line tell you:

(A) the colours (B) the total cells (C) the lengths of filled runs, in order (D) nothing

Write the answer

57. Between two separate runs on a line there must be at least:

Answer: _____

58. A row of 6 with clue "2 2". Minimum cells needed = $2 + \text{gap}(1) + 2 =$

Answer: _____

59. A row of 5 with clue "5" — since it fills everything, cell 3 is:

Answer: _____

60. A row of 4 with clue "3". The overlap (always-filled cells) is:

Answer: _____

Match each question to its answer

1. A completed line has clue "1 2". Reading left to right, you see: →

2. If a length-5 line has clue "2 2", how many cells are filled in total? →

3. A length-5 line with clue "2 2" fits exactly one way. It is: →

4. Nonograms are called "picture logic" because: →

5. A column clue "3" on a 3-tall column means the column is: →

(A) one filled, gap, then two filled

(B) 4

(C) solving the grid reveals a picture

(D) fill, fill, blank, fill, fill

(E) completely filled

7. logical reasoning

Circle the correct answer

61. Rule: "If it is a cat, then it is not a dog." Fido is a dog. Therefore Fido is:

(A) cannot tell (B) not a cat (C) a cat (D) both

62. "If Ann is the winner, she is in seat 1." Ann is in seat 3. So Ann:

(A) cannot tell (B) is the winner (C) is not the winner (D) is in seat 1

63. Assuming "the code starts with 5" leads to a rule being broken. This means:

(A) the rule is wrong (B) nothing (C) the code does NOT start with 5 (D) the code starts with 5

64. A contradiction is:

(A) two statements that agree (B) a single fact (C) a guess (D) two statements that cannot both be true

65. "All the boxes are empty" and "Box 2 has a coin" — together these are:

(A) unrelated (B) both true (C) the same statement (D) a contradiction

66. If assuming a suspect is guilty creates NO contradiction, then:

(A) the case is closed (B) they are innocent (C) they remain a possible suspect (D) they are definitely guilty

Write the answer

67. "If the door is red, it is locked." The door is unlocked. Therefore the door is:

Answer: _____

68. To PROVE something by contradiction, you:

Answer: _____

69. Rule: "Exactly one statement is true. (1) It's red. (2) It's blue." If (1) is true, then (2) must be:

Answer: _____

70. Two clues contradict each other. This tells you:

Answer: _____

Match each question to its answer

1. "If Bo lies, then Cy tells the truth." Bo lies. Therefore Cy: →

2. "If it rained, the ground is wet." The ground is dry. So: →

3. A valid proof leaves: →

4. "The treasure is in room A or B. It is not in A." Proof shows it is in: →

5. If your chain of deductions reaches a contradiction, the correct response is to: →

(A) tells the truth

(B) go back and change the last uncertain assumption

(C) room B

(D) no possible way for the conclusion to be false

(E) it did not rain

8. scientific reasoning

Circle the correct answer

71. You see $2 \rightarrow 4$, $3 \rightarrow 6$, $5 \rightarrow 10$. A good hypothesis for the rule is:

(A) output = input + 2 (B) output = input + 3 (C) output = input $\times$ 2 (D) output = input squared

72. A hypothesis is:

(A) a testable, proposed explanation (B) a proven fact (C) a final answer (D) a random guess with no reason

73. Inputs 1,2,3 give 1,4,9. The best hypothesis is:

(A) output = input $\times$ 2 (B) output = input $\times$ 3 (C) output = input + 3 (D) output = input $\times$ input (squared)

74. A good hypothesis must be:

(A) always true by definition (B) about your feelings (C) possible to test with evidence (D) impossible to check

75. You notice plants by the window grow taller. Hypothesis:

(A) tall plants move to windows (B) windows are magic (C) more light makes plants grow taller (D) plants like windows

76. Sequence 3,6,9,12. Hypothesis for the next term:

(A) 16 (B) 13 (C) 15 (add 3 each time) (D) 18

Write the answer

77. Two hypotheses fit the data so far. A scientist should:

Answer: _____

78. Inputs A,B,C $\rightarrow$ 2,4,6 where A=1,B=2,C=3. Hypothesis:

Answer: _____

79. A hypothesis that CANNOT be proven wrong by any test is:

Answer: _____

80. You see: red cards are all odd numbers (so far). Hypothesis:

Answer: _____

Match each question to its answer

1. The rule gives $10 \rightarrow 5$, $8 \rightarrow 4$, $6 \rightarrow 3$. Hypothesis: $\rightarrow$

2. A hypothesis differs from a fact because a hypothesis is: $\rightarrow$

3. Sequence 1,2,4,8. Hypothesis for the next term: →
4. Good hypotheses are often: →
5. You guess a rule from 3 examples. Before trusting it, you should: →
- (A) 16 (double each time)
 - (B) simple explanations that fit all the data
 - (C) still being tested
 - (D) test it on a NEW example
 - (E) $\text{output} = \text{input} \div 2$
-

9. scientific reasoning

Circle the correct answer

81. Your hypothesis: "output = input + 2". The best test is an input where a rival rule would DIFFER, such as:

- (A) input 2 (both +2 and $\times 2$ give 4) (B) an input you already tried (C) input 0 (gives 2 for +2, but 0 for $\times 2$) (D) no input

82. A good test of a hypothesis is one that:

- (A) ignores the hypothesis (B) could prove it WRONG if it's wrong (C) you already know passes (D) can only confirm it

83. Hypotheses A (" $\times 2$ ") and B (" $+2$ ") both fit $2 \rightarrow 4$. To tell them apart, test:

- (A) input 2 (both give 4) (B) input 2 again (C) no test needed (D) input 3 ($A \rightarrow 6$, $B \rightarrow 5$)

84. Confirming a hypothesis once does NOT prove it because:

- (A) the next case might still break it (B) hypotheses can't be tested (C) one test is always enough (D) confirmation is proof

85. The most informative test is one where your rival hypotheses:

- (A) are ignored (B) predict the same result (C) predict DIFFERENT results (D) predict nothing

86. You test "all red cards are odd" by flipping a red card. This test can DISPROVE it if the card is:

- (A) a picture (B) even (C) odd (D) red

Write the answer

87. To test "red cards are odd", which card is most useful to check?

Answer: _____

88. If a test result matches your prediction, your hypothesis is:

Answer: _____

89. If a test result CONTRADICTS your prediction, then:

Answer: _____

90. A "control" case in a test is:

Answer: _____

Match each question to its answer

1. Testing your OWN idea by trying to break it is good because: →

2. Rules A ("input+1") and B ("input²") both fit 1→? A says 2, B says 1 for input 1. So input 1: →

3. A test that would give the same result no matter which hypothesis is true is: →

4. After a hypothesis passes many strong tests, scientists treat it as: →

5. You predict "if I add salt, ice melts faster." The test is fair only if you: →

(A) already separates them

(B) change ONLY the salt and keep everything else the same

(C) useless for choosing between them

(D) well-supported (a reliable working idea)

(E) it finds mistakes before others do

10. scientific reasoning

Circle the correct answer

91. A fair test changes:

(A) one variable at a time (B) everything at once (C) two variables at once (D) nothing

92. To test if fertilizer helps plants, you should keep the SAME:

(A) plant type different (B) nothing (C) water, light, and soil for both plants (D) fertilizer amount only

93. The variable you deliberately change is the:

(A) independent variable (B) control (C) constant (D) dependent variable

94. The variable you measure as a result is the:

(A) constant (B) independent variable (C) dependent variable (D) control

95. Variables you keep the SAME on purpose are called:

(A) independent variables (B) controlled variables (constants) (C) dependent variables (D) random variables

96. You change both the light AND the water for a plant, and it grows taller. You CANNOT tell:

(A) the plant is alive (B) which change caused the growth (C) that it grew (D) the colour

Write the answer

97. A "control group" is used to:

Answer: _____

98. Testing if music helps studying: independent variable =

Answer: _____

99. In that music study, the dependent variable is:

Answer: _____

100. If your two test plants are different SIZES to start, the test is:

Answer: _____

Match each question to its answer

1. Why change only ONE variable? →

2. You test paper-plane designs. To be fair, you should throw each plane: →

3. A result you can't trust because two things changed at once is called: →

4. More trials (repeats) of a test help by: →

5. You test soda temperature's effect on fizz. You MUST keep constant: →

(A) so any difference in the result has a single clear cause

(B) confounded

(C) reducing the effect of random luck

(D) with the same force from the same spot

(E) the type and amount of soda

11. picture logic

Circle the correct answer

101. A cell is FILLED by its row solution but its column clue is "0" (empty). This means:
(A) a contradiction — recheck your work (B) leave it blank and ignore the row (C) the puzzle has two answers (D) fill it anyway

102. If a column clue forces cell (2,3) FILLED and the row also allows it filled, you can:
(A) confirm it filled (B) ignore both (C) guess (D) mark it blank

103. Solving nonograms uses BOTH row and column clues because:
(A) only rows matter (B) only columns matter (C) clues are optional (D) each cell must satisfy its row AND its column

104. A row deduction says cell (1,4) is BLANK; the column later says it must be FILLED. The correct move:
(A) fill it and move on (B) find and fix the earlier mistake (C) leave it both (D) erase the whole grid

105. After filling certain cells from rows, you should:
(A) stop (B) re-check columns for new forced cells (C) only do rows (D) erase the rows

106. A column of 5 has clue "5"; this forces every cell in that column FILLED, which then tells each crossing ROW that:
(A) one of its cells (in that column) is filled (B) the row is empty (C) nothing (D) its clue is wrong

Write the answer

107. The intersection technique means:
Answer: _____

108. If a cell is FILLED by both its row overlap and column overlap, confidence is:
Answer: _____

109. A column clue "0" means every cell in it is blank, so any ROW deduction that fills one of those cells is:
Answer: _____

110. Best cells to solve first in a big nonogram are:
Answer: _____

Match each question to its answer

1. Marking a cell BLANK (with an X) is useful because it: →

2. Row 1 must have its single filled cell somewhere in columns 1-3, and column 3's clue forces its top cell blank. So row 1's cell is in: →

3. When row and column clues are BOTH satisfied for every cell, the puzzle is: →

4. A good nonogram solver treats a contradiction as: →
5. Column clues and row clues together make a nonogram have: →
- (A) exactly one consistent solution
 - (B) constrains the crossing line too
 - (C) solved
 - (D) column 1 or 2
 - (E) a signal to backtrack, not a dead end
-

12. information

Circle the correct answer

111. You have 8 possible codes. The BEST guess is one that:
(A) rules out only 1 code (B) rules out 0 codes (C) you already know is right (D) splits them into groups of about 4 and 4
112. Guess A can leave you with 1 or 7 codes; guess B always leaves 4. In the WORST case, which is better?
(A) guess A (B) they are equal (C) neither (D) guess B (worst case $4 < 7$)
113. The amount a guess reduces your uncertainty is its:
(A) information value (B) cost (C) colour (D) luck
114. A guess that CAN'T change based on the answer gives:
(A) half the codes (B) the most information (C) the answer (D) no information
115. With 16 codes, the fewest halving guesses to reach 1 is about:
(A) 8 (B) 1 (C) 16 (D) 4 ($16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$)
116. Guessing to CONFIRM what you already believe (instead of to learn) is:
(A) impossible (B) always required (C) the best strategy (D) wasteful — it may add no information

Write the answer

117. If a guess would leave you with the SAME number of codes no matter the feedback, it:
Answer: _____
118. Best-guess strategy focuses on:
Answer: _____

119. You can win in the fewest guesses by each turn:

Answer: _____

120. With 2 codes left, the best guess:

Answer: _____

Match each question to its answer

1. Even a "wrong" guess is valuable when it: →
 2. A guess that could leave 1, 1, or 6 codes (depending on feedback) has a worst case of: →
 3. Between a guess with worst case 3 and one with worst case 5, pick: →
 4. Thinking about "which guess eliminates the most?" is the core of: →
 5. If two guesses have the same worst case, a tiebreaker is: →
- (A) 6
 - (B) worst case 3
 - (C) information-efficient deduction
 - (D) eliminates possibilities
 - (E) which does better on average across feedbacks
-

13. probability

Circle the correct answer

121. A bag has 3 red and 1 blue marble. The chance of drawing red is:

(A) 1 out of 2 (B) 3 out of 1 (C) 1 out of 4 (D) 3 out of 4

122. 4 equally likely codes remain. The chance your single guess is right is:

(A) 1 out of 4 (B) 1 out of 2 (C) 0 (D) 4 out of 4

123. If evidence makes code X twice as likely as each of the other three, X is:

(A) equally likely (B) the most likely single code (C) the least likely (D) impossible

124. "Likely" means:

(A) exactly 50% (B) impossible (C) certain (D) more probable than not (better than 50%)

125. Rolling a fair 6-sided die, the chance of an even number is:

(A) 1 out of 2 (B) 1 out of 6 (C) 5 out of 6 (D) 1 out of 3

126. Partial evidence rules out 2 of 5 suspects, leaving 3 equally likely. Each remaining suspect's chance is:

(A) 1 out of 5 (B) 2 out of 5 (C) 1 out of 2 (D) 1 out of 3

Write the answer

127. An event with probability 0 is:

Answer: _____

128. An event with probability 1 is:

Answer: _____

129. If a clue is TWICE as likely when suspect A is guilty than when innocent, the clue:

Answer: _____

130. Two fair coins are flipped. The chance of two heads is:

Answer: _____

Match each question to its answer

1. The most likely explanation given the evidence is the one that: →

2. A weather forecast of "70% rain" means: →

3. You draw 1 of 3 hidden codes; a clue matches 2 of them. Given the clue, the chance your code is one of those 2 is: →

4. Reasoning with probabilities is useful when you: →

5. If suspect A fits 3 clues and B fits 1 of the same 3, then A is: →

(A) more likely (fits more evidence)

(B) best fits (makes the evidence most expected)

(C) higher than before the clue

(D) can't be certain but some options are more likely

(E) rain is more likely than not

14. reasoning types

Circle the correct answer

131. DEDUCTIVE reasoning goes from:

(A) specific examples to a general guess (B) feelings to facts (C) guesses to rules
(D) general rules to a certain specific conclusion

132. INDUCTIVE reasoning goes from:

(A) conclusions to premises (B) rules to rules (C) general rules to certainty (D)
specific examples to a general (probable) rule

133. "All cats are mammals. Tom is a cat. So Tom is a mammal." This is:

(A) inductive (probable) (B) deductive (certain) (C) a hypothesis (D) a guess

- 134.** "Every swan I've seen is white, so all swans are white." This is:
(A) deductive (certain) (B) inductive (probable, not certain) (C) a proof (D) a contradiction
- 135.** Deductive conclusions are CERTAIN when:
(A) they feel right (B) they are popular (C) you have many examples (D) the premises are true and the logic is valid
- 136.** Inductive conclusions are:
(A) always wrong (B) never useful (C) always certain (D) probable but could be wrong

Write the answer

- 137.** A scientist forming a rule from many experiments is using mostly:
Answer: _____
- 138.** A mathematician proving a theorem from axioms is using mostly:
Answer: _____
- 139.** The weakness of induction is that:
Answer: _____
- 140.** The strength of deduction is that:
Answer: _____

Match each question to its answer

1. "The last 5 times I dropped this, it fell. So it will fall again." This is: →
 2. Both types of reasoning are useful because: →
 3. "All squares have 4 sides. This shape is a square. So it has 4 sides." is: →
 4. A detective who narrows suspects using firm rules ("the culprit is left-handed; X is right-handed, so not X") uses: →
 5. A detective who guesses a motive from patterns across many cases uses: →
- (A) induction
(B) deductive
(C) induction finds likely rules; deduction draws certain conclusions from them
(D) inductive
(E) deduction
-

15. explanation

Circle the correct answer

141. A good explanation is one that:

(A) sounds impressive (B) ignores the evidence (C) is the longest (D) is supported by evidence and accounts for the observations

142. To justify a conclusion, you should provide:

(A) only the conclusion (B) a louder claim (C) evidence and reasoning linking it to that evidence (D) an unrelated fact

143. Two explanations fit the evidence equally. The better one is usually the:

(A) more complicated one (B) one you like (C) longer one (D) simpler one (fewer assumptions)

144. "The plant died because I forgot to water it, and dry soil kills plants" is a good explanation because it:

(A) is short (B) uses big words (C) blames the plant (D) gives a cause AND the reasoning

145. An explanation that no evidence could ever contradict is:

(A) scientific (B) weak (it explains nothing testable) (C) the strongest (D) proven

146. The "claim–evidence–reasoning" pattern means:

(A) reasoning only (B) evidence only (C) claim only (D) state a claim, give evidence, explain how the evidence supports it

Write the answer

147. Evidence in an explanation should be:

Answer: _____

148. If new evidence contradicts your explanation, you should:

Answer: _____

149. An explanation is stronger when it:

Answer: _____

150. The reasoning part of an explanation:

Answer: _____

Match each question to its answer

1. "It rained because the ground is wet" can be WEAK because: →
2. A complete explanation rules out or addresses: →
3. Justifying an answer in math means: →
4. The best explanation among several is the one that: →
5. An explanation without evidence is: →

- (A) wet ground could have other causes (a sprinkler)
 - (B) fits the evidence best with the fewest extra assumptions
 - (C) just an assertion (an unsupported claim)
 - (D) reasonable alternative explanations
 - (E) showing the steps/reasons that lead to it
-

16. scientific method

Circle the correct answer

151. The scientific method usually starts with:

- (A) a question or observation (B) a guess with no reason (C) a conclusion (D) a prize

152. After a question, the next step is to:

- (A) give up (B) form a testable hypothesis (C) declare it proven (D) publish results

153. Predict → Observe → Explain (POE) means:

- (A) explain first, then guess (B) skip the prediction (C) commit a prediction, watch what happens, then reconcile why (D) observe only

154. Why predict BEFORE observing?

- (A) it wastes time (B) predictions are cheating (C) the answer changes (D) committing a prediction helps you learn from the result (even a wrong one)

155. A wrong prediction in POE is:

- (A) proof you're bad at science (B) meaningless (C) a failure to hide (D) useful — it exposes a misconception to fix

156. To test a hypothesis fairly you must:

- (A) control variables (change one thing at a time) (B) guess the result (C) change everything (D) skip the control

Write the answer

157. Your data contradicts your hypothesis. The scientific response is to:

Answer: _____

158. A conclusion should be:

Answer: _____

159. "All metals I tested expand when heated" is what kind of reasoning?

Answer: _____

160. "This is metal; metals expand when heated; so this will expand" is:

Answer: _____

Match each question to its answer

1. A code-breaker eliminating impossible codes from feedback is using: →

2. When several codes remain equally likely, the best guess is one that: →

3. A logic-grid deduction ("Ann≠red, Ann≠blue → Ann=green") is: →

4. A nonogram's overlap technique relies on: →

5. If two explanations fit equally, prefer the one that is: →

(A) eliminates the most possibilities

(B) deductive and certain

(C) simpler

(D) what MUST be true regardless of run position

(E) deduction (ruling out the impossible)

Riddle & Joke Break

Guess the answer, then check the key!

161. In a code-guessing game, "2 black pegs" means 2 of your guessed items are the right color AND in the right spot. If a 4-item guess earns 4 black pegs, what does that mean?

162. A white peg means "right color, wrong spot." If your guess earns all white pegs and no black, what do you know?

163. You guess a 3-digit code as 123 and get zero feedback pegs of any kind. What have you learned?

164. The secret is a number from 1 to 100. You may only ask "is it higher or lower?" What's the smartest first guess?

165. You know the code uses the colors red and blue only, across 2 slots. How many possible codes are there?

166. Your guess earns 1 black peg and 1 white peg on a 4-item code. How many of your 4 items appear in the code at all?

- 167.** A code has 3 slots, each a digit 0-9, with no repeats allowed. How many possible codes are there?
- 168.** You've narrowed the code to two possibilities: 42 or 47. What single guess can tell them apart for sure?
- 169.** Why did the code-breaker never give up?
- 170.** Why did the detective love Mastermind?
- 171.** Why did the secret code feel nervous?
- 172.** Why did the feedback peg feel so honest?
- 173.** Why did the guess wear a lab coat?
- 174.** Why did the process of elimination feel unstoppable?

Fun Facts

- Did you know? The board game Mastermind was invented in 1970 by Mordecai Meirowitz, an Israeli telecommunications expert. It has sold over 55 million copies worldwide!
- Did you know? Mathematicians proved that any Mastermind code (4 slots, 6 colors) can ALWAYS be cracked in 5 guesses or fewer with the perfect strategy -- no matter how tricky the code is!
- Did you know? "Binary search" -- always guessing the middle of the remaining range -- can find any number from 1 to a million in just 20 guesses, because each guess cuts the possibilities in half!
- Did you know? A wrong guess is valuable information, not a failure. Good code-breakers learn MORE from a guess that's mostly wrong than from a lucky partial hit -- it rules out more possibilities!
- Did you know? The best FIRST guess in code-breaking isn't a random one -- it's chosen to give the most information no matter what the answer is. Great openings set up fast wins!
- Did you know? Scientists use exactly this kind of reasoning: they form a hypothesis (a guess), test it, read the feedback (the results), and refine. Code-breaking is the scientific method in miniature!
- Did you know? The number of possible 4-slot, 6-color codes (with repeats) is $6 \times 6 \times 6 \times 6 = 1,296$. Cracking one in 5 guesses means narrowing 1,296 options down to 1 with amazing efficiency!
- Did you know? Filling every slot with a single color is a clever "probe" -- the feedback tells you EXACTLY how many of that color the code contains, all in one

guess!

Answer Key

1. D — 2
2. A — 2
3. A — 2
4. A — 2
5. B — 4
6. A — 0
7. 1
8. 2
9. 0
10. 4
Matching (code-breaking feedback): $1 \rightarrow B$, $2 \rightarrow B$, $3 \rightarrow E$, $4 \rightarrow A$, $5 \rightarrow D$
11. B — blue or green
12. D — 2 or 4
13. B — a dog
14. A — 4 or 6
15. B — Bo or Cy
16. B — square or triangle
17. no such even number... 15 (odd)? Recheck: $15 \rightarrow 1+5=6$ but odd
18. a yes/no question that splits them 4 and 4
19. 7 or 9
20. 1 code left (solved)
Matching (elimination): $1 \rightarrow A$, $2 \rightarrow C$, $3 \rightarrow E$, $4 \rightarrow B$, $5 \rightarrow D$
21. A — 2
22. D — 2

23. D — 0

24. D — 4

25. D — 4

26. D — 0

27. 2

28. 0

29. 4

30. 1

Matching (code-breaking feedback): $1 \rightarrow A$, $2 \rightarrow A$, $3 \rightarrow A$, $4 \rightarrow D$, $5 \rightarrow E$

31. B — $\times$ (impossible)

32. B — green

33. A — a fish

34. C — one-to-one matching

35. D — each colour belongs to only one person

36. B — forced (only one cell left)

37. that pairing is impossible

38. the remaining open cells reveal the true matches

39. the 4th sport

40. one $\checkmark$

Matching (logic grid): $1 \rightarrow E$, $2 \rightarrow C$, $3 \rightarrow B$, $4 \rightarrow A$, $5 \rightarrow D$

41. A — seat 1 or seat 3

42. C — Ann did not win

43. B — not the oldest

44. C — not the swimmer

45. B — Bo's

46. D — Bo

47. Cy, Bo, Ann

48. box 2

49. together they can pin down what neither does alone
50. play chess on Monday (she isn't the Monday person)
Matching (logic grid): $1 \rightarrow D, 2 \rightarrow A, 3 \rightarrow E, 4 \rightarrow B, 5 \rightarrow C$
51. B — 5 (all of them)
52. B — 0 (none)
53. C — 4
54. B — cells 2, 3, 4 (the overlap)
55. D — filled, blank, filled
56. C — the lengths of filled runs, in order
57. one empty cell
58. 5
59. filled
60. cells 2 and 3
Matching (picture logic): $1 \rightarrow A, 2 \rightarrow B, 3 \rightarrow D, 4 \rightarrow C, 5 \rightarrow E$
61. B — not a cat
62. C — is not the winner
63. C — the code does NOT start with 5
64. D — two statements that cannot both be true
65. D — a contradiction
66. C — they remain a possible suspect
67. not red
68. assume the opposite and show it leads to an impossibility
69. false
70. at least one clue (or an earlier step) is wrong
Matching (logical reasoning): $1 \rightarrow A, 2 \rightarrow E, 3 \rightarrow D, 4 \rightarrow C, 5 \rightarrow B$
71. C — output = input $\times$ 2
72. A — a testable, proposed explanation
73. D — output = input $\times$ input (squared)

- 74. C — possible to test with evidence
- 75. C — more light makes plants grow taller
- 76. C — 15 (add 3 each time)
- 77. design a test that they disagree on
- 78. $\text{output} = \text{input} \times 2$
- 79. not a good scientific hypothesis
- 80. red cards are odd
Matching (scientific reasoning): $1 \rightarrow E, 2 \rightarrow C, 3 \rightarrow A, 4 \rightarrow B, 5 \rightarrow D$
- 81. C — input 0 (gives 2 for +2, but 0 for $\times 2$)
- 82. B — could prove it WRONG if it's wrong
- 83. D — input 3 ($A \rightarrow 6, B \rightarrow 5$)
- 84. A — the next case might still break it
- 85. C — predict DIFFERENT results
- 86. B — even
- 87. a red card (does it break the rule?)
- 88. supported (but not proven)
- 89. the hypothesis is wrong (or the test was flawed)
- 90. a case where you know what SHOULD happen, for comparison
Matching (scientific reasoning): $1 \rightarrow E, 2 \rightarrow A, 3 \rightarrow C, 4 \rightarrow D, 5 \rightarrow B$
- 91. A — one variable at a time
- 92. C — water, light, and soil for both plants
- 93. A — independent variable
- 94. C — dependent variable
- 95. B — controlled variables (constants)
- 96. B — which change caused the growth
- 97. compare against the group that got the change
- 98. whether music plays
- 99. the test score

100. unfair (size is an uncontrolled variable)
Matching (scientific reasoning): $1 \rightarrow A, 2 \rightarrow D, 3 \rightarrow B, 4 \rightarrow C, 5 \rightarrow E$
101. A — a contradiction — recheck your work
102. A — confirm it filled
103. D — each cell must satisfy its row AND its column
104. B — find and fix the earlier mistake
105. B — re-check columns for new forced cells
106. A — one of its cells (in that column) is filled
107. combining row and column clues to force a cell
108. high — two independent deductions agree
109. wrong
110. long runs relative to the line (big overlaps)
Matching (picture logic): $1 \rightarrow B, 2 \rightarrow D, 3 \rightarrow C, 4 \rightarrow E, 5 \rightarrow A$
111. D — splits them into groups of about 4 and 4
112. D — guess B (worst case $4 < 7$)
113. A — information value
114. D — no information
115. D — 4 ($16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$)
116. D — wasteful — it may add no information
117. is a poor guess
118. the worst case, to guarantee progress
119. maximizing information gained
120. is one that distinguishes the two
Matching (information): $1 \rightarrow D, 2 \rightarrow A, 3 \rightarrow B, 4 \rightarrow C, 5 \rightarrow E$
121. D — 3 out of 4
122. A — 1 out of 4
123. B — the most likely single code
124. D — more probable than not (better than 50%)

- 125. A — 1 out of 2
- 126. D — 1 out of 3
- 127. impossible
- 128. certain
- 129. makes A more likely to be guilty
- 130. 1 out of 4
Matching (probability): $1 \rightarrow B$, $2 \rightarrow E$, $3 \rightarrow C$, $4 \rightarrow D$, $5 \rightarrow A$
- 131. D — general rules to a certain specific conclusion
- 132. D — specific examples to a general (probable) rule
- 133. B — deductive (certain)
- 134. B — inductive (probable, not certain)
- 135. D — the premises are true and the logic is valid
- 136. D — probable but could be wrong
- 137. inductive reasoning
- 138. deductive reasoning
- 139. a future example might break the rule
- 140. its conclusion is guaranteed if the premises hold
Matching (reasoning types): $1 \rightarrow D$, $2 \rightarrow C$, $3 \rightarrow B$, $4 \rightarrow E$, $5 \rightarrow A$
- 141. D — is supported by evidence and accounts for the observations
- 142. C — evidence and reasoning linking it to that evidence
- 143. D — simpler one (fewer assumptions)
- 144. D — gives a cause AND the reasoning
- 145. B — weak (it explains nothing testable)
- 146. D — state a claim, give evidence, explain how the evidence supports it
- 147. relevant and accurate
- 148. revise the explanation
- 149. is supported by multiple independent pieces of evidence
- 150. connects the evidence to the claim

Matching (explanation): $1 \rightarrow A$, $2 \rightarrow D$, $3 \rightarrow E$, $4 \rightarrow B$, $5 \rightarrow C$

- 151. A — a question or observation
- 152. B — form a testable hypothesis
- 153. C — commit a prediction, watch what happens, then reconcile why
- 154. D — committing a prediction helps you learn from the result (even a wrong one)
- 155. D — useful — it exposes a misconception to fix
- 156. A — control variables (change one thing at a time)
- 157. revise the hypothesis
- 158. supported by evidence and reasoning
- 159. inductive (general rule from examples)
- 160. deductive (certain, given the rule)

Matching (scientific method): $1 \rightarrow E$, $2 \rightarrow A$, $3 \rightarrow B$, $4 \rightarrow D$, $5 \rightarrow C$

- 161. You cracked the code exactly! All 4 are right in both color and position.
- 162. Every color is in the code, but every one is in the wrong position! You have the right set; you just need to rearrange.
- 163. None of the digits 1, 2, or 3 are in the code at all! That eliminates a lot at once.
- 164. 50! Guessing the middle each time halves the possibilities -- this is called binary search, and it finds any number in about 7 guesses.
- 165. 4! Each slot has 2 choices: RR, RB, BR, BB.
- 166. 2! One is right in place (black) and one is right color, wrong place (white) -- so exactly 2 of your items are code colors.
- 167. 720! It's $10 \times 9 \times 8$ -- 10 choices for the first, 9 for the second, 8 for the third.
- 168. Guess either one! If it's right, you win; if not, you now know it's the other. Any guess between them fully separates the two.
- 169. Because every wrong guess was still a clue!
- 170. Because it's all about narrowing down the suspects!
- 171. Because a good deducer always cracks it eventually!
- 172. Because it always tells you exactly how close you got!
- 173. Because a good guess is really a little experiment!

174. Because ruling things out is ruling things in!

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