



PRACTICE GUIDE · CLASSES 3 TO 8

Logical Reasoning for Olympiads: Rules and Practice

The logical reasoning section opens the SOF Maths and Science Olympiad papers, and school never teaches it. Here are the rules for each question type, then 15 practice questions with answers.

Maths Olympiad

Science Olympiad

Study skills

01 Number and letter series

Check the gaps – 3, 7, 11, 15 goes up by 4 each time

Look for multiplying – 2, 6, 18, 54 is $\times 3$ each time

Squares and cubes – 1, 4, 9, 16 are squares; 1, 8, 27, 64 are cubes

Gaps that grow – 2, 6, 12, 20 has gaps 4, 6, 8: the next gap is 10

Two series in one – 1, 10, 2, 20, 3, 30 alternates two patterns

Letters – number them A = 1 to Z = 26 and work with the numbers

Opposite letters – A and Z, B and Y: each pair adds up to 27

02 Coding and decoding

Shift codes – CAT → DBU moves every letter one step forward

Reverse codes – the word is written backwards, then the rule is applied

Number codes – letters become their positions: BAD → 2 1 4

Matching codes – find a letter that appears in two coded words to fix its code

Test your rule – check it on every letter you are given before answering

03 Directions

Draw it – sketch a compass with north at the top and east on the right

Turns – facing north, a right turn faces east and a left turn faces west

Two right turns – face the opposite way

Shadows – in the morning the Sun is in the east, so shadows fall to the west

Straight-line distance – if the walk makes a right angle, use Pythagoras: 3, 4, 5

04 Ranking and order

From the other end – position = total – position from this end + 1

Total in a row – position from the left + position from the right – 1

Comparisons – write the names in a line, tallest to shortest, as you read

05 Relations

Family tree – draw it: a line down for children, = for a married couple

Grandfather's only son – is the father

Mother's only son – is the speaker himself, if the speaker is a boy

Mother's brother – is the maternal uncle

06 Analogies and odd one out

Find the link first – worker and tool, animal and home, young one, opposite, part and whole

Odd one out – test groups such as fruit or vegetable, prime or not, bird or mammal

Check every option – the link must work for all the others, not just two

07 Clocks and calendars

Angle between the hands – $|30H - 5.5M|$ degrees at H hours and M minutes

Hands together – 11 times in 12 hours

Mirror image of a clock – 11:60 minus the time shown: 2:30 looks like 9:30

Odd days – an ordinary year moves the weekday on by 1, a leap year by 2

Leap years – divisible by 4; century years only if divisible by 400

08 Counting figures

Squares in an $n \times n$ grid – $1^2 + 2^2 + \dots + n^2$: 14 in a 3×3 grid

Triangles – count the small ones, then those made of two, three and more parts

Painted cube cut into $n \times n \times n$ – 8 cubes have three painted faces, $12(n - 2)$ have two, $6(n - 2)^2$ have one and $(n - 2)^3$ have none

Mirror images – left and right swap; water images :: top and bottom swap

09 Practice questions

1 mark each

- 1 Find the next number: 5, 11, 23, 47, ____
(A) 94 (B) 93 (C) 96 (D) 95
- 2 Find the next pair: AZ, BY, CX, ____
(A) DW (B) DV (C) EW (D) DX
- 3 If PEN is written as QFO, how is INK written?
(A) HMJ (B) JOL (C) JOK (D) KPM
- 4 Ravi faces south and turns right twice. Which way is he facing now?
(A) South (B) East (C) North (D) West
- 5 In a row of 25 children, Tina is 9th from the left. What is her position from the right?
(A) 16th (B) 18th (C) 15th (D) 17th
- 6 Kabir is 7th from the left and 12th from the right in a row. How many children are in the row?
(A) 18 (B) 19 (C) 17 (D) 20
- 7 Pointing to a girl, Arjun says, 'She is the daughter of my mother's only son.' How is the girl related to Arjun?
(A) Sister (B) Daughter
(C) Niece (D) Cousin
- 8 Book is to library as painting is to ____
(A) artist (B) brush (C) gallery (D) frame
- 9 Find the odd one out.
(A) 3 (B) 5 (C) 11 (D) 9
- 10 What is the angle between the hands of a clock at 4:00?
(A) 120° (B) 90° (C) 100° (D) 150°
- 11 A clock seen in a mirror shows 2:30. What is the real time?
(A) 10:30 (B) 9:30 (C) 8:30 (D) 2:30
- 12 3 March is a Friday. What day is 24 March of the same year?
(A) Thursday (B) Saturday
(C) Friday (D) Sunday
- 13 How many squares of any size are there in a 3×3 grid?
(A) 9 (B) 12 (C) 13 (D) 14
- 14 A $4 \times 4 \times 4$ cube painted on every face is cut into 64 small cubes. How many small cubes have no painted face?
(A) 8 (B) 16 (C) 24 (D) 4
- 15 Some cats are black. All black things are shiny. Which must be true?
(A) All cats are shiny.
(B) Some cats are shiny.
(C) No cat is shiny.
(D) All shiny things are cats.

Answers and explanations

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| <p>1 D Each term is double the one before, plus 1: $47 \times 2 + 1 = 95$.</p> <p>2 A The first letter goes forward from A and the second goes back from Z.</p> <p>3 B Every letter moves one step forward: I $\rightarrow$ J, N $\rightarrow$ O, K $\rightarrow$ L.</p> <p>4 C South, turn right: west. Turn right again: north.</p> <p>5 D $25 - 9 + 1 = 17$.</p> <p>6 A $7 + 12 - 1 = 18$: Kabir is counted twice otherwise.</p> <p>7 B His mother's only son is Arjun himself, so the girl is his daughter.</p> | <p>8 C Books are kept in a library; paintings are kept in a gallery.</p> <p>9 D 3, 5 and 11 are prime numbers; $9 = 3 \times 3$.</p> <p>10 A Each hour mark is 30° apart: $4 \times 30^\circ = 120^\circ$.</p> <p>11 B Subtract from 11:60: $11:60 - 2:30 = 9:30$.</p> <p>12 C $24 - 3 = 21$ days, exactly 3 weeks, so it is also a Friday.</p> <p>13 D 9 small squares, 4 squares of 2×2 and 1 of 3×3: 14.</p> <p>14 A The unpainted cubes form the inner $2 \times 2 \times 2$ block: 8.</p> <p>15 B The black cats are black things, so they are shiny. Nothing is known about the other cats.</p> |
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How to use this guide

- 1 Always draw: a compass for directions, a line for ranks, a tree for relations.
- 2 Write the alphabet with its numbers (A = 1 to Z = 26) at the top of your rough sheet.
- 3 Do ten reasoning questions a day for a month before the Olympiad.

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