

Arithmetic, Mental Ability & Observation

Village Field Assistant (VFA) - 10 Marks
Formulas, Practice Questions & Worked Answers

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1. Number Operations & Fractions	2
2. Percentage, Profit & Loss	2
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Try each question on paper first, then compare with the worked answer in green. Speed matters in this section, so practise with a timer. A combined answer key is on the last page.

1. Number Operations & Fractions

Key Notes & Formulas

- **Fractions:** to add or subtract, make the denominators equal using the LCM. Example: $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$. To multiply, multiply tops and bottoms; to divide, multiply by the reciprocal.
- **LCM and HCF:** LCM is the smallest number divisible by all the given numbers; HCF is the largest number that divides all of them. For two numbers, $\text{LCM} \times \text{HCF} = \text{product of the numbers}$.
- **Divisibility tests:** by 2 - last digit even; by 3 - digit sum divisible by 3; by 5 - ends in 0 or 5; by 9 - digit sum divisible by 9; by 11 - difference of alternate digit sums is 0 or a multiple of 11.
- **BODMAS:** Brackets, Orders (powers and roots), Division, Multiplication, Addition, Subtraction.

Exam-Style Questions

Q1. What is $\frac{3}{4} + \frac{5}{6}$?

- (A) $\frac{8}{10}$
- (B) $1\frac{7}{12}$
- (C) $1\frac{1}{2}$
- (D) $2\frac{1}{12}$

Answer: (B) $1\frac{7}{12}$. LCM of 4 and 6 is 12. $\frac{3}{4} = \frac{9}{12}$ and $\frac{5}{6} = \frac{10}{12}$. Sum = $\frac{19}{12} = 1\frac{7}{12}$.

Q2. The LCM of 12 and 18 is:

- (A) 6
- (B) 18
- (C) 54
- (D) 36

Answer: (D) 36. $12 = 2 \times 2 \times 3$ and $18 = 2 \times 3 \times 3$. $\text{LCM} = 2 \times 2 \times 3 \times 3 = 36$ (HCF is 6; $36 \times 6 = 12 \times 18$).

2. Percentage, Profit & Loss

Key Notes & Formulas

- **Percentage:** $x\%$ of $N = (x/100) \times N$. To convert a fraction to a percentage, multiply by 100. Useful values: $1/2 = 50\%$, $1/4 = 25\%$, $1/5 = 20\%$, $1/8 = 12.5\%$.
- **Discount:** selling price = marked price $\times (100 - \text{discount}\%) / 100$.
- **Profit and loss:** Profit = Selling Price - Cost Price; Profit % = (Profit / Cost Price) $\times 100$. Loss % = (Loss / Cost Price) $\times 100$. Both are always calculated on the cost price.
- **Ratio and average:** Average = sum of items / number of items. A ratio $a : b$ means parts of a and b in a total of $a + b$ parts.

Exam-Style Questions

Q1. A shirt marked at Rs. 800 is sold at a 15% discount. Its selling price is:

- (A) Rs. 640
- (B) Rs. 680
- (C) Rs. 700
- (D) Rs. 720

Answer: (B) Rs. 680. Discount = 15% of 800 = Rs. 120. Selling price = 800 - 120 = Rs. 680.

Q2. A trader buys an article for Rs. 400 and sells it for Rs. 500. His profit percentage is:

- (A) 20%
- (B) 30%
- (C) 25%
- (D) 125%

Answer: (C) 25%. Profit = 500 - 400 = Rs. 100. Profit % = $100/400 \times 100 = 25\%$.

3. Series & Number Patterns

Key Notes & Formulas

- **Check the differences first:** if the gaps are constant it is an arithmetic series (2, 5, 8, 11); if the gaps themselves change in a pattern, look at the second differences.
- **Check the ratio:** if each term is multiplied by the same number, it is a geometric series (3, 6, 12, 24).
- **Common patterns:** squares (1, 4, 9, 16, 25), cubes (1, 8, 27, 64), primes (2, 3, 5, 7, 11, 13), Fibonacci-type (each term is the sum of the previous two: 1, 1, 2, 3, 5, 8).
- **Alphabet series:** convert letters to positions (A = 1 ... Z = 26) and look for the same patterns.

Exam-Style Questions

Q1. Find the next number: 2, 6, 12, 20, 30, ?

- (A) 42
- (B) 40
- (C) 36
- (D) 44

Answer: (A) 42. The differences are 4, 6, 8, 10, so the next difference is 12. $30 + 12 = 42$.

Q2. Find the next number: 1, 4, 9, 16, 25, ?

- (A) 30
- (B) 36
- (C) 49
- (D) 32

Answer: (B) 36. These are the squares of 1, 2, 3, 4, 5. The next is 6 squared = 36.

4. Coding-Decoding & Analogies

Key Notes & Formulas

- **Letter shifting:** every letter moves forward or backward by a fixed number of places (CAT to DBU is +1 for each letter). Write the alphabet positions (A = 1 ... Z = 26) when in doubt.
- **Reverse and opposite coding:** a word may be written backwards, or each letter replaced by its mirror letter (A with Z, B with Y, and so on).
- **Analogy:** find the relationship in the first pair, such as worker and workplace, tool and use, part and whole, or country and capital, and apply the same relationship to the second pair.
- **Odd one out:** group the items by a common property and pick the one that does not fit.

Exam-Style Questions

Q1. If CAT is coded as DBU, then DOG will be coded as:

- (A) EPH
- (B) ENF
- (C) DPH
- (D) FQI

Answer: (A) EPH. Each letter is moved one place forward: D to E, O to P, G to H. So DOG becomes EPH.

Q2. Doctor : Hospital :: Teacher : ?

- (A) Student
- (B) Book
- (C) School
- (D) Class

Answer: (C) School. A doctor works in a hospital, and a teacher works in a school.

5. Blood Relations, Directions & Observation

Key Notes & Formulas

- **Family relations:** mother's brother = maternal uncle; father's sister = paternal aunt; the children of one's uncle or aunt = cousins; brother's son = nephew; sister's daughter = niece; mother's mother = maternal grandmother.
- **Direction sense:** draw a quick sketch. Moving north and then the same distance south cancels out. After turning right while facing north you face east; after turning left you face west.
- **Distance from start:** if a route goes in opposite directions, subtract the distances; if it goes at right angles, use Pythagoras (3-4-5 and 5-12-13 triplets appear often).
- **Observation skills:** look for missing items in a figure, odd shapes in a group, mirror images, counting of triangles or squares, and matching of patterns. Work systematically from left to right and top to bottom.

Exam-Style Questions

Q1. Pointing to a man, Anu said, 'He is the son of my mother's only brother.' How is the man related to Anu?

- (A) Brother
- (B) Uncle
- (C) Nephew
- (D) Cousin

Answer: (D) Cousin. Anu's mother's brother is her maternal uncle, so his son is her cousin.

Q2. A man walks 5 km north, then 3 km east, then 5 km south. How far is he from the starting point, and in which direction?

- (A) 3 km east
- (B) 5 km west
- (C) 8 km north
- (D) 13 km east

Answer: (A) 3 km east. The 5 km north and 5 km south cancel each other, leaving only the 3 km east.

Combined Answer Key

Topic	Answers
1. Number Operations & Fractions	Q1-B, Q2-D
2. Percentage, Profit & Loss	Q1-B, Q2-C
3. Series & Number Patterns	Q1-A, Q2-B
4. Coding-Decoding & Analogies	Q1-A, Q2-C
5. Blood Relations, Directions & Observation	Q1-D, Q2-A