CLASS 7 MATHS NCERT SOLUTIONS

NCERT Solutions for Class 7 Maths Chapter 6: Number Play – Ganita Prakash

Complete NCERT Solutions for Class 7 Maths Chapter 6 "Number Play" from the Ganita Prakash textbook, covering parity (odd/even), magic squares, the Virahanka-Fibonacci sequence, and cryptarithm puzzles.

Contents

Complete NCERT Solutions for Class 7 Maths Chapter 6 “Number Play” from the Ganita Prakash textbook, covering parity (odd/even), magic squares, the Virahanka-Fibonacci sequence, and cryptarithm puzzles.

6.1 Numbers Tell Us Things

Figure It Out (Page 128)

Q1. Arranging stick-figure cutouts to match given number sequences is based on a textbook figure and cannot be reproduced without it.

Q2. Classify each statement as Always True / Only Sometimes True / Never True (rule: each person’s number = count of taller people standing ahead of them):

(a) If a person says ‘0’, they are the tallest in the group. — **Only Sometimes True** (a person says ‘0’ only if no taller person is ahead of them, not necessarily that they are the group’s tallest).

(b) If a person is the tallest, their number is ‘0’. — **Always True** (the tallest person has no one taller anywhere, so certainly no one taller ahead).

(c) The first person’s number is ‘0’. — **Always True** (nobody stands ahead of the first person).

(d) If a person is not first or last, they cannot say ‘0’. — **Only Sometimes True** (a middle person can still have zero taller people ahead of them).

(e) The person who calls the largest number is the shortest. — **Only Sometimes True** (a large number just means many taller people are ahead, not that this person is the overall shortest).

(f) Largest possible number in a group of 8 people? — With 8 people, the shortest person can have at most 7 taller people ahead, so the **maximum possible number is 7**.

6.2 Picking Parity

Kishor’s puzzle: Can 5 odd number cards sum to 30? **Answer:** No — the sum of 5 (an odd count) of odd numbers is always odd, and 30 is even, so it’s impossible.

Sums of odd numbers (using cards 1,3,5,7,9,11): (a) 4 odd numbers: 1+3+5+7 = 16 (even) (b) 5 odd numbers: 1+3+5+7+9 = 25 (odd) (c) 6 odd numbers: 1+3+5+7+9+11 = 36 (even).

Figure It Out (Page 131)

Q1. Parity of sums:

(a) 2 even + 2 odd numbers → **Even** (e.g., 2+4+3+5 = 14)

(b) 2 odd + 3 even numbers → **Even** (e.g., 3+5+2+4+6 = 20)

(c) 5 even numbers → **Even** (e.g., 2+4+6+8+10 = 30)

(d) 8 odd numbers → **Even** (e.g., 1+3+5+7+9+11+13+15 = 64, since 4 pairs of odd+odd each give even)

Q2. Lakpa has an odd number of Rs. 1 coins, odd number of Rs. 5 coins, even number of Rs. 10 coins, totalling Rs. 205 — did he make a mistake?
Answer: Yes. Odd(Rs.1 total, odd) + Odd(Rs.5 total, odd) = Even; Even + Even(Rs.10 total) = Even. Since 205 is odd, this total is impossible, so Lakpa made a mistake.

Q3. Parity of subtraction:

Even – Even = **Even** (e.g., 6–2=4)

Odd – Odd = **Even** (e.g., 7–3=4)

Even – Odd = **Odd** (e.g., 8–3=5)

Odd – Even = **Odd** (e.g., 7–2=5)

Product parity rule: the product of two numbers is even if at least one number is even; odd only if both numbers are odd. Examples: (a) 27×13 — both odd → **odd** (351) (b) 42×78 — both even → **even** (3276) (c) 135×654 — one odd, one even → **even** (88,290).

Expressions with fixed parity: Always-even expressions: 2p+10, 8n, 6m–2. Always-odd expressions: 2m+1, 8a+3. Variable-parity expressions: 5k–2, n+5 (depends on whether the variable is odd or even). All even numbers can be listed using the expression **2n**; all odd numbers using **2n – 1** (for n = 1, 2, 3, ...). The nth even number is **2n**.

6.3 Some Explorations in Grids: Magic Squares

Figure It Out (Page 136)

Q1. How many different magic squares can be made using numbers 1–9? **Answer:** Using 1–9, there is exactly **one unique magic square** (excluding rotations/reflections); allowing rotations and reflections, there are **8 variations** of this same square.

Q2. Creating a magic square with numbers 2–10: start with the classic 1–9 magic square and add 1 to every cell. The magic sum becomes **18** (compared to 15 for the 1–9 square).

Q3. Starting from the 1–9 magic square (sum 15): (a) adding 1 to every number gives a new magic sum of **18** (15 + 3×1). (b) doubling every number gives a new magic sum of **30** (15×2). **General rule:** adding a constant c to every cell increases the magic sum by 3c (since each row has 3 cells); multiplying every cell by k multiplies the magic sum by k.

Q4 in this section repeats the same add-a-constant/multiply-by-a-constant reasoning shown in Q3 above, just phrased as a direct question rather than in two parts.

Q5. Creating magic squares from any 9 consecutive numbers: for 3–11, add 2 to every cell of the 1–9 square → magic sum = 15 + 3(2) = **21**. For 9–17, add 8 to every cell → magic sum = 15 + 3(8) = **39**.

Figure It Out (Page 137)

Q1-Q2. For a generalized 3×3 magic square with centre value m, the sum of any row, column, or diagonal always equals **3m**. For example, with m=25, every row/column/diagonal sums to 3×25 = **75**.

Q3 in this section asks students to verify the 3m rule from Q1-Q2 above on a magic square of their own choosing — a hands-on check of the same result rather than new content.

Q4. Creating a magic square with magic sum 60: since sum = 3×centre, the centre must be 60÷3 = **20**. Multiplying the original 1–9 magic square (sum 15, centre 5) by 4 gives sum 15×4 = 60 and centre 5×4 = 20, matching exactly.

Q5. Yes, it is possible to build a magic square from 9 non-consecutive numbers, as long as they follow a suitably patterned (e.g., evenly-stepped or scaled) structure analogous to the classic 1–9 square.

The Chautisa Yantra (First 4×4 Magic Square)

This famous 10th-century magic square from Khajuraho has a magic sum of 34 ("Chautisa" means 34 in Hindi). Besides every row, column, and diagonal, several other groups of 4 numbers also sum to 34: the four corner numbers (7+14+4+9 = 34), the four central numbers (13+8+10+3 = 34), and any 2×2 sub-square, such as the top-left block (7+12+13+2 = 34).

6.4 Nature's Favourite Sequence: The Virahanka-Fibonacci Numbers

Ways to write 6 as an ordered sum of 1s and 2s: there are exactly **13 ways** — this count matches the (n+1)th term of the Virahanka (Fibonacci-type) sequence for n=6.

Continuing the sequence 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, …: the next three terms are 55+89 = **144**, 89+144 = **233**, 144+233 = **377**.

Parity pattern: 1(odd), 2(even), 3(odd), 5(odd), 8(even), 13(odd), 21(odd), 34(even), 55(odd), 89(odd), 144(even), 233(odd), 377(odd) — the pattern repeats every 3 terms as **odd, odd, even**. So the term after 377 will be **even** (confirmed: 377+233 = 610, which is even).

6.5 Digits in Disguise (Cryptarithms)

K2 + K2 = HMM: Since K2 = 10K+2, doubling gives 20K+4. For a 3-digit result, K must be at least 5. Testing K=5–9 always gives a hundreds digit of 1 (e.g., 72+72=144), so **H = 1** always, and H can never be 2 or 3. Here, M = 4, H = 1 (with K=7).

KP × 2 = PRR: Solving gives **P = 1, R = 2, K = 6**. Check: KP = 61, and 61×2 = 122 = PRR (1,2,2). Correct.

Figure It Out (Pages 143-144)

Q1. A lit bulb is toggled 77 times — will it be on or off? **Answer:** Since 77 is odd, the bulb will end up **OFF** (each toggle flips the state; an odd number of toggles leaves it opposite to the start).

Q2. Can the page numbers on 50 loose double-sided sheets sum to 6000? Each sheet contributes pages (2n−1)+(2n) = 4n−1, so the total over 50 sheets is always of the form (multiple of 4) − 50, which leaves remainder 2 when divided by 4. Since 6000 is exactly divisible by 4 (remainder 0), **the sum can never be 6000**.

Q3 in this section is a variant staircase-counting puzzle following the same step-counting logic used for Q1 and Q8 (Virahanka-sequence step counts) elsewhere in this chapter.

Q4. Making a 3×3 magic square with magic sum 0: subtract 5 from every cell of the classic 1–9 magic square (which has centre 5), giving values from −4 to 4 with every row, column, and diagonal summing to **0**.

Q5. Fill in odd/even: (a) sum of an odd number of even numbers = **even** (b) sum of an even number of odd numbers = **even** (c) sum of an even number of even numbers = **even** (d) sum of an odd number of odd numbers = **odd**.

Q6. Parity of the sum 1 to 100: using the formula $n(n+1)/2 = 100\times101/2 = 5050$, which is **even**.

Q7. Given two consecutive Virahanka terms 987 and 1597: the next two terms are 987+1597 = **2584** and 1597+2584 = **4181**; the previous two terms are 1597−987 = **610** and 987−610 = **377**.

Q8. An 8-step staircase climbed 1 or 2 steps at a time: the total number of ways to reach the top is **34** (matching the 8th Virahanka term: 1,2,3,5,8,13,21,34).

Q9. Parity of the 20th Virahanka term: following the repeating odd-odd-even 3-term cycle, position 20 (20 mod 3 = 2) falls in the "even" slot, so the 20th term is **even** (its actual value is 10946).

Q10. True or False:

(a) $4m - 1$ always gives odd numbers. — **True** ($4m$ is always even, so $4m-1$ is always odd).

(b) All even numbers can be written as $6j - 4$. — **False** (this only generates 2, 8, 14, 20, ... — it skips numbers like 4 and 6).

(c) Both $2p+1$ and $2q-1$ describe all odd numbers. — **False** ($2p+1$ with $p=1,2,3,\ldots$ gives 3,5,7,... and misses 1; only $2q-1$ generates every odd number).

(d) $2f+3$ gives both even and odd numbers. — **False** ($2f$ is always even, so $2f+3$ is always odd — it never produces an even number).

Extra Questions: Class 7 Maths Chapter 6
Revision Notes: Class 7 Maths Chapter 6