Chapter 10: Elephants, Tigers, and Leopards

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Exercise 10.1 — NIM Game

Q1 Can you win the NIM game (target 10, adding 1 or 2 each turn) if the other player has reached a total of 6 and it is your turn?

SOLUTION

If the opponent is at 6 and you need to reach 10, you need 4 more.

If you add 2 → total 8. Opponent adds 2 → 10 (opponent wins). Or opponent adds 1 → 9, you add 1 → 10 (you win).

If you add 1 → total 7. Opponent adds 2 → 9, you add 1 → 10 (you win). Or opponent adds 1 → 8, you add 2 → 10 (you win).

Key insight: whoever reaches 7 is in a winning position (the opponent must land on 8 or 9, and you can always reach 10).

From 6, adding 1 reaches 7 — a winning position for you.

Yes, you can win: add 1 to reach 7, then mirror the opponent (if they add 1, you add 2; if they add 2, you add 1) to reach 10.

Q2 Can you win the NIM game if the other player has reached a total of 7 and it is your turn?

SOLUTION

From 7, you need 3 more to reach 10.
If you add 1 → 8. Opponent adds 2 → 10 (opponent wins).
If you add 2 → 9. Opponent adds 1 → 10 (opponent wins).
No matter what you add (1 or 2), the opponent can always reach 10 on the next turn.
No, you cannot guarantee a win if the opponent is at 7.

Q3 Can you win the NIM game if the other player has reached a total of 8 and it is your turn?

SOLUTION

From 8, you need 2 more to reach 10.
If you add 2 → 10. You win immediately!
Yes, you win by adding 2.

Exercise 10.2 — Addition Chart

Q1 Identify some patterns in the addition table (rows 0–12, columns 0–12).

SOLUTION

Each row increases by 1 as you move right (each column header adds 1).
Each column increases by 1 as you move down.
The table is symmetric: the value at row r, column c equals the value at row c, column r (addition is commutative).
All values along a diagonal slanting from top-right to bottom-left are the same (e.g., 0+12, 1+11, 2+10, … all equal 12).
Even + Even = Even; Odd + Odd = Even; Even + Odd = Odd — so the parity pattern alternates in a checkerboard.

Q2 Observe the cells where the number 9 appears in the table. How many times do you see 9? What about other numbers?

SOLUTION

The number 9 appears wherever row + column = 9.
Pairs: (0,9), (1,8), (2,7), (3,6), (4,5), (5,4), (6,3), (7,2), (8,1), (9,0) — that is 10 times.
In general, the number n (where $0 \le n \le 12$) appears (n + 1) times in the table.
Numbers 13–24 appear fewer times as they require larger row/column values.
The number 12 appears 13 times (pairs from (0,12) to (12,0)).

Q3 Are there any rows or columns that contain only even numbers or only odd numbers? Explain your observation.

SOLUTION

Row 0: 0,1,2,3,4,5,6,7,8,9,10,11,12 — contains both odd and even.
Row 1: 1,2,3,4,5,6,7,8,9,10,11,12,13 — contains both.
Every row contains both odd and even numbers because adding an even row-header to alternating column-headers (0,1,2,…) produces alternating even and odd sums.
No row or column contains only even numbers or only odd numbers.

Q4 Look at the 2×2 red window frame in the table. (a) Find the sum of the two numbers in each row. (b) Find the sum of the two numbers in each column. What do you notice? (c) Find the sum of the numbers in each of the two diagonals. What do you notice? (d) Move the frame to other places. What do you notice?

SOLUTION

The red 2×2 window frame in the table (page 150) sits at rows 5–6, columns 5–6, giving the four cells: 10 (top-left), 11 (top-right), 11 (bottom-left), 12 (bottom-right). (a) Row sums: top row 10+11=21; bottom row 11+12=23. (b) Column sums: left column 10+11=21; right column 11+12=23. The two row sums equal the two column sums. (c) Diagonal 1 (top-left to bottom-right): 10+12=22. Diagonal 2 (top-right to bottom-left): 11+11=22. Both diagonals give the same sum, 22. (d) When the frame is moved to any other position in the table this pattern holds: the two diagonal sums are always equal to each other.

Exercise 10.3 — Reverse and Add

Q1 Take the 2-digit number 27. Reverse its digits (72). Add them. What is the sum?

SOLUTION

27 reversed = 72
27 + 72 = 99

Q2 What sums can we get when we add a 2-digit number with its reverse?

SOLUTION

For any 2-digit number with tens digit a and units digit b: the number is 10a+b, its reverse is 10b+a.
Sum = (10a+b) + (10b+a) = 11a + 11b = 11(a+b).
Since a and b are digits 0–9 and the number is 2-digit (a ≥ 1), a+b ranges from 1 to 18.
But when b=0 the reverse is a single-digit number (not a 2-digit reverse), so valid pairs give a+b from 2 to 18.
Possible sums are multiples of 11: 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 176, 187, 198.

Q3 List all numbers which when added to their reverse give (i) 55, (ii) 88.

SOLUTION

Using the formula: sum = 11(a+b). For sum 55: a+b = 5.
(i) Pairs (a,b) with a+b=5 and both digits valid: (1,4)→14, (2,3)→23, (3,2)→32, (4,1)→41. Check: 14+41=55, 23+32=55.
Numbers: 14, 23, 32, 41 (each pair gives the same sum, so all four numbers give 55 when added to their reverse).
(ii) For sum 88: a+b = 8.
Pairs: (1,7)→17, (2,6)→26, (3,5)→35, (4,4)→44, (5,3)→53, (6,2)→62, (7,1)→71. Check: 17+71=88, 26+62=88, 35+53=88, 44+44=88.
Numbers: 17, 26, 35, 44, 53, 62, 71.

Q4 Can we get a 3-digit sum by adding a 2-digit number and its reverse? What is the smallest 3-digit sum we can get?

SOLUTION

Sum = 11(a+b). For a 3-digit sum: 11(a+b) ≥ 100, so a+b ≥ 10 (since 11×10 = 110, 11×9 = 99 is 2-digit).
Smallest a+b = 10, giving sum = 110.
Smallest 2-digit number with digit-sum 10: tens digit = 1, units digit = 9 → 19. Check: 19 + 91 = 110.

Yes, we can get 3-digit sums. The smallest is 110.

Exercise 10.4 — Fill in the Blanks — Number Sequences

Q1 Fill in the blank: 2540, ____, 2590 (the sequence increases by equal steps).

SOLUTION

Difference from 2540 to 2590 = 50. With one blank in between, each step = 50 ÷ 2 = 25.
2540 + 25 = 2565
Sequence: 2540, 2565, 2590.

Q2 Fill in the blank: 354, ____, 1354 (the sequence increases by equal steps).

SOLUTION

Difference from 354 to 1354 = 1000. With one blank in between, each step = 1000 ÷ 2 = 500.
354 + 500 = 854
Sequence: 354, 854, 1354.

Q3 Fill in the blanks: 7645, ____, 7670, ____, ____, 7745 (equal steps of 25).

SOLUTION

7670 − 7645 = 25, so the step size is 25.
7645 + 25 = 7670 ✓
7670 + 25 = 7695
7695 + 25 = 7720
7720 + 25 = 7745 ✓
Sequence: 7645, 7670, 7695, 7720, 7745.

Exercise 10.5 — How Many Animals? — Addition

Q1 The population of elephants in Karnataka is 6049 and in Kerala is 3054. How many total elephants are there in these two states?

SOLUTION

We need to add: 6049 + 3054
Ones: 9 + 4 = 13 → write 3, carry 1
Tens: 4 + 5 + 1 (carry) = 10 → write 0, carry 1
Hundreds: 0 + 0 + 1 (carry) = 1
Thousands: 6 + 3 = 9
6049 + 3054 = 9103

Q2 Gujarat has 1355 leopards, Karnataka has 1131 and Madhya Pradesh has 1817. How many total leopards are there in these three states?

SOLUTION

We need to add: 1355 + 1131 + 1817
Ones: 5 + 1 + 7 = 13 → write 3, carry 1
Tens: 5 + 3 + 1 + 1 (carry) = 10 → write 0, carry 1
Hundreds: 3 + 1 + 8 + 1 (carry) = 13 → write 3, carry 1
Thousands: 1 + 1 + 1 + 1 (carry) = 4
1355 + 1131 + 1817 = 4303

Q3 Maharashtra has 444 tigers. Madhya Pradesh has 341 more tigers than Maharashtra. Uttarakhand has 116 more tigers than Maharashtra. (a) How many tigers does Madhya Pradesh have? (b) How many tigers does Uttarakhand have? (c) How many tigers do Madhya Pradesh and Uttarakhand have together? (d) How many tigers are there in total across the three states?

SOLUTION

(a) Madhya Pradesh = Maharashtra + 341 = 444 + 341
Ones: 4+1=5, Tens: 4+4=8, Hundreds: 4+3=7
Madhya Pradesh has 785 tigers.

(b) Uttarakhand = Maharashtra + 116 = 444 + 116
Ones: 4+6=10 → write 0, carry 1
Tens: 4+1+1(carry)=6
Hundreds: 4+1=5
Uttarakhand has 560 tigers.

(c) MP + Uttarakhand = 785 + 560
Ones: 5+0=5, Tens: 8+6=14 → write 4, carry 1
Hundreds: 7+5+1(carry)=13 → 1345
Together they have 1345 tigers.

(d) Total = Maharashtra + MP + Uttarakhand = 444 + 785 + 560

444 + 785 = 1229

1229 + 560 = 1789

Total tigers across the three states: 1789.

Exercise 10.6 — More or Less? — Subtraction

Q1 Assam has 5719 elephants. It has 3965 more elephants than Meghalaya. How many elephants are there in Meghalaya?

SOLUTION

Meghalaya = Assam − 3965 = 5719 − 3965
Ones: 9 − 5 = 4
Tens: 1 − 6 — cannot subtract; regroup: borrow from hundreds (1 becomes 11), 11 − 6 = 5
Hundreds: 7 − 1 (borrowed) = 6; 6 − 9 — cannot subtract; regroup from thousands: (6 becomes 16), 16 − 9 = 7
Thousands: 5 − 1 (borrowed) = 4; 4 − 3 = 1
5719 − 3965 = 1754
There are 1754 elephants in Meghalaya.

Q2 The population of leopards in 2022 was 8820 in Central India and Eastern Ghats. It had increased by 749 compared to 2018. How many leopards were there in 2018?

SOLUTION

2018 population = 2022 population − increase = 8820 − 749
Ones: 0 − 9 — cannot subtract; regroup: borrow from tens (2 becomes 1, ones become 10), 10 − 9 = 1
Tens: 1 − 4 — cannot subtract; regroup: borrow from hundreds (8 becomes 7, tens become 11), 11 − 4 = 7
Hundreds: 7 − 7 = 0
Thousands: 8 − 0 = 8
8820 − 749 = 8071
There were 8071 leopards in 2018.

Exercise 10.7 — Map Activity — Write Number of Animals

Q1 Write the number of animals on the map based on data from the previous problems. Fill in: total tigers in MP, UK and Maharashtra; total elephants in KA and KL; total leopards in GJ, KA and MP; elephants in Assam, Meghalaya and Kerala.

SOLUTION

From the map on page 156, the blank labels to fill are grounded in the calculations from the previous problems: the box labelled 'No. of Tigers in these states:' (pointing to MP, Uttarakhand, Maharashtra) = 1789; the box labelled 'Tigers:' (pointing to the Uttarakhand/UP region in the northeast of the tiger range) = the individual state count is not a separate box — the map shows tigers in Maharashtra (444), MP (785), Uttarakhand (560) individually noted and the combined total box = 1789; the box labelled 'Elephants:' in the northeast (Meghalaya) = 1754; the box labelled 'No. of Leopards in these states:' (Gujarat, Karnataka, MP) = 4303; the box labelled 'No. of Elephants in these states:' (Kerala + Karnataka combined) = 9103. Already-filled values visible on the map: Elephants: 5719 (Assam), Elephants: 6049 (Karnataka), Elephants: 3054 (Kerala).

Exercise 10.8 — Let Us Do

Q1 The board at Kaziranga National Park shows: December — 8591 visitors; November — 6415 visitors; October — ?. (a) How many more visitors came in December than in November? (b) The number of November visitors is 1587 more than October. How many visitors were there in October?

SOLUTION

(a) December − November = 8591 − 6415
Ones: 1 − 5 — regroup: 11 − 5 = 6
Tens: 0 (after borrow) − 1 — regroup: 10 − 1 = 9; but wait:
Ones: 1 − 5 → borrow: ones = 11 − 5 = 6; tens reduced by 1
Tens: 9 − 1 = 8 (tens digit of 6415 is 1, 9−1=8)
Hundreds: 5 − 4 = 1
Thousands: 8 − 6 = 2
8591 − 6415 = 2176
2176 more visitors came in December than in November.

(b) October = November − 1587 = 6415 − 1587
Ones: 5 − 7 → regroup: 15 − 7 = 8
Tens: 0 (after borrow) − 8 → regroup: 10 − 8 = 2; tens of 6415 is 1, reduced to 0
Hundreds: 3 (after borrow) − 5 → regroup: 13 − 5 = 8
Thousands: 5 (after borrow) − 1 = 4
6415 − 1587 = 4828
There were 4828 visitors in October.

Q2 In a juice factory, pineapple juice: 1348 bottles; passion fruit: 4781 bottles. (a) Guava juice is 759 more than pineapple. Find number of guava bottles. (b) Orange juice is 1257 more than guava and 1417 less than passion fruit. How many bottles of orange juice? (c) Is total of guava + orange more or less than passion fruit? How much?

SOLUTION

(a) Guava = 1348 + 759
Ones: 8+9=17 → write 7, carry 1
Tens: 4+5+1=10 → write 0, carry 1
Hundreds: 3+7+1=11 → write 1, carry 1
Thousands: 1+0+1=2
Guava = 2107 bottles.

(b) Orange = guava + 1257 = 2107 + 1257
Ones: 7+7=14 → write 4, carry 1
Tens: 0+5+1=6
Hundreds: 1+2=3
Thousands: 2+1=3

Orange = 3364 bottles.
Verify: passion fruit should equal orange + 1417 = 3364 + 1417 = 4781 ✓

(c) Guava + Orange = 2107 + 3364
Ones: 7+4=11 → write 1, carry 1
Tens: 0+6+1=7
Hundreds: 1+3=4
Thousands: 2+3=5
Guava + Orange = 5471 bottles.
Passion fruit = 4781 bottles.
5471 > 4781, so guava + orange is MORE than passion fruit.
Difference: 5471 − 4781 = 690 bottles more.

Q3 In a town, jeeps registered = 6304. (a) Buses are 253 more than jeeps. How many buses? (b) Tractors are 5247 less than buses. How many tractors? (c) Taxis are 1579 more than tractors. How many taxis? (d) Arrange all vehicle types from lowest to highest.

SOLUTION

(a) Buses = 6304 + 253
Ones: 4+3=7, Tens: 0+5=5, Hundreds: 3+2=5, Thousands: 6+0=6
Buses = 6557.

(b) Tractors = 6557 − 5247
Ones: 7−7=0, Tens: 5−4=1, Hundreds: 5−2=3, Thousands: 6−5=1
Tractors = 1310.

(c) Taxis = 1310 + 1579
Ones: 0+9=9
Tens: 1+7=8
Hundreds: 3+5=8
Thousands: 1+1=2
Taxis = 2889.

(d) Ascending order: Tractors (1310) < Taxis (2889) < Jeeps (6304) < Buses (6557).

Q4 Solve: (a) 1459+476 (b) 3863+4188 (c) 5017+899 (d) 4285+2132 (e) 3158+1052 (f) 7293−2819 (g) 3105−1223 (h) 8006−5567 (i) 5000−4124 (j) 9018−487

SOLUTION

(a) 1459 + 476: Ones 9+6=15→5 carry1; Tens 5+7+1=13→3 carry1; Hundreds 4+4+1=9; Thousands 1. = 1935
(b) 3863 + 4188: Ones 3+8=11→1 carry1; Tens 6+8+1=15→5 carry1; Hundreds 8+1+1=10→0 carry1; Thousands 3+4+1=8. = 8051
(c) 5017 + 899: Ones 7+9=16→6 carry1; Tens 1+9+1=11→1 carry1; Hundreds 0+8+1=9; Thousands 5. = 5916

(d) 4285 + 2132: Ones 5+2=7; Tens 8+3=11→1 carry1; Hundreds 2+1+1=4; Thousands 4+2=6. = 6417

(e) 3158 + 1052: Ones 8+2=10→0 carry1; Tens 5+5+1=11→1 carry1; Hundreds 1+0+1=2; Thousands 3+1=4. = 4210

(f) 7293 − 2819: Ones 3−9→borrow: 13−9=4; Tens 8(after borrow)−1=7→wait: 9−1−1(borrow)=7→7−1=6→recheck: 9−1=8, borrow from hundreds → 8 becomes 7+10=17? Let me recompute systematically.

7293−2819: Ones: 3−9 can't; borrow: 13−9=4, tens reduced by 1.

Tens: 9−1(borrow)=8; 8−1=7.

Hundreds: 2−8 can't; borrow: 12−8=4, thousands reduced by 1.

Thousands: 7−1(borrow)=6; 6−2=4.

7293 − 2819 = 4474

(g) 3105 − 1223: Ones 5−3=2; Tens 0−2 can't; borrow: 10−2=8, hundreds reduced; Hundreds 0(after borrow)−2 can't; borrow: 10−2=8, thousands reduced; Thousands 3−1(borrow)=2; 2−1=1. = 1882

(h) 8006 − 5567: Ones 6−7 can't; borrow: 16−7=9; Tens 0(after borrow)−6 can't; need to borrow but hundreds=0; borrow from thousands: hundreds becomes 10, then lend to tens: tens = 10−1=9→ 9−6=3→ actually: 00→borrow cascades: thousands 8→7, hundreds 0→10, then hundreds 10→9 (lending to tens), tens 0→10: 10−6=4→ wait let me recompute:

8006−5567: thousands=8,hundreds=0,tens=0,ones=6.

Ones: 6−7 can't; borrow from tens: tens=0 can't; borrow from hundreds: hundreds=0 can't; borrow from thousands: thousands 8→7, hundreds 0→10; lend to tens: hundreds 10→9, tens 0→10; lend to ones: tens 10→9, ones 6→16.

Ones: 16−7=9. Tens: 9−6=3→ wait tens digit of 5567 is 6: 9−6=3. Hundreds: 9−5=4→ wait hundreds of 5567 is 5: 9−5=4. Thousands: 7−5=2.

8006 − 5567 = 2439

(i) 5000 − 4124: Similar cascade borrowing. 5000: all zeros cascade. Ones: 10−4=6→9 becomes ones+1, Tens: 9−2=7→ wait:

5000−4124: Thousands=5,hundreds=0,tens=0,ones=0.

Borrow cascade: thousands 5→4, hundreds 0→10→9 (lending to tens), tens 0→10→9 (lending to ones), ones 0→10.

Ones: 10−4=6. Tens: 9−2=7. Hundreds: 9−1=8→ wait hundreds of 4124 is 1: 9−1=8. Thousands: 4−4=0.

5000 − 4124 = 876

(j) 9018 − 487: Ones 8−7=1; Tens 1−8 can't; borrow: 11−8=3, hundreds reduced; Hundreds 0(after borrow)−4 can't; borrow: 10−4=6, thousands reduced; Thousands 9−1(borrow)=8.

9018 − 487 = 8531

Q5 Raju has 2045, Rani has 3578, and Roja has 1240. They deposit money in the School Panchayat Bank. Help fill the deposit slips. The given partial slip for Raju shows: 500×3=1500, 100×3=300, 50×2=___, 10×14=___, 5×1=___, 2×0=___, 1×0=___. Also suggest a combination for Rani and Roja.

SOLUTION

Raju's deposit slip (2045):

500 × 3 = 1500
100 × 3 = 300
50 × 2 = 100
10 × 14 = 140
5 × 1 = 5
2 × 0 = 0
1 × 0 = 0
Total = 1500+300+100+140+5 = 2045 ✓

Rani's deposit slip (3578) — one possible combination:

500 × 7 = 3500
100 × 0 = 0
50 × 1 = 50
10 × 2 = 20
5 × 1 = 5
2 × 1 = 2
1 × 1 = 1
Total = 3500+50+20+5+2+1 = 3578 ✓

Roja's deposit slip (1240) — one possible combination:

500 × 2 = 1000
100 × 2 = 200
50 × 0 = 0
10 × 4 = 40
5 × 0 = 0
2 × 0 = 0
1 × 0 = 0
Total = 1000+200+40 = 1240 ✓

Note: Different combinations of notes can give the same amount.

Exercise 10.9 — Let Us Solve — Column Addition and Subtraction

Q1 Solve using column method: (a) 3695 + 4208 (b) 2507 + 6847 (c) 6352 − 3521 (d) 8803 − 5726

SOLUTION

(a) 3695 + 4208:
Ones: 5+8=13 → write 3, carry 1
Tens: 9+0+1=10 → write 0, carry 1
Hundreds: 6+2+1=9
Thousands: 3+4=7
= 7903

(b) 2507 + 6847:
Ones: 7+7=14 → write 4, carry 1
Tens: 0+4+1=5
Hundreds: 5+8=13 → write 3, carry 1
Thousands: 2+6+1=9
= 9354

(c) 6352 − 3521:
Ones: 2−1=1
Tens: 5−2=3
Hundreds: 3−5 can't; borrow: 13−5=8, thousands reduced
Thousands: 6−1(borrow)=5; 5−3=2
= 2831

(d) 8803 − 5726:
Ones: 3−6 can't; borrow: 13−6=7, tens reduced
Tens: 0−1(borrow)=−1 can't; borrow: 10−1=9; 9−2=7
Hundreds: 8−1(borrow)=7; 7−7=0
Thousands: 8−5=3
= 3077

Q2 Arrange in columns and solve: (a) 3683−971 (b) 8432−46 (c) 4011−3666 (d) 5203−2745 (e) 1465+632 (f) 3567+77 (g) 8263+3737 (h) 5429+3287

SOLUTION

(a) 3683 − 971 = 2712
Ones: 3−1=2; Tens: 8−7=1; Hundreds: 6−9 can't; borrow: 16−9=7, thousands reduced; Thousands: 3−1(borrow)=2.

(b) 8432 − 46 = 8386
Ones: 2−6 can't; borrow: 12−6=6, tens reduced; Tens: 2(after borrow)→3−1=2→ wait: tens digit of 8432 is 3; 3−1(borrow)=2; 2−4 can't; borrow: 12−4=8, hundreds reduced; Hundreds: 4−1(borrow)=3; 3−0=3; Thousands: 8.

= 8386

(c) 4011 − 3666 = 345

Ones: 1−6 can't; borrow cascade from tens (0)→hundreds (0)→thousands: thousands 4→3, hundreds 0→10→9 (lending to tens), tens 0→10→9 (lending to ones), ones 1→11.

Ones: 11−6=5; Tens: 9−6=3; Hundreds: 9−6=3; Thousands: 3−3=0.

= 345

(d) 5203 − 2745 = 2458

Ones: 3−5 can't; borrow: 13−5=8, tens reduced; Tens: 0−1(borrow)=−1 can't; borrow: 10−1=9; 9−4=5→ wait: tens of 2745 is 4: 9−4=5; Hundreds: 2−1(borrow)=1; 1−7 can't; borrow: 11−7=4, thousands reduced; Thousands: 5−1(borrow)=4; 4−2=2.

= 2458

(e) 1465 + 632 = 2097

Ones: 5+2=7; Tens: 6+3=9; Hundreds: 4+6=10 → write 0, carry 1; Thousands: 1+0+1=2.

= 2097

(f) 3567 + 77 = 3644

Ones: 7+7=14 → write 4, carry 1; Tens: 6+7+1=14 → write 4, carry 1; Hundreds: 5+0+1=6; Thousands: 3.

= 3644

(g) 8263 + 3737 = 12000

Ones: 3+7=10 → write 0, carry 1; Tens: 6+3+1=10 → write 0, carry 1; Hundreds: 2+7+1=10 → write 0, carry 1; Thousands: 8+3+1=12.

= 12000

(h) 5429 + 3287 = 8716

Ones: 9+7=16 → write 6, carry 1; Tens: 2+8+1=11 → write 1, carry 1; Hundreds: 4+2+1=7; Thousands: 5+3=8.

= 8716

Exercise 10.10 — Let Us Solve — Mental Maths

Q1 Find easy ways to solve: (a) 8787−99 (b) 4596+104 (c) 3459+21 (d) 5010+95 (e) 4990+310 (f) 7844−15 (g) 260+240 (h) 1575−125 (i) 3999+290

SOLUTION

(a) 8787 − 99: Subtract 100 then add 1. 8787 − 100 = 8687; 8687 + 1 = 8688.
(b) 4596 + 104: Add 100 then add 4. 4596 + 100 = 4696; 4696 + 4 = 4700.
(c) 3459 + 21: Add 20 then add 1. 3459 + 20 = 3479; 3479 + 1 = 3480.
(d) 5010 + 95: 5010 + 90 = 5100; 5100 + 5 = 5105.
(e) 4990 + 310: 4990 + 300 = 5290; 5290 + 10 = 5300.
(f) 7844 − 15: 7844 − 10 = 7834; 7834 − 5 = 7829.
(g) 260 + 240: 200 + 200 = 400; 60 + 40 = 100; 400 + 100 = 500.
(h) 1575 − 125: 1575 − 100 = 1475; 1475 − 25 = 1450.
(i) 3999 + 290: 3999 + 1 = 4000; 4000 + 289 = 4289.

Q2 Use <, =, > to compare without calculating: (a) 54+97 vs 54+90 (b) 84−68 vs 90−68 (c) 76+85 vs 80+86 (d) 73−54 vs 73−56

SOLUTION

(a) 54+97 vs 54+90: Same number 54 is added; 97 > 90, so 54+97 > 54+90.
(b) 84−68 vs 90−68: Same 68 is subtracted; 90 > 84, so 90−68 > 84−68, meaning 84−68 < 90−68.
(c) 76+85 vs 80+86: 76+85=161; 80+86=166; 161 < 166, so 76+85 < 80+86.
(Reasoning: 80 is 4 more than 76, but 86 is only 1 more than 85; the right side gains more overall.)
(d) 73−54 vs 73−56: Same 73; subtracting more gives less: 56 > 54, so 73−56 < 73−54, meaning 73−54 > 73−56.

Q3 Use the given information to find values: Given 139+175=314, find 314−175. Given 845−394=451, find 845−395. Given 354+167=521, find 354+168. Given 456+209=665, find 446+219.

SOLUTION

314 − 175: Since 139 + 175 = 314, then 314 − 175 = 139.
845 − 395: 845 − 394 = 451. Subtracting 1 more gives 451 − 1 = 450.
354 + 168: 354 + 167 = 521. Adding 1 more gives 521 + 1 = 522.
446 + 219: 456 + 209 = 665. We decreased the first number by 10 (456→446) and increased the second by 10 (209→219). The sum stays the same: 665.

Exercise 10.11 — Add and Subtract — Practice

Q1 Add: (a) 2783+378 (b) 8948+97 (c) 7006+367 (d) 8009+485 (e) 3480+479 (f) 3792+2688 (g) 4999+3888 (h) 5005+4895 (i) 5768+4053 (j) 6062+3809

SOLUTION

(a) 2783 + 378: Ones 3+8=11→1c1; Tens 8+7+1=16→6c1; Hundreds 7+3+1=11→1c1; Thousands 2+0+1=3. = 3161

(b) 8948 + 97: Ones 8+7=15→5c1; Tens 4+9+1=14→4c1; Hundreds 9+0+1=10→0c1; Thousands 8+1=9. = 9045

(c) 7006 + 367: Ones 6+7=13→3c1; Tens 0+6+1=7; Hundreds 0+3=3; Thousands 7. = 7373

(d) 8009 + 485: Ones 9+5=14→4c1; Tens 0+8+1=9; Hundreds 0+4=4; Thousands 8. = 8494

(e) 3480 + 479: Ones 0+9=9; Tens 8+7=15→5c1; Hundreds 4+4+1=9; Thousands 3. = 3959

(f) 3792 + 2688: Ones 2+8=10→0c1; Tens 9+8+1=18→8c1; Hundreds 7+6+1=14→4c1; Thousands 3+2+1=6. = 6480

(g) 4999 + 3888: Ones 9+8=17→7c1; Tens 9+8+1=18→8c1; Hundreds 9+8+1=18→8c1; Thousands 4+3+1=8. = 8887

(h) 5005 + 4895: Ones 5+5=10→0c1; Tens 0+9+1=10→0c1; Hundreds 0+8+1=9; Thousands 5+4=9. = 9900

(i) 5768 + 4053: Ones 8+3=11→1c1; Tens 6+5+1=12→2c1; Hundreds 7+0+1=8; Thousands 5+4=9. = 9821

(j) 6062 + 3809: Ones 2+9=11→1c1; Tens 6+0+1=7; Hundreds 0+8=8; Thousands 6+3=9. = 9871

Q2 Subtract: (a) 4456−2768 (b) 5300−467 (c) 8067−4546 (d) 5302−1034 (e) 3444−2555 (f) 3400−897 (g) 9382−4857 (h) 7561−2933 (i) 6478−5986 (j) 8004−3107

SOLUTION

(a) 4456 − 2768: Ones 6−8→borrow: 16−8=8; Tens 5−1(b)=4; 4−6→borrow: 14−6=8; Hundreds 4−1(b)=3; 3−7→borrow: 13−7=6; Thousands 4−1(b)=3; 3−2=1. = 1688

(b) 5300 − 467: Ones 0−7→cascade: thousands 5→4, hundreds 3→2→(lending to tens)→tens 0→10→9(lending to ones); ones 10−7=3; tens 9−6=3; hundreds 2−4→borrow: 12−4=8→wait: hundreds of 467 is 4; 2 borrow needed: cascade already done; = 5300−467.

Recompute: 5300−467. Ones: 0−7 can't; borrow tens: tens=0 can't; borrow hundreds: hundreds=3→2, tens=0+10=10; now lend to ones: tens=10−1=9, ones=0+10=10; Ones: 10−7=3; Tens: 9−6=3; Hundreds: 2−4 can't; borrow thousands: thousands=5→4, hundreds=2+10=12; Hundreds: 12−4=8; Thousands: 4−0=4. = 4833

(c) 8067 − 4546: Ones 7−6=1; Tens 6−4=2→wait: tens of 4546 is 4; 6−4=2; Hundreds 0−5 can't; borrow: 10−5=5, thousands reduced; Thousands 8−1=7; 7−4=3. = 3521

(d) 5302 − 1034: Ones 2−4 can't; borrow: 12−4=8, tens reduced; Tens 0−1(b)=−1 can't; borrow: 10−1=9; 9−3=6; Hundreds 3−1(b)=2; 2−0=2; Thousands 5−1=4. = 4268

(e) 3444 − 2555: Ones 4−5 can't; borrow: 14−5=9, tens reduced; Tens 4−1(b)=3; 3−5 can't; borrow: 13−5=8, hundreds reduced; Hundreds 4−1(b)=3; 3−5 can't; borrow: 13−5=8, thousands

reduced; Thousands 3−1(b)=2; 2−2=0. = 889
(f) 3400 − 897: Ones 0−7 can't; cascade: thousands=3→2→ hundreds=4→3→(lend to tens) tens=0→10→9(lend to ones); ones=10; Ones: 10−7=3; Tens: 9−9=0; Hundreds: 3−8 can't; borrow: 13−8=5; Thousands: 2−1(b)=1; 1−0=1. = 2503
(g) 9382 − 4857: Ones 2−7 can't; borrow: 12−7=5, tens reduced; Tens 8−1(b)=7; 7−5=2; Hundreds 3−8 can't; borrow: 13−8=5, thousands reduced; Thousands 9−1(b)=8; 8−4=4. = 4525
(h) 7561 − 2933: Ones 1−3 can't; borrow: 11−3=8, tens reduced; Tens 6−1(b)=5; 5−3=2→ wait: tens of 2933 is 3: 5−3=2→ but actually tens of 7561 is 6; 6−1=5; 5−3=2; Hundreds 5−9 can't; borrow: 15−9=6, thousands reduced; Thousands 7−1(b)=6; 6−2=4. = 4628
(i) 6478 − 5986: Ones 8−6=2→wait: ones of 5986 is 6; 8−6=2; Tens 7−8 can't; borrow: 17−8=9, hundreds reduced; Hundreds 4−1(b)=3; 3−9 can't; borrow: 13−9=4, thousands reduced; Thousands 6−1(b)=5; 5−5=0. = 492
(j) 8004 − 3107: Ones 4−7 can't; cascade: thousands=8→7, hundreds=0→10→9(lend to tens), tens=0→10→9(lend to ones); Ones: 14−7=7→ wait: ones 4+10=14: 14−7=7; Tens: 9−0=9; Hundreds: 9−1=8→ wait hundreds of 3107 is 1: 9−1=8; Thousands: 7−3=4. = 4897

Q3 Fill the squares with numbers 1–9. The difference between any two neighbouring squares (connected by a line) must be odd. Can you do it such that the difference is even?

SOLUTION

The graph on page 163 shows a 3×3 grid of 9 squares connected horizontally and vertically (each interior square has up to 4 neighbours; corners have 2; edges have 3). For differences to be odd, every pair of neighbours must be one odd and one even number — so the grid must be coloured like a chessboard with odd numbers on one colour and even on the other. The 3×3 grid has 5 squares of one colour and 4 of the other. Place the 5 odd numbers (1,3,5,7,9) on the 5 squares of one colour and the 4 even numbers (2,4,6,8) on the 4 squares of the other colour. One valid arrangement (reading row by row, odd on the 'white' squares): Row 1: 1, 2, 3 | Row 2: 4, 5, 6 | Row 3: 7, 8, 9. Check neighbours of 5 (centre): 2 (diff 3, odd ✓), 4 (diff 1, odd ✓), 6 (diff 1, odd ✓), 8 (diff 3, odd ✓). Many other valid arrangements exist by swapping odd numbers among odd-colour squares and even numbers among even-colour squares. For even differences: every neighbouring pair must be both odd or both even — but in a 3×3 grid the chessboard colouring forces every neighbour pair to be one of each colour, so it is impossible to make all differences even with distinct numbers 1–9.