

Chapter 10: The Other Side of Zero

Complete Solutions to all "Figure It Out" Exercises (NCERT Ganita Prakash, Grade 6)

This document solves every 'Figure it Out' / 'Try This' exercise from the chapter, section by section, exactly as they appear in the textbook.

Page 245 – Figure it Out

1. You start from Floor +2 and press -3 in the lift. Where will you reach? Write an expression for this movement.

Ans. $(+2) + (-3) = -1$. He reaches Floor -1 (the Toy Store).

2. Evaluate: a. $(+1) + (+4)$ b. $(+4) + (+1)$ c. $(+4) + (-3)$ d. $(-1) + (+2)$ e. $(-1) + (+1)$ f. $0 + (+2)$ g. $0 + (-2)$

Ans. a. +5 b. +5 c. +1 d. +1 e. 0 f. +2 g. -2

3. Starting from different floors, find the movements required to reach Floor -5. Write the expressions.

Ans. $(+1) + (-6) = -5$; $(-2) + (-3) = -5$; $0 + (-5) = -5$. (Many other starting floors are possible.)

Page 246 – Figure it Out

1. Evaluate: a. $(+1) + (+4)$ b. $(+4) + (+1)$ c. $(+4) + (-3) + (-2)$ d. $(-1) + (+2) + (-3)$

Ans. a. +5 b. +5 c. -1 d. -2

2. Write the inverses of these numbers: +4, -4, -3, 0, +2, -1.

Ans. Inverse of +4 = -4; Inverse of -4 = +4; Inverse of -3 = +3; Inverse of 0 = 0; Inverse of +2 = -2; Inverse of -1 = +1.

3. Connect the inverses by drawing lines: +9, +7, -8, -5, -7, +8, +5, -9.

Ans. Pairs of inverses: $(+9 \leftrightarrow -9)$, $(+7 \leftrightarrow -7)$, $(-8 \leftrightarrow +8)$, $(-5 \leftrightarrow +5)$. Draw a line joining each number to its inverse.

(Who is on the lowest floor?). Jay is in the Art Centre (Floor +2). Asin is in the Sports Centre (Floor +5). Binnu is in the Cinema Centre (Floor -3). Aman is in the Toy Store (Floor -1). Who is on the lowest floor?

Ans. Binnu is on the lowest floor (Floor -3). Jay: +2, Asin: +5, Binnu: -3, Aman: -1.

Page 247 – Figure it Out

1. Compare using < or >: a. $-2 \square +5$ b. $-5 \square +4$ c. $-5 \square -3$ d. $+6 \square -6$ e. $0 \square -4$ f. $0 \square +4$

Ans. a. $-2 < +5$ b. $-5 < +4$ c. $-5 < -3$ d. $+6 > -6$ e. $0 > -4$ f. $0 < +4$

2. Compare using < or >: a. $-10 \square -12$ b. $+17 \square -10$ c. $0 \square -20$ d. $+9 \square -9$ e. $-25 \square -7$ f. $+15 \square -17$

Ans. a. $-10 > -12$ b. $+17 > -10$ c. $0 > -20$ d. $+9 > -9$ e. $-25 < -7$ f. $+15 > -17$

3. If Floor A = -12, Floor D = -1 and Floor E = +1, find the numbers of Floors B, C, F, G and H (equally spaced floors).

Ans. B = -9, C = -6, F = +2, G = +6, H = +11.

4. Mark the following floors: a. -7 b. -4 c. +3 d. -10

Ans. These are marked as points on the vertical building/number line at the corresponding positions between -12 and +11 (as shown in the textbook figure).

Page 248 – In-text question

–. Evaluate $15 - 5$, $100 - 10$ and $74 - 34$ by thinking of subtraction as "finding the missing number to be added".

Ans. $15 - 5$: $5 + ? = 15$, so $? = 10$. $100 - 10$: $10 + ? = 100$, so $? = 90$. $74 - 34$: $34 + ? = 74$, so $? = 40$.

Page 249 – Figure it Out

1. Complete: a. $(+1) - (+4)$ b. $(0) - (+2)$ c. $(+4) - (+1)$ d. $(0) - (-2)$ e. $(+4) - (-3)$ f. $(-4) - (-3)$ g. $(-1) - (+2)$ h. $(-2) - (-2)$ i. $(-1) - (+1)$ j. $(+3) - (-3)$

Ans. a. -3 b. -2 c. +3 d. +2 e. +7 f. -1 g. -3 h. 0 i. -2 j. +6

Page 251 – Figure it Out

1. Complete: a. $(+40) + \underline{\quad} = +200$ b. $(+40) + \underline{\quad} = -200$ c. $(-50) + \underline{\quad} = +200$ d. $(-50) + \underline{\quad} = -200$ e. $(-200) - (-40)$ f. $(+200) - (+40)$ g. $(-200) - (+40)$

Ans. a. +160 b. -240 c. +250 d. -150 e. -160 f. +160 g. -240

Page 252 – Math Talk (in-text questions)

–. Did you notice that subtracting a negative number is the same as adding the corresponding positive number? Does the infinite lift remind you of a number line?

Ans. Yes — in every case, subtracting a negative gave the same result as adding the corresponding positive number. The infinite lift is exactly like a number line turned vertically: 0 is the reference point, and numbers extend endlessly in both directions.

–. If, from 5 you wish to go over to 9, how far must you travel along the number line?

Ans. You must travel +4 steps forward, since $5 + 4 = 9$.

–. From 9, if you wish to go to 3, how much must you travel?

Ans. You must travel -6 (6 steps backward), since $9 + (-6) = 3$.

Page 253–254 – Figure it Out

1. Mark 3 positive numbers and 3 negative numbers on the number line.

Ans. Sample: mark +2, +5, +8 to the right of 0, and -1, -3, -7 to the left of 0.

2. Write down the above 3 marked negative numbers in the boxes.

Ans. Using the sample above: -7, -3, -1 (in increasing order).

3. Is $2 > -3$? Why? Is $-2 < 3$? Why?

Ans. Yes, $2 > -3$, because 2 lies to the right of -3 on the number line. Yes, $-2 < 3$, because -2 lies to the left of 3 on the number line.

4. What are: a. $-5 + 0$ b. $7 + (-7)$ c. $-10 + 20$ d. $10 - 20$ e. $7 - (-7)$ f. $-8 - (-10)$?

Ans. a. -5 b. 0 c. +10 d. -10 e. +14 f. +2

Page 255 – In-text question (unmarked number line)

- . Use unmarked number lines to evaluate: a. $-125+(-30)$ b. $+105-(-55)$ c. $+80-(-150)$ d. $-99-(-200)$

Ans. a. -155 b. $+160$ c. $+230$ d. $+101$

Page 255 – Converting subtraction to addition (worked example, no separate exercise)

- . Confirm: $(+7)-(+5) = (+7)+(-5)$; $(-3)-(+8) = (-3)+(-8)$; $(+8)-(-2) = (+8)+(+2)$; $(+6)-(-9) = (+6)+(+9)$.

Ans. All four conversions check out: subtracting a number is the same as adding its inverse, in every case.

Page 257 – Figure it Out (Token Model – Addition)

1. Complete the additions using tokens: a. $(+6)+(+4)$ b. $(-3)+(-2)$ c. $(+5)+(-7)$ d. $(-2)+(+6)$

Ans. a. $+10$ b. -5 c. -2 d. $+4$

2. Cancel the zero pairs in the two sets of tokens. On what floor is the lift attendant, and what is the addition statement?

Ans. a. 3 positive and 5 negative tokens: $(+3)+(-5) = -2$. The attendant is on Floor -2 . b. 6 positive and 3 negative tokens: $(+6)+(-3) = +3$. The attendant is on Floor $+3$.

Page 258 – Figure it Out (Token Model – Subtraction)

1. Evaluate using tokens: a. $(+10)-(+7)$ b. $(-8)-(-4)$ c. $(-9)-(-4)$ d. $(+9)-(+12)$ e. $(-5)-(-7)$ f. $(-2)-(-6)$

Ans. a. $+3$ b. -4 c. -5 d. -3 e. $+2$ f. $+4$

2. Complete the subtractions: a. $(-5)-(-7)$ b. $(+10)-(+13)$ c. $(-7)-(-9)$ d. $(+3)-(+8)$ e. $(-2)-(-7)$ f. $(+3)-(+15)$

Ans. a. $+2$ b. -3 c. $+2$ d. -5 e. $+5$ f. -12

Page 259 – Figure it Out (Token Model – Subtraction with zero pairs)

1. Try to subtract: $-3-(+5)$. How many zero pairs will you have to put in? What is the result?

Ans. You must put in 5 zero pairs. Result: $-3-(+5) = -8$.

2. Evaluate: a. $(-3)-(+10)$ b. $(+8)-(-7)$ c. $(-5)-(+9)$ d. $(-9)-(+10)$ e. $(+6)-(-4)$ f. $(-2)-(+7)$

Ans. a. -13 b. $+15$ c. -14 d. -19 e. $+10$ f. -9

Page 259–260 – In-text bank balance questions

- . You deposit ₹60 (credit). What is your new balance (starting from ₹100)?

Ans. ₹100 + ₹60 = ₹160.

- . You pay a ₹30 electric bill (debit). What is your balance now?

Ans. ₹160 – ₹30 = ₹130.

- . You make a ₹150 purchase (debit). What is your balance now? Is this possible?

Ans. ₹130 – ₹150 = –₹20. Yes, this is possible — some banks allow a temporary negative balance, sometimes with an added fee or interest.

–. You then earn ₹200 at your business. What is your balance now?

Ans. $-\text{₹}20 + \text{₹}200 = \text{₹}180$.

Page 260 – Figure it Out (Credits and Debits)

1. Start with ₹0. Credits of ₹30, ₹40, ₹50 and debits of ₹40, ₹50, ₹60. Find the balance.

Ans. $(+30) + (+40) + (+50) + (-40) + (-50) + (-60) = -\text{₹}30$.

2. Start with ₹0. Debits of ₹1, 2, 4, 8, 16, 32, 64, 128 and a credit of ₹256. Find the balance.

Ans. $-(1+2+4+8+16+32+64+128) + 256 = -255 + 256 = +\text{₹}1$.

3. Why is it generally better to maintain a positive bank balance? When may a temporary negative balance be worthwhile?

Ans. A positive balance avoids interest/penalty charges and keeps money available for emergencies. A temporary negative balance may be worthwhile for an urgent, important expense (e.g., medical need or business opportunity) that is expected to be repaid soon from future income.

Page 261 – Figure it Out (Geographical Cross Section)

1. Fill in the respective heights a–g from the cross-section diagram.

Ans. Approximate readings: a. A = +1500 m b. B = -500 m c. C = +300 m d. D = -1200 m e. E = +1200 m f. F = -200 m g. G = +100 m.

2. Which is the highest and lowest point in the cross section?

Ans. Highest: Point A. Lowest: Point D.

3. Write the points in decreasing and then increasing order of height.

Ans. Decreasing: A, E, C, G, F, B, D. Increasing: D, B, F, G, C, E, A.

4. What is the highest point above sea level on Earth, and its height?

Ans. Mount Everest, with a height of about +8,848 m.

5. What is the lowest point with respect to sea level (land or ocean floor)?

Ans. The Challenger Deep in the Mariana Trench, Pacific Ocean, at about -10,994 m.

Page 262 – Figure it Out (Temperature)

1. Find places in India where temperature can go below 0 °C, and what is common among them.

Ans. Places such as Leh, Kargil, Dras, Shimla and Srinagar can go below 0 °C in winter. They are generally located at high altitudes or in northern regions close to the Himalayas, where winters are much colder.

2. Match the temperature with the correct time of day/night in Leh.

Ans. 14 °C → 02:00 p.m.; 8 °C → 11:00 a.m.; -2 °C → 11:00 p.m.; -4 °C → 02:00 a.m.

Page 263 – Figure it Out (Border sum grids)

1. Do the calculations for the second grid and find the border sum.

Ans. Top row: $5 + (-3) + (-5) = -3$. Bottom row: $(-8) + (-2) + 7 = -3$. Left column: $5 + 0 + (-8) = -3$. Right column: $(-5) + (-5) + 7 = -3$. Border sum = -3.

Page 264 – Figure it Out (Border sum grids – complete)

2. Complete the grids for border sums +4, -2 and -4.

Ans. One possible solution for each: Border sum +4: -10, 10, 4 / 5, -, -5 / 9, -10, 5. Border sum -2: 6, 8, -16 / 11, -, -5 / -19, -2, 19. Border sum -4: 7, -2, -9 / -3, -, -5 / -8, -6, 10. (Many other correct solutions exist.)

3. For the last grid (border sum -4), find more than one way of filling the numbers.

Ans. Multiple arrangements are possible as long as every row and column of the border sums to -4; students should try at least one alternative filling, e.g., changing the middle border values while adjusting the corners to keep each line summing to -4.

4. Which other grids can be filled in multiple ways? What could be the reason?

Ans. Grids with more "free" (unfilled) cells relative to fixed corner/edge values allow more than one valid solution, because there are more unknowns than independent constraints (equations), giving freedom of choice.

5. Make a border integer square puzzle and challenge your classmates.

Ans. Open-ended activity — students design their own grid and exchange it with a classmate to solve.

Page 264–265 – Figure it Out (Amazing grid game)

1. Try afresh with different numbers. What sum did you get?

Ans. Answers vary with the numbers picked, but the sum of the four circled numbers will always be the same for a given grid (try it out — it stays constant, here -1, for the sample grid).

2. Play with the two given 4×4 grids. What answer did you get?

Ans. Grid 1 (7, 10, 13, 16 / -2, 1, 4, 7 / -11, -8, -5, -2 / -20, -7, -14, -11): the four circled numbers always add to +12. Grid 2 (-11, -10, -9, -8 / -7, -6, -5, -4 / -3, -2, -1, 0 / 1, 2, 3, 4): the four circled numbers always add to -14.

3. What could be special about these grids? Is the magic in the numbers or their arrangement, or both?

Ans. The magic lies in both: each grid is built so that every row is an arithmetic sequence and the row-to-row and column-to-column differences are consistent, which makes the sum of one circled number from each row and column always constant, regardless of which numbers are chosen.

Page 265 – Try This

1. Write all integers between the given pairs, in increasing order: a. 0 and -7 b. -4 and 4 c. -8 and -15 d. -30 and -23

Ans. a. -6, -5, -4, -3, -2, -1 b. -3, -2, -1, 0, 1, 2, 3 c. -14, -13, -12, -11, -10, -9 d. -29, -28, -27, -26, -25, -24

2. Give three numbers such that their sum is -8.

Ans. One possibility: -5, 7, -10 (since $-5+7+(-10) = -8$). Many other combinations are possible.

3. Two dice have faces -1, 2, -3, 4, -5, 6. The smallest sum is -10 and the largest is +12. Which sums between them are not possible?

Ans. The impossible sums are: -9, -7, -5, 0, 2, 7, 9, 11.

4. Solve: $8-13$, $(-8)-(13)$, $(-13)-(-8)$, $(-13)+(-8)$, $8+(-13)$, $(-8)-(-13)$, $(13)-8$, $13-(-8)$

Ans. $8-13 = -5$; $(-8)-(13) = -21$; $(-13)-(-8) = -5$; $(-13)+(-8) = -21$; $8+(-13) = -5$; $(-8)-(-13) = +5$; $(13)-8 = +5$; $13-(-8) = +21$.

5. Find the years: a. 150 years ago from the present year b. 2200 years ago c. what year is 320 years after 680 BCE (remember there is no year 0)

Ans. a. and b. depend on the current present year, so calculate as (Present year – 150) and (Present year – 2200) respectively for years CE, adjusting through 1 CE/1 BCE with no year 0 if the result crosses into BCE. c. $680 \text{ BCE} + 320 \text{ years} = 360 \text{ BCE}$ (since there is no year 0, $680-320 = 360$, and it stays BCE).

6. Complete the sequences: a. $(-40), (-34), (-28), (-22), _, _, _$ b. $3, 4, 2, 5, 1, 6, 0, 7, _, _, _$ c. $_, _, 12, 6, 1, (-3), (-6), _, _, _$

Ans. a. $-16, -10, -4$ (each term is 6 more than the previous one) b. $-1, 8, -2$ (the pattern $+1, -2$ repeats) c. Full sequence: $27, 19, 12, 6, 1, -3, -6, -8, -9, -9$ (the difference between consecutive terms increases by 1 each time: $-8, -7, -6, -5, -4, -3, -2, -1, 0$).

7. Using cards $(+1), (+7), (+18), (-5), (-2), (-9)$, make an expression whose value is closer to -30 .

Ans. One way: $(-2)+(-9)-(+18)-(+1) = -30$.

8. The sum of two positive integers is always positive, but (positive)–(positive) can be positive or negative. What about: a. (positive)–(negative) b. (positive)+(negative) c. (negative)+(negative) d. (negative)–(negative) e. (negative)–(positive) f. (negative)+(positive)?

Ans. a. Always positive. b. Can be positive, negative or zero. c. Always negative. d. Can be positive, negative or zero. e. Always negative. f. Can be positive, negative or zero.

9. A string has 100 tokens arranged in a pattern $(+++---++---++---)$ repeating). What is the value of the string?

Ans. The repeating block of tokens sums to a small positive value per block; multiplying out across all 100 tokens gives a total value of $+20$ for the string.

Page 267 & 268 – Figure it Out (Brahmagupta's Rules)

1. Explain each of Brahmagupta's rules using Bela's Building of Fun or the number line.

Ans. Each rule matches a lift movement: adding two positives means pressing '+' extra times (going further up); adding two negatives means pressing '-' extra times (going further down); adding opposite signs is like pressing '+' and '-', which partly cancel, leaving the sign of whichever was pressed more; a number and its inverse cancel completely, returning to Floor 0; and adding/subtracting zero means not pressing any button, so the floor stays the same.

2. Give your own examples of each rule.

Ans. Sample: $(2)+(5)=7$ [Rule 1]; $(-4)+(-3)=-7$ [Rule 2]; $(-6)+(4)=-2$ and $(6)+(-4)=2$ [Rule 3]; $(9)+(-9)=0$ [Rule 4]; $(-7)+(0)=-7$ [Rule 5]. (Students may give any valid examples.)

Note: For Try This Q5 (years) and the Page 253 marking questions, answers depend on the current year or on the numbers a student personally marks; a representative/sample method has been shown above for teacher reference.