

NCERT Solutions Class 6 Maths (Ganita Prakash)

Chapter 10 The Other Side of Zero

Figure it Out (Page No. 245)

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

Solution: The starting floor is (+ 2)
and the number on the button pressed is (- 3).
 $\therefore$ The target floor $(+2) + (- 3) = + 2 - 3 = -1$

Question 2. Evaluate these expressions (you may think of them as Starting Floor + Movement by referring to the Building of Fun).

(a) $(-1) + (+ 4) =$ _____

(b) $(+4) + (+1) =$ _____

(c) $(+ 4) + (- 3) =$ _____

(d) $(-1) + (+ 2) =$ _____

(e) $(-1) + (+1) =$ _____

(f) $0 + (+ 2) =$ _____

(g) $0 + (-2) =$ _____

Solution:

(a) $(-1) + (+ 4) = + 5$

(b) $(+4) + (+1) = +5$

(c) $(+ 4) + (- 3) = +1$

(d) $(-1) + (+ 2) = +1$

(e) $(-1) + (+1) = 0$

(f) $0 + (+ 2) = +2$

(g) $0 + (-2) = -2$

Question 3. Starting from different floors, find the movements required to reach Floor -5. For example, if I start at Floor +2, I must press -7 to reach Floor -5. The expression is $(+2) + (-7) = -5$.

Find more starting positions and the movements needed to reach Floor -5 and write the expressions.

Solution:

Other such expressions are:

$(+3) + (-8) = -5$

$(+4) + (-9) = -5$

$(+5) + (-10) = -5$

$$(+6) + (-11) = -5$$

And there could be infinite such expressions.

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Evaluate these expressions by thinking of them as the resulting movement of combining button presses:

(a) $(+1) + (+4) =$ _____

Solution: Target floor = $(+1) + (+4) = +5$

(b) $(+4) + (+1) =$ _____

Solution: Target floor = $(+4) + (+1) = +5$

(c) $(+4) + (-3) + (-2) =$ _____

Solution: Target floor = $(+4) + (-3) + (-2)$
 $= 4 + (-5)$
 $= -1$

(d) $(-1) + (+2) + (-3) =$ _____

Solution:

Target floor = $(-1) + (+2) + (-3)$
 $= (-4) + (2)$
 $= -2$

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Notice that all negative number floors are below Floor 0. So, all negative numbers are less than 0. All the positive number floors are above Floor 0. So, all positive numbers are greater than 0.

Question 1. Compare the following numbers using the building of fun and fill in the boxes with < or >.

(a) -2 _____ $+5$

(b) -5 _____ $+4$

(c) -5 _____ -3

(d) $+6$ _____ -6

(e) 0 _____ -4

(f) 0 _____ $+4$

Solution:

(a) Floor -2 is lower than the floor $+5$.

So, $-2 < +5$

(b) Floor -5 is lower than the floor $+4$.

So, $-5 < +4$

(c) Floor -5 is lower than the floor -3 .

So, $-5 < -3$

(d) Floor $+6$ is higher than the floor -6 .

So, $+6 > -6$

(e) Floor 0 is higher than the floor -4 .

So, $0 > -4$

(f) Floor 0 is lower than the floor $+4$.

So, $0 < +4$

Question 2. Imagine the building of fun with more floors. Compare the numbers and fill in the boxes with $<$ or $>$.

(a) -10 _____ -12

(b) $+17$ _____ -10

(c) 0 _____ -20

(d) $+9$ _____ -9

(e) -25 _____ -7

(f) $+15$ _____ -17

Solution:

(a) $-10 > -12$

(b) $+17 > -10$

(c) $0 > -20$

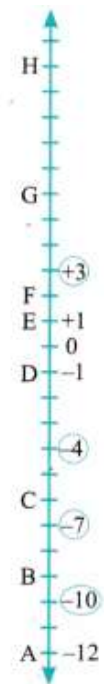
(d) $+9 > -9$

(e) $-25 < -7$

(f) $+15 > -17$

Question 3.

If Floor A = -12 , Floor D = -1 and Floor E = $+1$ in the building shown on the right as a line, find the numbers of Floors B, C, F, G and H.



Solution:

Floor B is 9 floors lower than Floor 0.

So, the number of Floor B is -9.

Floor C is 6 floors lower than Floor 0.

So, the number of Floor C is -6.

Floor F is 2 floors higher than Floor 0.

So, the number of Floor F is +2.

Floor G is 6 floors higher than Floor 0.

So, the number of Floor G is +6.

Floor H is 11 floors higher than Floor 0.

So, the number of Floor H is +11.

Question 4. Mark the following floors of the building shown on the right.

(a) -7

(b) -4

(c) +3

(d) -10

Solution:

Floors -7, -4, +3, and -10 of the building are marked on the line given on previous page.

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Question 1. Complete these expressions. You may think of them as finding the movement needed to reach the Target Floor from the Starting Floor.

(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) $(+3) - (-3) =$ _____

Solution:

(a) $(+1) - (+4) = 1 - 4 = -3$

(b) $(0) - (+2) = 0 - 2 = -2$

(c) $(+4) - (+1) = 4 - 1 = 3$

(d) $(0) - (-2) = 0 + 2 = 2$

(e) $(+4) - (-3) = 4 + 3 = 7$

(f) $(-4) - (-3) = -4 + 3 = -1$

(g) $(-1) - (+2) = -1 - 2 = -3$

(h) $(-2) - (-2) = -2 + 2 = 0$

(i) $(-1) - (+1) = -1 - 1 = -2$

(j) $(+3) - (-3) = 3 + 3 = 6$

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Complete these expressions. Check your answers by thinking about the movement in the mineshaft.

(a) $(+40) +$ _____ $= +200$

Solution: Given $(+40) +$ _____ $= +200$

Let $(+40) + x = +200$

$\Rightarrow +x = 200 - 40 = 160$

$\therefore (+40) + \underline{+160} = +200$

(b) $(+40) +$ _____ $= -200$

Solution: Given $(+40) +$ _____ $= -200$

Let $(+40) + x = -200$

$\Rightarrow x = -200 - 40 = -240$

$\therefore (+40) + \underline{-240} = -200$

(c) $(-50) + \underline{\hspace{2cm}} = +200$

Solution: Given $(-50) + \underline{\hspace{2cm}} = +200$

Let $(-50) + x = +200$

$\Rightarrow x = +200 - (-50) = +250$

$\therefore (-50) + \underline{(+250)} = +200$

(d) $(-50) + \underline{\hspace{2cm}} = -200$

Solution: Given $(-50) + \underline{\hspace{2cm}} = -200$

Let $(-50) + x = -200$

$\Rightarrow x = -200 - (-50) = -150$

$\therefore (-50) + \underline{(-150)} = -200$

(e) $(-200) - (-40) = \underline{\hspace{2cm}}$

Solution: Given $(-200) - (-40) = \underline{\hspace{2cm}}$

Let $(-200) - (-40) = x$

$\Rightarrow (-200) - (-40) = -160 = x$

$\therefore (-200) - (-40) = \underline{-160}$

(f) $(+200) - (+40) = \underline{\hspace{2cm}}$

Solution: Given $(+200) - (+40) = \underline{\hspace{2cm}}$

Let $(+200) - (+40) = x$

$\Rightarrow +160 = x$

$\therefore (+200) - (+40) = \underline{+160}$

(g) $(-200) - (+40) = \underline{\hspace{2cm}}$

Solution:

Given $(-200) - (+40) = \underline{\hspace{2cm}}$

Let $(-200) - (+40) = x$

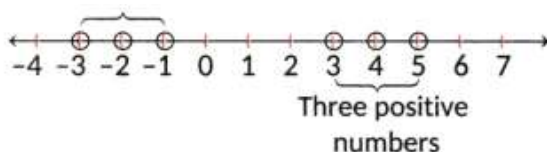
$\Rightarrow (-200) + (-40) = -240 = x$

$\therefore (-200) - (+40) = \underline{-240}$

Figure it Out (Page No. 253 – 254)

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

Solution:



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

Solution:

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

Solution: Represent the numbers 2, -3, -2 and 3 on a number line.



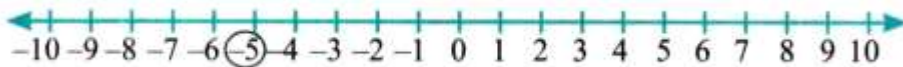
2 is to the right of -3 on the number line.

So, $2 > -3$.

And, -2 is to the left of 3 on the number line. So, $-2 < 3$.

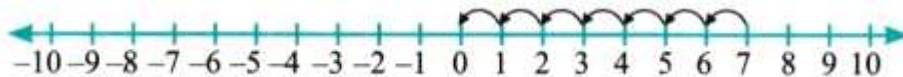
Question 4. (i) $-5 + 0$

Solution:



(ii) $7 + (-7)$

Solution:



(iii) $-10 + 20$

Solution:



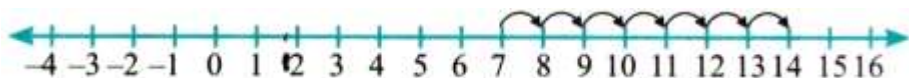
(iv) $10 - 20$

Solution:



(v) $7 - (-7)$

Solution:



(vi) $-8 - (-10)$?

Solution:

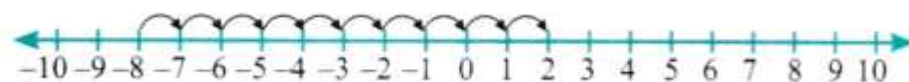


Figure it Out (Page No. 257)

Question 1. Complete the additions using tokens.

(a) $(+6) + (+4)$

(b) $(-3) + (-2)$

(c) $(+5) + (-7)$

(d) $(-2) + (+6)$

Solution:

(a) $\oplus \oplus \oplus \oplus \oplus \oplus$
 $\oplus \oplus \oplus \oplus$

$$\therefore (+6) + (+4) = +10$$

(b) $\ominus \ominus \ominus$
 $\ominus \ominus$

$$\therefore (-3) + (-2) = -5$$

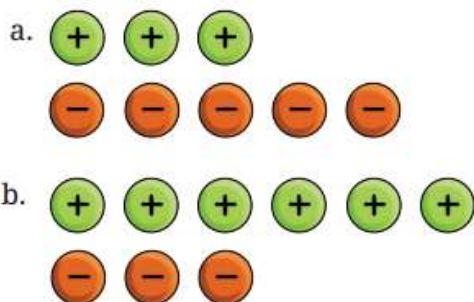
(c) $\oplus \oplus \oplus \oplus \oplus$
 $\ominus \ominus \ominus \ominus \ominus \ominus \ominus$

$$\therefore (+5) + (-7) = -2$$

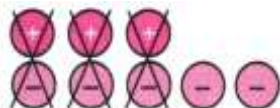
(d) $\ominus \ominus$
 $\oplus \oplus \oplus \oplus$

$$\therefore (-2) + (+6) = +4$$

Question 2. Cancel the zero pairs in the following two sets of tokens. On what floor is the lift attendant in each case? What is the corresponding addition statement in each case?



Solution: (a) From the picture we see that we can remove three pairs.



This cancels out to 0.

Remaining tokens = 

Since two negative tokens are remaining, the lift attendant is on the second floor below the ground floor.

The corresponding addition statement is $(+3) + (-5) = (-2)$

(b) From the picture we see that we can remove three pairs.



This cancels out to 0.

Remaining tokens = 

Since three positive tokens are remaining, the lift attendant is on the third floor above the ground floor.

The corresponding addition statement is $(+6) + (-3) = (+3)$

Figure it Out (Page No. 258)

Question 1. Evaluate the following differences using tokens. Check that you get the same result as with other methods you now know:

(a) $(+10) - (+7)$

Solution:



$$(+10) - (+7) = 3$$

(b) $(-8) - (-4)$

Solution:



$$(-8) - (-4) = -4$$

(c) $(-9) - (-4)$

Solution:



$$(-9) - (-4) = -5$$

(d) $(+9) - (+12)$

Solution:

Start with 9 positives.



But there are not enough tokens to take out 12 positives. So, we will add 3 extra zero pairs and then take out 12 positives.



$$(+9) - (+12) = -3$$

(e) $(-5) - (-7)$

Solution:

Start with 5 negatives.



But there are not enough tokens to take out 7 negatives. So, we will add 2 extra zero pairs and then take out 7 negatives.



$$(-5) - (-7) = +2$$

(f) $(-2) - (-6)$

Solution:

Start with 2 negatives.



But there are not enough tokens to take out 6 negatives. So, we will add 4 extra zero pairs and then take out 6 negatives.



$$(-2) - (-6) = +4$$

Figure it Out (Page No. 259)

Question 1. Try to subtract $-3 - (+5)$.

How many zero pairs will you have to put in? What is the result?

Solution: You have -3 (3 negative tokens). Subtracting $+5$ means you need to remove 5 positive tokens.

Add 5 zero pairs to introduce 5 positive tokens that can be removed.

Remove the 5 positive tokens.

After removing these, you are left with 3 original negative tokens and 5 additional negative tokens.

3 original negative tokens + 5 additional negative tokens

= 8 negative tokens

So, the result is -8 and you needed to add 5 zero pairs to perform the subtraction.

$$-3 - (+5) = -8$$

Question 2. Evaluate the following using tokens.

(a) $(-3) - (+10)$

(b) $(+8) - (-7)$

(c) $(-5) - (+9)$

(d) $(-9) - (+10)$

(e) $(+6) - (-4)$

(f) $(-2) - (+7)$

Solution:**(a)**

$$\therefore (-3) - (+10) = -13$$

(b)

$$\therefore (+8) - (-7) = 15$$

(c)

$$\therefore (-5) - (+9) = -14$$

(d)

$$\therefore (-9) - (+10) = -19$$

(e)

$$\therefore +6 - (-4) = +10$$

(f)

$$\therefore (-2) - (+7) = -9$$

10.3 Integers in Other Places Figure it Out (Page No. 260)**Question 1.**

Suppose you start with 0 rupees in your bank account, and then you have credits of ₹ 30, ₹ 40, and ₹ 50, and debits of ₹ 40, ₹ 50, and ₹ 60. What is your bank account balance now?

Solution:

Here, Credits = ₹ 30 + ₹ 40 + ₹ 50 = ₹ 120

and Debits = ₹ 40 + ₹ 50 + ₹ 60 = ₹ 150

$\therefore$ Balance = Credits – Debits

= ₹ 120 – ₹ 150

= – ₹ 30

Therefore, your bank account balance is – ₹ 30.

Question 2.

Suppose you start with 0 rupees in your bank account, and then you have debits of ₹1, 2, 4, 8, 16, 32, 64, and 128, and then a single credit of ₹ 256. What is your bank account balance now?

Solution:

Consider 'credits' as positive numbers and 'debits' as negative numbers.

Total credits = +256

Total debits = $(-1) + (-2) + (-4) + (-8) + (-16) + (-32) + (-64) + (-128) = -255$

Account balance = Total credits + Total debits = $(+256) + (-255) = +1$

Hence, the account balance is ₹ 1.

Question 3.

Why is it generally better to try and maintain a positive balance in your bank account?

What are circumstances under which it may be worthwhile to temporarily have a negative balance?

Solution:

Maintaining a positive balance ensures you avoid fees or interest charges.

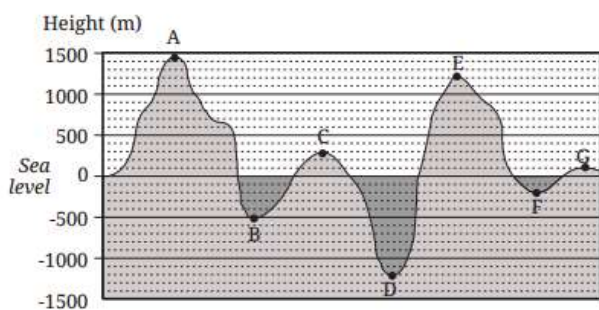
In situations like making an investment that will quickly pay off a profit, a temporary negative balance might be worthwhile.

Figure it Out (Page No. 261)

Question 1. Looking at the geographical cross-section fill in the respective heights:

A B C D

E F: G



Solution: A = +1500 m

B = -500 m

C = +300 m

D = -1200 m

E = +1200 m

F = -200 m

G = +100 m

Question 2. Which is the highest point in this geographical cross-section? Which is the lowest point?

Solution: Identify the point on the graph that reaches the height point above sea level. Point A shows the highest point. Similarly find the point that is the lowest, considering points below sea level as well. Point D shows the lowest point.

Question 3. Can you write the points A, B,....., and G in a sequence of decreasing order of heights? Can you write the points in a sequence of increasing order of heights?

Solution: Based on the heights we determined in question 1, arrange the points from highest to lowest (decreasing order) $A > E > C > G > F > B > D$ and then from lowest to highest (increasing order) $D < B < F < G < C < E < A$.

Question 4.

What is the highest point above sea level on Earth? What is its height?

Solution: The highest point above sea level on Earth is the peak of Mount Everest. It stands at approximately 29,032 feet or 8,848 metres above sea level.

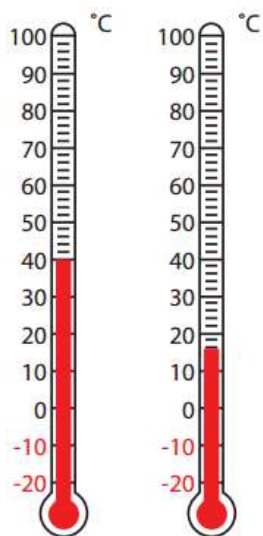
Question 5. What is the lowest point with respect to sea level on land or on the ocean floor? What is its height? (This height should be negative).

Solution: The lowest point on land with respect to sea level is the shoreline of the Dead Sea, which is approximately 1,410 feet (430 metres) below sea level. In terms of height, we can write it as approximately -1,410 feet or -430 metres.

But the lowest point on the ocean floor is the Challenger Deep in the Mariana Trench, which is about 36,070 feet or 10,994 metres below sea level. In terms of height, we can write it as -36070 feet or -10994 metres.

Figure it Out (Page No. 262)

Question 1. Do you know that there are some places in India where temperatures can go below 0°C ? Find out the places in India where temperatures sometimes go below 0°C . What is common among these places? Why does it become colder there and not in other places?



Solution: Thangu Valley (North Sikkim), Leh, Ladakh, Spiti Valley. Dras Valley, Sinchen, etc. All these are high altitude places.

Therefore, it becomes colder there and not in other places.

Question 2. Leh in Ladakh gets very cold during winter. The following is a table of temperature readings taken during different times of the day/night in Leh on a day in November. Match the temperature with the appropriate time of the day/night.

Temperature	Time
14°C	02:00 am
8°C	11:00 pm
-2°C	02:00 pm
-4°C	11:00 am

Answer: 14°C → 02: 00 PM

8°C → 11:00 AM

Figure it Out (Page No. 263 – 264)

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

5	-3	-5
0		-5
-8	-2	7

Solution: $5 + (-3) + (-5) = -3$

$(-8) + (-2) + 7 = -3$

$5 + 0 + (-8) = -3$

$(-5) + (-5) + 7 = -3$

Question 2. Complete the grids to make the required border sum:

-10		
		-5
9		

Border sum is +4

6	8	
		-5
	-2	

Border sum is -2

7		
		-5

Border sum is -4

Solution:

-10	0	14
5		-5
9	0	-5

6	8	-16
11		-5
-19	-2	19

7	-9	-2
-1		-5
-10	3	3

Question 3. For the last grid above, find more than one way of filling the numbers to get the border sum -4.

Solution: There are multiple ways to fill the last grid with a border sum of -4, here are two examples:

7	-19	8
-2		-5
-9	12	-7

7	6	-17
8		-5
-19	5	18

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

Solution: We can also fill up the grid 1 in multiple ways. Any grid with 3 or fewer prefilled numbers can be filled in multiple ways.

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

Solution: Here's the puzzle:

-5	?	7
?	?	?
4	-3	?

Border sum: 2

[Additional Notes: There might be more than two ways to fill the last grid. Creating larger grids with different order sums can lead to more complex and challenging puzzles.]

Figure it Out-1 (Page No. 265)

Question 1. Try afresh, choose different numbers this time. What sum did you get? Was it different from the first time? Try a few more times!

Solution:

3	4	0	9
-2	-1	-5	4
1	2	-2	7
-7	-6	-10	-1

3	4	0	9
-2	-1	-5	4
1	2	-2	7
-7	-6	-10	-1

3	4	0	9
-2	-1	-5	4
1	2	-2	7
-7	-6	-10	-1

3	4	0	9
-2	-1	-5	4
1	2	-2	7
-7	-6	-10	-1

Sum is $2 + 3 + (-5) + (-1) = 5 - 5 - 1 = -1$

It is the same as the first time.

Try yourself.

Question 2. Play the same game with the grids below. What answer did you get?

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Solution: (a) Let's circle the number 1.

Now as per the game, let's strike out the row and column with number 1.

Now try yourself.

(b) Let's circle the number 0.

Now as per the game, let's strike out the row and column with the number 0.

Now try yourself.

Now let's add the circled numbers = $0 + (-5) + 1 + (-10) = -14$ which is the required answer.

Question 3. What could be so special about these grids? Is the magic in the numbers the way they are arranged or both? Can you make more such grids?

Solution: Grids can be fascinating because of both the numbers and the way they are arranged. Here's why:

- **Numbers:** The numbers in a grid can follow specific patterns or sequences, such as magic squares where the sums of numbers in each row, column, and diagonal are the same.
- **Arrangement:** The way elements are arranged in a grid can create visual balance and harmony.

Figure it Out-2 (Page No. 265 – 266)

Question 1. Write all the integers between the given pairs, in increasing order.

(a) 0 and -7

(b) -4 and 4

(c) -8 and -15

(d) -30 and -23

Solution: (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

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

Solution: Three numbers whose sum is -8 , are -2 , -5 , -1 .

Question 3. There are two dice whose faces have these numbers: $-1, 2, -3, 4, -5, 6$. The smallest possible sum upon rolling these dice is $-10 = (-5) + (-5)$ and the largest possible sum is $12 = (6) + (6)$. Some numbers between (-10) and $(+12)$ are not possible to get by adding numbers on these two dice. Find those numbers.

Solution: The required numbers are $-9, 0, 7, 9$ and 11 .

Question 4. Solve these:

$8 - 13$	$(-8) - (13)$	$(-13) - (-8)$	$(-13) + (-8)$
$8 + (-13)$	$(-8) - (-13)$	$(13) - 8$	$13 - (-8)$

Solution:

$8 - 13 = -5$	$(-8) - (13)$ $= -21$	$(-13) - (-8)$ $= -5$	$(-13) + (-8)$ $= -21$
$8 + (-13)$ $= -5$	$(-8) - (-13)$ $= 5$	$(13) - 8 = 5$	$13 - (-8)$ $= 21$

Question 5. Find the years below.

(a) From the present year, which year was it 150 years ago?

(b) From the present year, which year was it 2200 years ago?

(Hint Recall that there was no year 0.)

(c) What will be the year 320 years after 680 BCE?

Solution: (a) 1874

(b) 176 BCE

(c) 360 BCE

Question 6. Complete the following sequences:

(a) (-40), (-34), (-28), (-22) _____, _____, _____

(b) 3, 4, 2, 5, 1, 6, 0, 7, _____, _____, _____

(c) _____, _____, 12, 6, 1, (-3), (-6), _____, _____, _____

Solution: (a) In this sequence, each consecutive number is obtained by adding 6 to the previous number.

The required sequence is -40, -34, -28, -22, -16, -10, -4,.....

(b) Identify the Differences Between Consecutive Terms:

3 to 4: +1

4 to 2: -2

2 to 5: +3

5 to 1: -4

1 to 6: +5

6 to 0: -6

0 to 7: +7

So, now $7 - 8 = -1$

$-1 + 9 = 8$

$8 - 10 = -2$

Therefore, the required numbers are -1, 8 and -2

3, 4, 2, 5, 1, 6, 0, 7, -1, 8, -2

(c) The numbers to the right of 12 are decreasing as per the following rule:

12 to 6 = -6

6 to 1 = -5

1 to -3 = -4

-3 to -6 = -3

So, further, they should decrease as follows:

$-6 - 2 = -8$

$-8 - 1 = -9$

Now, the numbers to the left of 12 should each increase as follows:

$12 + 7 = 19$

$19 + 8 = 27$

27, 19, 12, 6, 1, (-3), (-6), -8, -9, -9

Question 7. Here are six integer cards: (+1), (+7), (+18), (-5), (-2), (-9).

You can pick any of these and make an expression using addition(s) and subtraction(s).

Here is an expression: $(+18) + (+1) - (+7) - (-2)$ which gives a value (+14).

Now, pick cards and make an expression such that its value is closer to (-30).

Solution:

Let's try to create an expression that gets as close to (-30) as possible using the given cards: (+1, +7, +18, -5, -2, -9).

One possible expression is: $(-9) + (-5) + (-2) + (-18) + (+1)$

Let's calculate the value step by step:

1. $(-9) + (-5) = -14$
2. $-14 + (-2) = -16$
3. $-16 + (-18) = -34$
4. $-34 + (+1) = -33$

Hence, the value of this expression is (-33), which is quite close to (-30).

Question 8. The sum of two positive integers is always positive but a (positive integer) – (positive integer) can be positive or negative. What about
(a) (Positive) – (Negative)

Solution: (Positive) – (Negative):

Subtracting a negative number is the same as adding its positive counterpart. So, this will always be positive.

For example, $5 - (-3) = 5 + 3 = 8$.

(b) (Positive) + (Negative)

Solution: (Positive) + (Negative):

This depends on the magnitudes of the numbers. If the positive number is larger, the result is positive; if the negative number is larger, the result is negative.

For example,

$$7 + (-4) = 3 \text{ (positive)}$$

$$4 + (-7) = -3 \text{ (negative)}$$

(c) (Negative) + (Negative)

Solution: (Negative) + (Negative):

Adding two negative numbers always results in a negative number.

For example, $-2 + (-3) = -5$.

(d) (Negative) – (Negative)

Solution: (Negative) – (Negative):

This is like adding the positive counterpart of the second number to the first negative number.

If the first negative number is larger in magnitude, the result is negative.

However, if the first negative number is smaller than the second negative number, then it is

positive.

For example,

$$7 + (4) = 3 \text{ (positive)}$$

$$4 + (-7) = -3 \text{ (negative)}$$

(e) (Negative) – (Positive)

Solution: (Negative) – (Positive):

This will always be negative because you're subtracting a positive number from a negative number.

For example, $-4 - 2 = -6$.

(f) (Negative) + (Positive)

Solution: (Negative) + (Positive):

Similar to (Positive) + (Negative), it depends on the magnitudes. If the positive number is larger, the result is positive; if the negative number is larger, the result is negative.

For example,

$$-3 + 5 = 2 \text{ (positive)}$$

$$-5 + 3 = -2 \text{ (negative)}$$

Question 9.

This string has a total of 100 tokens arranged in a particular pattern. What is the value of the string?



Solution: The group of 5 tokens has the value, $(+3) + (-2) = +1$

There will be 20 such groups in a string of 100 tokens.

So, the total value will be +20.

Figure it Out (Page No. 268)

Question 1. Can you explain each of Brahmagupta's rules in terms of Bela's buildings of fun, or in terms of a number line?

Solution: Do it yourself

Question 2. Give your examples of each rule.

Solution: Rules for Addition:

1. The sum of two positives is positive.

$$3 + 4 = 7$$

2. The sum of two negatives is negative.

$$(-4) + (-6) = -10$$

3. To add a positive number and a negative number, subtract the smaller number (without the sign) from the greater number (without the sign), and place the sign of the greater number to obtain the result.

$$(-3) + 4 = 1$$

4. The sum of a number and its inverse is zero.

$$(-4) + 4 = 0$$

5. The sum of any number and zero is the same number.

$$(-7) + 0 = -7$$

Rules for Subtraction:

1. If a smaller positive is subtracted from a larger positive, the result is positive.

$$9 - 8 = 1$$

2. If a larger positive is subtracted from a smaller positive, the result is negative.

$$7 - 8 = -1$$

3. Subtracting a negative number is the same as adding the corresponding positive number.

$$3 - (-5) = 3 + 5 = 8$$

4. Subtracting a number from itself gives zero.

$$9 - 9 = 0$$

5. Subtracting zero from a number gives the same number.

$$8 - 0 = 8$$

Intext Questions

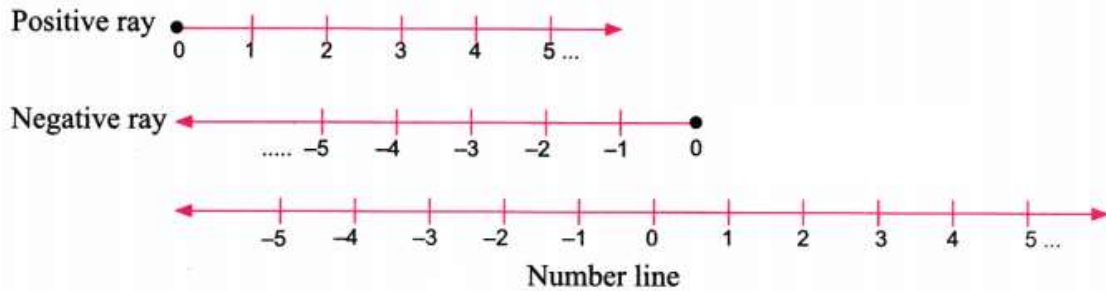
Can there be a number less than 0? Can you think of any way to have less than 0 of something? (Page No. 243)

Solution: Negative Numbers: Less than zero.

Yes, there can be numbers less than 0. These numbers are called negative numbers.

[While it might seem impossible to have less than nothing, but negative numbers are used

in many real-world situations.]



10.1 Bela's Building of Fun (Page No. 243)

What do you press to go four floors up? What do you press to go three floors down ?



Solution: If you press the '+' button once then you will go up one floor and if you press the '-' button once then you will go down 1 floor.

Hence to go four floors up you must press the '+' button four times which we write as + + + + or +4.

Now to go three floors down you must press the button three times which we write as - - - or -3.

Number all the Floors in the Building of Fun. (Page 244)



Solution: Let's mark numbers on all the Floors in the Building of Fun.



In addition to Keep Track of Movement (Page No. 245)

Start from the Food Court and press +2 in the lift Where will you reach? _____

Solution: Here, Target floor = Starting floor + Movement

∴ The starting floor is +1 (Food Court) and the number of button presses is +2.

Therefore, floor = starting floor + movement
= $(+1) + (+2)$
= +3 (Book Store)

Back to Zero! : (Page No. 246)

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

Solution: The additive inverse of +4 = $-(+4) = -4$.

The additive inverse of -4 = $-(-4) = +4$.

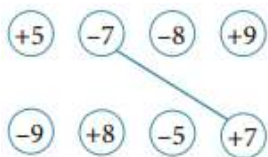
The additive inverse of -3 = $-(-3) = +3$.

The additive inverse of zero (0) is zero itself.

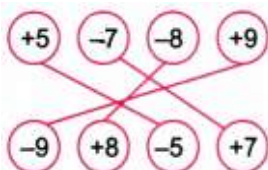
The additive inverse of +2 = $-(+2) = -2$.

The additive inverse of -1 = $-(-1) = +1$.

Connect the inverses by drawing lines. (Page No. 246)



Solution:



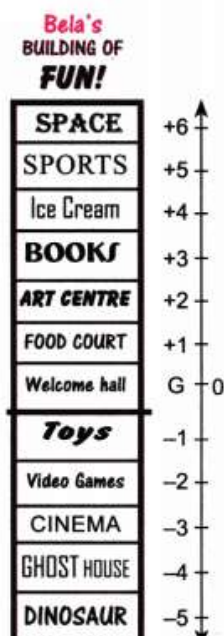
Comparing Numbers using Floors (Page No. 246)



Who is on the lowest floor?

1. Jay is in the Art Centre. So, he is on Floor +2.
2. Asin is in the Sports Centre. So, she is on Floor _____.
3. Binnu is in the Cinema Centre. So, she is on Floor _____.
4. Aman is in the toy shop. So, he is on _____.

Solution:



1. Jay is in the Art Centre. So, he is on Floor +2.
2. Asin is in the Sports Centre. So, she is on Floor +5.
3. Binnu is in the Cinema Centre. So, she is on Floor -3.
4. Aman is in the toy shop. So, he is on Floor -1.

Evaluate $15 - 5$, $100 - 10$, and $74 - 34$ from this perspective. (Page No. 248)

Solution:

(a) There are 15 pens in the shop. I take away 5 pens. How many pens are left in the shop?
Then $15 - 5 = 10$

(b) There are 100 books on the shelf. I take away 10 books. How many are left on the shelf?
Then $100 - 10 = 90$

(c) There are 74 books on the shelf. I take away 34 books. How many are left on the shelf?
Then $74 - 34 = 40$

Adding, Subtracting, and Comparing any Numbers

Try evaluating the following expressions by similarly drawing or imagining a suitable lift: (Page No. 251)

(a) $-125 + (-30)$

(b) $+105 - (-55)$

(c) $+105 + (+55)$

(d) $+80 - (-150)$

(e) $+80 + (+150)$

(f) $-99 - (-200)$

(g) $-99 + (+200)$

(h) $+1500 - (-1500)$

Solution:

(a) $-125 + (-30) = -125 - 30 = -155$

(b) $+105 - (-55) = 105 + 55 = +160$

(c) $+105 + (+55) = 105 + 55 = +160$

(d) $+80 - (-150) = 80 + 150 = +230$

(e) $+80 + (+150) = 80 + 150 = +230$

(f) $-99 - (-200) = -99 + 200 = +101$

(g) $-99 + (+200) = -99 + 200 = +101$

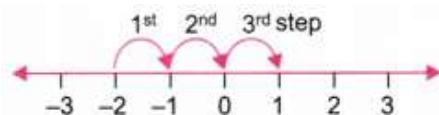
(h) $+1500 - (-1500) = +1500 + 1500 = 3,000$

In the other exercises that you did above, did you notice that subtracting a negative number was the same as adding the corresponding positive number? (Page No. 252)

Solution: Subtracting a number is the same as adding its opposite. So subtracting a positive number is like adding a negative number – you move to the left on the number line. Subtracting a negative number is like adding a positive number – you move to the right on the number line.

For example: Subtract $-2 - (-3)$

Start at -2 and move 3 units to the right.

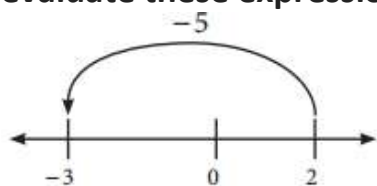


So, $-2 - (-3) = +1$

Take a look at the ‘infinite lift’ above. Does it remind you of a number line? In what ways? (Page No. 252)

Solution: A number line is a way of representing numbers visually on a straight line. For instance, the number line has arrows at the end to represent this, idea of having no bounds. The symbol used to represent infinity is ∞ .

Using the Unmarked Number Line to Add and Subtract. Use unmarked number lines to evaluate these expressions: (Page No. 255)



(a) $-125 + (-30) =$ _____

(b) $+105 - (-55) =$ _____

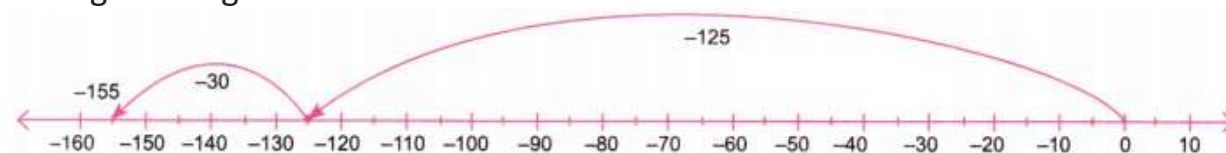
(c) $+80 - (-150) =$ _____

(d) $-99 - (-200) =$ _____

Solution:

(a) $-125 + (-30)$

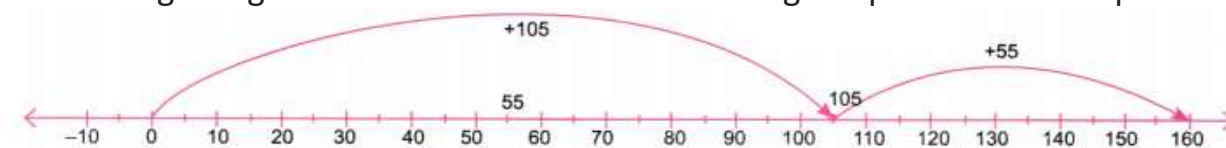
Adding two negative numbers on the number line



$\therefore -125 + (-30) = -125 - 30 = -155$

(b) $+105 - (-55)$

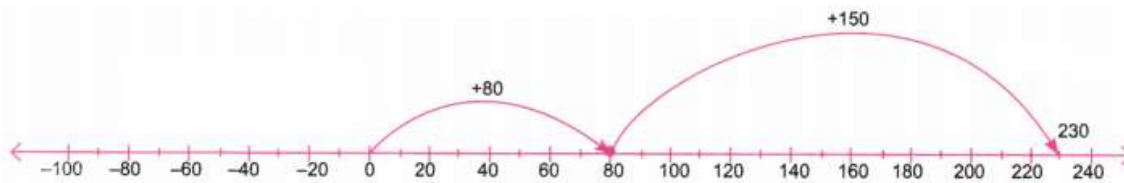
Subtracting a negative number is the same as adding the positive counterpart.



$\therefore +105 - (-55) = 105 + 55 = 160$

(c) $+80 - (-150)$

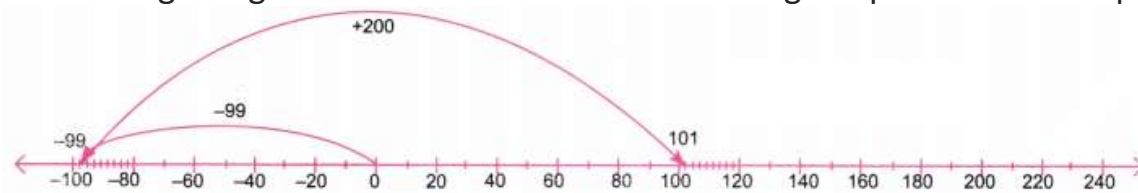
Subtracting a negative number is the same as adding the positive counterpart.



$$\therefore +80 - (-150) = 80 + 150 = 230$$

(d) $-99 - (-200)$

Subtracting a negative number is the same as adding the positive counterpart.



$$\therefore -99 - (-200) = -99 + 200 = 101$$