



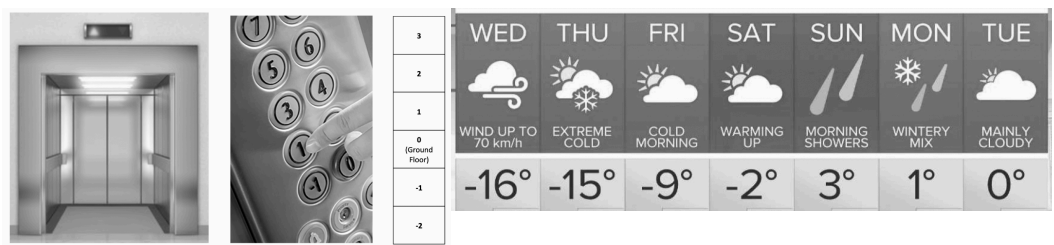
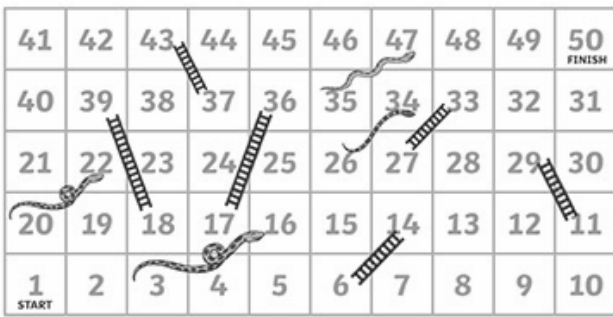
INTEGERS BOARD GAME (LEVEL 3)


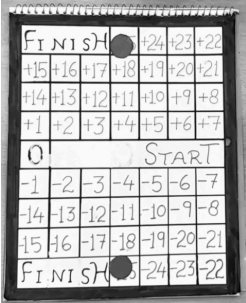

Description	Learners design a board game to help the teacher explain the concepts of integers to other students. They do so by applying the concepts of plotting integers on a number line and performing basic operations on them.
Leading question	Can I design a board game using integers?
Subjects covered	Math, Art, English
Total time required	40-60 min a day for 4 days
Resources required	Chart paper, coloured pens/pencils, number chits for integers from -10 to +10, chalk, paper, pencil/ pen
Learning outcomes:	<p>By the end of this project, learners will be able to:</p> <p>Knowledge-Based Outcomes:</p> <ol style="list-style-type: none"> 1. Identify that integers are made up of whole numbers and negative numbers. 2. Plot integers on a number line. 3. Compare integers based on their position on the number line. 4. Perform basic operations on integers using a number line. <p>21st Century Skill Outcomes:</p> <ol style="list-style-type: none"> 1. Think creatively while designing the game board and making challenge cards. 2. Work collaboratively while receiving and incorporating feedback on their board game idea. 3. Think critically while testing the game and identifying challenge cards that need to be added or modified. 4. Communicate effectively while writing rules and instructions for their board game.
Previous Learning	Plotting whole numbers on a number line Basic operations on whole numbers
Supervision required	Medium

Day 1 -

Today, you will find out what integers are, plot them on a number line, and start thinking about the design of your board game.

Time	Activity and Description
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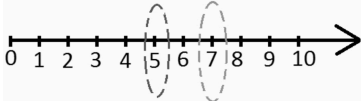

<p>10 minutes</p>	<p>Introduction to Integers</p> <p>Draw a number line and mark numbers 0 to 10 on it.</p>  <p>What do you think would come to the left of 0 on the number line? What are such numbers called?</p> <p>Note: Draw the shown number line indicating negative numbers on the board.</p>  <p>Just like we mark whole numbers such as 1, 2 and 3 on a number line to the right of the 0, we can also mark numbers to the left of 0.</p> <ul style="list-style-type: none"> - Such numbers are called negative and we place a minus sign before them. - Negative numbers and whole numbers are together called integers. - Numbers greater than 0 are called positive integers and numbers less than 0 are called negative integers. 0 is called a non-negative integer. <p>Note: Explain day-to-day uses of negative integers using the example of:</p> <ul style="list-style-type: none"> - elevators (Appendix 1, negative integers are used to indicate levels below 0 [ground floor]) - weather reports (Appendix 2, negative integers show temperature below 0 [freezing point of water]). 
<p>5 minutes</p>	<p>Introduction to the Project</p> <p>The Leading Question that we will answer in this project is: Can I design a board game using integers?</p> <ul style="list-style-type: none"> - To answer this question, we will first learn about integers. Then, we will make board games using the concepts we learn. - On the last day of the project, we will play these board games!  <p>Note: Show learners a board game, if possible, or an image of the snakes and ladders board (See Appendix 3). Inform</p>

	<p>them that just like Snakes and Ladders uses natural numbers, they will make a board game using integers.</p>
10 minutes	<p>Integers Highway Let us first learn how to mark integers on a number line!</p> <p>Note: Using chalk, draw a number line on the floor in the middle of the room and mark 0 in the middle. Make 10 markings on both sides of 0, and write the positive integers.</p>  <ul style="list-style-type: none"> - Think of 0 as a mirror on the number line. - Negative integers are like images of positive integers to the left of 0. - Each negative integer is as many steps away from 0, as the positive integer of the same value. <p>Pick one number chit at a time and place it on the correct spot on the number line!</p>
15 minutes	<p>Planning the Board Game Just like a Snakes and Ladders board shows boxes with numbers and paths our game board should show a number line of integers!</p> <ul style="list-style-type: none"> - You will now make a plan for your board game. - As you do that, think about these questions: <ol style="list-style-type: none"> 1. How do you want your number line to look - straight, curved, or any other shape? 2. How many numbers do you want to mark on it? 3. What are the rules of your game? 4. How many players will play the game? How will they move forward in the game? E.g.: You could make tokens for each player and get them to solve challenges to move forward on the number line. 5. How will you include integer-related challenges in the game? E.g.: You could make challenge cards that players will pick out and solve. 6. How does a player win the game? 7. How would you like to decorate your game board? <p>Note: Show learners two game board ideas to help them think (See Appendix 4).</p> <div style="display: flex; justify-content: space-around;">   </div>

At-home activities	Draw a number line and mark integers from -20 to +20 on it.
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Day 2

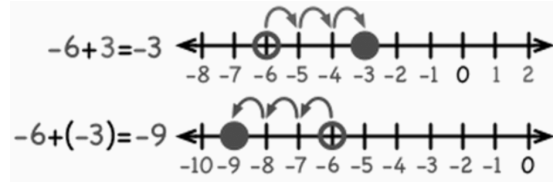
Today, you will compare integers using a number line, perform basic operations on them, and use these concepts to make some challenge cards for your board game.

Time	Activity and Description
10 minutes	<p>Comparing Integers</p> <p>Using a number line, how will you prove that 7 is greater than 5?</p>  <p>Between any 2 numbers, the number placed towards the right on a number line is bigger and the number placed towards the left is a smaller number. We can understand this with two examples.</p> <ul style="list-style-type: none"> - Ali has \$ 10 and Nina has \$. 20. Who has more money? Where does this value appear on the number line - to the left or the right? - Yes, 20 is greater than 10 and appears towards the right on the number line. (Mark 10 and 20 on the number line) - Now, Joanna borrows \$ 20 from a friend. So we can say her balance is -20. Kiran borrows Rs. 10 from a friend, so his balance is -10. Who has more money? Where does this value appear on the number line - to the left or the right? - Yes, -20 is more negative than -10 and thus is considered lower. (Mark -10 and -20 on the number line) <p>Note:</p> <ul style="list-style-type: none"> - Mark -20, -10, 10 and 20 on a number line. - Based on this, ask learners to draw ">" or "<" in the box to compare the given numbers. Suggest them to use the number line from the previous day. <p> $4 \square 6$ $-2 \square -6$ $10 \square 9$ $0 \square -1$ $0 \square 1$ $-10 \square -9$ </p> <p>Tip:</p> <ul style="list-style-type: none"> - To simplify, explain how to compare numbers using a number line. - To challenge learners, ask them to compare integers beyond the number line, such as -100 & 93, -50 & -51, and -69 & -96. - Ask learners to order three or more numbers beyond the number line, such as -125, 25, 5; 17, -17, -34; and -1000, -100, -10.
10 minutes	<p>Adding Integers</p> <p>How will you solve $6 + 3$ using a number line?</p> 

To add two whole numbers, we start at the first number and jump as many steps as the second number towards the right.

Note:

- Get learners to discuss what $-6 + 3$ and $-6 + (-3)$ will be, using the number line.
- Discuss the answers using the shown images.
- Explain to them that:
 - If we add a positive integer, we move towards the right.
 - If we add a negative integer, we move towards the left.



When we add a positive integer and its negative equivalent, we get a zero. For example, $1 + (-1)$, $7 + (-7)$, and $8 + (-8)$.

- Such pairs of numbers are called **zero pairs**.
- Separating out zero pairs while adding or subtracting integers makes it easy to arrive at the final position on the number line.
- For example:

$\begin{aligned} &(a) -7 + 4 \\ &= -3 + (-4) + 4 \text{ (zero pair)} \\ &= -3 + 0 \\ &= -3 \end{aligned}$	$\begin{aligned} &(b) 6 - 8 \\ &= -8 + 6 \\ &= -2 + (-6) + 6 \text{ (zero pair)} \\ &= -2 + 0 \\ &= -2 \end{aligned}$
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Note: Ask learners to answer the following:

$$1 + (-2) \qquad -7 + 5 \qquad -6 + (-4)$$

Discuss the answers ($1 + (-2) = -1$, $-7 + 5 = -2$, $-6 + (-4) = -10$) using the number line.

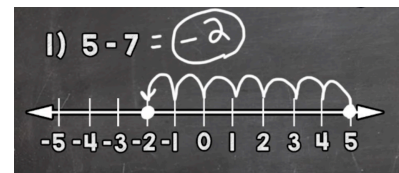
Tip: To challenge learners, ask them to add integers beyond the number line, such as $-20 + 19$, $52 + (-79)$, and $-89 + (-17)$.

10 minutes

Subtracting Integers

Solve $7-5$ using a number line and think about the method you followed.

Now, try solving $5-7$.



While subtracting integers, we do the exact opposite of what we do while adding them.

- If we subtract a positive integer, we move towards the left.
- If we subtract a negative integer, we move towards the right.

Note: Share this tip box with learners:

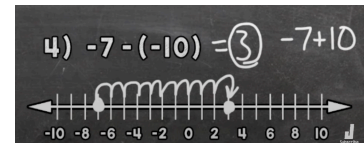
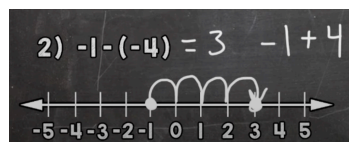
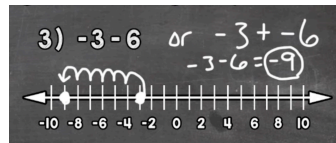
Subtracting Positive and Negative Integers			
Integer Sign	Operation	Answer Sign	Example
$\oplus - \oplus$	Subtract	Larger Integer's Sign	$2 - 5$ $= -3$
$\ominus - \ominus$	Subtract	Larger Integer's Sign	$-2 - (-5)$ $= -2 + 5$ $= 3$
$\oplus - \ominus$	Add	\oplus	$2 - (-5)$ $= 2 + 5$ $= 7$
$\ominus - \oplus$	Add	\ominus	$-2 - 5$ $= -7$

Note: Ask learners to answer the following and then discuss the answers using the shown images.

$$-3 - 6$$

$$-1 - (-4)$$

$$-7 - (-10)$$



Tip:

- Ask learners to subtract integers beyond the number line, such as $-82 - 17$, $28 - (-91)$, and $-48 - (-26)$.
- Ask learners to multiply and divide integers, such as -12×-4 , $48 \div (-12)$, and $(-63) \div (-7)$.

10 minutes

Making Challenges Cards

- Now that we know a few concepts on integers, let us use them to make some challenge cards for our board game!
- You can place these cards on different spots on your board for people to follow when they land on it.

Note: Give learners some ideas, such as the ones listed below, to help them think:

Move as many steps back as the smallest number among -4, -6 and -2.	What is $-2 - (-5)$? You will move ahead with the same number of steps!	Number Line Block! Skip this turn.
$2 - 7$ will give you your next position!	Move to the same position on the other side of the number line!	Look at $-7 + 4$ in the mirror of 0 and move the same number of steps!

At-home activities	Solve: <ul style="list-style-type: none"> - $-8 - (-12)$ - $6 - 16$ - $-9 + 19$
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Day 3 –

Today, you will write down your rules and then make your board games!

Time	Activity and Description
10 minutes	<p>Writing Rules</p> <ul style="list-style-type: none"> - Based on the ideas you thought about on the first day, list down all the rules of your game in detail. - These rules are for your friends to read when they play your board game. Write them in such a way that they can understand exactly how to play the game just by reading the list of rules. <p><i>Note: Share some rules, such as the ones shown below, to give learners ideas.</i></p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><i>Rules of the Integers Board Game!</i></p> <ul style="list-style-type: none"> ● 4 players can play at a time. ● All players start at -20. ● The first players to reach +20 wins. </div>
30 minutes	<p>Making the Board Game</p> <p>Let us now make our board games! Here are some tasks you need to do:</p> <ul style="list-style-type: none"> - Making the board game and decorating it. - Create game tokens. - Finishing the challenge cards. - Any other tasks based on the rules of your game. <p><i>Tip: If more than one learner is participating in this project, ask learners to divide tasks among themselves to collaborate effectively.</i></p>
At-home activities	Get feedback from your friends and family on the design of your board game and ask them to share what they like and what you can improve. Once done, make changes to improve your board game based on the ideas you get.

Day 4 –

Today, you will play your board game with your friends and reflect on your experience of this project.

Time	Activity and Description
30 minutes	Playing the Board Game

	<p>Note: <i>If only one learner is participating in this module, ask them to bring 3-4 friends to the class on this day to play their board games with.</i></p> <p>Today we will play our board games!</p> <ul style="list-style-type: none"> - Share the sheet of rules with your friends and ask them to read it to understand how to play the game. - Once done, ask them to explain to you how the game should be played. - If your friends understood the rules incorrectly, think about how you could have written them differently to make sure they would have been understood correctly. - Clarify any rules that you may need to, and start playing the game!
10 minutes	<p>Reflection</p> <p>Clap for yourselves for making beautiful board games!</p> <p>Now that we have completed the project, let us think and share:</p> <ul style="list-style-type: none"> - What went well? - What did not go well? - What did you learn during this project? - What will you do differently in the next project?

Additional enrichment activities:	Learners can be asked to make a board game using a number line from -50 to +50 or -100 to +100.
Modifications for simplification	Learners can be given pre-prepared board game outlines to work with.

ASSESSMENT CRITERIA

A majority of my learners were able to:

- Plot negative integers on a number line.
- Compare integers using a number line.
- Add integers using a number line.
- Subtract integers from each other using a number line.
- Design a board game based on using a number line to compare integers and perform operations on them.

APPENDIX

Appendix 1: Application of negative integers in elevators.



Appendix 2: Application of negative integers in weather reports.

WED	THU	FRI	SAT	SUN	MON	TUE
WIND UP TO 70 km/h	EXTREME COLD	COLD MORNING	WARMING UP	MORNING SHOWERS	WINTERY MIX	MAINLY CLOUDY
-16°	-15°	-9°	-2°	3°	1°	0°

Appendix 3: An image of a snakes and ladders board

41	42	43	44	45	46	47	48	49	50 FINISH
40	39	38	37	36	35	34	33	32	31
21	22	23	24	25	26	27	28	29	30
20	19	18	17	16	15	14	13	12	11
1 START	2	3	4	5	6	7	8	9	10

Appendix 4: Game board ideas

