

# MULTI MATHS



Textbook

# 6



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# Preface




## Ultimaths - Textbook 6

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is a mathematics learning series for primary school students. The contents are systematically arranged according to the ability of the child, which can be applied in everyday life, and can be used as preparation for the next level.



uses an international standard of mathematical teaching and learning approaches, which have been proven to bring children success in learning mathematics. The Concrete-Pictorial-Abstract approach introduces new concepts with the use of appropriate manipulatives, before moving to pictorials and abstract representations. The development of topics across the levels in spiral progression approach helps learners acquire a new concept by building on previously learned concepts. The focus on Problem Solving by promoting the use of bar models, empowers students to develop visualization skills to better understand word problems before solving them.



provides active, fun, and collaborative mathematics learning with lots of activities and games. These learning experiences will enable students to acquire and apply concepts and skills, develop critical thinking skills, and positive attitudes towards mathematics.

# Using This Book

Ultimaths has some special features to help students learn and use this book.



## Let's Find Out

To check students' prior knowledge.



**Unit 7 Mean, Median and Mode**

**Lesson 1 Understanding Mean Or Average**

**Let's Find Out**

Three bags contain some marbles.

Wend needs to ensure that all three bags have the same number of marbles. Think of different ways this can be done. Discuss with your partner and try it out.

**Let's Learn**

The 40 Club has 12 pupils. They want to make a total of 60 paper cranes.

Total number of paper cranes = 60  
Number of pupils = 12  
Number of paper cranes made by each pupil =  $\frac{\text{Total} \div \text{Number of pupils}}{= 60 \div 12 = 5}$

Each pupil will make an average of 5 paper cranes.

**This is a concrete approach**

Average value of a set of numbers is  $\frac{\text{Total value of all the numbers}}{\text{Number of numbers}}$



## Let's Learn

To introduce concepts, skills, or problem-solving strategies in an engaging way by using Concrete-Pictorial-Abstract approach.



## Let's Practise

To practise the concepts learned in Let's Learn section.

**Let's Practise**

- A class has 40 pupils.
  - They are placed equally into 8 groups. What is the mean number of pupils in each group?
  - They are to work on their projects in groups of 5. What is the mean number of groups?
- The masses of 5 bags of rice are shown in the table below. The bags are opened and redistributed equally. What is the average mass of each bag?
 

Bag	A	B	C	D	E
Mass (kg)	11	19	16	10	14
- The average mass of 8 girls is 42 kg. What is the total mass of the girls?

Worksheet Generator 5, Page 120 to 121

## Something More Exciting

More challenging practice to stimulate higher order thinking.

**Something More Exciting**

The mean of four consecutive even numbers is 20. Find the largest of the numbers. Let us draw a model to show the four numbers.



## Let's Play



Provide fun games to encourage collaboration and to deepen or extend understanding of concepts through the games.

**Let's Play**



- Get into groups of 5. Each group is to focus on one investigation.
- Conduct a survey of the pupils in your class. Collect information:
  - 1. their shoe size
  - 2. their hand span
  - 3. the length of their arms
  - 4. the length of their legs
  - 5. their favourite ice cream flavours, etc.
- Fit in your results in a tally table.
- Analyse your data and state the:
  - 1. mean
  - 2. median
  - 3. mode
- Compare the 5 classes. Which class obtained?


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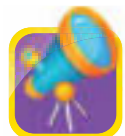
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### Lesson 1 Understanding Negative Numbers



#### Let's Find Out

Look at the scale on a wall thermometer or a laboratory thermometer.  
What do you notice about the type of numbers on the scale?



A thermometer has positive numbers, zero and negative numbers.



#### Let's Learn

**Negative numbers** are numbers with the 'negative sign' (-) in front of them.

**Examples:** -1, -2, -3, -4, -5, ...

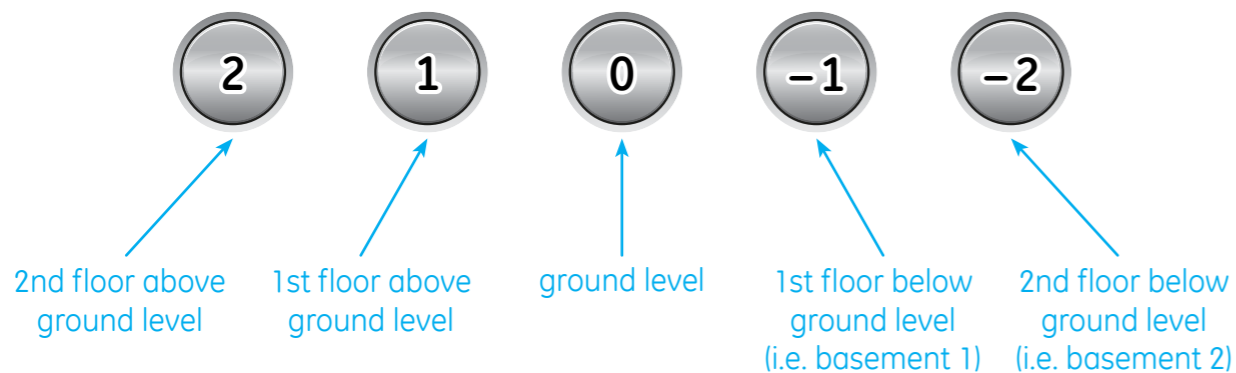
**We read:** negative one, negative two, negative three, negative four, negative five, ...

#### In Daily Life

Negative numbers are used in temperature readings.

**Example:** -5°C means 5 degrees below zero.

Negative numbers are also used in some lifts.



In addition, they can be used to read depths below sea levels.

**Example:** 2 m below sea level is -2 m from sea level.

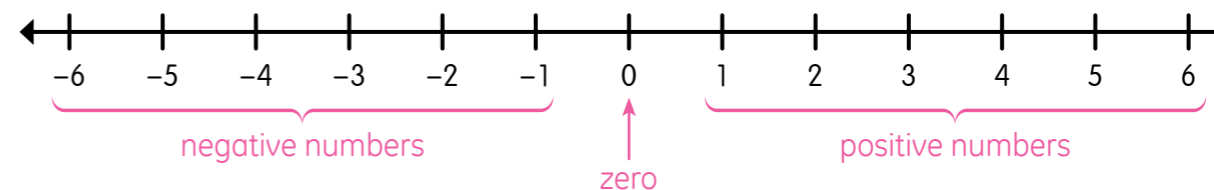
Last but not least, negative numbers can also be applied when we take the lift to the basement of a building.

**Example:** Lift going down to basements.

Level 3	Level 2	Level 1	Basement 1	Basement 2
3	2	1	-1	-2

#### Number Line

A number line shows positive numbers, zero and negative numbers.

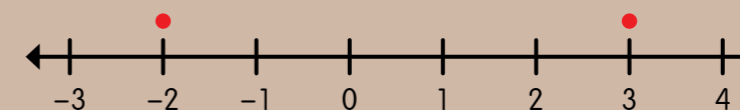


The arrows at both ends show that the line can extend on both ends.

Zero is neither positive nor negative.



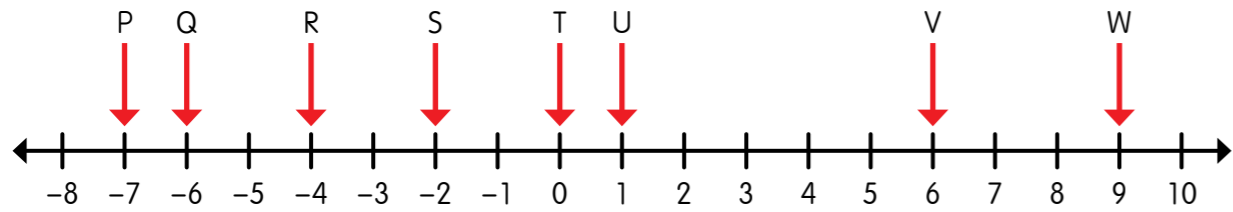
Every number on the **right** of the number line is **greater** than any number on its **left**.



3 is greater than -2 and is denoted by  $3 > -2$

or -2 is smaller than 3 and is denoted by  $-2 < 3$

$A > B$  means A is **greater than** B.  
 $A < B$  means A is **smaller than** B.  
 $A = B$  means A is **equal to** B.



P represents **-7**      R represents **-4**      T represents **0**      V represents **6**  
 Q represents **-6**      S represents **-2**      U represents **1**      W represents **9**

From the number line, we see that

- 9 is greater than 0       $9 > 0$
- 0 is greater than -2       $0 > -2$
- 4 is smaller than 0       $-4 < 0$
- 4 is smaller than -2       $-4 < -2$
- 6 is smaller than 6       $-6 < 6$
- 6 is greater than -7       $-6 > -7$

Remember:  
On the number line, numbers on the right are greater than numbers on the left.



We can compare the following numbers:

6, -6, 0, 9, -4, -7

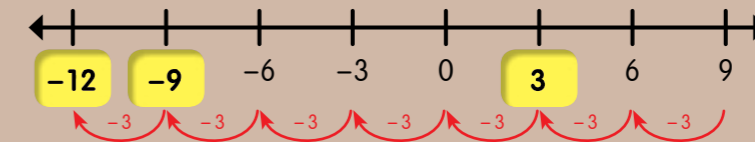
We arrange (from the number line):

-7, -6, -4, 0, 6, 9 (in ascending order)  
smallest                      greatest

9, 6, 0, -4, -6, -7 (in descending order)  
greatest                      smallest

We can also use the number line in a number pattern:

9, 6, \_\_\_\_\_, 0, -3, -6, \_\_\_\_\_, \_\_\_\_\_



Count back by 3.



**3** is 3 less than **6** .  
**-9** is 3 less than **-6** .  
**-12** is 3 less than **-9** .

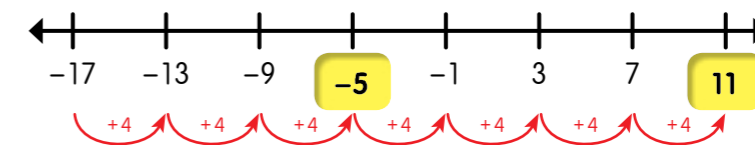
So, we have:

9, 6, **3**, 0, -3, -6, **-9**, **-12**

Let's Try

-17, -13, -9, \_\_\_\_\_, -1, 3, 7, \_\_\_\_\_

We draw and place all numbers on a number line.



Count on by 4.



**-5** is 4 more than **-9** .  
**11** is 4 more than **7** .

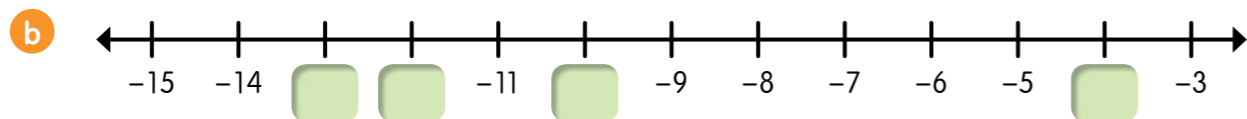
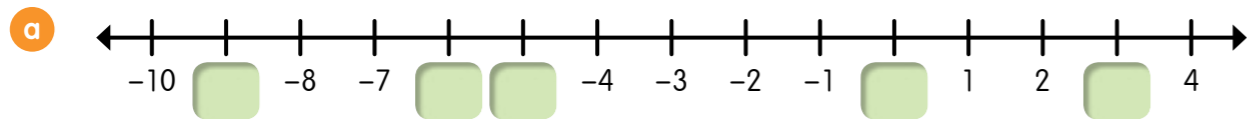
So, we have:

-17, -13, -9, **-5**, -1, 3, 7, **11**

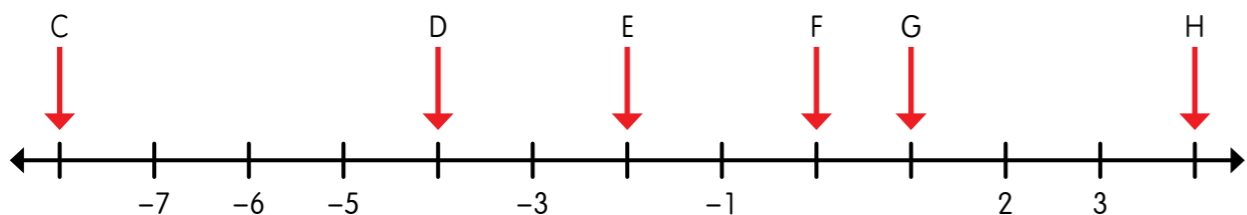


## Let's Practise

1 Fill in the missing numbers on each given number line.



2 State what number each letter represents on the number line.



a C represents  D represents  E represents   
 F represents  G represents  H represents

b Fill in the appropriate symbols: >, < or =

-8  -4      -4  4      4  -2      0  1

c Arrange the following in **i** ascending order; **ii** descending order.  
 1, -4, 4, -8, 0

3 Complete the following number patterns by drawing number lines to help you.

a 13, 8, 3, \_\_\_\_\_, -7, -12, \_\_\_\_\_

b -16, -6, \_\_\_\_\_, 14, \_\_\_\_\_, 34, 44



## Lesson 2

## Addition Involving Negative Numbers



### Let's Find Out

Using the algebra discs  $-1$  and  $1$ , can you represent  $-5$  or  $-2$ ?  
 What happens when you put them all together?



### Let's Learn

1 Let's show  $-5$  first.

$-5$ :  $-1$   $-1$   $-1$   $-1$   $-1$

There are 5  $-1$  discs.

We now show  $-2$ .

$-2$ :  $-1$   $-1$

There are 2  $-1$  discs.

#### Addition

Altogether:  $-1$   $-1$   $-1$   $-1$   $-1$  +  $-1$   $-1$  =  $-1$   $-1$   $-1$   $-1$   $-1$   $-1$   $-1$   
 $(-5)$  +  $(-2)$  =  $-7$

There are 7  $-1$  discs.

So,  $(-5) + (-2) = -7$ .

2 Let's try adding 4 to  $(-6)$ .

We show 4:  $1$   $1$   $1$   $1$

and  $-6$ :  $-1$   $-1$   $-1$   $-1$   $-1$   $-1$

$1$  and  $-1$  result in zero.  
 $1 - 1 = 0$

So, we can cancel  $1$  and  $-1$  as a pair.

#### Addition

Altogether:  $1$   $1$   $1$   $1$   $-1$   $-1$  }  $4 + (-6)$   
 $-1$   $-1$

2  $-1$  discs in total

So,  $4 + (-6) = -2$ .



3 Let's try adding  $(-7)$  to 3.

We show  $-7$ :

and 3:

and  $\Rightarrow$  zero

**Addition**

Altogether: }  $(-7) + 3$

4 discs in total

So,  $(-7) + 3 = -4$ .

4 Let's now try adding  $(-4) + 9$ .

We show  $-4$ :

and 9:

**Addition**

Altogether: }  $(-4) + 9$

5 discs in total

So,  $(-4) + 9 = 5$ .



**Let's Practise**

1 Add the following:

a  $(-2) + (-5)$

$-2$ :

$-5$ :

Altogether:  $(-2) + (-5) =$

b  $8 + (-8)$

8:

$-8$ :

Altogether:  $8 + (-8) =$

2 Solve the following:

a  $(-6) + 10 =$

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

b  $12 + (-4) =$

d  $14 + (-9) =$



Workbook: Exercise 2, Page 7 to 10



# Lesson 4 Multiplication Involving Negative Numbers



## Let's Find Out

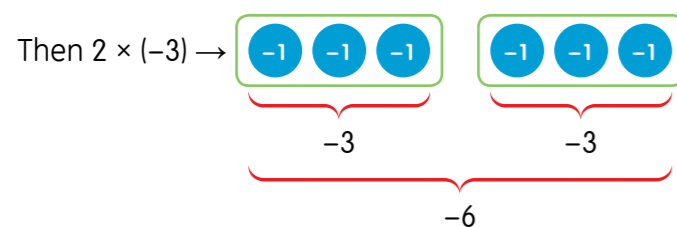
Show using diagrams the operations '2 × 3' and '3 × 2'.  
Similarly, are you able to show '2 × (-3)' and '3 × (-2)'?



## Let's Learn

1 First, we show '2 × (-3)'.

$$-3 \rightarrow \textcircled{-1} \textcircled{-1} \textcircled{-1}$$

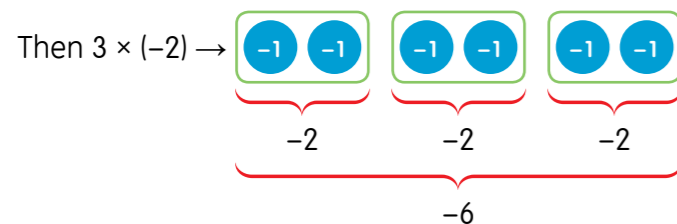


2 groups of (-3)  
= two (-3)s  
= (-3) + (-3)  
= -6

So,  $2 \times (-3) = -6$ .

Now we look at '3 × (-2)'.

$$-2 \rightarrow \textcircled{-1} \textcircled{-1}$$



3 groups of (-2)  
= three (-2)s  
= (-2) + (-2) + (-2)  
= -6

So,  $3 \times (-2) = -6$ .



In  $2 \times (-3)$ , there are 2 groups of (-3).

In  $3 \times (-2)$ , there are 3 groups of (-2).



2 Let's work out '-3 × 2' instead.

### Method 1:

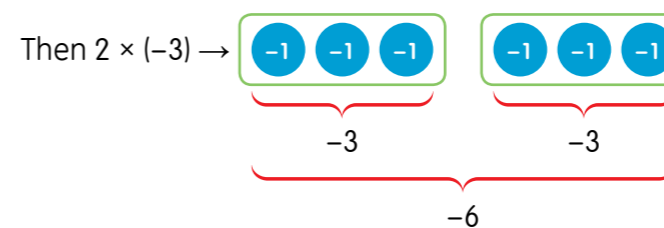
We can understand it as the negative of  $3 \times 2$ .  
The negative of 3 groups of 2 =  $-(3 \times 2)$  or  $-(2 + 2 + 2)$   
= -6 = -6

So,  $-3 \times 2 = -6$ .

### Method 2:

$-3 \times 2$  can also be written as  $2 \times (-3)$ .

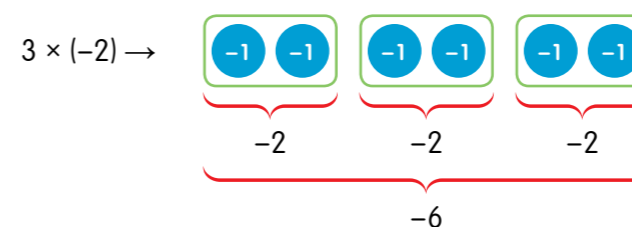
$$-3 \rightarrow \textcircled{-1} \textcircled{-1} \textcircled{-1}$$



2 groups of (-3)  
= two (-3)s  
= (-3) + (-3)  
= -6

3 Now, we try  $(-3) \times (-2)$ .

$(-3) \times (-2)$  is the negative of 3 groups of (-2).



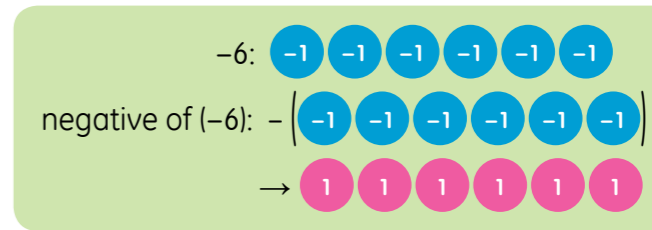
3 groups of (-2)  
= three (-2)s  
= (-2) + (-2) + (-2)  
= -6

So, the negative of  $3 \times (-2) =$  the negative of (-6)  
= -(-6)  
= 6

Recall:  
The negative of a negative number is a **positive** number!



So,  $(-3) \times (-2) = 6$ .





## Let's Practise

- 1 Multiply.
- a  $4 \times (-5)$                       b  $5 \times (-4)$

- 2 Multiply using both **Method 1** and **Method 2**.
- a  $-5 \times 4$                               b  $-4 \times 5$

- 3 Multiply.
- a  $(-5) \times (-4)$                       b  $(-6) \times (-3)$



Workbook: Exercise 4, Page 17 to 23

## Lesson 5 Division Involving Negative Numbers



### Let's Find Out

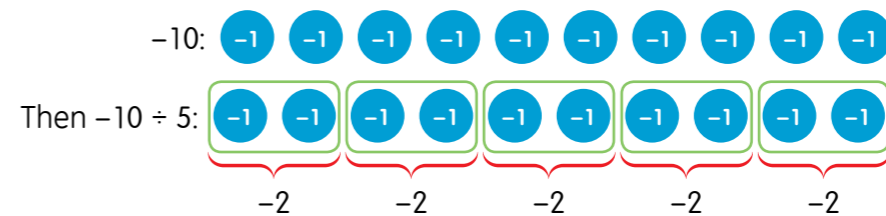
Show '-10' using the algebra discs.  
Discuss how you could work out '-10 ÷ 5'.



### Let's Learn

- 1 First, we show '-10'.

#### Method 1:



'÷ 5' means forming 5 equal groups.



So,  $-10 \div 5 = -2$ .

We can also work it out this way:

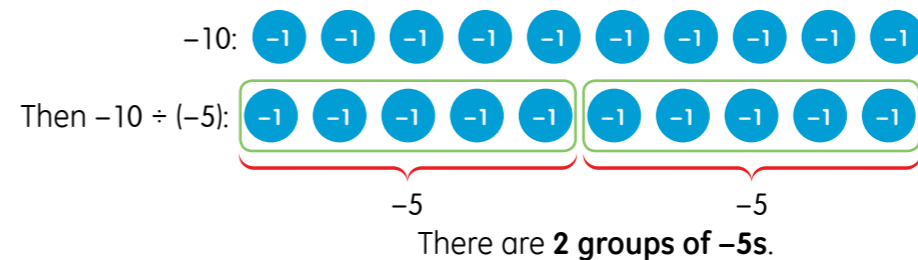
#### Method 2:

$-10 \div 5 \rightarrow 5$  groups of = -10 (i.e.  $5 \times$  = -10)

So,  $-10 \div 5 = -2$ .

- 2 Now, we work out '-10 ÷ (-5)'.

#### Method 1:



'÷ (-5)' means how many groups of (-5) are there?



So,  $-10 \div (-5) = 2$ .

We can also work it out this way:

#### Method 2:

$-10 \div (-5) \rightarrow$  groups of (-5) = -10 (i.e.  $\times$  (-5) = -10)

So,  $-10 \div (-5) = 2$ .

In summary:

### Multiplication

Negative number multiplied by positive number results in negative number.

Negative number multiplied by negative number results in positive number.

### Division

Negative number divided by positive number results in negative number.

Negative number divided by negative number results in positive number.



## Let's Practise

1 Divide using Method 1 and Method 2.

a  $-6 \div 3$

b  $-15 \div 5$

2 Divide.

a  $-6 \div (-3)$

b  $-18 \div (-6)$



Workbook: Exercise 5, Page 24 to 28

## Something More Exciting



In each of the following, insert the operations '+', '-', 'x' or '÷', and/or brackets '(' )' at appropriate places so that both sides of the equation are equal.

a  $2 \quad 2 \quad 2 \quad 2 \quad 2 = 0$

b  $2 \quad 2 \quad 2 \quad 2 \quad 2 = 1$

c  $2 \quad 2 \quad 2 \quad 2 \quad 2 = 2$



## Let's Play



### Tug of War!

Number of players: 2

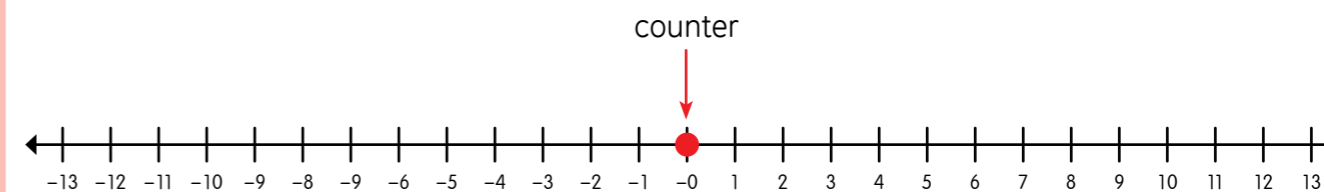
Materials: 2 counters, 2 dice – one with positive numbers, the other with negative numbers –1 to –6.

Steps: Player 1 : Positive

Moves from Left to Right

Player 2 : Negative

Moves from Right to Left



(You can even draw this number line on the floor and play.)

- Take turns to throw the 2 dice.
- Add the scores to see how far you move your counter.
- Player 1 wins when his/her counter reaches 13.
- Player 2 wins when his/her counter reaches –13.