TUG OF WAR Inclusion and Home Learning Guide is part of a Learning Pack downloadable from the AIMING HIGH website https://aiminghigh.aimssec.ac.za
It provides related activities for home learning for all ages and learning stages from pre-school to school-leaving, together with guidance for home-learning and also for inclusion in school lessons, all on the Common Theme: **THE NUMBER LINE**
Guidance for school lessons is given in the separate Notes for Teachers documents.
Choose what seems suitable for the age or attainment level of your learners.

TUG OF WAR

TUG OF WAR
MINUS   PLUS
-13   +13
Game for 2 players
Start at 0. Take it in turns to throw 2 dice. Add the scores and move a counter that number of places on the number line in your direction. To win MINUS must land exactly on -13 and PLUS must land on +13.
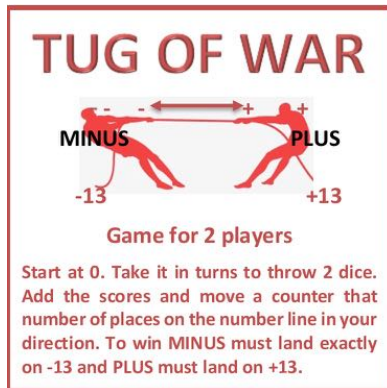
This is a game for 2 players, call yourselves Minus and Plus. You need 2 dice or a spinner and a counter. Draw a number line from -13 to +13.

Place the counter on zero. Take it in turn to throw the dice, add the scores and move the counter that number of places on the number line in your direction. To win Minus must land exactly on -13 and Plus must land exactly on + 13. If your score would overshoot then you don't move at all. No calculators allowed.
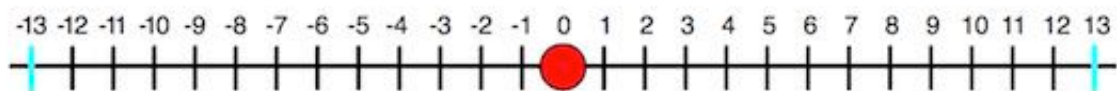
You can play with different rules. Do you prefer the game so that you only have to reach +13 or -13, and it's OK to overshoot? Why?

In the **TUG MUCH HARDER** game you can choose whether to add, subtract, multiply or divide the 2 scores (in either order) and, if the answer is a whole number, you can use it to move the counter. If your opponent challenges you, and you have done the calculation wrongly, then the counter goes 3 spaces towards your opponent's goal.
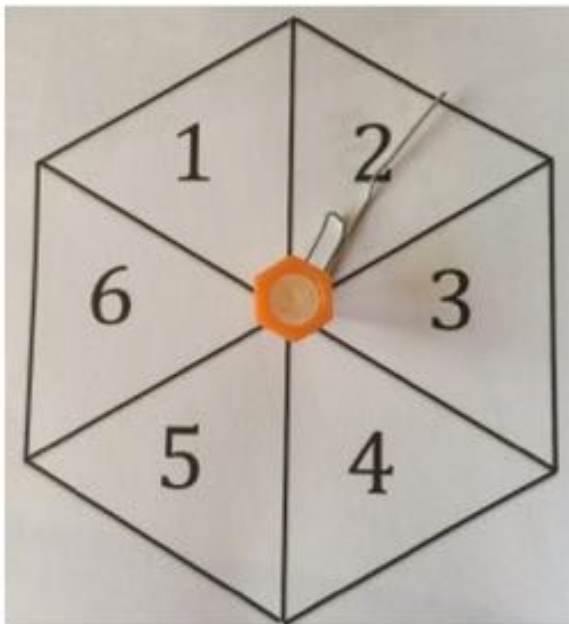
HELP

You can use a calculator, but only to check answers. If you are challenged and you got the calculation wrong, the counter goes 3 spaces towards your opponent's goal
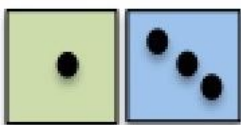
NEXT

TWO-WAY WAR

Make your own spinner if you don't have dice

You'll need a paper clip, a pin and scrap card.

Draw a regular hexagon or print this, prick through the corners and centre of the diagram, and join the points with straight line segments.

Write numbers in then cut out your spinner.

Use coloured dice. Make one die positive and the other negative. With a spinner, take the first spin to be positive and the second negative.
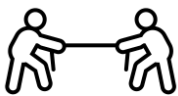
The rules for **TWO-WAY WAR** are that each player can use addition, subtraction, multiplication or division, in any order as long as the result is a whole number.

With green positive and the blue negative as shown, the possibilities are:

- Addition $^+1 + {}^-3 = {}^-2$ and $^-3 + {}^+1 = {}^-2$
- Subtraction $^+1 - {}^-3 = {}^+4$ (best choice for Plus) or $^-3 - {}^+1 = {}^-4$ (best choice for Minus)
- Multiplication $^+1 \times {}^-3 = {}^-3$ or $^-3 - {}^+1 = {}^-3$
- Division $^-3 \div {}^+1 = {}^-3$

INCLUSION AND HOME LEARNING GUIDE

THEME: THE NUMBER LINE

Early Years – ZERO TO TEN

RULES OF THE GAME

1. A game for 2 players. We call one player Zero and the other player Ten.

2. The game starts with the counter on 5. Players take it in turns to throw the die and, according to the number that comes up, move that number of steps. Zero moves the counter towards 0 and Ten moves the counter towards 10.

3. To win, a player must land **exactly** on the target number 0 or 10. If the number thrown would go past the target then the player does not move the counter and the other player has a turn.

4. Zero starts and moves the counter towards 0 unless he gets a six, and then he does not move it. Ten plays next and moves the counter in the opposite direction.

5. The game continues until one of the players lands on his target and scores a point for that round.

6. On the next round Ten starts and after that the players take turns to start each round.

7. The first player to score 12 points wins the game.

VARIATION – ZERO TO TWENTY

The number line can be drawn from 0 to 20. The game starts with the counter on the midpoint and it is played in the same way.

COUNTING WITH THE NUMBER LINE
You will need a stick to point to the numbers. Point to the numbers as the children quietly count with you; when the children are more confident stop counting yourself and just point.
Variations.
- **Count forward and then backward**. The children must watch carefully not to be caught out.
- **Count in 2s** 0, 2 4 ... You are pointing, it is the children who are counting,
- Hand the stick to a child let them choose how to count.
- **Adding 3**. Point to a small number and ask the children to add 3.

Then ask questions. Is it 7 ?
Children must show thumbs up if they think yes, thumbs down if they think no. Is it 5? Is it 6 YES 3 + 3 =6 . You will think of lots of variations.
Thumbs up, thumbs down helps you get a response from EVERY child in the group.

- **Don't stop at 20**.   Count in 1s to 20 then tap the empty wall next to 20 and say 21, 22….….Children must keep counting as you tap. Stop at 30 and count backwards. If the children get good at this you can leap along the wall and say 48,49….

Lower Primary

ZERO TO TWENTY

RULES OF THE GAME

1. A game for 2 players. We call one player Zero and the other player Twenty.

2. The game starts with the counter on 10. Players take it in turns to throw the die and, according to the number that comes up, move that number of steps. Zero moves the counter towards 0 and Twenty moves the counter towards 20.

3. To win, a player must land **exactly** on the target number 0 or 20. If the number thrown would go past the target then the player does not move the counter and the other player has a turn.

4. Zero starts and moves the counter towards 0. Twenty plays next and moves the counter in the opposite direction.

5. The game continues until one of the players lands on his target and scores a point for that round.

6. On the next round Twenty starts and after that the players take turns to start each round.

7. The first player to score 12 points wins the game.

VARIATION – ZERO TO FIFTY OR ZERO TO HUNDRED

The number line can be drawn from 0 to 50 or from 0 to 100. The game starts with the counter on the midpoint and it is played in the same way. Two dice can be used for the 0 to 100 version.

COUNTING WITH THE NUMBER LINE

Whole group. You will need a stick to point to the numbers. Point to the numbers as the children quietly count with you; when the children are more confident stop counting yourself and just point.

Variations.

- **Count forward and then backward**. The children must watch carefully not to be caught out.
- **Count in 2s** 0, 2 4 … You are pointing, it is the children who are counting,
- Hand the stick to a child let them choose how to count.
- **Adding 3**. Point to a small number and ask the children to add 3.

Then ask questions. Is it 7?
Children must show thumbs up if they think yes, thumbs down if they think no. Is it 5? Is it 6 YES 3 + 3 =6 . You will think of lots of variations.
Thumbs up, thumbs down helps you get a response from EVERY child in the group.

- **Don't stop at 20**.   Count in 1s to 20 then tap the empty wall next to 20 and say 21, 22….. Children must keep counting as you tap. Stop at 30 and count backwards. If the children get good at this you can leap along the wall and say 48,49….

Paired work
Children can draw the number line in their workbooks or on paper. Ask them to INVENT 10 problems to solve on the number line. E.g. 8 + 4 =   12-6 =

They should write down the answers. Then pairs of children come to the wall and ask the group to solve their problems.

Inventing problems is useful for DIFFERENTIATION as more confident children invent harder problems
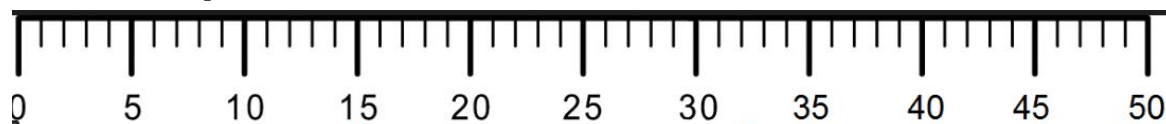
Counting for the whole group or class You will need a stick to point to the numbers
Counting in 5s and 10s
- Point to 0, 5, 10 and ask the children to count quietly. Count yourself the first time then just point and let the children count.
- Now point to the tiny mark just beyond 0 and count 1, 6, 11, 16, 21… slowly at first then repeat faster as the class get the idea.
- Repeat starting on 4.   4, 9, 14, 19, 24 ,… Stop and ask the children to show Thumbs Up if they think you will point to and say 44. Thumbs Down if they don't. Carry on counting and you WILL arrive at 44. Ask someone to explain how they knew you would land on 44.
- Try variations. Count backwards in 10s from 49, in 5s from any number.

How far to 50?
- Point to a number e.g. 35 and ask what you must add to get to 50. Children can write the answers in their books. When they Are confident they can all say the answers together as you point.

Counting beyond 50
- Count in 5s but don't stop at 50. Just tap the empty wall where 55, 60 etc would be and carry on counting to 100. Then change direction and count back.
- Tap further round and say a large number e.g Three hundred and forty. Repeat all the ideas above for larger numbers.

Upper Primary

Make a Number Line
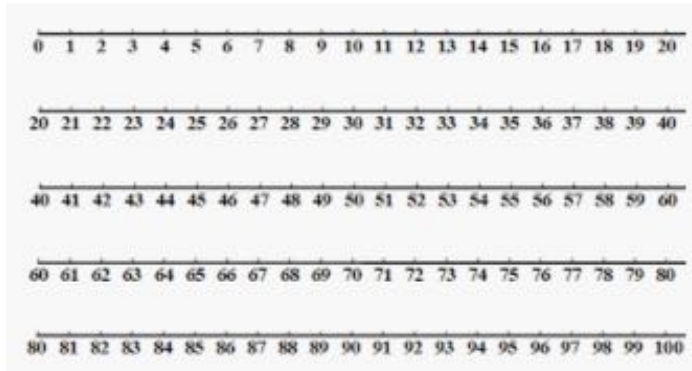
First you might like to make a number line and start counting along the line. Start with 1 to 20. The number line is not usually introduced in school until children are 7 or older but, if your child enjoys counting, and many do, then the number line is useful.

You need to plan to mount the line on a strip of wall as the line grows from 0 to 100 section by section. Make the line in sections on separate strips of paper, that you paste end to end: 0 to 20; 20 to 40; 40 to 60 etc… It may take weeks or months to complete the line from 0 to 100. In school it will eventually extend to higher numbers and, in the opposite direction, to negative numbers.

Counting on the Number Line Follow the advice given for Early Years and Lower Primary.

Tug of War and its variations as described for Early Years and Lower Primary are good games to play with young children. There may be a need to help your children to manage their emotions and not get upset if they don't win, which is good preparation for life. If your family or household likes to play games, then Tug of War can be a good family game played in two teams.

Lower Secondary

Make the number line as described for Upper Primary and use it for skip counting in multiples to reinforce knowledge and understanding of multiplication tables.

Copy page 1. Your learners should play this game to reinforce their understanding of the arithmetic of integers and they should progress when ready to the more challenging versions.

Start with the Diagnostic Quiz. Then draw the number line from -13 to + 13 and ask learners to come and mark the numbers -8, 2, -3 and 5 on the number line to make the ordering clear. Then, if you have a group, split them into two teams and call the teams Minus and Plus. Play the game as a group to introduce and explain the rules. Then, if you have enough dice or spinners, or the learners make spinners, they can play the game in pairs or one pair against another pair. The 'foursome' game works well because there are more people to check the arithmetic.

DIAGNOSTIC ASSESSMENT This should take about 5–10 minutes.

Write the question on the board, say to the class:
"Put up 1 finger if you think the answer is A, 2 fingers for B, 3 fingers for C and 4 fingers for D".

1. Notice how the learners respond. Ask a learner who gave answer A to explain why he or she gave that answer. DO NOT say whether it is right or wrong but simply thank the learner for giving the answer.

2. It is important for learners to explain the reasons for their answers. Putting thoughts into words may help them to gain better understanding and improve their communication skills.

Put the numbers shown in **ascending** order

-8 2 -3 5

A	B	C	D
$2, -3, 5, -8$	$-3, -8, 2, 5$	$-8, -3, 2, 5$	$5, 2, -3, -8$

3. Then do the same for answers B, C and D. Try to make sure that learners listen to these reasons and try to decide if their own answer was right or wrong.

4. Ask the class to vote again for the right answer by putting up 1, 2, 3 or 4 fingers. Notice if there is a change and who gave right and wrong answers.

The correct answer is: C

Upper Secondary - For independent study

You might enjoy playing the Two Way War game (see page 2) with someone your own age, or one of the easier versions of the Tug of War game with younger children.
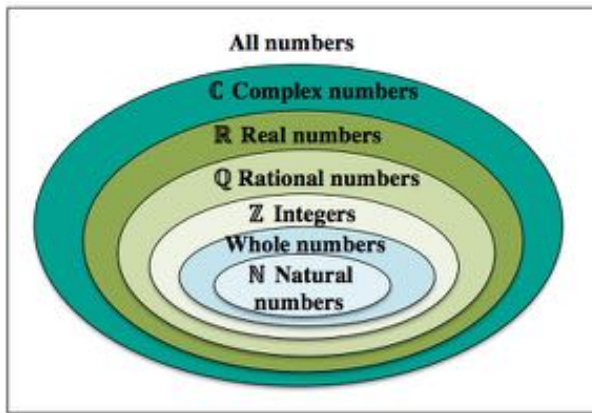
Through school and in life you have met different types of numbers, whole numbers, rational numbers (fractions), irrational numbers (surds) and perhaps other numbers.

You will have learned to solve equations whose solutions are numbers and you will have learned that each real number corresponds to a unique point on the real number line.

Some quadratic equations have real number solutions, other quadratic equations do not.

For example the equation $x^2 - x - 1 = 0$ has solutions $\frac{1}{2}(1 \pm \sqrt{5})$ which are irrational numbers (one is the Golden Mean) and they have their place on the real number line.

The equation $x^2 - x + 1 = 0$ has solutions $\frac{1}{2}(1 \pm \sqrt{-3})$ which are not real.

They are complex numbers corresponding to the points $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ and $\left(\frac{1}{2}, \frac{-\sqrt{3}}{2}\right)$ in the complex plane. It is not complicated, just think of the real part of the number as the x-coordinate and the part of the number that is not real as the y-coordinate.

You can add, subtract, multiply and divide complex numbers 'algebraically' in the obvious way.

When you combine two numbers from a particular set by addition, subtraction, multiplication or division, sometimes you get another number in the set, and we say the set is closed for that operation, and sometimes you do not. For example if you subtract one positive integer from another you don't always get a positive integer.

Fill in the table below.

Operations ➡ Sets of numbers ⬇	+	-	×	÷
Counting numbers				
Whole numbers		Not closed		
Integers		Closed		
Rational numbers				
Real numbers				
Complex numbers				

SOLUTION

Operations → Sets of numbers ↓	+	–	×	÷
Counting or Natural	closed	not closed	closed	not closed
Whole	closed	not closed	closed	not closed
Integers	closed	closed	closed	not closed
Rational	closed	closed	closed	closed
Real	closed	closed	closed	closed
Complex	closed	closed	closed	closed

Why do this activity?
Learners enjoy playing this game and they get practice in calculating with integers.

It can be played by the whole class split into 2 teams as a lesson starter, to enable the teacher to make an assessment of how well the learners understand and can carry out, the addition, subtraction, multiplication and division of integers.

The game has several stages of challenge. It can be used repeatedly for short times to give new challenges to some of the learners while enabling others to get the practice they need at a simpler level, thus optimising the progress of all the learners.

Learning objectives
In doing this activity students will have an opportunity to:
- practise calculations involving negative and positive integers;
- develop mental images of directed numbers (vectors) on the number line.

Generic competences
In doing this activity students will have an opportunity to:
- enjoy playing games that require mental effort, with a good attitude to losing and consideration for other players.

Follow up
Target Game of Integers https://aiminghigh.aimssec.ac.za/years-7-10-target-game/

Go to the **AIMSSEC AIMING HIGH** website for lesson ideas, solutions and curriculum links: http://aiminghigh.aimssec.ac.za
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