

YuMi Deadly Maths

Year 6 Teacher Resource: NA – Ups and downs

Prepared by the YuMi Deadly Centre
Faculty of Education, QUT



YuMi Deadly Maths Year 6 Teacher Resource: NA – Ups and downs



ACKNOWLEDGEMENT

We acknowledge the traditional owners and custodians of the lands in which the mathematics ideas for this resource were developed, refined and presented in professional development sessions.

TERMS AND CONDITIONS OF YOUR USE OF THE WORK AND RESTRICTED WAIVER OF COPYRIGHT

Copyright and all other intellectual property rights in relation to all of the information available on this website, including teaching models and teacher resources (the Work) are owned by the Queensland University of Technology (QUT).

Except under the conditions of the restricted waiver of copyright below, no part of the Work may be reproduced or otherwise used for any purpose without receiving the prior written consent of QUT to do so.

The Work is subject to a restricted waiver of copyright to allow copies to be made, subject to the following conditions:

1. all copies shall be made without alteration or abridgement and must retain acknowledgement of the copyright;
2. the Work must not be copied for the purposes of sale or hire or otherwise be used to derive revenue; and
3. the restricted waiver of copyright is not transferable and may be withdrawn if any of these conditions are breached.

By using the Work you are deemed to have accepted these terms and conditions.

Prepared by the YuMi Deadly Centre
Queensland University of Technology
Kelvin Grove, Queensland, 4059

ydc.qut.edu.au


© 2014 Queensland University of Technology
through the YuMi Deadly Centre

Year 6 Number and Algebra

Going down

Learning goal	Students will position positive and negative whole numbers on a number line.
Content description	Number and Algebra – Number and place value <ul style="list-style-type: none">Investigate everyday situations that use integers. Locate and represent these numbers on a number line (ACMNA124)
Big idea	Number – discrete vs continuous/number line, comparison, order, rank
Resources	Rope or masking tape, markers (Myer Centre levels: Level 6: Centre Management, Level 5: Entertainment, Level 4: Homewares, Level 3: Children’s Floor, Level 2: Men’s Floor, Level 1: Women’s Floor, Level Q or 0: Queen Street Entrance, Level ⁻ 1: Food Court, Level ⁻ 2: Bus Station/Car park, Level ⁻ 3: Car park, Level ⁻ 4: Car park, Level ⁻ 5: Car park, Level ⁻ 6 Car park); two dice (one showing digits 1–6, the other marked on three sides with “up” and the other three sides with “down”), football field diagram

Reality

Local knowledge	Ask students to think of situations where we go below ground level, e.g. lifts in the Myer Centre, submarines, mines, in-ground swimming pools. <i>Are there other situations that go below zero?</i> [temperature, money].
Prior experience	Check knowledge of the counting sequence and zero as the starting point (e.g. in a race), measurement and the concept that a line goes continuously in both directions.
Kinaesthetic	Myer Centre: Use a rope or masking tape placed on the floor  with markers to show floor levels (6 – 0 – ⁻ 6), ground floor being zero. Students take turns in throwing the dice and moving up or down on the lift. <i>Notice the direction of the negative numbers – they are going level by level less than zero, below zero.</i> One student stands at zero while another two students throw a die. The direction die shows which direction to move: <i>up</i> means going forward in a positive direction, <i>down</i> means going backwards (actually move backwards) in a negative direction. The numeral die shows how many steps to take in either the up (positive) direction or down (negative) direction. After a few throws of the dice, choose other students to act as demonstrators. Record tosses. Reverse: Give some examples where a student stands at Level 1. <i>What direction is Level ⁻3 and how many levels down do we need to go?</i> Repeat giving other directions, going in both positive and negative directions.

Abstraction

Body	Origin Game: All students are the Maroons. <i>Where does the kick-off take place?</i> [halfway]. <i>So that is the starting line. What digit represents the starting point?</i> [0]. <i>Where do the Maroons want to go?</i> [forward into the Blues’ territory to cross the line and score a try]. <i>So going forward is positive. Do the Maroons always go forward? What sometimes happens?</i> [they are pushed backwards to defend their own try line]. Call the play: Students start at zero (halfway) and take steps as called by the teacher; e.g. <i>Which side will go down? Johnathon Thurston kicks off for the Maroons and the ball goes 35 metres into NSW territory (only the ball not the players are here). It’s taken by Will Hopoate who runs the ball down as the Maroons surge forwards to the 20 m line before Josh Dugan is tackled by Cooper Cronk. But in the next play of the ball the Maroons are pushed back to the halfway mark before Paul Gallen is tackled and Trent Hodgkinson streaks away pushing the Maroons back to the 10 m line in Maroon territory. Ryan Hoffman attempts to barge through the Maroon defence but it is rock solid and the Maroons are able to gain 5 m as four of the mighty Maroons propel Hoffman closer to halfway. Jarryd Hayne makes a</i>
-------------	---

determined run and the **Maroons go 25 m back** close to their own try line. Hayne is tackled and Robbie Farah passes the ball to Daniel Tupou but it is intercepted by Billy Slater **who streaks away gaining 15 m** before being **pushed backwards 5 m** by the Blues. Cameron Smith now has the ball and he passes to **Sam Thaiday who runs the full length of the field** to give the Maroons their first try!

Hand

Moneybox: Track your money using a number line – start with **\$20 in your wallet**.

1. Movies
 - Movie ticket – \$8
 - Popcorn and drink – \$10
 - Fun parlour – \$5
 - *How much do you owe your friend?*
 - *What is worse – to be \$10 or \$20 in debt?*
2. Shopping
 - Milk – \$3
 - Steak – \$25
 - Bank withdrawal – \$15
 - BBQ chicken – \$12
 - *How much do you need to withdraw to have \$20 back in your wallet?*

Reverse: Tell a story and create a number line to show these moves: Start at 3, go up by 5, fall down by 7, fall down again by 9, go up by 4, fall down again by 2, go up by 5. Where do you end?

Mind

Close your eyes and watch the thermometer as it goes from 20° at midday, to 11° at 7.00 pm, to 2° at midnight, and drops by another 3° at 2.00 am. How cold was it at 2.00 am?

Creativity

Students create their own picture for showing how numbers move up and down; e.g. miners, submarines, Giant Drop at Dreamworld, etc.

Mathematics

Language/symbols

integers, positive, negative, forwards, backwards, up, down

Practice

1. Draw number lines to show the moves in the Myer Centre and record the end result. Do the same for the Origin rugby activities above (the Origin game could be shown on the diagram of a marked field). *How far did Sam Thaiday have to run to score his try?*
2. Game:
Materials: a die, two game pieces, game board (as below with as many rows as necessary), pencil. Each student plots own results on a number line.

Remember: Even throws are positive (go up); odd throws are negative (go down)					
Player 1			Player 2		
Turn	Roll	Result	Turn	Roll	Result
		0			0
1.	4	4	1.	-3	-3
2.	2	6	2.	4	1
3.	-3	3	3.	6	7
4.			4.		
5.			5.		

Starting at "0", players will move their game piece on a number line according to the roll of their die. Even numbers rolled move up, e.g. +4, odd numbers move down, e.g. -3. The game ends when: (a) a player reaches a score of 30 (the winner); or (b) a player reaches -30 (the loser).

3. Worksheets: e.g. Write the opposite of -4 , 7 , ... etc.

Write the missing integer -6 , -5 , -4 , , -2 , -1 , 0 , 1 , 2 , 3 , 4 , , 6

Which sign $>$, $=$, $<$ makes this statement true? -5 1

Connections Relate to money, temperature, common and decimal fractions.

Reflection

Validation Students check where they find negative numbers in the world, e.g. water in a tank: going in (up) with rain, going out (down) watering the garden; history assignments plotting events: BC (or BCE) and AD (or CE).

Application/problems Provide applications and problems for students to apply to different real-world contexts independently; e.g. a holiday at the snow where the temperature drops from positive degrees inside to negative degrees outside, decreasing to lower degrees the higher you climb. Inside chairlifts/gondolas may give some welcome change in temperature.

Extension **Flexibility.** Students design a poster showing where negative numbers are found in the world and factors $>$ that impact a negative or positive direction.

Reversing. Students are able to move between telling a negative numbers story \leftrightarrow acting it out \leftrightarrow drawing a number line showing the movement of integers \leftrightarrow calculating the end result, starting from and moving between any given point.

Generalising. *A number line goes up or forwards from zero to represent positive numbers and down or backwards from zero to represent negative numbers. A number line starts at zero and the positive numbers and negative numbers pivot or rotate around zero, the starting point. Any negative number is a reflection around zero of its positive counterpart e.g. -5 and 5 are opposites and symmetrical around zero. Negative numbers are less than zero and so get smaller the farther away from zero they get, e.g. $-12 < -4$ and $-6 > -10$; $-2 < 0$ and $0 > -3$.*

Changing parameters. Extend work with negative numbers to include common and decimal fractions as negative quantities.

Teacher's notes

- Ensure students have a sound understanding of negative numbers being less than zero and going in a negative or backwards direction from zero so that the smaller the quantity the negative number represents, the greater the number of backward steps have been taken.
- Students need to be taught the skill of visualising: closing their eyes and seeing pictures in their minds, making mental images; e.g. show a picture of a kookaburra, students look at it, remove the picture, students then close their eyes and see the picture in their mind; then make a mental picture of a different bird.
- Suggestions in Local Knowledge are only a guide. It is very important that examples in Reality are taken from the local environment that have significance to the local culture and come from the students' experience of their local environment.
- Useful websites for resources: www.rrr.edu.au; <https://www.qcaa.qld.edu.au/3035.html>
- Explicit teaching that **aligns with students' understanding** is part of every section of the RAMR cycle and has particular emphasis in the Mathematics section. The RAMR cycle is not always linear but may necessitate revisiting the previous stage/s at any given point.
- Reflection on the concept may happen at any stage of the RAMR cycle to reinforce the concept being taught. Validation, Application, and the last two parts of Extension should not be undertaken until students have mastered the mathematical concept as students need the foundation in order to be able to validate, apply, generalise and change parameters.