



## Balancing Act - A dice game

### Concept purpose

As part of understanding patterns and number relationships, students need to develop an understanding that the 'equal sign' means 'the same as'. That is, it acts as a balance to show equality on either side. Students often misinterpret the 'equal sign' as meaning answer or total only. When presented with problems or mathematical questions that include operations on both sides, students often find it difficult to solve. They may only pay attention to one side of the symbol in finding the answer, or ignore the equal sign and complete the operations only.



## Links to the syllabus

Stage 1	Stage 2	Stage 3
<p>All Working Mathematically outcomes in each stage are linked to this game</p> <p><b>1WM Communicating</b> Students describe mathematical situations using an increasingly sophisticated range of language from everyday to mathematical terminology and conventions to represent ideas.</p> <p><b>2WM Problem Solving</b> Students will explore mathematical problems using stage-appropriate mental and written strategies</p> <p><b>3WM Reasoning</b> Students will support conclusions and solutions by explaining how answers were obtained, in later stages students will also give valid reasons to justify their solutions</p>		
<p><b>MA1-5NA</b> <i>Addition and Subtraction</i> <b>Key ideas</b> <b>Part 1</b> Recognise and recall combinations of numbers that add to numbers up to 20 Model and apply the commutative property for addition Record number sentences using drawings, words, numerals and the symbols +, – and = <b>Part 2</b> Make connections between addition and subtraction</p>	<p><b>MA2-5NA</b> <i>Addition and Subtraction</i> <b>Key Ideas</b> <b>Part 1</b> Model and apply the associative property for addition Use the equals sign to record equivalent number sentences <b>Part 2</b> Use the inverse operation to check addition and subtraction calculations Use and record a range of mental strategies for addition and subtraction</p>	<p><b>MA3-5NA</b> <i>Addition and Subtraction</i> <b>Key ideas</b> <b>Part 1</b> Select and apply efficient mental, written and calculator strategies for addition and subtraction of numbers of any size</p>
	<p><b>MA2-6NA</b> <i>Multiplication and Division</i> <b>Key Ideas</b> <b>Part 1</b> Recall multiplication facts for twos, threes, fives and tens Recognise and use the symbols <math>\times</math> and <math>\div</math> Use mental strategies to multiply one-digit numbers by multiples of 10 <b>Part 2</b> Recall and use multiplication facts up to <math>10 \times 10</math> with automaticity Relate multiplication facts to their inverse division facts Use the equals sign to record equivalent number relationships involving multiplication</p>	<p><b>MA3-6NA</b> <i>Multiplication and Division</i> <b>Key Ideas</b> <b>Part 1</b> Use and record a range of mental and written strategies to multiply by one- and two-digit operators <b>Part 2</b> Select and apply efficient mental, written and calculator strategies to solve word problems and record the strategy used Recognise and use grouping symbols Apply the order of operations in calculations</p>
<p><b>MA1-8NA</b> <i>Patterns and Algebra</i> <b>Key Ideas</b> <b>Part 2</b> involving one operation of addition or subtraction</p>	<p><b>MA2-8NA</b> <i>Patterns and Algebra</i> <b>Key Ideas</b> <b>Part 2</b> Find missing numbers in number sentences involving addition or subtraction on one or both sides of the equals sign Find missing numbers in number sentences involving one operation of multiplication or division</p>	<p><b>MA3-8NA</b> <i>Patterns and Algebra</i> <b>Key Ideas</b> <b>Part 1</b> Find missing numbers in number sentences involving multiplication or division on one or both sides of the equals sign</p>

## How to play

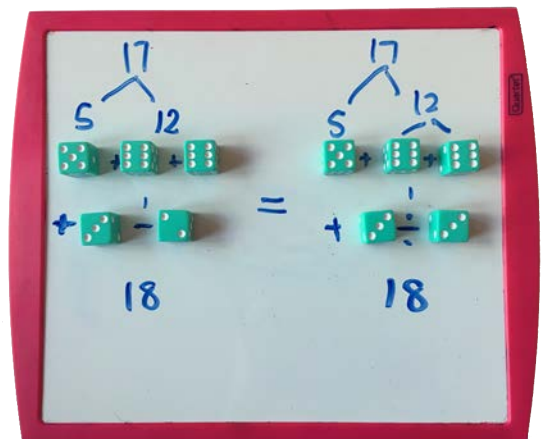
Students can play individually (up to four players) or in teams (as pairs, up to maximum 6 players).

## Equipment

- 10 dice per player or per team (I use my sets of 10 dice from Tenzi™ - another great game!) It's good if the each player's dice are all the same colour. I used dot dice but some students may find it easier with numbered dice.
- Whiteboards and pens
- You can use paper and have students write in the operations however as students may change their minds as they are working, the ability to wipe off or 'move' or replace operation signs may be difficult.
- Alternately you can create operation cards that students can place between their dice to show the sentence. (If you own Catherine Attard's game [Mabble](#) you could use the operation tiles from that game)
- Recording paper or iPads
- Egg timer

Players all roll their ten dice at the same time. They then need to try to use all ten dice to make a number sentence that balances. This means that the two sides of the number sentence need to equal the same amount. e.g. If a student rolled the dice 1, 1, 2, 2, 2, 4, 4, 5, 5, 6 they could make this number sentence  $5 + 5 + 2 - 4 = 1 + 1 + 4 + 6 - 2 - 2$  (both sides equal 8).

Student must include at least one operation sign per side. Students can make two- and three-digit numbers etc...



## Enabling and extending game play

For Stage 1 and Stage 2 students I would set the rule to only use addition and subtraction (at least as a starting point).

For Stage 3 students you could allow them to use any combination of the four operations. Students will need to apply order of operations to ensure they can explain their reasoning to the other players or teams.

You can use an egg timer if you want to keep the students to a certain time limit to make their number sentences. A three minute timer would work. If more capable students want a challenge, you could use a minute timer!

## Scoring

If you use all 10 dice you get 10 points

If you use 9 dice you get 9 points

And so on....

First player to get 100 points is the winner, or if the game takes too long you can reduce the target score or play a set number of rounds (say 5 ) and the highest score wins.

It is important that students record, or take photos of their number sentences for each turn for checking and discussion after the game.

## Note

It is best to take a photo of the dice when rolled or have students write their list of numbers down in case they bump the dice and forget what numbers they had.

## Variations

- Create versions of the game where students can use only multiplication. Or can use multiplication and division only.
- The number of dice can be reduced for younger grades, e.g. start with 6 dice.

- The scoring system can be changed and bonus points can be awarded e.g. for the use of all four operations, or, for using two-digit or greater numbers.
- The game can be played with jumbo dice as a whole class.
- Use online dice generators to play the game on the interactive whiteboard or ipads/ tablets.
- Use 8-sided or 10-sided dice instead of six-sided.
- Give students a set of number cards (1-100) They turn over a card and try to make the target number e.g. 40. In this version students don't roll the dice, they can turn them to find the numbers they need.

## Strategies students may start with

- putting out larger numbers first
- guess and check method
- placing the same dice numbers on each side first
- looking for combinations to 10
- adding all dice first to see if the number is even (as odd numbers will take more than straight addition to be able to use all ten dice)



## References

Mathematics K-10 Syllabus outcomes © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2012.