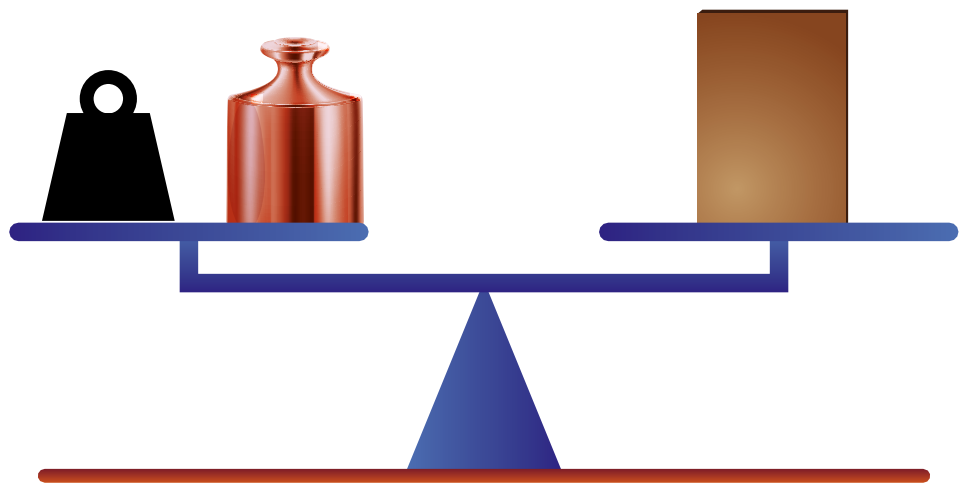


Balance

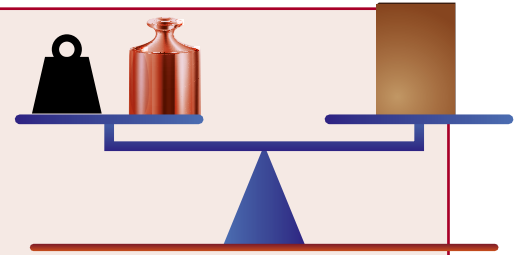


Support materials for teachers



Year 6 Reasoning in the classroom – Balance

These Year 6 activities start with an item that was included in the 2014 National Numeracy Tests (Reasoning). They continue with one linked activity, in which learners continue the theme of balance, but this time with numbers.



Activity 1

Balance

Learners use their numerical reasoning to work out the mass of an object.

Includes:

- Balance question
- Markscheme

Activity 2

What does it equal?

They work out number balance puzzles, then create their own.

Includes:

- Explain and question – instructions for teachers
- Whiteboard – Puzzle
- Resource sheet – Puzzles 1
- Resource sheet – Puzzles 2
- Resource sheet – Puzzles 3
- Teachers' sheet – Solutions

Reasoning skills required

Identify

Learners choose their own methods to solve a range of puzzles.

Communicate

They present their own balance puzzles for others to solve and work together to create a class puzzle book.

Review

They check their own work, and that of others.

Procedural skills

- Four rules of number

Numerical language

- Balance
- Equation (optional)
- Equal
- Symbol
- Solution

Activity 1

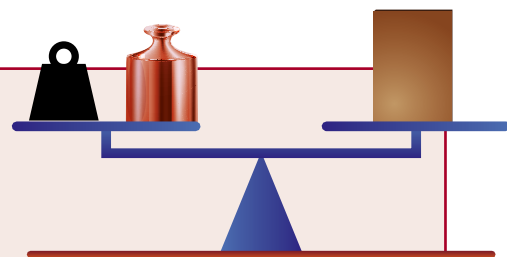
Balance

Activity 1 – Balance



Outline

In this Year 6 activity, learners use their numerical reasoning to work out how many kilograms an object on a balance scale weighs.



You will need



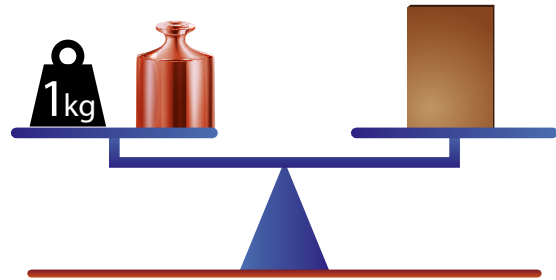
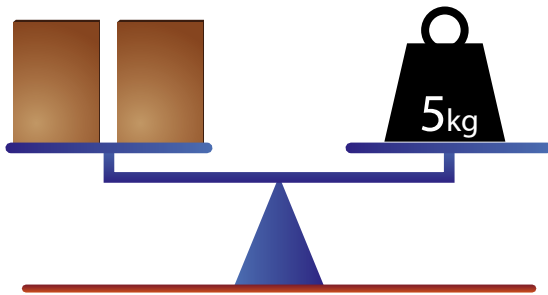
Balance question

A half-page for each learner

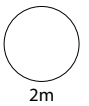


Markscheme

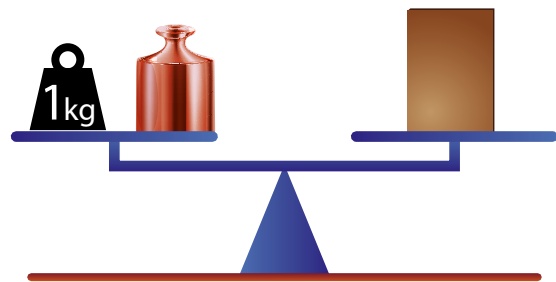
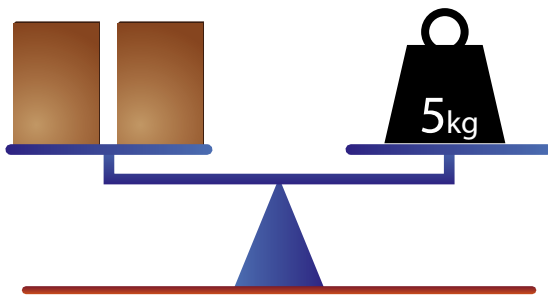
Both sets of scales are balanced.



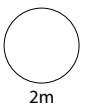
How much does  weigh?

 kg

Both sets of scales are balanced.



How much does  weigh?

 kg

Activity 1 – Balance – Markscheme and exemplars

Marks	Answer
2m	$1\frac{1}{2}$ or 1.5 kg
Or 1m	Shows the value $2\frac{1}{2}$ or 2.5



How much does weigh? kg

1kg 500g is equivalent to 1.5 kg; **2 marks**

- If learners change units, they must show the changed units correctly.

How much does weigh? kg

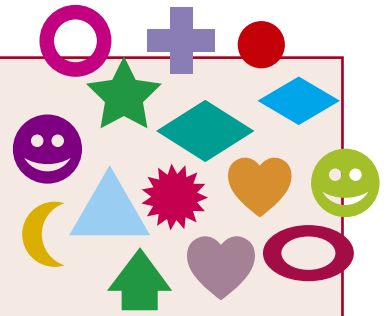
Shows the value $2\frac{1}{2}$; **1 mark**

- This learner shows the correct first step towards the solution. Note that $2\frac{1}{2}$ in the answer box would also score 1 mark.

Activity 2

What does it equal?

Activity 2 – What does it equal?



Outline

This Year 6 activity continues the theme of balance from **Activity 1 – Balance**, but within the context of balancing numbers. Learners solve a range of balance puzzles that use symbols instead of numbers. Then they create their own puzzles to put into a class puzzle book for other classes or next year's Year 6 learners to solve.

The activity emphasises the importance and meaning of 'equal' – this is often misinterpreted by young learners as 'makes' which can lead to difficulties later on in mathematics. It is additionally an early preparation for algebra.

Activity 2 – What does it equal? would also sit well with the Year 6 activity **Pictures for numbers**.

Depending on ability and confidence levels, some learners may benefit from additional support in both completing their puzzles and writing their own.

You will need



Whiteboard – Puzzle



Resource sheet – Puzzles 1
One page for each pair/group



Resource sheet – Puzzles 2
One page for each pair/group



Resource sheet – Puzzles 3
One page for each pair/group



Teachers' sheet – Solutions

Activity 2 – What does it equal?



Explain

Draw the equals sign on the whiteboard and ask learners what it means. (*'The same as' or 'balances with' – if necessary, demonstrate by writing on the whiteboard a simple equation such as $2 + 3 = 4 + 1$*) Ask if anyone has seen number puzzles where you are given different pictures or symbols and have to work out what numbers they represent. Show **Puzzle** on the whiteboard and ask what number the red circle must equal in order for the first calculation to balance. (7) So what number must the square equal? (3 – *make sure you use the word equal*)

Pairs/groups then go through the puzzles from the resource sheets **Puzzles 1**, **Puzzles 2** and **Puzzles 3** finding their solutions (*they increase in difficulty, so allocate as appropriate*). Then they check their answers with another pair/group, or with you (*see the teachers' sheet, Solutions*).

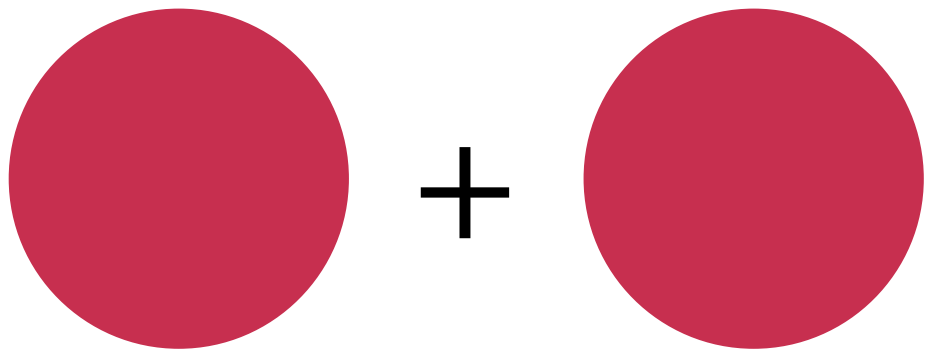
Their next challenge is to create their own puzzle(s) for other learners to solve. At the end, their puzzles will be shared with the rest of the class, then put together into a class puzzle book for other classes/next year's Year 6 to solve – so they need to be good! (*And clear, and correct*)

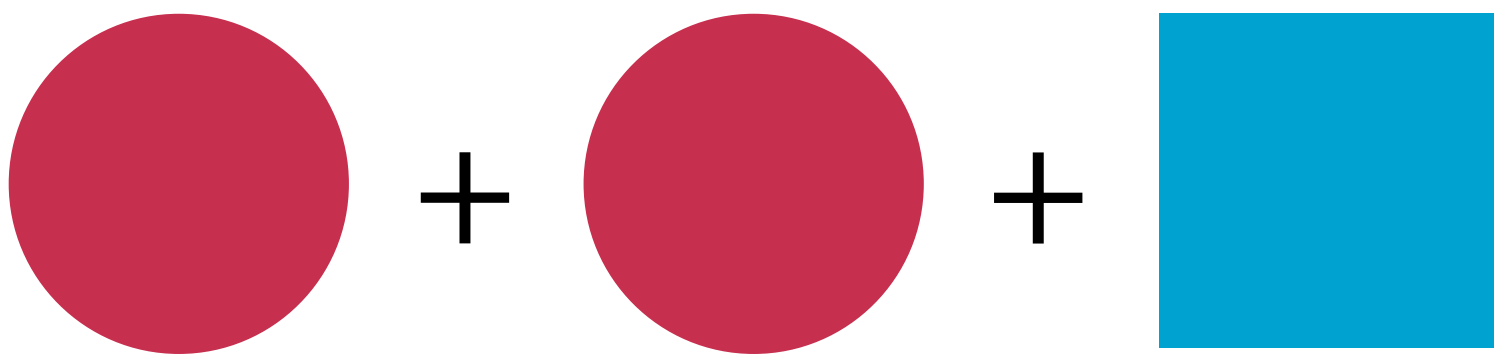
Ask them to produce the puzzle on the top half of one sheet of paper and the solution on the bottom half, so the sheet can be cut up later and presented in the class book separately. Once they have their puzzles, and have given them to other pairs/groups to solve, work with the class to choose which puzzles to put into their class book (*potentially all, but make sure they are correct!*) and in which order. Then they work together to make their class book.



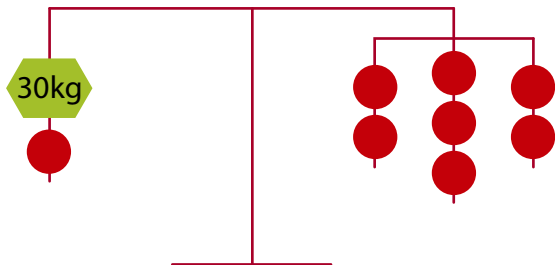
Question

- When you have a balance, what happens if you take the same number away from both sides? What if you add the same number to both sides? (*It still balances.*)
- When you can't see how to solve a puzzle, what could you do? (*Try numbers – trial and improvement is a useful strategy.*)
- Which puzzles have only one solution? Which have more? Why?
- What puzzle are you going to write? Why? How are you going to make it different from the ones on the sheets and interesting for other people to solve?
- Have you made sure your puzzle and solution are correct? How?
- (*When choosing puzzles to include in the book*) How are you going to decide which puzzles should go in the book? What about this one . . . ? Should this be included? Why/why not? And how are you going to decide the order? (*For example, according to difficulty, or randomly ordered*)
- Other than in puzzles, why might we want to use symbols rather than words in a calculation (*equation*)? (*If, for example, we know the amount of flour and sugar together in a bowl weighs 300 grams but we don't know how much of each there is, rather than write 'the amount of flour and the amount of sugar equals 300 grams' it is simpler to write $f + s = 300$ (where f equals the amount of flour in grams and s is the amount of sugar in grams).*)


$$+ + = 14$$

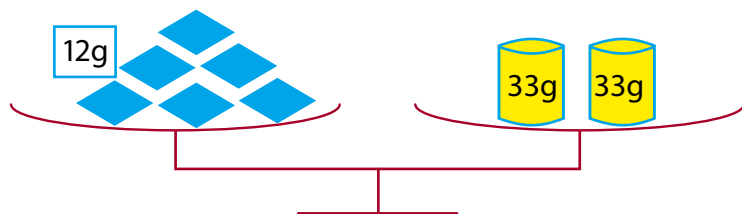

$$+ + + = 17$$

Puzzle



Solution

$$\bullet = \boxed{}$$



$$\blacklozenge = \boxed{}$$

$$\text{😊} + \text{😊} + \text{😊} = 25$$

$$\text{😊} = \boxed{}$$

$$\mathbf{z} \times \mathbf{z} + 11 = 60$$

$$\mathbf{z} = \boxed{}$$

Puzzle

$$\star + \star + \heartsuit = 10$$

$$\heartsuit + \star = 8$$

Solution

$$\star = \square \quad \heartsuit = \square$$

$$+ + - 7 = 25$$

$$+ - \bigcirc - \bigcirc = 10$$

$$+ = \square \quad \bigcirc = \square$$

$$B + C - D = 11$$

$$B = \square \quad C = \square \quad D = \square$$

Or...?

Puzzle

$$4 - \frac{\text{diamond}}{\text{circle}} - \frac{\text{diamond}}{\text{circle}} = 3.5$$

Solution

$$\text{diamond} = \square \quad \text{circle} = \square$$

















Or...?

$$\text{smiley} + \text{heart} = 14$$

$$\text{smiley} + \text{heart} + \text{triangle} = 18$$

$$\text{smiley} + \text{triangle} = 10$$

$$\text{triangle} = \square \quad \text{smiley} = \square \quad \text{heart} = \square$$




$$= 22$$

$$= 23$$





$$= 24$$

$$\text{moon} = \square \quad \text{tree} = \square \quad \text{starburst} = \square$$









Puzzle sheet 1

Puzzle	Solution
1	 = 5kg
2	 = 9g
3	 = 10
4	Z = 7

Puzzle sheet 2

Puzzle	Solution
1	 = 2  = 6
2	 = 16  = 3
3	B C D Any three numbers where $B + C - D = 11$, e.g. $B = 8, C = 9, D = 6$

Puzzle sheet 3

Puzzle	Solution
1	  Any two numbers that create a fraction where $\frac{\text{teal diamond}}{\text{pink circle}} = \frac{1}{4}$
2	 = 4  = 6  = 8
3	 = 6  = 5  = 7