

The City of Edinburgh Outdoor Learning Team

Title:	Bucket Maths
Mathematics Zone:	Number, Money and Measure - Multiples, factors and primes.
Key Outcomes:	I can investigate and identify the multiples and factors of numbers.
Suggested level:	Second level. Can be adjusted to different levels/year groups by varying the number and shape properties.

Activity



Adapted from Outdoor Learning Card TB13 Toxic Waste (OEAP Outdoor Learning Cards).

Resources (1 set):	<ul style="list-style-type: none"> Elastic cord. Rope (any number/normally at least 6 lines). Buckets (any number), preferably a light colour so you can write numbers on them. Laminated A4 sheets with different shape drawings. Chalk/rope/canes to create the Venn or Carroll Diagram. Marker pen. Cloth. Pad and pencil to support workings. Divisibility rule A3 poster. Calculator to check divisibility rules. Set of rules for pupils.
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Aim: work as a team to sort a group of numbers or shapes via a Carroll or Venn diagram.

Exploratory Phase (10 mins max)

1. Encourage the pupils to read the instructions so they can determine the rules independently. Get familiar with the apparatus – simple introductory task e.g. moving and stacking the buckets. How do you pick up and release a bucket? Let them work this out.

Have a go, then **reflect**: identify the need for effective teamwork and good communication. Clarify any rules. Everyone has a part to play.

Repeat to develop skills. Include a race e.g. which team can move their buckets the quickest from one point to another?

(ONCE PUPILS ARE FAMILIAR WITH THE APPRARATUS, THE TEACHER CAN USE THIS LEARNING TOOL IN MANY DIFFERENT CONTEXTS ACROSS THE CURRICULUM).

Application Phase (20 mins)

2. Move to a Carroll diagram (create using rope or canes).

Check pupil understanding of this diagram and vocabulary (factor/multiple/prime) by using an introductory challenge (see sequence below). Discuss diagram and vocabulary after the initial challenge. Ensure understanding.

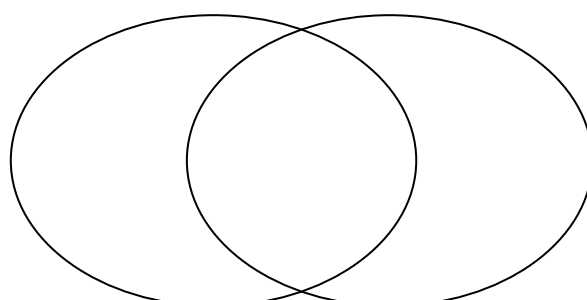
e.g.

	Prime	Not a Prime
Multiple of 7		
Not a multiple of 7		

Okay for one person to have more than one piece of rope.

If using Venn Diagram;

Multiple of 7



Prime

Attach laminated paper to the buckets or write the numbers onto the bucket.

Challenge the pupils to use the ropes with the 'elastic circle' to transport the buckets to the correct part of the sorting diagram. The pupils must not touch the bucket. NB: pull the rope to stretch the elastic, which releases the bucket. The pupils need to find these things out for themselves.

Suggested sequence for Carroll Diagram

(teach divisibility rules to support pupils with identifying factors/multiples/primes – adjust according to level)

Set 1			Odd	Even
Example numbers (4 numbers)		Multiple of 4	?	232
		Not a multiple of 4	123	18 234
Notes/key questions:	Check divisibility rule for factors of 4. If 232 is divisible by 4, why is 234 not divisible by 4? Can they think of a number to go in the first cell – explain their answer. NO! All multiples of 4 are even.			
Set 2			Prime	Not a Prime
Example numbers (4 numbers)	Check understanding of prime.	Multiple of 3	3	462
		Not a multiple of 3	23	452
Notes/key questions:	452/462 not primes – even. 462 – divisible by 3 – add the digits (add up to 12, which is divisible by 3). Other factors of 452 e.g. 2 (even), 4 (halve last 2 digits – even).			
Set 3			Prime	Not a Prime
Example numbers (create 4 numbers for each part of the Carroll Diagram)	Use the divisibility rules.	Multiple of 6	Not possible.	3 digit multiple of 6 e.g.108 (even and divisible by 3)
		Not a multiple of 6	E.g. 23, 29	3 digit not a multiple of 6 e.g. 106 (even but not divisible by 3 – workout from 108).
Notes/key questions:	Encourage them to keep it simple e.g. not a prime – create an even number. If they worked out 108, easier to work out 106. Is it possible to place a number in each cell? Explain answer. No – all multiples of 6 are even and therefore divisible by 2.			

Differentiation: Provide properties. Can pupils create numbers e.g. 3 digit multiple of 3 that is a prime number?

Provide numbers and the pupils create the labels for the sorting diagram.

Create different labels to match needs e.g. extend to quadrilaterals/triangles and more complex number properties. Complete via mixed ability or ability groups. Can be directed learning too.

e.g. 1) Fibonacci numbers.

e.g. 2) Extend to shape.

Name and classify triangles.

Key Vocabulary	
Factor	Factors are numbers we can multiply together to get another number. Example: 2 and 3 are factors of 6, because $2 \times 3 = 6$. A number can have MANY factors!
Multiple	The result of multiplying a number by an integer (not by a fraction). Examples: • 12 is a multiple of 3, because $3 \times 4 = 12$.
Prime	A prime number is a whole number (integer) greater than 1 whose only factors are 1 and itself. The first few prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23 and 29.
Divisibility Rules	Useful to find factors.

Divisibility Rules	
A number is divisible by	
2	If last digit is 0, 2, 4, 6, or 8
3	If the sum of the digits is divisible by 3
4	If the last two digits is divisible by 4
5	If the last digit is 0 or 5
6	If the number is divisible by 2 and 3
7	cross off last digit, double it and subtract. Repeat if you want. If new number is divisible by 7, the original number is divisible by 7
8	If last 3 digits is divisible by 8
9	If the sum of the digits is divisible by 9
10	If the last digit is 0
11	Subtract the last digit from the number formed by the remaining digits. If new number is divisible by 11, the original number is divisible by 11
12	If the number is divisible by 3 and 4

NB: Divisibility test for 4: Last 2 digits must be even. Halve the last 2 digits. If the answer is even, then the number (integer) is divisible by 4.

Skills:

Numeracy and mathematical skill	Key features of the skill	Additional guidance
Select and communicate processes and solutions.	<ul style="list-style-type: none"> explains choice of process shares thinking verbalises or demonstrates thought processes. 	Learners need to: <ul style="list-style-type: none"> be able to explain why they have chosen a particular process as it demonstrates their understanding of the task, question or assessment; have frequent opportunities to discuss their thinking with their peers and teachers; select from a range of processes and increasingly choose processes which are most efficient; discuss their solutions to verbalise their thought process, either through explaining their thinking or demonstrating it pictorially; and become more confident in their abilities to select from a growing repertoire of strategies, articulate their chosen approaches with increasing clarity and make greater use of specialised vocabulary.
Justify choice of strategy used	<ul style="list-style-type: none"> shows and talks though their thinking explains their strategy justifies choice of strategy compared to other approaches. 	Learners need to: <ul style="list-style-type: none"> show and talk through their thinking to better understand and explain their own strategies; regularly work in pairs and groups to learn with and from each other to refine their strategies; and justify their choice of strategy, identifying the most efficient strategies for different types of task.
Use mathematical vocabulary and notation.	<ul style="list-style-type: none"> uses correct mathematical vocabulary. 	Learners need to: <ul style="list-style-type: none"> apply the correct mathematical vocabulary, notation and appropriate units in a range of contexts.

Second Level Numeracy and Mathematics Benchmarks:

Curriculum organisers	Experiences and Outcomes for planning learning,	Benchmarks to support practitioners' professional judgement of achievement of a level
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	teaching and assessment	
Multiples, factors and primes	Having explored the patterns and relationships in multiplication and division, I can investigate and identify the multiples and factors of numbers. MTH 2-05a	<ul style="list-style-type: none"> Identifies multiples and factors of whole numbers and applies knowledge and understanding of these when solving relevant problems in number, money and measurement.