YEAR 9 – REASONING WITH ALGEBRA…
Testing conjectures

@whisto_maths

What do I need to be able to do?

By the end of this unit you should be able to:

- Use factors, multiples and primes
- Reason True or False
- Reason Always, sometimes never true
- Show that reasoning
- Make conjectures about number
- Expand binomials
- Make conjectures with algebra
- Explore the 100 grid

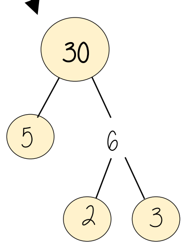
Keywords

Multiples: found by multiplying any number by positive integers
Factor: integers that multiply together to get another number.
Prime: an integer with only 2 factors.
HCF: highest common factor (biggest factor two or more numbers share)
LCM: lowest common multiple (the first time the times table of two or more numbers match)
Verify: the process of making sure a solution is correct
Proof: logical mathematical arguments used to show the truth of a statement
Binomial: a polynomial with two terms
Quadratic: a polynomial with four terms (often simplified to three terms)

Factors, Multiples and Primes

R

Multiplication part-whole models



All three prime factor trees represent the same decomposition

HCF – Highest common factor

HCF of 18 and 30

18: 1, 2, 3, (6), 9, 18
30: 1, 2, 3, 5, (6), 10, 15, 30

Common factors are factors two or more numbers share

LCM – Lowest common multiple

LCM of 9 and 12

9: 9, 18, 27, (36), 45, 54
12: 12, 24, (36), 48, 60

Common multiples are multiples two or more numbers share

True or False?

Conjecture

A pattern that is noticed for many cases

1, 2, 4….
The numbers in the sequence are doubling each time.

Counterexamples

This sequence isn't doubling it is adding 2 each time

Only **one** counterexample is needed to disprove a conjecture

Always, Sometimes, Never true.

Always – Every value always supports the statement
Sometimes – Examples show the statement being true and counter examples to show when it is false.
Never – No example supports the statement

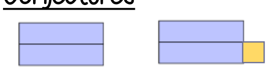
Examples to try
- 0 and 1
- Fractions
- Negative numbers

Show that

Numerical verification – Show the stages to a solution with numerical values
Algebraic verification – Show algebraic properties of the solution. You may want to use pictorial images to support this
Proof – Simple proofs using algebra

Compare the left hand side of an equation with the right hand side – are they the same or different?

Conjectures

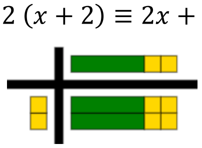


Even $(2n)$ – Multiple of 2
Odd $(2n+1)$ – One more than any even

Use numerical verification first
Use pictorial verification – the representations of numbers of odd and even

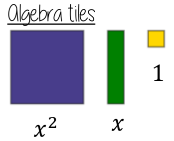
Expanding binomials

$2(x+2) \equiv 2x+4$



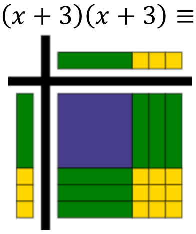
Algebra tiles can represent a binomial expansion
Has two terms

Algebra tiles



Positive values

$(x+3)(x+3) \equiv x^2+6x+9$



This is a quadratic. It has four terms which simplified to three terms

The order of the binomial has no impact on the outcome.
e.g. $(x+3)(3+x)$

Exploring the 100 square

In terms of 'n' is used to make generalisations about relationships between numbers

Positions of numbers in relation to n form expressions.
E.g. one space to the right of n
$n+1$

E.g. One row below n
$n+10$

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

The size of the grid for generalisation changes the relationship statements