

Year 9 – Reasoning with Algebra

Testing Conjectures

Suggested reading

HOW MANY SOCKS MAKE A PAIR?

Surprisingly interesting everyday maths

ROB EASTAWAY

Want to know more?
Scan the QR code to visit the curriculum overview for Year 9 Maths, including topic summaries, key words, and books that you may want to read in your own time



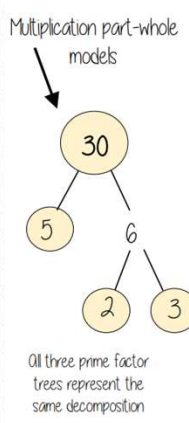
What do I need to be able to do?

- 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



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

x^2 x 1
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
eg $(x + 3)(3 + x)$

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
Eg one space to the right of n
 $n + 1$
Eg 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