Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Teaching Algebra through Problem Solving

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Introducing Oide

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Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Lárionad Ceannaireachta Scoile
CSL
Centre for School Leadership

An tSraith Shóisearach do Mhúinteoirí
JuniorCYCLE for teachers

NIPT
An Clár Náisiúnta Ionduchtaithe do Mhúinteoirí
The National Induction Programme for Teachers

PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

Key Message

Using a problem-solving approach to Algebra supports sense-making for students.

Intended Learning

Learning Intention

Today we are learning about using manipulatives to support an inclusive problem-solving approach in algebra.

Success Criteria

Participants will

- find factors of linear expressions using
  - algebra tiles
  - digital tiles
- use the array method to find factors of cubic expressions with
  - real coefficients
  - unknown coefficients
- find solutions to linear equations using algebra tiles
- compare use of algebra tiles to the stabiliser method for solving equations

Reflect

What challenges exist in the teaching, learning and assessment of Algebra?

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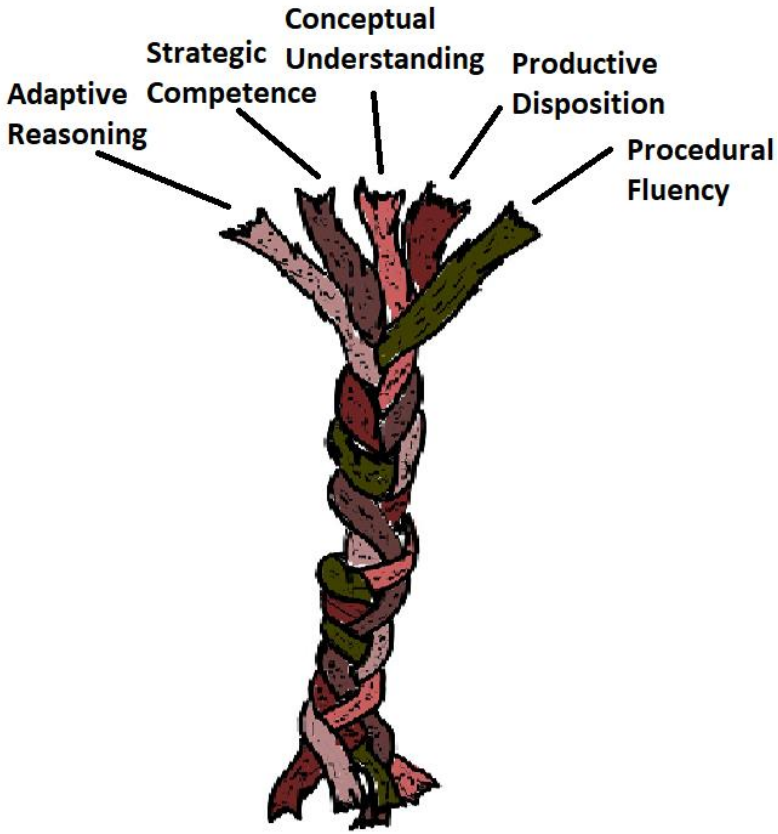
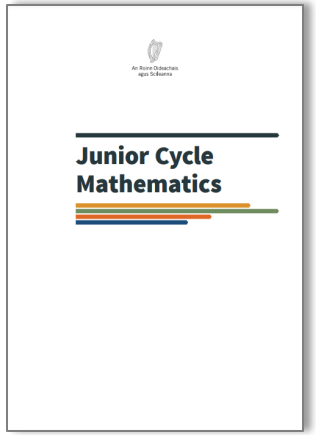
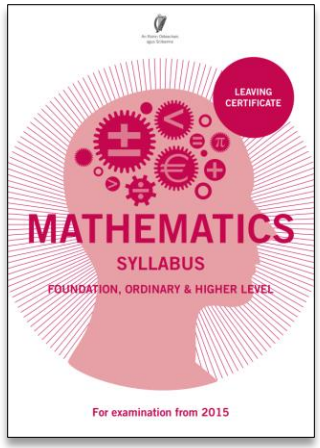
Mathematical Proficiency







Factorising

What do our students need to know, understand and be able to do?

Junior Cycle Factorising

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Junior Cycle Mathematics

Expectations for Students

Number strand

Students should be able to:

N.1 investigate the representation of numbers and arithmetic operations so that they can:

a. represent the operations of addition, subtraction, multiplication, and division in $\mathbb{N}$, $\mathbb{Z}$, and

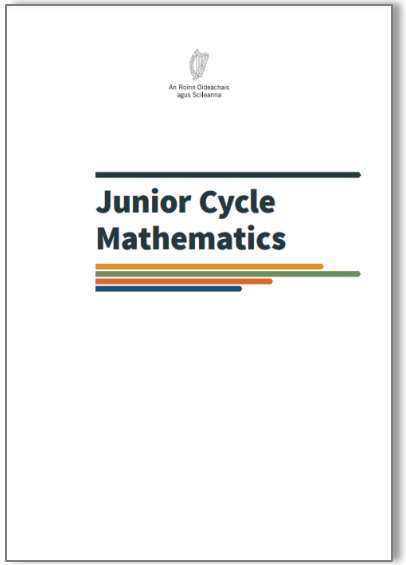
b.

c. explore numbers written as a^b (in index form) so that they can:

$(ab)^r = a^r b^r$; and $(a/b)^r = (a^r)/(b^r)$, for $a, b \in \mathbb{R}$; $p, q \in \mathbb{Z}$; and $r \in \mathbb{Q}$

d. calculate and interpret factors (including the highest common factor), multiples

e.



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Junior Cycle Mathematics

Algebra and functions strand

Students should be able to:

AF.1 investigate patterns and relationships (linear, quadratic, doubling and tripling) in number,

c. categorise patterns as linear, non-linear, **quadratic, and exponential (doubling and tripling)** using their defining characteristics as they appear in the different

y can:

c. use the concept of equality to generate and interpret equations

ii. quadratic expressions in one variable with coefficients in $\mathbb{Z}$

Students should be able to:

N.1 investigate the representation of numbers and arithmetic operations so that they can:

d. calculate and interpret factors (including the highest common factor), multiples (including the lowest common multiple), and prime numbers

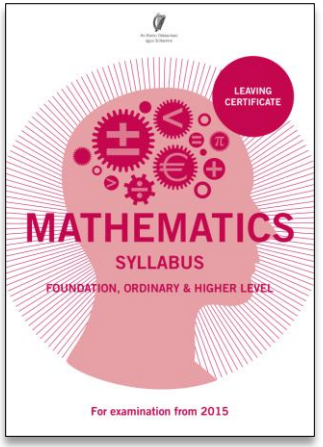
AF.3 apply the properties of arithmetic operations and factorisation to generate equivalent expressions so that they can develop and use appropriate strategies

d. flexibly convert between the factorised and expanded forms of algebraic expressions

Leaving Certificate Factorising

Students should be able to

- prove by induction **factorisation results** such as 3 is a factor of $4n - 1$
- express numbers in terms of their **prime factors**
- use the **Factor Theorem** for polynomials



Visual Representation

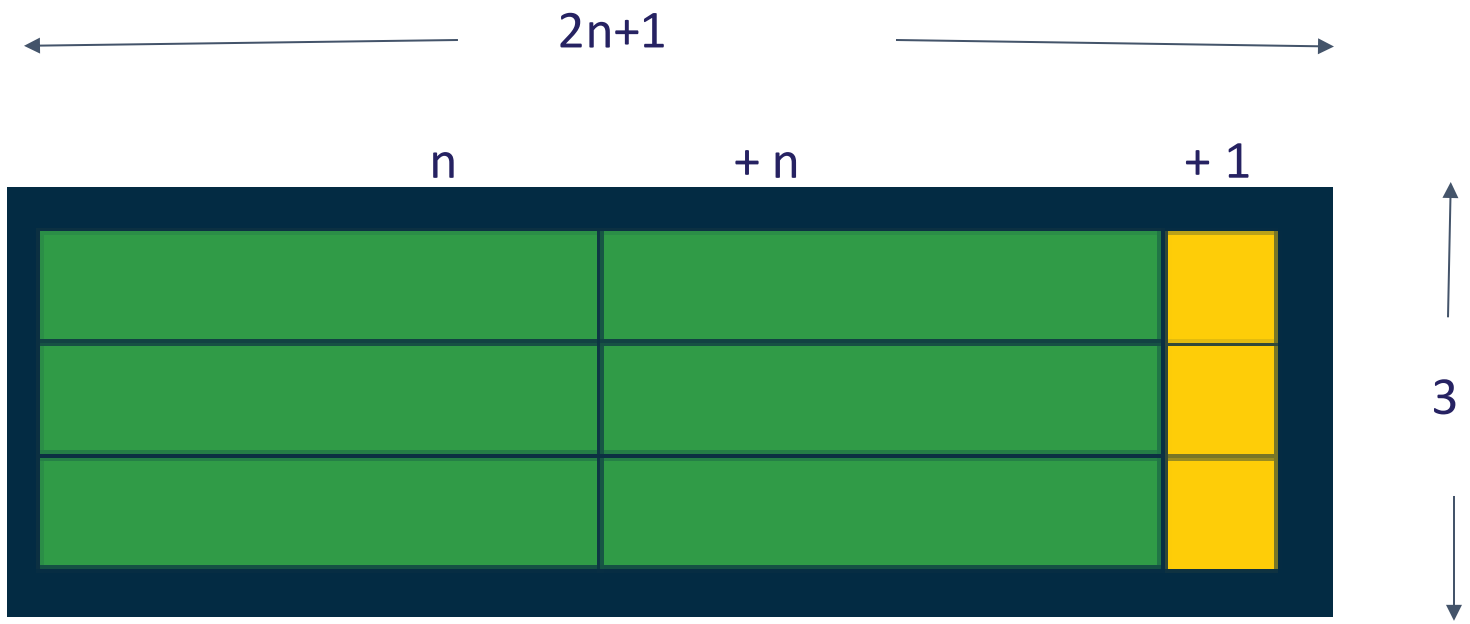
Factorising

The green rectangles have dimensions n and 1 and an area of n units^2

The yellow squares have length of side 1 and area 1 units^2.

How can **6n+3** be rearranged to form a single rectangle?

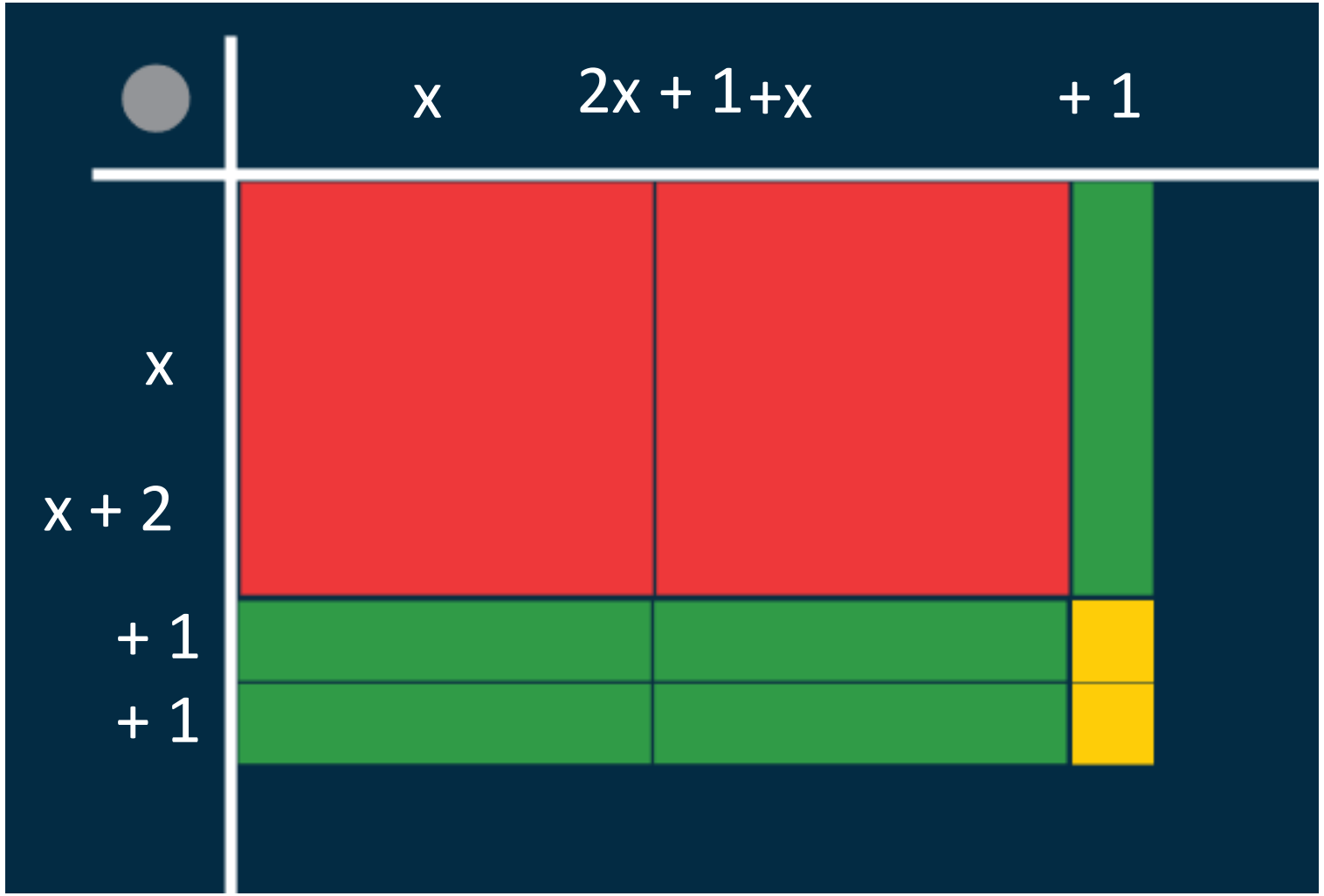
Factorising



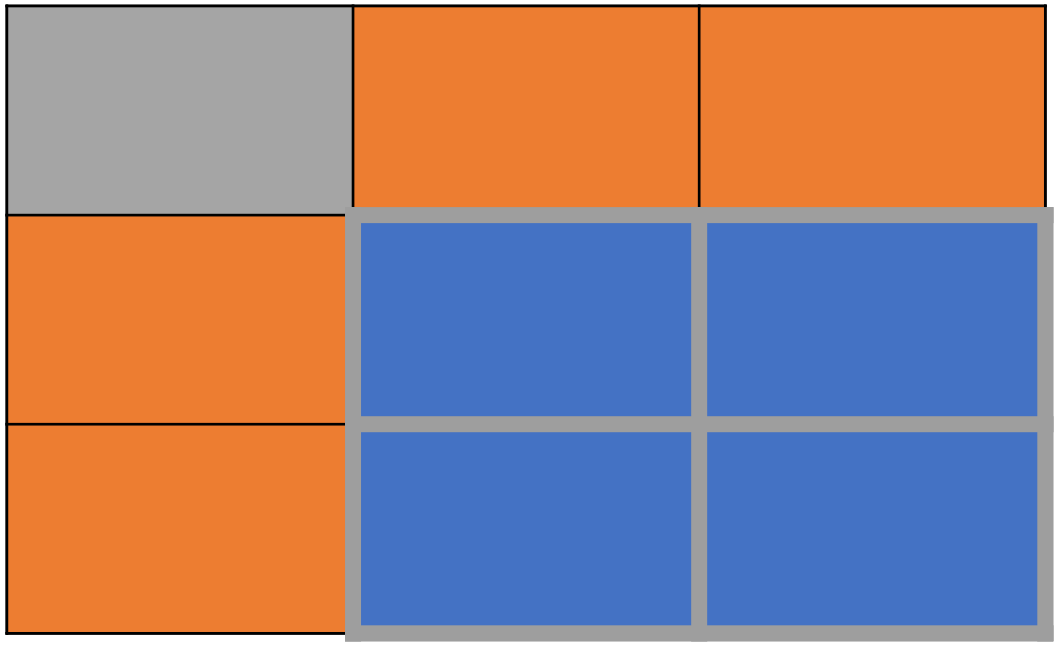
Summarising with a number array

	2n	+1
3	6n	+3

Factorising $2x^2 + 5x + 2$


x
2x + 1+x
+ 1
x
x + 2
+ 1
+ 1

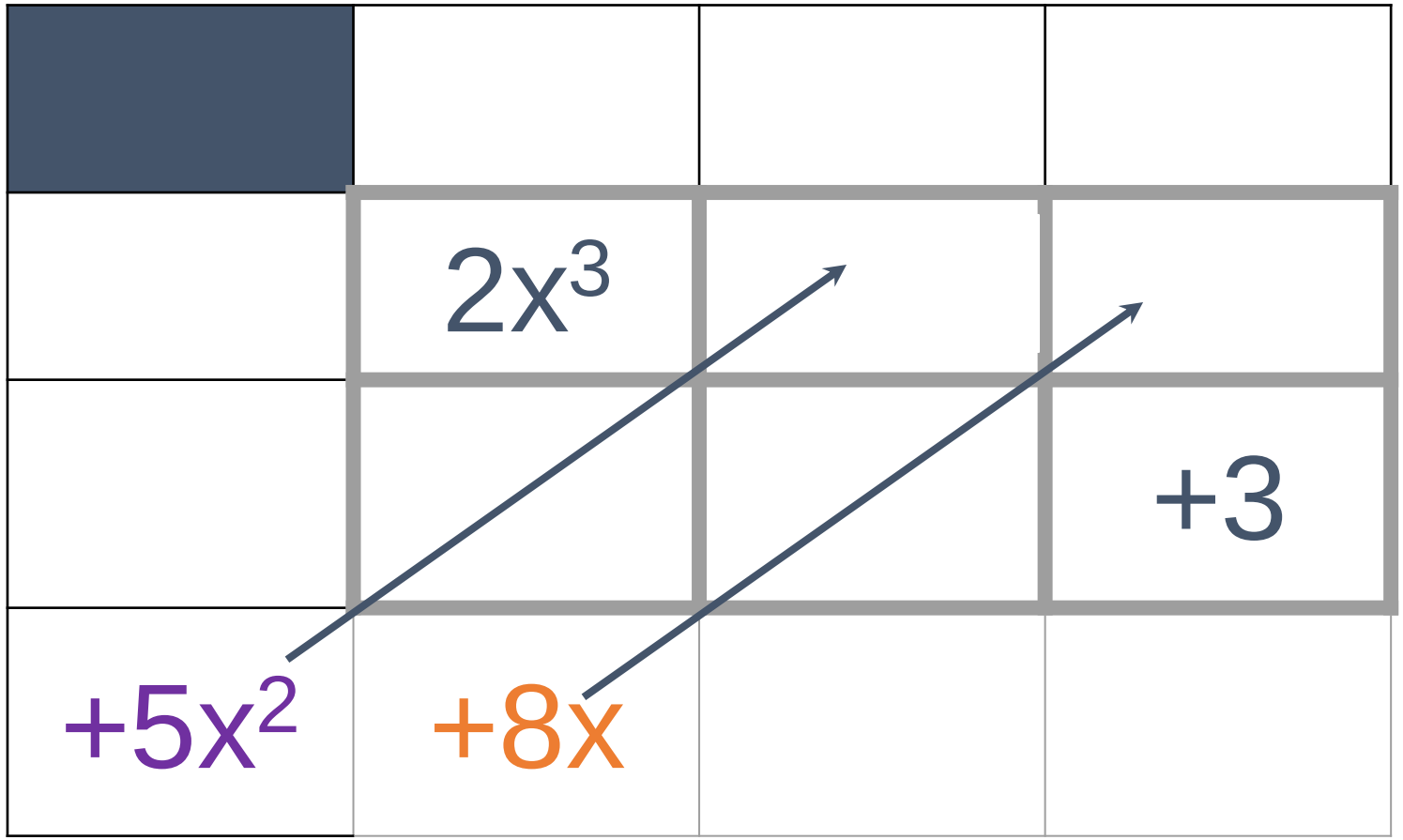
Summarising with a number array



The Cubic as a problem-solving exercise

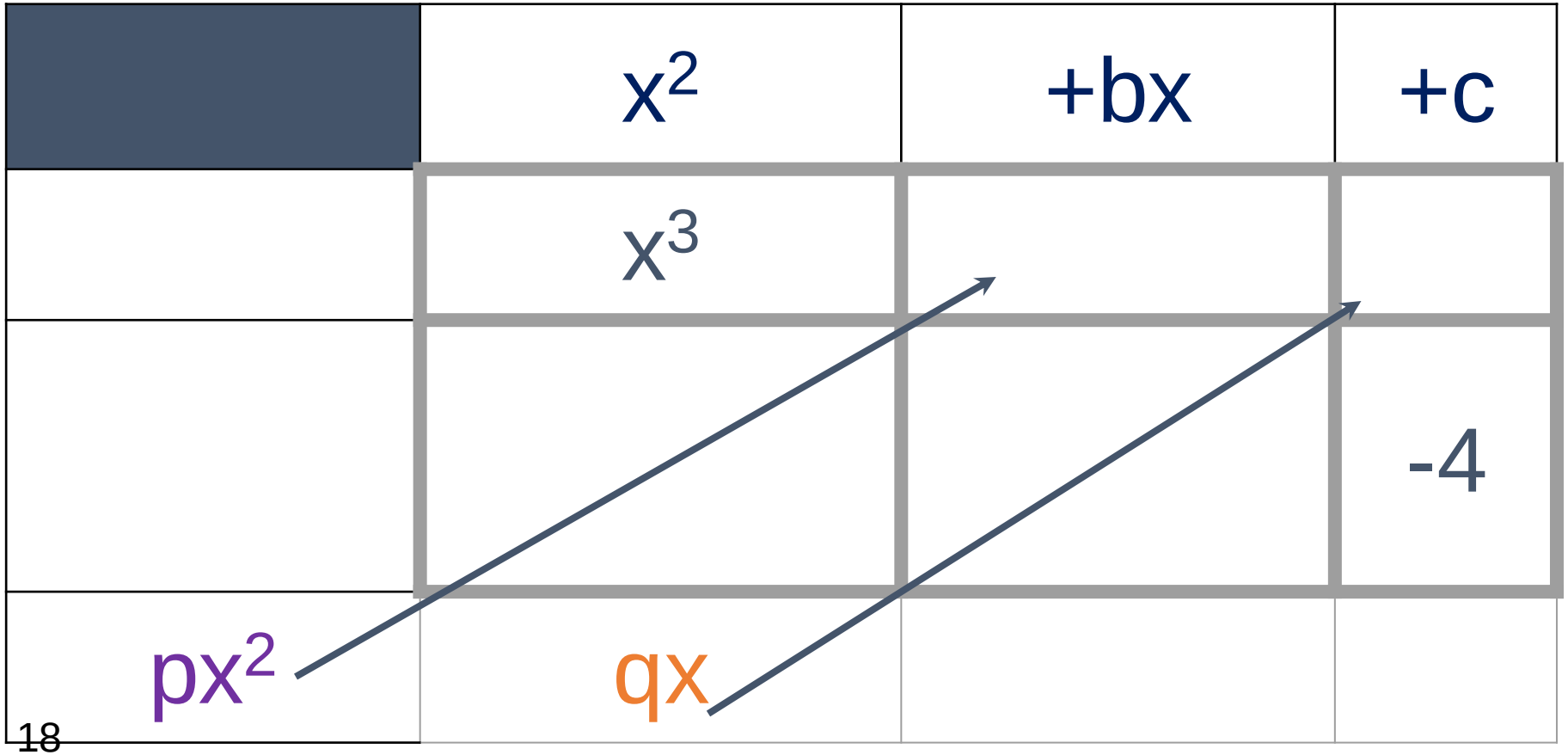
Factorise

$2x^3 + 5x^2 + 8x + 3$



Future learning…

Given that $x^2 + bx + c$ is a factor of $x^3 + px^2 + qx - 4$, show that $c(p - b) = -4$.



$$px^2 = \frac{-4x^2}{c} + bx^2$$

$$p = -\frac{4}{c} + b$$

$$pc = -4 + bc$$

$$pc - bc = -4$$

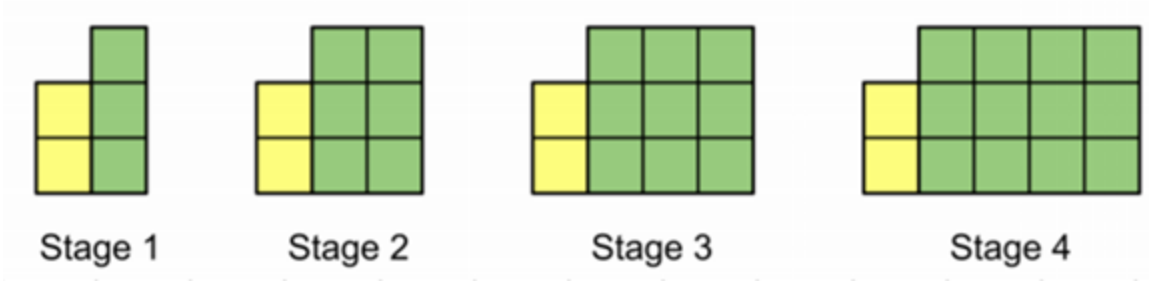
$$c(p - b) = -4$$

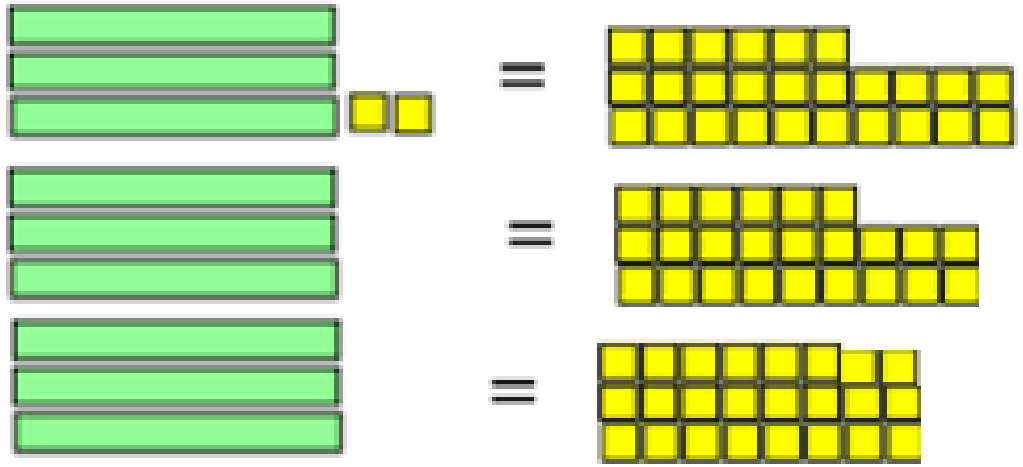
Solving Equations

b = 3n + 2 where b= total no. of blocks n = stage number

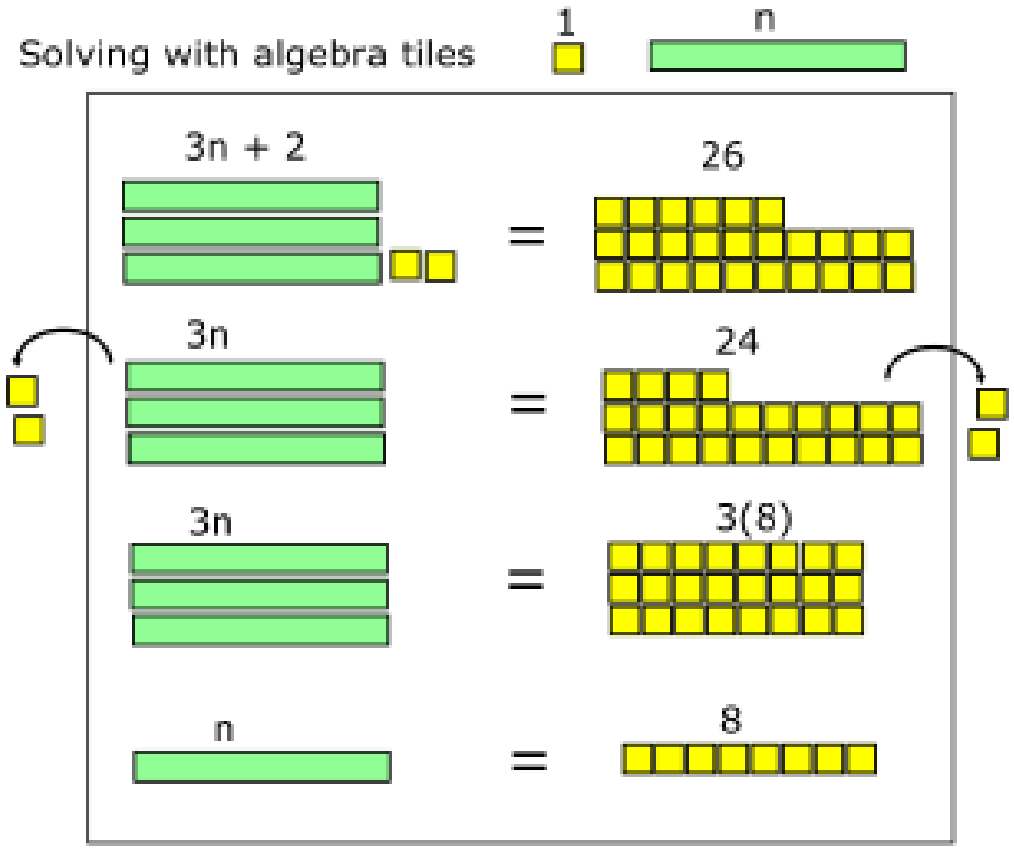
Which stage has 26 blocks?

3n + 2 = 26





Solving Equations



$$
\begin{array}{r|c|l}
 & 3n + 2 = 26 & \\
-2 & 3n + 2 - 2 = 26 - 2 & -2 \\
 & 3n = 24 & \\
3\div & \frac{3n}{3} = \frac{24}{3} & 3\div \\
 & n = 8 &
\end{array}
$$