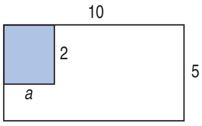
As outcomes, Year 8 pupils should, for example:

Explore general algebraic relationships.

For example:

- By dividing this shape into rectangles in different ways, form different equivalent expressions for the unshaded area, for example:

  50 – 2a
  2(10 – a) + 30
  3a + 5(10 – a)



  Then multiply out and simplify the expressions to show in a different way that they are equivalent.

- Use a **spreadsheet** to verify that 2a + 2b has the same value as 2(a + b) for any values of a and b, e.g. set up the expressions in columns C and D.

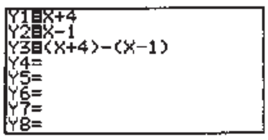
	A	B	C	D
1			=2*A1+2*B1	=2*(A1+B1)

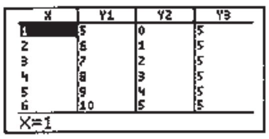
	A	B	C	D
1	3	7	20	20

  Repeatedly enter a different pair of numbers in columns A and B. Try positive and negative numbers, and whole numbers and decimals.

  Recognise that if equivalent expressions have been entered in C1 and D1, then columns C and D will always show the same number.

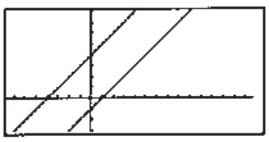
- Use a **graphical calculator** to verify that (x + 4) – (x – 1) = 5, for any value of x.





  Use the table to confirm that 4 – ⁻1 = 5.

  Draw the graphs of the two straight lines y = x + 4 and y = x – 1.



  Confirm that the vertical distance beween the two lines is always 5, i.e. (x + 4) – (x – 1) = 5.

As outcomes, Year 9 pupils should, for example:

Add simple algebraic fractions.

Generalise from arithmetic that:

$$\frac{a}{b} \pm \frac{c}{d} = \frac{ad \pm bc}{bd}$$

- This is what a pupil wrote. Show that the pupil was wrong.

  For all numbers *t* and *w*

  $$\frac{1}{t} + \frac{1}{w} = \frac{2}{t + w}$$

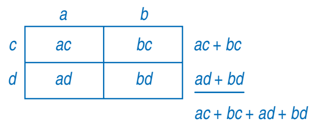
Square a linear expression, and expand and simplify the product of two linear expressions of the form x ± n.

Apply the distributive law to calculations such as:

- 53 × 37 = (50 + 3)(30 + 7)
  = 50 × 30 + 3 × 30 + 50 × 7 + 3 × 7
- 57 × 29 = (50 + 7)(30 – 1)
  = 50 × 30 + 7 × 30 – 50 × 1 – 7 × 1

Derive and use identities for the product of two linear expressions of the form (a + b)(c ± d):

- $(a + b)(c + d) \equiv ac + bc + ad + bd$
- $(a + b)(a + b) \equiv a^2 + ab + ab + b^2 = a^2 + 2ab + b^2$
- $(a + b)(c - d) \equiv ac + bc - ad - bd$
- $(a + b)(a - b) \equiv a^2 - ab + ab - b^2 = a^2 - b^2$



For example:

- Multiply out and simplify:
  $(p - q)^2 = (p - q)(p - q)$
  $= p^2 - pq - pq + q^2$
  $= p^2 - 2pq + q^2$
  $(3x + 2)^2 = (3x + 2)(3x + 2)$
  $= 9x^2 + 6x + 6x + 4$
  $= 9x^2 + 12x + 4$
  $(x + 4)(x - 3) = x^2 + 4x - 3x - 12$
  $= x^2 + x - 12$

Use geometric arguments to prove these results.
For example:

- Multiply out and simplify these expressions to show that they are equivalent.
  $a^2 - b^2$
  $a(a - b) + b(a - b)$
  $2b(a - b) + (a - b)(a - b)$
  $(a - b)(a + b)$

  By formulating the area of this shape in different ways, use geometric arguments to show that the expressions are equivalent.