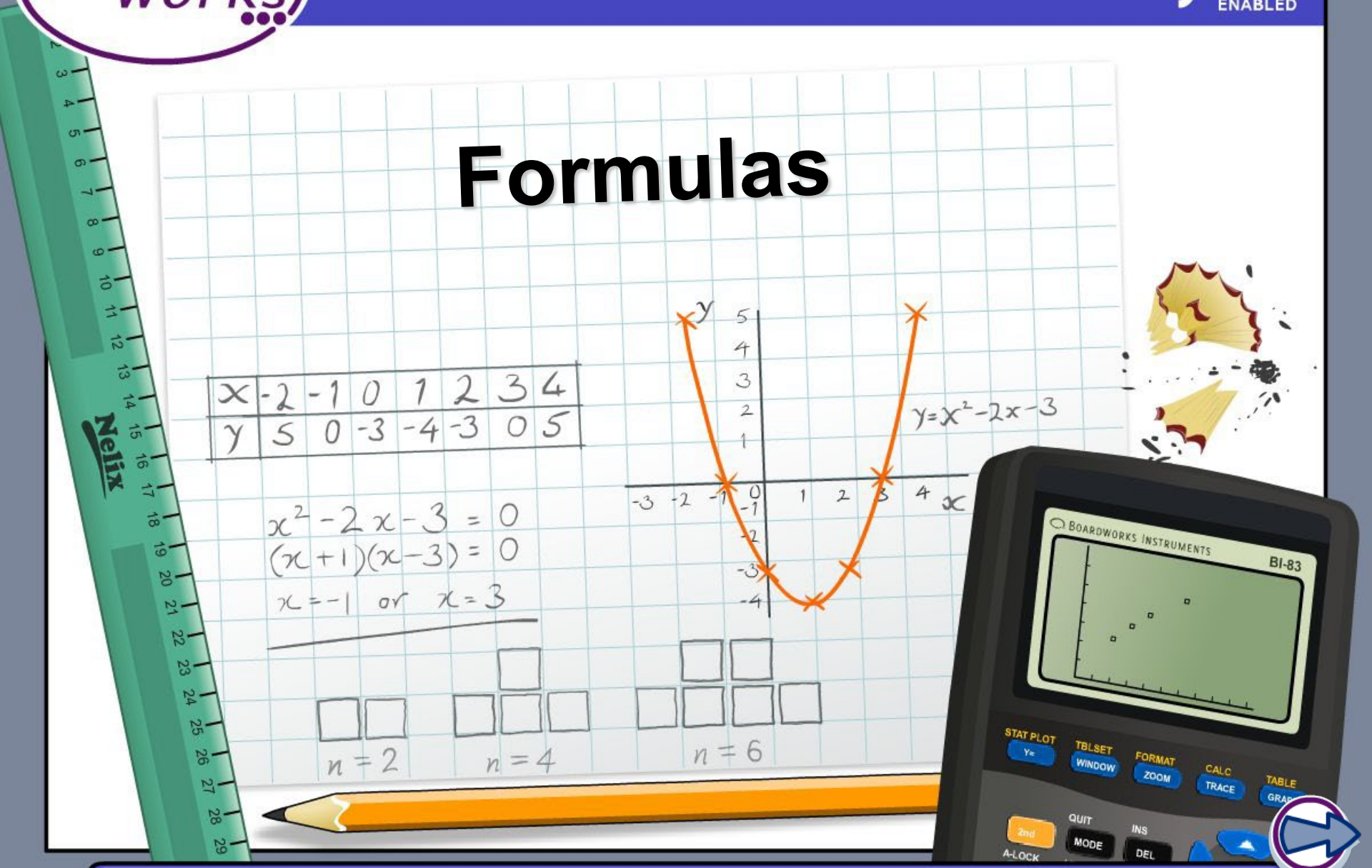
Formulas



Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

They are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

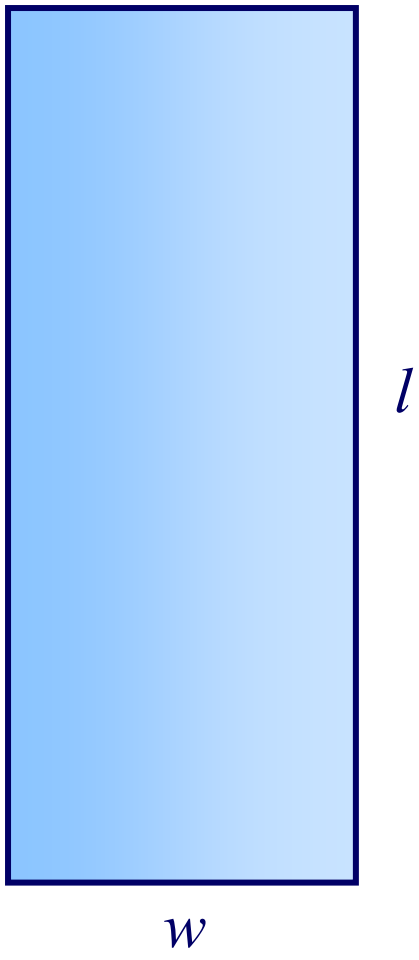
This icon indicates teacher's notes in the Notes field.

What is a formula?

A **formula** is a special type of equation that links two or more physical variables.

Formulas say something about the real world. Here is a formula that applies to rectangles:

$$P = 2(l + w)$$



The letters represent features of a rectangle.

- P stands for the perimeter of a rectangle.
- l stands for the length of the rectangle.
- w stands for the rectangle's width.

Substituting values

We can use this formula to work out the perimeter of any rectangle given its length and width.

$$P = 2(l + w)$$

We do this by **substituting** known values into the formula.

Brittney wants a fence to keep dogs off the lawn. The lawn is a rectangle 4 m wide and 7 m long. How much fence does she need?

$P = 2(l + w)$

$P = 2(7 + 4)$

Write 7 instead of l and 4 instead of w.

$P = 2 \times 11$

$P = \mathbf{22\ m}$

Rectangle perimeters

Use the formula $P = 2(l + w)$ to match the rectangle perimeters to their length and width.

$l = 7\,\text{cm}, w = 9\,\text{cm}$	$P = 30\,\text{cm}$
$l = 12\,\text{cm}, w = 15\,\text{cm}$	$P = 54\,\text{cm}$
$l = 13\,\text{cm}, w = 6\,\text{cm}$	$P = 38\,\text{cm}$
$l = 8\,\text{cm}, w = 9\,\text{cm}$	$P = 34\,\text{cm}$
$l = 10\,\text{cm}, w = 5\,\text{cm}$	$P = 32\,\text{cm}$

Writing formulas

There is not always a ready-made formula to apply to a problem. Sometimes we need to write a formula.

For example, Stacey buys some bags of chips from a store. Each bag of chips costs $3.

Write n for the number of bags.

Write c for the total cost of the chips.

Write a formula linking n and c:

$$c = 3n$$

What would the formula be if each bag cost $2.50?

$$c = 2.5n$$

Practice writing formulas

MODELING

Write a formula that could be used to solve problems in the real-life situations given.

Press "**start**" to begin.

start

Calculating costs

A window cleaner charges $10 for travel plus $7 for every window that he cleans. Write a formula to find the total cost, c, when n windows are cleaned.

$$c = 7n + 10$$

Using this formula, how much would it cost to clean all 105 windows of *Formula Tower*?

Substitute **105** into the formula instead of n.

$$c = 7 \times \mathbf{105} + 10$$

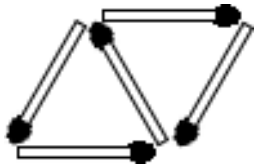
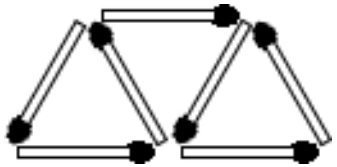
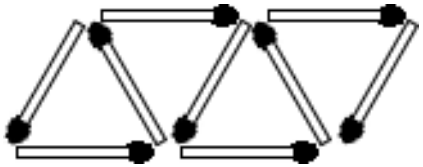
$$= 735 + 10$$

$$= 745$$

It will cost **$745**.

Matchstick pattern

Look at this pattern made from matchsticks:

				
pattern number, n	1	2	3	4
number of matches, m	3	5	7	9

What is the formula for the number of matches, m, in pattern number n?

$$m = 2n + 1$$

Writing mathematical rules

Formulas can describe mathematical rules.

For example, Julio is investigating patterns in the numbers on a 25 square grid numbered along the rows.

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

He looks at arrangements of numbers in two-by-two squares, like the shaded block shown.

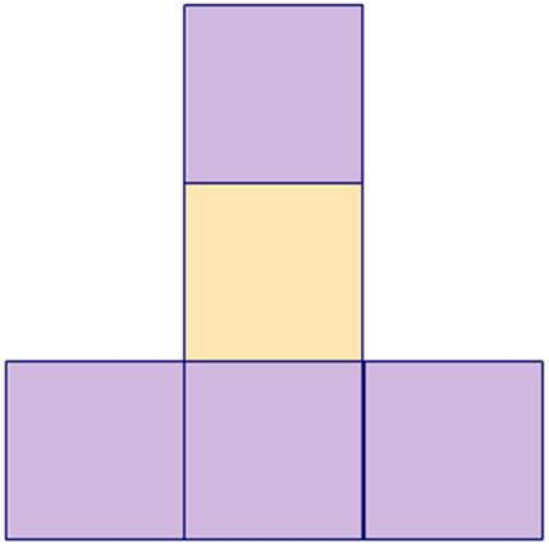
Julio notices that the sum of the numbers in a two by two square is always equal to four times the number in the top left-hand square plus 12.

He writes this as a formula:

$$s = 4a + 12$$

Number grid patterns

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



formula:

$n = 12$

$S = 80$