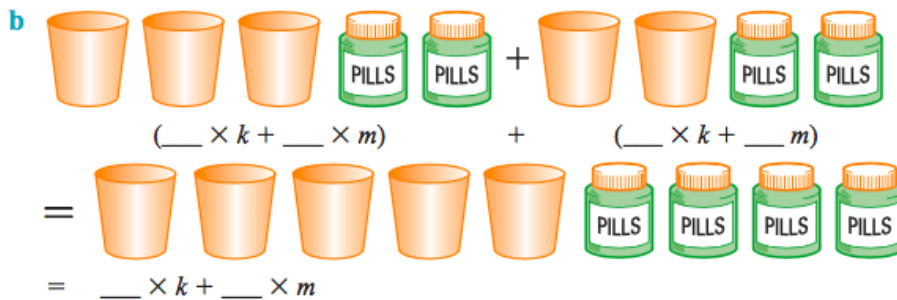
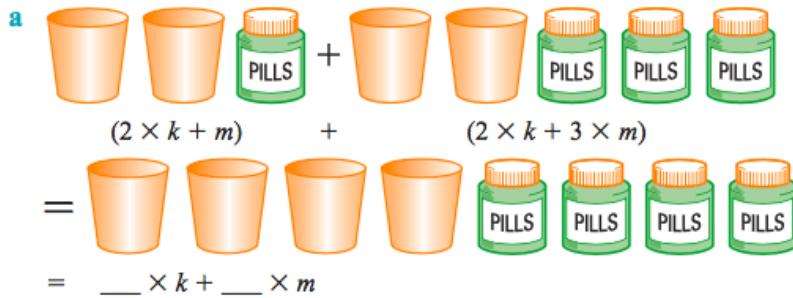


**Do Now - Ludi**

† Let  $k$  = the number of pills in each cup and  $m$  = the number of pills in each bottle. Complete the following to write an algebraic expression for the total number of pills shown by each diagram.



Check your answers

**23 a**  $(2 \times k + m) + (2 \times k + 3 \times m) = 4 \times k + 4 \times m$   
**b**  $(3 \times k + 2 \times m) + (2 \times k + 2 \times m) = 5 \times k + 4 \times m$

WALT: Substitute values into an algebraic expression

Success Criteria: I know I need to replace a variable/ unknown/pronomeral by a number in order to get the answer. It is represented by a symbol such as x,y,z

[Substitution Video](#) Video 1

[View the video for substitution](#) - More explanation Video 2

# B

## Substitution into algebraic expressions

**Substitution** into an algebraic expression means replacing a pronumeral by a number, in order to **evaluate** the expression.

Evaluate means find the value of. !.....

### EXAMPLE 1

Evaluate the algebraic expression  $3 \times z + 4$  if:

**a**  $z = 2$

**b**  $z = 5$

**a** Replace  $z$  by the number 2.

$$\begin{aligned} \text{If } z = 2, \quad 3 \times z + 4 \\ = 3 \times 2 + 4 = 10 \end{aligned}$$

**b** Replace  $z$  by the number 5.

$$\begin{aligned} \text{If } z = 5, \quad 3 \times z + 4 \\ = 3 \times 5 + 4 = 19 \end{aligned}$$

## Exercise 7B

**1** Complete the following to find the value of the algebraic expression  $z + 6$ .

**a** If  $z = 2$ ,  $z + 6$   
 $= \underline{\quad} + 6 = \underline{\quad}$

**b** If  $z = 5$ ,  $z + 6$   
 $= \underline{\quad} + 6 = \underline{\quad}$

**2** Complete the following to find the value of the algebraic expression  $2 \times w - 5$ .

**a** If  $w = 6$ ,  $2 \times w - 5$   
 $= 2 \times \underline{\quad} - 5 = \underline{\quad}$

**b** If  $w = 10$ ,  $2 \times w - 5$   
 $= 2 \times \underline{\quad} - 5 = \underline{\quad}$

**3** Evaluate the algebraic expression  $20 - 3 \times k$  if:

**a**  $k = 2$

**b**  $k = 4$

**c**  $k = 5$

**4** Evaluate the algebraic expression  $3 \times (t - 1) + 5$  if:

**a**  $t = 2$

**b**  $t = 5$

**c**  $t = 10$

#### Example 4 Substituting multiple variables

Substitute  $x = 3$  and  $y = 6$  to evaluate  $3x + 2y$ .

##### Solution

$$\begin{aligned}3x + 2y &= 3(3) + 2(6) \\ &= 9 + 12 \\ &= 21\end{aligned}$$

##### Explanation

Replace all the variables by their values and remember the order in which to evaluate (multiplication before addition).

9 If  $a = 4$  and  $b = 7$ , evaluate:

**a**  $3a + 2$

**b**  $2b - 1$

**c**  $a + b$

**d**  $6 + ab$

**e**  $3a + b$

**f**  $2a + 3b$

**g**  $b - a$

**h**  $3b - a$

10 Evaluate the expression  $2x - 3y$  when:

**a**  $x = 10$  and  $y = 4$

**b**  $x = 4$  and  $y = 2$

#### EXAMPLE 2

Substitute  $y = 4$  into each expression and evaluate.

**a**  $5 \times y + 2$

**b**  $2 \times (y - 1) + 5$

This is another way of asking us to replace  $y$  by the number 4 in each expression, then simplify.

**a**  $5 \times y + 2$

$= 5 \times 4 + 2 = 22$

**b**  $2 \times (y - 1) + 5$

$= 2 \times (4 - 1) + 5$

$= 2 \times 3 + 5 = 11$

5 Complete the following by substituting  $p = 5$  into each expression, then simplifying.

**a**  $p + 9$

$= \underline{\quad} + 9 = \underline{\quad}$

**b**  $p - 5$

$= \underline{\quad} - 5 = \underline{\quad}$

**c**  $6 \times p$

$= 6 \times \underline{\quad} = \underline{\quad}$

**d**  $10 \times p + 2$

$= 10 \times \underline{\quad} + 2 = \underline{\quad}$

**e**  $7 \times p - 4$

$= 7 \times \underline{\quad} - 4 = \underline{\quad}$

**f**  $12 - 2 \times p$

$= 12 - 2 \times \underline{\quad} = \underline{\quad}$

6 Substitute  $m = 12$  into each expression and evaluate.

**a**  $15 - m$

**b**  $m + 4$

**c**  $2 \times m + 3$

**d**  $3 \times (m + 2)$

**e**  $m \times m$

7 Substitute  $k = 2$  into each expression and evaluate.

**a**  $5 \times k - 3$

**b**  $4 \times (k + 3)$

**c**  $5 + 6 \times k$

**d**  $(k + 1) \times 6$

**e**  $4 \times k - 3 \times k$

### EXAMPLE 3

If  $a = 9$ ,  $b = 4$  and  $c = 10$ , find the value of each expression.

**a**  $a + b - c$

**b**  $2 \times a + 3 \times b$

**c**  $a \times b \times c$

**d**  $2 \times a \div 6$

Again we are being asked to replace each pronumerals by a numerical value.

**a**  $a + b - c$

$= 9 + 4 - 10 = 3$

**b**  $2 \times a + 3 \times b$

$= 2 \times 9 + 3 \times 4 = 30$

**c**  $a \times b \times c$

$= 9 \times 4 \times 10 = 360$

**d**  $2 \times a \div 6$

$= 2 \times 9 \div 6 = 3$

**8** If  $a = 5$ ,  $b = 6$  and  $c = 8$ , find the value of:

**a**  $a + b + c$

**b**  $a + b - c$

**c**  $12 - a$

**d**  $c - 8$

**e**  $10 \times b$

**f**  $2 \times c$

**g**  $c \times 3$

**h**  $a \times b$

**i**  $b \times c$

**j**  $a \times b \times c$

**k**  $a \times a$

**l**  $b \times b$

**m**  $10 \div a$

**n**  $2 \times a + 5$

**o**  $7 + 3 \times b$

**p**  $4 \times a - 2 \times c$

**q**  $c \div 2$

**r**  $a \times b \div 10$

**s**  $(a + 1) \times 3$

**t**  $4 \times (b - 2)$

**u**  $(a + 1) \times (c - 1)$

**v**  $(b + 2) \div 4$

**w**  $(c - 2) \div b$

**x**  $(b + c) \div (a + 2)$

Check your answers for the green part of the work

**1 a**  $2 + 6 = 8$

**b**  $5 + 6 = 11$

**2 a**  $2 \times 6 - 5 = 7$

**b**  $2 \times 10 - 5 = 15$

**3 a** 14

**b** 8

**c** 5

**4 a** 8

**b** 17

**c** 32

**5 a**  $5 + 9 = 14$

**b**  $5 - 5 = 0$

**c**  $6 \times 5 = 30$

**d**  $10 \times 5 + 2 = 52$

**e**  $7 \times 5 - 4 = 31$

**f**  $12 - 2 \times 5 = 2$

**6 a** 3

**b** 16

**c** 27

**d** 42

**e** 144

**7 a** 7

**b** 20

**c** 17

**d** 18

**e** 2

**8 a** 19

**b** 3

**c** 7

**d** 0

**e** 60

**f** 16

**g** 24

**h** 30

**i** 48

**j** 240