SUBSTITUTING INTO FORMULAE

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

Substitute means replace the letter with its value.

2x means 2 × x

× and ÷ before + and –

If x = 5: **2x + 3 = 2 × 5 + 3 = 10 + 3 = 13**

1 x = 4. Replace x with 4, then work it out.

a) **x + 9** 4 + 9 = ☐

b) **3x** 3 × 4 = ☐

c) **5x – 2** 5 × 4 – 2 = ☐

d) **x ÷ 2 + 1** 4 ÷ 2 + 1 = ☐

2 Substitute the values into each expression.

a = 3 **b = 5**

TIP ab means a × b

a) **a + b =** ☐

b) **ab =** ☐

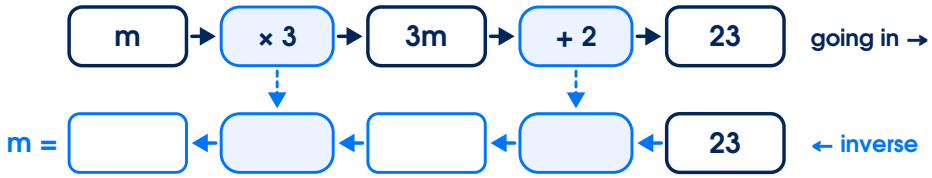
c) **2a + b =** ☐

d) **4b – a =** ☐

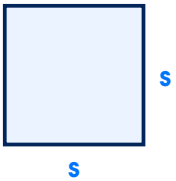
3 A taxi costs £3 for each mile, plus £2.

a) 6-mile journey: 6 × 3 + 2 = £ ☐

b) A journey of m miles costs £23. Use the inverse machine to find m.



4 The perimeter P of a square with side s is P = 4s. Complete the table.



P = 4s

s (cm)	3	5	7.5
P (cm)	☐	☐	☐

When P = 36, what is s? s = ☐

SUBSTITUTING INTO FORMULAE

SUPPORT

NAME _____ CLASS _____ DATE _____

KEY IDEA

A formula shows how variables are linked.

C = 25 + 12h A window cleaner charges £25, plus £12 for each hour h.

h = 2: C = 25 + 12 × 2 = 25 + 24 = £49

1 Use the formula to find v.

v = u + at TIP at means a × t

a) u = 5, a = 2, t = 3 **v =** ☐

b) u = 0, a = 9.8, t = 2 **v =** ☐

c) u = 12, a = –3, t = 4 **v =** ☐

2 Use the window cleaner formula C = 25 + 12h.

a) Find C when h = 3. C = ☐

b) Find h when C = 97.

25 + 12h = 97

– 25 → **12h =** ☐ → ☐

÷ 12 → **h =** ☐ → ☐

3 Use the pressure formula.

$P = \frac{F}{A}$ pressure = force ÷ area

a) F = 120, A = 4. P = ☐

b) P = 15, A = 6. Find F.

$\frac{F}{6} = 15$

× 6 → **F =** ☐ → ☐

4 Lily says, "When y = 6, 3y = 36."

a) Explain Lily's mistake. .....

b) What is the correct value of 3y? ☐

SUBSTITUTING INTO FORMULAE

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

Substitute the values, then follow the order of operations. If the unknown is not the subject, substitute what you know to make an equation, then solve it. Letters in formulae are variables.

FLUENCY

1 Substitute the values into each formula.

a) $V = IR$ $I = 2.5,\ R = 12$ $V =$ ☐

b) $A = \frac{1}{2}(a + b)h$ $a = 5,\ b = 9,\ h = 4$ $A =$ ☐

c) $E = \frac{1}{2}mv^2$ $m = 4,\ v = 3$ $E =$ ☐

d) $s = ut + \frac{1}{2}at^2$ $u = 2,\ t = 4,\ a = 2$ $s =$ ☐

2 Substitute the values, then solve the equation to find the variable.

a) $v = u + at$ $v = 30,\ u = 6,\ t = 4$ $a =$ ☐

b) $s = \frac{1}{2}(u + v)t$ $s = 40,\ u = 3,\ v = 7$ $t =$ ☐

c) $P = 2(l + w)$ $P = 31,\ l = 9$ $w =$ ☐

REASONING

3 Show that $x = -2$ is a solution of $3x + 10 = x + 6$.

.....

.....

4 Is each one a formula or an equation? Circle your answer.

a) $y = 3x + 2$ FORMULA EQUATION

b) $3x + 2 = 11$ FORMULA EQUATION

c) $A = lw$ FORMULA EQUATION

d) $5 = 2a - 1$ FORMULA EQUATION

SUBSTITUTING INTO FORMULAE

GREATER DEPTH

NAME _____ CLASS _____ DATE _____

REASONING

1 Is each statement always, sometimes or never true? Circle your answer.

If it is sometimes true, give an example of when it is true and when it is not.

a) If a is negative, then a^2 is negative. ALWAYS SOMETIMES NEVER

b) $x^2 > x$ ALWAYS SOMETIMES NEVER

c) If n is positive, then half of n is less than n. ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

2 This formula converts temperatures from °C to °F.

$$F = \frac{9C}{5} + 32$$

C = °C (Celsius), F = °F (Fahrenheit)

a) Find F when C = 25. ☐

b) Find C when F = 14. ☐

c) Find the temperature that has the same value in °C and °F. ☐

3 The power P (watts) of a device is given by P = IV. A device has a power of 36 watts.

a) Find three different pairs of values of I and V. ☐

b) I is doubled and V is halved. What happens to P? Explain.

★ CHALLENGE FOR ALL

4 This formula is used in Physics.

$$v^2 = u^2 + 2as$$

a) u = 3, a = 4, s = 2. Find v. ☐

b) v = 13, u = 5, s = 8. Find a. ☐

c) Why are there two possible answers to a)?

SUBSTITUTING INTO FORMULAE ? ANSWERS

ANSWERS

BUILDING BLOCKS

1 a) 13 · b) 12 · c) 18 · d) 3
2 a) 8 · b) 15 · c) 11 · d) 17
3 a) × 3 gives 18, + 2 gives £20 · b) − 2 then ÷ 3: 23 − 2 = 21, 21 ÷ 3 = 7 miles
4 P = 12, 20, 30 · when P = 36, s = 9

SUPPORT

1 a) v = 11 · b) v = 19.6 · c) v = 0
2 a) C = 61 · b) 12h = 72, h = 6
3 a) P = 30 · b) × 6 both sides: F = 90
4 a) She wrote 3y as 36, as if y were a digit; 3y means 3 × y · b) 18

CORE

1 a) V = 30 · b) A = 28 · c) E = 18 · d) s = 24
2 a) 30 = 6 + 4a, a = 6 · b) 40 = 5t, t = 8 · c) 31 = 2(9 + w), w = 6.5
3 LHS: 3 × (−2) + 10 = 4; RHS: −2 + 6 = 4; both sides equal, so x = −2 is a solution
4 a) formula · b) equation · c) formula · d) equation

GREATER DEPTH

1 a) never (e.g. $(-3)^2 = 9$) · b) sometimes (true for x = 2, false for x = 0.5) · c) always
2 a) 77°F · b) −10°C · c) −40 (solve C = 9C/5 + 32)
3 a) any three pairs with IV = 36, e.g. I = 2, V = 18; I = 3, V = 12; I = 4, V = 9 · b) P stays the same: 2I × V/2 = IV
4 a) $v^2 = 9 + 16 = 25$, v = 5 or −5 · b) 169 = 25 + 16a, a = 9 · c) 5^2 and $(-5)^2$ are both 25