Substitution: fact sheet

Planner week 9 · Learn these facts

Substitution

$g = 9$, $h = 4$

$2g + 3h = 2 \times 9 + 3 \times 4$

$= 18 + 12 = 30$

Swap each letter for its number

2g means 2 × g

Negative numbers

$r = 5$, $q = -4$

$7r + 3q = 35 + (-12)$

$= 23$

Use brackets for negatives

3 × −4 = −12

Squares

$w = 40 - t^2$, $t = -5$

$(-5)^2 = 25$

$w = 15$

A negative squared is positive

Do the power first

Finding a letter

$P = 2g + 4h$, $P = 38$, $h = 3$

$38 = 2g + 12$

$g = 13$

Substitute, then solve the equation

Check by putting it back in

Writing a formula

5 apples in a bag, 28 in a crate

$T = 5b + 28c$

Use the letters you are given

Include "T ="

Expression or formula?

5a + 3 expression

L = 5a + 3 formula

5m − 3m ≡ 2m identity

A formula has an = and a subject

An identity is true for every value

Fractions in formulae

$v = u + at$

$1 + (-3) \times \frac{1}{2} = -0.5$

Multiply before adding

Write every step

Rules

$2g$	$2 \times g$
g^2	$g \times g$
gh	$g \times h$
$\frac{g}{2}$	$g \div 2$

Which sheet do I need?

Substituting into formulae ▸
put numbers into a formula

Writing formulae ▸
write a formula from words

Key words

- **Substitute** replace a letter with a number
- **Formula** a rule with an = sign
- **Subject** the letter on its own
- **Identity** true for all values (≡)

Exam tips

- Write the formula out with the numbers in **before** working it out.
- Put negative numbers in brackets.
- Follow BIDMAS: powers, then × and ÷, then + and −.
- Finding a letter in the middle: substitute, then solve.
- Writing a formula: try it with a number to check it works.
- "As simply as possible": collect like terms.

Substituting into formulae: fact sheet

Substitution · Planner week 9 · Learn the method

Worked example

QUESTION

$T = 3x + 4y$

Work out the value of T when $x = 5$ and $y = -7$.

ANSWER

1. Put the numbers in: $T = 3 \times 5 + 4 \times (-7)$
2. $= 15 + (-28)$
3. $= 15 - 28$

$T = -13$

Write it out with the numbers in, then use BIDMAS.

How to do it

1. Write the formula again with the numbers in place of the letters.
2. Put negative numbers in brackets.
3. Work it out using BIDMAS.
4. If you know the answer but not a letter, substitute what you know and solve.
5. Check your answer makes sense.

Model answer:

$T = -13$

Watch out

- Writing 3x as 35 when x = 5.
- $4 \times -7 = +28$.
- -5^2 as -25 (it is $(-5)^2 = 25$).

Writing formulae: fact sheet

Substitution · Planner week 9 · Learn the method

Worked example

QUESTION

Ben is n years old. Chloe is twice as old as Ben. Dan is 5 years younger than Ben.
Write a formula for T, the total of their ages.

ANSWER

1. Ben: n Chloe: $2n$ Dan: $n - 5$
2. $T = n + 2n + n - 5$
3. Collect the n terms: $n + 2n + n = 4n$

$T = 4n - 5$

Write each part with the letter, then add.

How to do it

1. Write each amount in terms of the letter.
2. Add (or multiply) as the question says.
3. Collect like terms to simplify.
4. Start with the subject: “T = …”.
5. Check with a number, e.g. n = 10.

Model answer:

$T = 4n - 5$

Watch out

- Leaving off “T =”.
- Writing n2 instead of 2n.
- Not simplifying.