

# Notes & Steps



## Key idea

Substitution means replacing a variable with its value, then simplifying carefully. If  $x = 3$ , then every  $x$  is replaced by 3.

## Steps

1. Write the value of the variable clearly.
2. Replace each variable with that value.
3. Use brackets if needed, especially with negatives.
4. Work out the expression using GEMA.

## Common mistake

Forgetting brackets with negatives. If  $x = -3$ , then  $x^2 = (-3)^2 = 9$ , not  $-9$ .

## Key facts

- ▶ If  $x = 4$ , then  $2x = 8$ .
- ▶ If  $a = 5$ , then  $a^2 = 25$ .
- ▶ If  $p = 3$  and  $q = 2$ , then  $p + 2q = 7$ .
- ▶ Brackets matter: if  $x = -2$ , then  $x^2 = 4$  but  $-x^2 = -4$ .

## Try these

1. If  $x = 3$ , find  $x + 4$ .
2. If  $a = 5$ , find  $2a$ .
3. If  $m = 2$ ,  $n = 4$ , find  $m + n$ .

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## Example 1: one variable

If  $x = 4$ , find  $2x + 3$ .

$$2x + 3 = 2(4) + 3 = 8 + 3 = 11$$

## Example 2: two variables

If  $p = 5$  and  $q = 2$ , find  $p + 2q$ .

$$p + 2q = 5 + 2(2) = 5 + 4 = 9$$

## Example 3: powers

If  $a = 3$ , find  $a^2 + 1$ .

$$a^2 + 1 = 3^2 + 1 = 9 + 1 = 10$$

## Example 4: negative value

If  $x = -2$ , find  $x^2 + 3$ .

$$x^2 + 3 = (-2)^2 + 3 = 4 + 3 = 7$$