

Algebra is a very powerful tool which is used to make problem solving easier. Algebra involves using letters or **pronumerals** to represent unknown values or **variables** which can change depending on the situation.

Many worded problems can be converted to algebraic symbols to make algebraic **equations**. We will learn how to **solve** equations to find **solutions** to the problems.

Algebra can also be used to construct **formulae**, which are equations that connect two or more variables. Many people use formulae as part of their jobs, so an understanding of how to **substitute** into formulae and **rearrange** them is essential. Builders, nurses, pharmacists, engineers, financial planners, and computer programmers all use formulae which rely on algebra.

The ability to convert worded sentences and problems into algebraic symbols and to understand algebraic notation is essential in the problem solving process.

Notice that:

- $x^2 + 3x$ is an algebraic **expression**, whereas
- $x^2 + 3x = 8$ is an **equation**, and
- $x^2 + 3x > 28$ is an **inequality** or **inequation**.

When we simplify **repeated sums**, we use **product** notation:

For example:

$x + x$	and	$x + x + x$
$= 2$ 'lots' of x		$= 3$ 'lots' of x
$= 2 \times x$		$= 3 \times x$
$= 2x$		$= 3x$

When we simplify **repeated products**, we use **index** notation:

For example: $x \times x = x^2$ and $x \times x \times x = x^3$

Example 1 **Self Tutor**

Write, in words, the meaning of:

a $x - 5$

b $a + b$

c $3x^2 + 7$

a $x - 5$ is “5 less than x ”.**b** $a + b$ is “the sum of a and b ” or “ b more than a ”**c** $3x^2 + 7$ is “7 more than three times the square of x ”.**Example 2** **Self Tutor**

Write the following as algebraic expressions:

a the sum of p and the square of q **b** the square of the sum of p and q **c** b less than double a

a $p + q^2$

b $(p + q)^2$

c $2a - b$

Example 3 **Self Tutor**

Write, in sentence form, the meaning of:

a $D = ct$

b $A = \frac{b + c}{2}$

a D is equal to the product of c and t .**b** A is equal to a half of the sum of b and c ,
or, A is the average of b and c .**Example 4** **Self Tutor**Write ‘ S is the sum of a and the product of g and t ’ as an equation.The product of g and t is gt .The sum of a and gt is $a + gt$.So, the equation is $S = a + gt$.**EXERCISE 1A****1** Write, in words, the meaning of:

a $2a$

b pq

c \sqrt{m}

d a^2

e $a - 3$

f $b + c$

g $2x + c$

h $(2a)^2$

i $2a^2$

j $a - c^2$

k $a + b^2$

l $(a + b)^2$

2 Write the following as algebraic expressions:

- | | |
|---|--|
| a the sum of a and c | b the sum of p , q and r |
| c the product of a and b | d the sum of r and the square of s |
| e the square of the sum of r and s | f the sum of the squares of r and s |
| g the sum of twice a and b | h the difference between p and q if $p > q$ |
| i a less than the square of b | j half the sum of a and b |
| k the sum of a and a quarter of b | l the square root of the sum of m and n |
| m the sum of x and its reciprocal | n a quarter of the sum of a and b |
| o the square root of the sum of the squares of x and y | |

3 Write, in sentence form, the meaning of:

- | | | |
|-----------------------------------|---------------------------------|--------------------------------|
| a $L = a + b$ | b $K = \frac{a+b}{2}$ | c $M = 3d$ |
| d $N = bc$ | e $T = bc^2$ | f $F = ma$ |
| g $K = \sqrt{\frac{n}{t}}$ | h $c = \sqrt{a^2 + b^2}$ | i $A = \frac{a+b+c}{3}$ |

4 Write the following as algebraic equations:

- a** S is the sum of p and r
- b** D is the difference between a and b where $b > a$
- c** A is the average of k and l
- d** M is the sum of a and its reciprocal
- e** K is the sum of t and the square of s
- f** N is the product of g and h
- g** y is the sum of x and the square of x
- h** P is the square root of the sum of d and e

The **difference** between two numbers is the larger one minus the smaller one.



EXERCISE 1A

- 1** **a** double a **b** the product of p and q
c the square root of m **d** the square of a **e** 3 less than a
f the sum of b and c **g** the sum of double x and c
h the square of twice a **i** twice the square of a
j the difference between a and the square of c , where $a > c^2$
k the sum of a and the square of b
l the square of the sum of a and b

- 2** **a** $a + c$ **b** $p + q + r$ **c** ab **d** $r + s^2$
e $(r + s)^2$ **f** $r^2 + s^2$ **g** $2a + b$ **h** $p - q$
i $b^2 - a$ **j** $\frac{a + b}{2}$ **k** $a + \frac{b}{4}$ **l** $\sqrt{m + n}$
m $x + \frac{1}{x}$ **n** $\frac{1}{4}(a + b)$ or $\frac{a + b}{4}$ **o** $\sqrt{x^2 + y^2}$

- 3** **a** L is equal to the sum of a and b .
b K is equal to the average of a and b .
c M is equal to 3 times d .
d N is equal to the product of b and c .
e T is equal to the product of b and the square of c .
f F is equal to the product of m and a .
g K is equal to the square root of the quotient of n and t .
h c is equal to the square root of the sum of the squares of a and b .
i A is equal to the average of a , b and c .

- 4** **a** $S = p + r$ **b** $D = b - a$ **c** $A = \frac{k + l}{2}$
d $M = a + \frac{1}{a}$ **e** $K = t + s^2$ **f** $N = gh$
g $y = x + x^2$ **h** $P = \sqrt{d + e}$