

1.A.(d) Working out in the right order

If you are replacing letters by numbers, then you must stick to the following rules to work out the answer from these numbers.

- (1) In general, we work from left to right.
- (2) Any working inside a bracket must be done first.
- (3) When doing the working out, first find any powers, then do any multiplying and dividing, and finally do any adding and subtracting.

Here are two examples.

EXAMPLE (1) If $a = 2$, $b = 3$, $c = 4$ and $d = 6$, find $3a(2d + bc) - 4c$.

- Find the inside of the bracket, which is $2 \times 6 + 3 \times 4 = 12 + 12 = 24$.
- Multiply this by $3a$, giving $6 \times 24 = 144$.
- Find $4c$, which is $4 \times 4 = 16$.
- Finally, we have $144 - 16 = 128$.

EXAMPLE (2) If $x = 2$, $y = 3$, $z = 4$ and $w = 6$, work out the value of $x(2y^2 - z) + 3w^2$.

We start by working out the inside of the bracket.

- Find y^2 which is 9.
- The bracket comes to $2 \times 9 - 4 = 14$.
- Multiply this by x , getting 28.
- $w^2 = 6^2 = 36$ so $3w^2 = 108$.
- Finally, we get $28 + 108 = 136$.

EXERCISE 1.A.2

Now try the following yourself.

(1) If $a = 2$, $b = 3$, $c = 4$, $d = 5$ and $e = 0$ find the values of:

- (a) $ab + cd$ (b) ab^2e (c) ab^2d (d) $(abd)^2$ (e) $a(b + cd)$
(f) $ab^2d + c^3$ (g) $ab + d - c$ (h) $a(b + d) - c$

(2) Multiply out the following, tidying up the answers by putting together as much as possible.

- (a) $3x(2x + 3y) + 4y(x + 7y)$ (b) $5p^2(2p + 3q) + q^2(3p + 5q) + pq(p + 2q)$

Check your answers to these two questions, before going on.

Questions (3) and (4) are very similar to (1) and (2) and will give you some more practice if you need it.

(3) If $a = 3$, $b = 4$, $c = 1$, $d = 5$ and $e = 0$ find the values of:

- (a) a^2 (b) $3b^2$ (c) $(3b)^2$ (d) c^2 (e) $ab + c$ (f) $bd - ac$ (g) $b(d - ac)$
(h) $d^2 - b^2$ (i) $(d - b)(d + b)$ (j) $d^2 + b^2$ (k) $(d + b)(d + b)$
(l) $a^2b + c^2d$ (m) $5e(a^2 - 3b^2)$ (n) $a^b + d^a$

(4) Multiply out and collect like terms together if possible:

- (a) $3a(2b + 3c) + 2a(b + 5c)$ (b) $2xy(3x^2 + 2xy + y^2)$
(c) $5p(2p + 3q) + 2q(3p + q)$ (d) $2c^2(3c + 2d) + 5d^2(2c + d)$

Answers to the exercises

Chapter 1

Exercise 1.A.1

- (1) (a) $8a + b + 3c$ ($1b$ is written as just b .) (b) $5ab + 5a + 3b$ (since $ab = ba$.)
 (c) $5p + 5pq + 8q$ (d) $2x + 5y + 3xy$
- (2) (a) $2^3 = 8$ (b) $5a^2 = 5 \times 2^2 = 20$ (c) $(5a)^2 = 10^2 = 100$ (d) $1^2 = 1$
 (e) $8 + 3 = 11$
- (3) (a) $6xy$ (b) $15x^3y$ (c) $6a + 9b$ (d) $6a^2 + 10ab$ (e) $6p^3 + 4p^2q + 2pq^2$
 (f) $6x^3 + 4x^3y + 2x^2y^2$

Exercise 1.A.2

- (1) (a) $ab + cd = 2 \times 3 + 4 \times 5 = 6 + 20 = 26$ (b) $ab^2e = 2 \times 3^2 \times 0 = 0!$
 (c) $ab^2d = 2 \times 3^2 \times 5 = 2 \times 9 \times 5 = 90$ (d) $(abd)^2 = (2 \times 3 \times 5)^2 = 30^2 = 900$
 (e) $a(b + cd) = 2(3 + 4 \times 5) = 2(3 + 20) = 46$
 (f) $ab^2d + c^3 = 2 \times 3^2 \times 5 + 4^3 = 90 + 64 = 154$
 (g) $ab + d - c = 2 \times 3 + 5 - 4 = 6 + 5 - 4 = 7$
 (h) $a(b + d) - c = 2(3 + 5) - 4 = 2 \times 8 - 4 = 16 - 4 = 12$
- (2) (a) $3x(2x + 3y) + 4y(x + 7y) = 6x^2 + 9xy + 4xy + 28y^2 = 6x^2 + 13xy + 28y^2$
 (b) $5p^2(2p + 3q) + q^2(3p + 5q) + pq(p + 2q) = 10p^3 + 15p^2q + 3pq^2 + 5q^3 + p^2q + 2pq^2 = 10p^3 + 16p^2q + 5pq^2 + 5q^3$
- (3) (a) $a^2 = 3^2 = 3 \times 3 = 9$ (b) $3b^2 = 3 \times 4^2 = 3 \times 16 = 48$ (c) $(3b)^2 = (12)^2 = 144$
 Notice this last pair! Students quite often confuse (b) and (c). In (b), only the b is squared.
- (d) $c^2 = 1^2 = 1 \times 1 = 1$ (not $2!$) (e) $ab + c = 3 \times 4 + 1 = 12 + 1 = 13$
 (f) $bd - ac = 4 \times 5 - 3 \times 1 = 20 - 3 = 17$ (g) $b(d - ac) = 4(5 - 3 \times 1) = 4(2) = 8$
 (h) $d^2 - b^2 = 5^2 - 4^2 = 25 - 16 = 9$ (i) $(d - b)(d + b) = (5 - 4)(5 + 4) = 9$
 (j) $d^2 + b^2 = 5^2 + 4^2 = 25 + 16 = 41$ (k) $(d + b)(d + b) = (5 + 4)(5 + 4) = 9 \times 9 = 81$
 (l) $a^2 + c^2d = 3^2 \times 4 + 1^2 \times 5 = 9 \times 4 + 1 \times 5 = 36 + 5 = 41$
 (m) $5e(a^2 - 3b^2) = 0$ since it is all multiplied by 0
 (n) $a^b + d^a = 3^4 + 5^3 = 81 + 125 = 206$
- (4) (a) $3a(2b + 3c) + 2a(b + 5c) = 6ab + 9ac + 2ab + 10ac = 8ab + 19ac$
 (b) $2xy(3x^2 + 2xy + y^2) = 6x^3y + 4x^2y^2 + 2xy^3$
 (c) $5p(2p + 3q) + 2q(3p + q) = 10p^2 + 15pq + 6pq + 2q^2 = 10p^2 + 21pq + 2q^2$
 (d) $2c^2(3c + 2d) + 5d^2(2c + d) = 6c^3 + 4c^2d + 10cd^2 + 5d^3$

Exercise 1.A.3

- (1) $2x - (x - 2y) + 5y = 2x - x + 2y + 5y = x + 7y$
 (2) $4(3a - 2b) - 6(2a - b) = 12a - 8b - 12a + 6b = -2b$
 (3) $6(2c + d) - 2(3c + d) + 5 = 12c + 6d - 6c + 2d + 5 = 6c + 8d + 5$