S1

CfE Level 3

Working at Home Workbook

Algebra

Learning Intention. To be able to -
Collect "like" terms & multiply terms in algebraic expressions
Expand out brackets
Expand out brackets, then collect like terms
Solve simple equations
Solve equations with brackets

Learning Intention. To be able to -
Substitute numbers for letters
Construct and evaluate formula from statements and diagrams

Collect "like" terms & multiply terms in algebraic expressions

Question 1

Simplify the following expressions by collecting like terms :-

a	$a + a + a + a$	b	$2a + a - 3a + a$
c	$3a + 4a + 5a - 10a$	d	$5a + 2b + 3a$
e	$6a + 4b + 2a + 5b$	f	$4a + 7b - 3a - 5b$
g	$12a + 8b - 3a - 6b - 4a$	h	$5a^2 + 3a - 3a^2$
i	$8a - 5a^2 + a + 7a^2$	j	$a + 4b - 7a + b$

Question 2

Simplify by multiplying (or dividing) :-

a	$4 \times a$	b	$5 \times a \times b$
c	$a \times a$	d	$3a \times 5a$
e	$3a \times 4b$	f	$5a \times 2a \times 3a$
g	$16a \div 8a$	h	$24a^2 \div 4a$

Expand out brackets

Question 1

Multiply out the brackets :-

a	$2(a + 3)$	b	$4(a + 2)$
c	$3(a - 7)$	d	$5(a - 3)$
e	$2(3a - 1)$	f	$3(5a - 2)$
g	$7(2a + 3)$	h	$6(3 - 2a)$
i	$8(3 - 5a)$	j	$10(3a + b)$
k	$6(3a + 5b)$	l	$3(2a - 7b)$
m	$4(5a + 7b + 1)$	n	$5(3a - 2b + 3)$
o	$3a(a + 2)$	p	$4a(3a - 4)$
q	$2a(3a - 2b + 1)$	r	$6a(2 - 3a + b)$

Question 2

Remove the brackets :-

a	-2(3a + 4)	b	-3(4a + 1)
c	-5(2a – 3)	d	-6(3a – 5)
e	-2(8a – 3b + 1)	f	-4(a – b + c)

Expand out brackets, then collect like terms

Expand brackets and simplify :-

a	3(a + 2) - 4	b	2(a – 4) + 10
c	2(3a – 1) + 5	d	4(5a + 2) - 1
e	6(2a – 7) – 3a	f	4(5a + 6) – 7a
g	5(3a – 1) + 8a	h	3(2a – 5) + 4a
i	22 + 3(2a – 5)	j	18a + 2(3a – 7)
k	15 – 3(a + 1)	l	12 – 2(3a + 5)
m	2(3a + 4) + 3(4a – 1)	n	3(4a – 5) + 6(a + 8)
o	5(2a + 1) + 3(a – 1)	p	6(5a – 4b + 1) + 2(2 + 4b – a)
q	7(3a + 1) – 2(2a + 3)	r	6(5a + 3) – (2a + 1)

Solve simple equations

Solve each of these equations by dividing:-

a	2a = 8	b	3a = 15
c	7a = 21	d	4a = 24
e	10a = 120	f	8a = 80
g	7a = 35	h	2a = 3
i	3a = 10	j	5a = 12

Question 2

Solve these equations by multiplying:-

a) $\frac{1}{2}a = 5$ b) $\frac{1}{3}a = 2$ c) $\frac{a}{2} = 7$

d) $\frac{a}{5} = 3$ e) $\frac{a}{6} = 1$ f) $\frac{1}{3}a = 0$

Question 3

Solve these equations:

a	a + 3 = 5	b	a + 6 = 10
c	a – 4 = 7	d	a – 2 = 9
e	4 + a = 9	f	10 + a = 12
g	a + 3 = 3	h	a – 6 = 6
i	a + 4 = 0	j	a – 2 = 0

Question 4

Solve these two step equations:-

a	2a + 3 = 9	b	2a – 1 = 11
c	3a + 1 = 16	d	3a – 4 = 17
e	5a + 7 = 42	f	5a – 8 = 32
g	4a – 5 = 31	h	7a + 1 = 50
i	2a + 3 = 4	j	2a + 7 = 10
k	3a – 1 = 0	l	5a + 2 = 4
m	7a + 5 = 8	n	6a – 1 = 50

Solve equations with brackets

Expand the brackets and solve the equations:-

a	2(a + 1) = 10	b	3(2a – 1) = 12
c	4(3a + 2) = 16	d	5(2a – 6) = 15
e	3(5a – 2) = 9	f	6(2a – 3) = 18
g	10(2a + 1) = 90	h	3(2a + 5) = 30

Substitute numbers for letters

Question 1

Find the value of each of the following expressions when a = 4

a	a + 7	b	12 - a
c	6a	d	5a - 7
e	2(a + 1)	f	a^2
g	20 – 3a	h	$7 + a^3$

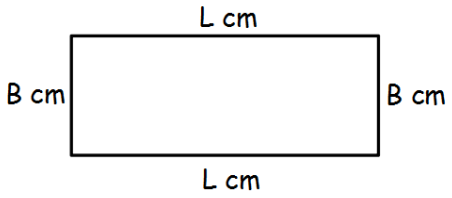
Question 2

Given that a = 2, b = 3 and c = 5, find the value for the following:-

a	6a + 4b	b	ab
c	bc - 1	d	$b^2 + 7$
e	a(b + c)	f	$c^2 - a$
g	ab + ac + bc	h	10abc

Construct and evaluate formula from statements and diagrams

Question 1



Here is a rectangle.

a) Write a formula for the perimeter of the rectangle.

b) Calculate the perimeter when B is 4 cm and L is 9.5 cm.

c) Calculate L when B is 3 cm and P is 28 cm.

Question 2

Ricky is a plumber. He charges X as a call out charge and £18 for every Y hours he works.

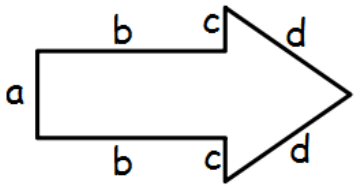
a) Write a formula in terms of X and Y for C the amount he charges.

b) How much will he charge if he uses a call out charge of £50 and he works 4 hours.

Question 3

a) Write a formula for P the perimeter of the shape.

b) Calculate the perimeter when a is 4cm, b is 8 cm, c is 1 cm and d is 5 cm.



Question 4

The distance (d) travelled is equal to the speed (s) multiplied by time (t).

a) Write a formula distance (d) travelled.

b) Calculate the distanced travelled if travel at a speed of 38 km/h for 3 hours.

Question 5

Mrs Smith gave her maths class this problem:

"When 8 is added to a certain number, the result is 3 times as large as when 2 is subtracted from the number."

She asked the class to find the original number. What was the correct number?

Question 6

To calculate your Body Mass Index (BMI) you divide your weight in kilograms (k) by the square of your height in metres (m).

a) Write a formula for BMI

b) Calculate the BMI for a weight of 56 kg and a height of 1.5 m.