

GRADE 10 – WORKSHEET 1

ALGEBRAIC EXPRESSIONS

OUTCOMES:

MULTIPLICATION OF ALGEBRAIC EXPRESSIONS

Examples:

Multiplying monomial by polynomial (Revision of Grade 9)

Here we multiply each term inside the bracket with each term inside the bracket. Let us look at why.

$$2(x + y) = x + y + x + y \text{ i.e. } x + y \text{ added twice.}$$

So we see we have 2 x 's and 2 y 's i.e. $= 2x + 2y$

$$\text{The same with } 7(x + m) = 7x + 7m$$

In the same way we will have $a(x + y) = ax + ay$

$$x(x + 4) = x(x) + x(4) = x^2 + 4x$$

$$2x(3x - 4y) = 2x(3x) + 2x(-4y) = 6x^2 - 8xy$$

$$3(2x + 3y) = 3(2x) + 3(3y) = 6x + 9y$$

$$7(4x - 2y) = 7(4x) + 7(-2y) = 28x - 14y$$

$$-3(2x - 3) = -3(2x) - 3(-3) = -6x + 9$$

1. Simplify the following expression i.e. write them without brackets.

1.1. $3(x - 5)$

1.2. $5(x + 1)$

1.3. $-3(x + 5)$

1.4. $-4(x - 3)$

1.5. $-2(2x - 5)$

1.6. $-3(5x - 3)$

1.7. $5(3x - 2a)$

1.8. $a(2x - 5)$

1.9. $4(2x - 3y + 5w)$

1.10. $3x(2x^2 - 5x + 4)$

Multiplying binomials and binomial.

This will be a sum like $(x + 1)(x + 3)$. We can see that the

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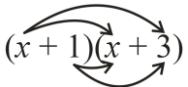
bracket $(x + 3)$ does not have something simply outside of it like 3 or $2x$ but has $(x + 1)$ outside of it. But we take the $x + 1$ as the “thing outside” so we get

$$(x + 1)x + (x + 1)3$$

So now the “thing” outside the bracket x and 3 respectively so we get

$$x(x) + x(1) + 3(x) + 3(1) = x^2 + 1x + 3x + 3 \\ = x^2 + 4x + 3$$

But this takes very long so we notice that the x gets multiplied by the other x and the 3 . The 1 get multiplied by the other x and 3 as well. So we normally do this.


$$(x + 1)(x + 3)$$

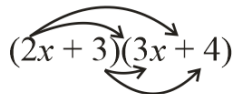
Note the arrow from the first x goes to the x in the second bracket giving us $x(x) = x^2$

The second arrow goes from the x to the 3 giving us $x(3) = 3x$

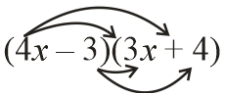
The third arrow (at the bottom) goes from the 1 to the $x = 1(x) = 1x$

The last arrow goes from the 1 to the $3 = 1(3) = 3$

So we get $x^2 + 3x + 1x + 3 = x^2 + 4x + 3$

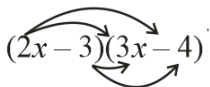

$$(2x + 3)(3x + 4)$$

$$2x(3x) + 2x(4) + 3(3x) + 3(4) = 6x^2 + 8x + 9x + 12 = 6x^2 + 17x + 12$$


$$(4x - 3)(3x + 4)$$

$$4x(3x) + 4x(4) - 3(3x) - 3(4)$$

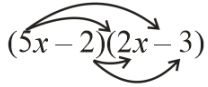
$$12x^2 + 16x - 9x - 12 = 12x^2 + 7x - 12$$


$$(2x - 3)(3x - 4)$$

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

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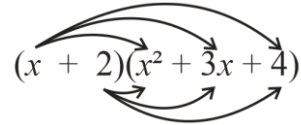
$$= 6x^2 - 8x - 9x + 12 = 6x^2 - 17x + 12$$


$$(5x - 2)(2x - 3)$$

$$= 5x(2x) + 5x(-3) - 2(2x) - 2(-3)$$

$$= 10x^2 - 15x - 4x + 6 = 10x^2 - 19x + 6$$

Multiplying binomials and trinomial.

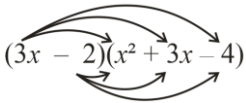

$$(x + 2)(x^2 + 3x + 4)$$

This is the same as binomial and binomial. Each term in the one bracket get multiplied by each term in the other bracket. So we will get:

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

$$= x^3 + \underbrace{3x^2} + \underbrace{4x} + \underbrace{2x^2} + \underbrace{6x} + 8 = x^3 + \underbrace{5x^2} + \underbrace{10x} + 8$$

Note that the ones with the underbrace ($\underbrace{\quad}$) are like terms and are added together to give the answer with the underbrace. The ones with the overbrace ($\overbrace{\quad}$) are like terms and are added together to give the answer with the overbrace.


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

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

$$= 3x^3 + 9x^2 - 12x - 2x^2 - 6x + 8 = 3x^3 + 7x^2 - 18x + 8$$

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2. Simplify the following expressions. Show all calculations.

2.1	$(x + 3)(x + 2)$
2.2	$(3y - 1)(2y + 4)$
2.3	$(2x - 4y)(1x - 3y)$
2.4	$(2ab + 3)(ab - 5)$
2.5	$(2x^3 + 7y)(x^3 - 2y)$
2.6	$(x - y)(x^2 - 3xy + 2y^2)$
2.7	$(8 - 3n^2)(4 + n) - (n - 3)(n^2 + 3n + 9)$

HOMEWORK

3. Expand and simplify the following:

3.1	$(x - 3)(x + 4)$	3
3.2	$(x - 4)^2$	3
3.3	$(x^3 - 5)(x^2 - 2)$	3
3.4	$3(x - 4)(x + 2)$	4
3.5	$(4 - 2y)(7 + 3y)$	4
3.6	$(x + y)(2x^2 + 3x - 4)$	4
3.7	$(-4y - 3)(12y^2 - 6y + 3)$	4
3.8	$(7y^2 - 6y - 8)(-2y + 2)$	4

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3.9	$(2y^6 + 3y^5)(-5y^2 - 12)$	4
3.10	$(2x - 3)(3x^2 - 4x + 2)$	4
3.11	$(3x - 2)(4x^2 - x + 3)$	4
3.12	$(a - 2)^2 - a(a - 4)$	5
3.13	$(2x - 1)^2 - (x - 3)^2$	5
3.14	$5 - 3(2x - 1)^2 + 2x(x + 3)(3x - 4) - 4(2x + 1)(2x - 1)$	7
3.15	$2(x - 3)^2 - (x - 2)(x + 2) - 3(2x - 1)(x + 2)$	7
3.16	$\left(\frac{5}{m} - m\right)^2$	3
3.17	$(2x - 3)^2 - (2x + 3)^2$	5
3.18	$2 - 3(x - 4)^2 - (2x - 1)(x + 2) + 5x(x + 1)$	7