**Simplifying and Substituting (H)**

Intervention Booklet

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Class: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Useful websites:**

**www.mathswatchvle.com**

*(Video explanations and questions)*

Username: STH…@twgash

Password: stmaths

**www.methodmaths.com**

*(Past papers online that get instantly marked)*

Centre ID: wga

Username: firstname

Password: lastname

**www.hegartymaths.com**

*(Online tutorials and quizzes)*

Login: first name and last name are case sensitive

**www.bbc.co.uk/schools/gcsebitesize/maths**

 **Expand and Factorise Quadratics**

**Things to remember:**

* Use FOIL (first, outside, inside, last) or the grid method (for multiplication) to expand brackets.
* For any quadratic ax² + bx + c = 0, find a pair of numbers with a sum of b and a product of ac to factorise.

**Questions:**

**1.** Expand and simplify (*m* + 7)(*m* + 3)

……………………………………

**(Total for question = 2 marks)**

**2.** (a) Factorise      6 + 9*x*

……………………………………

 **(1)**

(b) Factorise      *y*2 – 16

……………………………………

 **(1)**

(c) Factorise      2*p*2 – *p* – 10

……………………………………

 **(2)**

**(Total for Question is 4 marks)**

**3.** Solve, by factorising, the equation      8*x*2 – 30*x* – 27 = 0

……………………………………

**(Total for Question is 3 marks)**

**4.** Factorise *x*2 + 3*x* – 4

……………………………………

**(Total for question is 2 marks)**

**5.** Write *x*2 + 2*x* – 8 in the form (*x* + *m*)2 + *n* where *m* and *n* are integers.

……………………………………

**(Total for question is 2 marks)**

**6.** (a) Expand    4(3*x* + 5)

……………………………………

 **(1)**

(b) Expand and simplify    2(*x* – 4) + 3(*x* + 5)

……………………………………

 **(2)**

(c) Expand and simplify    (*x* + 4)(*x* + 6)

……………………………………

 **(2)**

**(Total for Question is 5 marks)**

**7.** (a) Factorise      *x*2 + 5*x* + 4

……………………………………

 **(2)**

(b) Expand and simplify    (3*x* −1)(2*x* + 5)

……………………………………

 **(2)**

 **(Total for Question is 4 marks)**

**8.** (a) Expand    3(2 + *t*)

……………………………………

 **(1)**

(b) Expand    3*x*(2*x* + 5)

……………………………………

 **(2)**

(c) Expand and simplify (*m* + 3)(*m* + 10)

……………………………………

 **(2)**

**(Total for Question is 5 marks)**

**9.** (a) Factorise                    *x*2 + 7*x*

……………………………………

 **(1)**

(b) Factorise                   *y*2 – 10*y* + 16

……………………………………

 **(2)**

\*(c) (i) Factorise             2*t*2 + 5*t* + 2

……………………………………

        (ii) *t* is a positive whole number.
         The expression 2*t*2 + 5*t* + 2 can never have a value that is a prime number.
         Explain why.

       ………..................................................................................................................

       ………..................................................................................................................

       ………..................................................................................................................

**(3)**

**(Total for Question is 6 marks)**

**Algebraic Fractions – Simplifying**

**Things to remember:**

* Factorise the numerator and denominator;
* Cancel common factors;
* Then add/subtract/multiply divide if necessary.

**Questions:**

**1.** Simplify $\frac{p^{2}-9}{2p+6}$

...........................................................

 **(Total 3 marks)**

**2.** Simplify fully $\frac{6x^{2}+3x}{4x^{2}-1}$

...........................................................

 **(Total 3 marks)**

**3.** Simplify $\frac{x^{2}+2x+1}{x^{2}+3x+2}$

...........................................................

 **(Total 3 marks)**

**4.** Simplify fully $\frac{x^{2}+x-6}{x^{2}-7x+10}$

/

...........................................................

 **(Total 3 marks)**

**5.** (a) Simplify $\frac{2x+4}{x^{2}+4x+4}$

...........................................................

 **(3)**

 (b) Write $\frac{1}{x+4}+\frac{2}{x-4}$ as a single fraction in its simplest form.

...........................................................

**(3)**

**(Total 6 marks)**

**6.** Simplify fully $\frac{x+3}{4}+\frac{x-5}{3}$

...........................................................

 **(Total 3 marks)**

**Expanding more than two binomials**

**Things to remember:**

* Start by expanding two pair of brackets using the grid or FOIL method.
* Then expand the third set of brackets.
* Use columns to keep x³, x² etc in line to help with addition.

**Questions:**

1. Show that

(x − 1)(x + 2)(x − 4) = x³ - 3x² - 6x + 8

for all values of x.

...........................................................

**(Total for question is 3 marks)**

2. Show that

(3x − 1)(x + 5)(4x − 3) = 12x³ + 47x² − 62x + 15

for all values of x.

...........................................................

**(Total for question is 3 marks)**

3. Show that

(x - 3)(2x + 1)(x + 3) = 2x³ + x² − 18x - 9

for all values of x.

...........................................................

**(Total for question is 3 marks)**

4. (2x + 1)(x + 6)(x - 4) = 2x³ + ax² + bx – 24

for all values of x, where a and b are integers.

Calculate the values of a and b.

a = ...........................................................

b = ...........................................................

**(Total for question is 4 marks)**

**Inverse and Composite Functions**

**Things to remember:**

* y = f(x) means that y is a function of x.
* f(a) means the value of x is a, so substitute x with a.
* The graph of the inverse is the reflection of the graph in the line y = x
* We find the inverse function by putting the original function equal to y and rearranging to make x the subject.
* We use the notation f-1(x) for the inverse function.
* When a function is followed by another, the result is a composite function.
* fg(x) means do g first, followed by f.

**Questions:**

1. The functions f and g are such that

f(*x*) = 1 − 5*x*      and      g(*x*) = 1 + 5*x*

(a) Show that gf(1) = − 19

**(2)**

(b)   Prove that f−1(*x*) + g−1(*x*) = 0 for all values of *x*.

**(3)**

**(Total for question = 5 marks)**

2. The function f is such that

f(*x*) = 4*x* − 1

(a)   Find f−1(x)

f−1(*x*) = ...........................................................

**(2)**

The function g is such that

g(*x*) = *kx*2 where *k* is a constant.

Given that fg(2) = 12

(b)   work out the value of *k*

*k* = ...........................................................

**(2)**

**(Total for question = 4 marks)**

3. The functions f and g are such that

 f(x) = 3(x – 4) and g(x) = $\frac{x}{5}$ + 1

(a)   Find the value of f(10)

...........................................................

**(1)**

(b)   Find g–1(*x*)

g–1(*x*) = ...........................................................

**(2)**

(c)   Show that ff(*x*) = 9*x* – 48

**(2)**

**(Total for question = 5 marks)**

4. f(*x*) = 3*x*2 − 2*x* − 8

Express f(*x* + 2) in the form *ax*2 + *bx*

...........................................................

**(Total for question is 3 marks)**