



Simplifying and Substituting (H)

Intervention Booklet

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 x^3 , x^2 etc in line to help with addition.

Questions:

1. Show that

$$(x - 1)(x + 2)(x - 4) = x^3 - 3x^2 - 6x + 8$$

for all values of x .

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

2. Show that

$$(3x - 1)(x + 5)(4x - 3) = 12x^3 + 47x^2 - 62x + 15$$

for all values of x .

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

3. Show that
 $(x - 3)(2x + 1)(x + 3) = 2x^3 + x^2 - 18x - 9$
for all values of x .

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

4. $(2x + 1)(x + 6)(x - 4) = 2x^3 + ax^2 + bx - 24$
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
 $f(x) = 1 - 5x$ and $g(x) = 1 + 5x$
(a) Show that $gf(1) = -19$

- (b) Prove that $f^{-1}(x) + g^{-1}(x) = 0$ for all values of x .

(2)

(3)

(Total for question = 5 marks)

2. The function f is such that

$$f(x) = 4x - 1$$

(a) Find $f^{-1}(x)$

$$f^{-1}(x) = \dots\dots\dots \quad (2)$$

The function g is such that

$$g(x) = kx^2 \text{ where } k \text{ is a constant.}$$

Given that $fg(2) = 12$

(b) work out the value of k

$$k = \dots\dots\dots \quad (2)$$

(Total for question = 4 marks)

3. The functions f and g are such that

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

(a) Find the value of $f(10)$

$$\dots\dots\dots \quad (1)$$

(b) Find $g^{-1}(x)$

$$g^{-1}(x) = \dots\dots\dots \quad (2)$$

(c) Show that $f(x) = 9x - 48$

(2)
(Total for question = 5 marks)

4. $f(x) = 3x^2 - 2x - 8$
Express $f(x + 2)$ in the form $ax^2 + bx$

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