AQA IGCSE FM "Full Coverage": Algebraic Expressions

This worksheet is designed to cover one question of each type seen in past papers, for each AQA IGCSE Further Maths topic. This worksheet was automatically generated by the DrFrostMaths Homework Platform: students can practice this set of questions interactively by going to www.drfrostmaths.com/homework, logging on, *Practise → Past Papers/Worksheets* (or *Library → Past/Past Papers* for teachers), and using the 'Revision' tab.

Question 1
Categorisation: Simplify an algebraic fraction by first factorising the numerator and denominator.

[AQA IGCSE FM Practice paper set 4 P2 Q18]
Simplify fully

$$\frac{24m - 9m^2}{64 - 9m^2}$$

....

Question 2
Categorisation: As above, but where multiple factorisation techniques are required within the numerator or within the denominator.

[AQA IGCSE FM Practice paper set 2 P2 Q10]
Simplify fully

$$\frac{9x^3 - 16x}{6x + 8}$$

Input note: give your answer as a single fraction

....

Question 3

Categorisation: Add algebraic fractions to then subsequently simplify by cancelling.

[AQA IGCSE FM June2015-P2 Q15 Edited]
Use algebra to prove that the value of

$$\frac{8c^2 + 16}{3c^2 + 6} + \frac{1}{3}$$

is an integer for all values of c .

....

Question 4

Categorisation: Divide algebraic terms.

[AQA IGCSE FM Practice paper set 3 P1 Q5]
Simplify fully

$$20a^9b^6 \div 4a^3b^2$$

....

Question 5

Categorisation: Divide general algebraic fractions.
[AQA IGCSE FM Practice paper set 1 P1 Q10]
Simplify fully

$$\frac{3x^2 - x - 14}{9x^2 - 4} \div \frac{x + 2}{3x^2 + 2x}$$

....

Question 6

Categorisation: As above.
[AQA IGCSE FM Jan2013-P1 Q12]
Simplify fully

$$\frac{4x^2 + 19x - 5}{9x^2 - 16} \div \frac{x + 5}{3x - 4}$$

....

Question 7

Categorisation: Recognise that fractions can be split, e.g. $\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$

[AQA IGCSE FM June2015-P2 Q6]
Write

$$\frac{15x^8 - 18x^7}{3x^2}$$

in the form $ax^n - nx^a$ where a and n are integers.

....

Question 8

Categorisation: Add algebraic fractions.

[AQA IGCSE FM June2014-P2 Q11b]
Write as a single fraction

$$\frac{5}{m+1} + \frac{6}{m-4}$$

Give your answer in its simplest form.

....

Question 9

Categorisation: Add algebraic fractions where there is a common factor in the denominators.

[AQA IGCSE FM Practice paper set 2 P1 Q9]
Simplify fully

$$\frac{3x}{(x-3)(x+6)} - \frac{2}{(x+6)}$$

....

Question 10

Categorisation: Solve an equation involving algebraic fractions.

[AQA IGCSE FM June2016-P2 Q21]
Solve

$$\frac{3}{x-2} + \frac{2}{x-1} = 5$$

Do **not** use trial and improvement.
Write your solutions to 3 significant figures.

....

Question 11

Categorisation: Multiply out two brackets where one or both brackets has more than 2 terms.

[AQA IGCSE FM SAM P2 Q9a]
Expand and simplify

$$(x-5)(x^2 + 4x - 2)$$

....

Question 12

Categorisation: Understand the difference between an equation '=' (true for specific values of x) and an identity '≡' (true for all values of x). Recognise that for the latter, that we can compare coefficients on each side of the identity.

[AQA IGCSE FM Practice paper set 3 P1 Q2]

$$5(3x - 2) - 3(x - h) \equiv 4(kx + 2)$$

Work out the values of h and k.

....

Question 13

Categorisation: Factorise a quadratic where this is a common numeric factor.

[AQA IGCSE FM June2012-P1 Q4a]

Factorise fully

$$2x^2 - 2x - 40$$

....

Question 14

Categorisation: Factorise a quadratic-like expression involving a mix of two variables.

[AQA IGCSE FM June2014-P1 Q8b]

Factorise

$$5x^2 + 4xy - 12y^2$$

....

Question 15

Categorisation: Factorise an expression involving factorizing out a common term before use of difference of two squares.

[AQA IGCSE FM Jan2013-P2 Q8a]

Factorise fully

$$5m^2 - 20p^2$$

....

Question 16

Categorisation: Factorise an expression involving multiple applications of the difference of two squares.

[AQA IGCSE FM Practice paper set 3 P2 Q16b]

Factorise fully

$$x^4 - 1$$

....

Question 17

Categorisation: Recognise when an entire bracketed expression can be factorized out.

[AQA IGCSE FM SAM P2 Q9b]

Factorise fully

$$(x^2 - 16) - (x - 4)(3x + 5)$$

....

Question 18

Categorisation: As above.

[AQA IGCSE FM June2012-P1 Q4b]

Factorise fully

$$(x + y)^2 + (x + y)(2x + 5y)$$

....

Question 19

Categorisation: Complete the square.

[AQA IGCSE FM Practice paper set 2 P2 Q15a]
Work out the values of a and b such that

$$x^2 - 6x + 5 \equiv (x + a)^2 + b$$

....

Question 20

Categorisation: Complete the square when the coefficient of x^2 is not 1.

[AQA IGCSE FM Practice paper set 3 P1 Q15]

$$2x^2 - 4x + 5 \equiv a(x + b)^2 + c$$

Work out the values of a , b and c .

....

Question 21

Categorisation: Complete the square to show that a quadratic expression is positive for all values of its variable.

[AQA IGCSE FM June2014-P2 Q15b Edited]
The nth term of a sequence is $n^2 - 6n + 14$
By completing the square, or otherwise, show that every term is positive.

....

Answers

Question 1

$$\frac{3m}{8+3m}$$

Question 2

$$\frac{x(3x-4)}{2}$$

Question 3

3

Question 4

$$5a^6b^4$$

Question 5

$$\frac{x(3x-7)}{3x-2}$$

Question 6

$$\frac{4x-1}{3x+4}$$

Question 7

$$5x^6 - 6x^5$$

Question 8

$$\frac{11m-14}{(m+1)(m-4)}$$

Question 9

$$\frac{1}{x-3}$$

Question 10

$x = 1.23$ or $x = 2.77$

Question 11

$$x^3 - x^2 - 22x + 10$$

Question 12

$h = 6$, $k = 3$

Question 13

$$2(x+4)(x-5)$$

Question 14

$$(5x-6y)(x+2y)$$

Question 15

$$5(m+2p)(m-2p)$$

Question 16

$$(x^2+1)(x-1)(x+1)$$

Question 17

$$(x-4)(-2x-1)$$

Question 18

$$3(x+y)(x+2y)$$

Question 19

$a = -3$, $b = -4$

Question 20

$a = 2$, $b = -1$, $c = 3$

Question 21

$(n-3)^2 + 5$
But $(n-3)^2 \geq 0$ **for all n**
Therefore $(n-3)^2 + 5 > 0$ for all n.