ALGEBRAIC FRACTIONS (EQUATIONS)

DATE OF SOLUTIONS: 15/05/2018
MAXIMUM MARK: 46

SOLUTIONS

GCSE (+ IGCSE) EXAM QUESTION PRACTICE

1. [Edexcel, 2014] Algebraic Fractions (Equations) **[4 Marks]**

Solve $\frac{6x-1}{4} - \frac{5-2x}{2} = 1$

Show clear algebraic working.

$$\frac{2(6x-1) - 4(5-2x)}{8} = 1 \quad \text{(M1)}$$

$$\frac{12x - 2 - 20 + 8x}{8} = 1 \quad \text{(M1)}$$

$$\frac{20x - 22}{8} = 1$$

$$20x - 22 = 8 \quad \text{(M1)}$$

$$20x = 30$$

$$x = \frac{30}{20}$$

$$= 1.5 \quad \text{(A1)}$$

2. [Edexcel, 2011] Algebraic Fractions (Equations) **[4 Marks]**

Solve $\frac{2x-1}{4}+\frac{x-1}{5}=2$

$$\frac{5(2x-1)+4(x-1)}{20} = 2 \quad \text{(M1) COMMON DENOMINATOR}$$

$$5(2x-1)+4(x-1) = 40 \quad \text{(M1) NO FRACTION}$$

$$10x-5+4x-4 = 40$$

$$14x-9 = 40 \quad \text{(M1) SIMPLE EQUATION}$$

$$14x = 49$$

$$x = \frac{49}{14}$$

$$= \frac{7}{2}$$

$x =$ 3.5 (A1)

3. [Edexcel, 2005] Algebraic Fractions (Equations) **[4 Marks]**

Solve $\frac{x-1}{2}+\frac{2x+3}{4}=1$

M1 $\frac{4(x-1)+2(2x+3)}{8} = 1$

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

$4x-4+4x+6 = 8$ M1

$8x = 8-6+4$

$8x = 6$ M1

$x = \frac{6}{8}$

$x =$ 0.75 A1

4. [Edexcel, 2013] Algebraic Fractions (Equations) **[4 Marks]**

Solve $\frac{2}{5x-2}=\frac{3}{6x+1}$

Show clear algebraic working.

$2(6x+1) = 3(5x-2)$ M1

$12x + 2 = 15x - 6$ M1

$12x - 15x = -6 - 2$

$-3x = -8$ M1

$x = \frac{-8}{-3}$

$= 2\frac{2}{3}$

$x =$ $2\frac{2}{3}$ A1

Solve $\frac{5x-7}{x-1} = x+1$

$5x-7 = (x+1)(x-1)$ M1

$\Rightarrow 5x-7 = x^2 - x + x - 1$ M1

F O I L

$\Rightarrow 5x-7 = x^2-1$

$\Rightarrow x^2 - 5x + 6 = 0$ M1

$(x-3)(x-2) = 0$

$x = 3$ $\quad$ $x = 2$

A1 BOTH

$x = 3, x = 2$

(a) Factorise $4x^2 - 1$

A1 A1

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

(2)

(b) Solve $\frac{4}{2x+1} + \frac{1}{4x^2-1} = 3$

Show clear algebraic working.

$$\frac{4}{2x+1} + \frac{1}{(2x+1)(2x-1)} = 3$$

$$4(2x-1) + 1 = 3(2x-1)(2x+1) \quad \text{M1}$$

$$\Rightarrow 8x - 4 + 1 = 3 \times [4x^2 - 1]$$

$$\Rightarrow 8x - 4 + 1 = 12x^2 - 3 \quad \text{M1 EITHER}$$

$$\Rightarrow 12x^2 = 8x \quad \text{M1}$$

[NOTE THAT x COULD BE ZERO!]

$$\Rightarrow 12x = 8 \quad \text{[OR EQUIVALENT]}$$

$$x = \frac{8}{12}$$

$$= \frac{2}{3} \quad \text{A1}$$

Solve $\frac{5}{(x+2)}+\frac{9}{(x-2)}=2$

Show clear algebraic working.

$$\frac{5(x-2)+9(x+2)}{(x+2)(x-2)} = 2 \quad \text{M1}$$

$$\Rightarrow \frac{5x-10+9x+18}{(x+2)(x-2)} = 2$$

$$\Rightarrow \frac{14x+8}{(x+2)(x-2)} = 2 \quad \text{B1}$$

$$14x+8 = 2(x+2)(x-2) \quad \text{B1}$$

$$7x+4 = (x+2)(x-2)$$

$$7x+4 = x^2-4$$

$$\Rightarrow x^2-7x-8=0 \quad \text{B1}$$

$$(x+1)(x-8)=0$$

$x+1=0$, $x=-1$

$x-8=0$, $x=8$

$x=-1$, $x=8$ A1

Solve the equation $\frac{6}{x-2} - \frac{6}{x+1} = 1$

Show clear algebraic working.

$$\frac{6(x+1) - 6(x-2)}{(x-2)(x+1)} = 1 \quad \text{(M1 [SINGLE DENOM.])}$$

$$\Rightarrow \frac{6x+6-6x+12}{(x-2)(x+1)} = 1$$

$$\Rightarrow \frac{18}{(x-2)(x+1)} = 1$$

$$\Rightarrow 18 = (x-2)(x+1) \quad \text{(M1 [NO DENOMINATOR])}$$

$$18 = x^2 + x - 2x - 2$$

$$18 = x^2 - x - 2$$

$$\Rightarrow x^2 - x - 20 = 0 \quad \text{(M1 [QUADRATIC])}$$

$$(x+4)(x-5) = 0 \quad \text{(M1 [FACTORS OR FORMULA USE])}$$

$$x = -4 \qquad x = 5 \quad \text{(A1 [BOTH])}$$

Solve $\frac{3}{(x+1)} + \frac{2}{(2x-3)} = 1$

Show clear algebraic working.

$$\frac{3(2x-3) + 2(x+1)}{(x+1)(2x-3)} = 1$$ M1 [COMMON DENOMINATOR]

$3(2x-3) + 2(x+1) = (x+1)(2x-3)$ M1 [NO DENOMINATOR]

$6x - 9 + 2x + 2 = 2x^2 - 3x + 2x - 3$

$8x - 7 = 2x^2 - x - 3$

$2x^2 - 9x + 4 = 0$ M1 [QUADRATIC]

$(2x - 1)(x - 4) = 0$ M1 [FACTORISING]

$2x - 1 = 0$

$2x = 1$

$x = \frac{1}{2}$

$x - 4 = 0$

$x = 4$

A1 [BOTH SOLUTIONS]

Solve the equation $\frac{3}{(x+2)} + \frac{4}{(x-3)} = 2$

Show clear algebraic working.

MULTIPLY BY BOTH DENOMINATORS!

$3(x-3) + 4(x+2) = 2(x+2)(x-3)$ (M1)

$3x - 9 + 4x + 8 = 2 \times [x^2 - 3x + 2x - 6]$ (M1)

$7x - 1 = 2 \times [x^2 - x - 6]$

$= 2x^2 - 2x - 12$

$\Rightarrow 7x - 1$

REARRANGING:-

$2x^2 - 9x - 11 = 0$ (M1)

$(2x - 11)(x + 1) = 0$ (M1) [FACTORISING]

$2x - 11 = 0$

$2x = 11$

$x = \frac{11}{2}$

$x + 1 = 0$

$x = -1$

(A1) [BOTH ANSWERS]

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