2.2 Algebraic Fractions: Adding, Subtracting and Solving Equations: Test Pack

AQA 8365 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write each expression as a single fraction in its simplest form.

(a) Simplify $x/5 + 2x/3$. **(2)**

(b) Simplify $(3x - 1)/4 - (x + 2)/6$. **(3)**

(Total for Question 1 is 5 marks)

2 Solve $x/4 + x/6 = 10$

(Total for Question 2 is 2 marks)

3 Write $5/(x - 1) - 3/(x + 2)$ as a single fraction in its simplest form.

(Total for Question 3 is 3 marks)

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4 Solve $(2x + 3)/(x + 5) = (2x - 1)/(x + 1)$.

(Total for Question 4 is 4 marks)

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5 Write $(2x - 8)/4 - (2x - 10)/5$ as a single fraction in its simplest form.

(Total for Question 5 is 3 marks)

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6 Solve $(x - 6)/(x - 2) = (x - 1)/(x - 5)$.

(Total for Question 6 is 4 marks)

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7 A cyclist rides 40 km at x km/h and then 40 km at $(x + 2)$ km/h. The total time for the two stages is 130/21 hours. Form an equation in x and show that it can be written as a quadratic. Hence find the value of x, given that $x > 0$.

(Total for Question 7 is 4 marks)

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8 Solve $(x + 6)/4 - (x + 4)/3 = -1/12$.

(Total for Question 8 is 3 marks)

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9 Solve $1/(x + 6) + 1/(x + 16) = 1/12$.

(Total for Question 9 is 5 marks)

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10 Write $2/(x^2 - x - 6) + 3/(x - 3)$ as a single fraction in its simplest form.

(Total for Question 10 is 4 marks)

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11 Show that $(2x^2 + 7x + 3)/(2x^2 - 7x - 4)$ simplifies to $(x + 3)/(x - 4)$, stating any value(s) of x for which the fraction is undefined.

(Total for Question 11 is 5 marks)

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12 Write $2/(x + 1) - 3/(x - 1) + 4/(x^2 - 1)$ as a single fraction in its simplest form.

(Total for Question 12 is 5 marks)

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13 Maya cycles 60 km from her home to a lake at an average speed of x km/h. Due to a strong headwind on the return journey, her average speed falls to (x - 3) km/h, and the return journey takes 1 hour longer than the outward journey.

(a) Show that $x^2 - 3x - 180 = 0$. **(2)**

(b) Solve the equation to find the value of x, given that x is greater than 3. **(3)**

(Total for Question 13 is 5 marks)

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Mark scheme · 2.2 Algebraic Fractions: Adding, Subtracting and Solving Equations: Test Pack

Question 1

(a) common denominator 15 used, e.g. 3x/15 + 10x/15	**M1**
(a) 13x/15 oe cao	**A1**
(a) Answer: 13x/15	
(b) common denominator 12 used	**M1**
(b) numerator 3(3x-1) - 2(x+2) formed and expanded	**M1**
(b) 7(x-1)/12 oe cao, e.g. (7x-7)/12	**A1**
(b) Answer: 7(x - 1)/12	

Question 2

multiply through by common denominator 12: 3x + 2x = 120	**M1**
x = 24 cao	**A1**
Answer: x = 24	

Question 3

common denominator (x-1)(x+2) used	**M1**
numerator 5(x+2) - 3(x-1) expanded correctly	**M1**
$(2x + 13)/(x^2 + x - 2)$ oe cao	**A1**
Answer: $(2x + 13)/(x^2 + x - 2)$	

Question 4

cross multiply: (2x + 3)(x + 1) = (2x - 1)(x + 5)	**M1**
expand both brackets correctly	**M1**
x^2 terms cancel, leaving 5x + 3 = 9x - 5	**M1**
x = 2 cao	**A1**
Answer: x = 2	

Question 5

common denominator 20	**M1**
numerators scaled and combined	**M1**
(x)/10 oe cao	**A1**
Answer: (x)/10	

Question 6

cross-multiplies	**M1**
expands both sides; x^2 terms cancel	**M1**
collects x terms	**M1**
x = 7/2 cao	**A1**
Answer: x = 7/2	

Question 7

40/x + 40/(x + 2) = 130/21	**M1**
multiplies through to remove denominators	**M1**
correct quadratic obtained	**A1**
x = 12 cao	**A1**
Answer: x = 12	

Question 8

multiplies through by 12 or combines fractions	**M1**
3(x +6) - 4(x +4) = -1	**M1**
x = 3 cao	**A1**
Answer: x = 3	

Question 9

combines the left-hand side into a single fraction	**M1**
cross-multiplies	**M1**
x^2 - 2x - 168 = 0 oe	**A1**
factorises or uses the formula	**M1**
x = -12 or x = 14 cao	**A1**
Answer: x = -12 or x = 14	

Question 10

factorise x^2 - x - 6 = (x - 3)(x + 2)	**M1**
rewrite second fraction with denominator (x-3)(x+2), e.g. 3(x+2)/[(x-3)(x+2)]	**M1**
combine numerators: 2 + 3(x + 2)	**M1**
$(3x + 8)/(x^2 - x - 6)$ oe cao	**A1**
Answer: $(3x + 8)/(x^2 - x - 6)$	

Question 11

factorise numerator: (2x + 1)(x + 3)	**M1**
factorise denominator: (2x + 1)(x - 4)	**M1**
cancel common factor (2x + 1)	**M1**
(x + 3)/(x - 4) cso, answer printed	**A1**
states x not equal to -1/2 and x not equal to 4	**B1**
Answer: (x + 3)/(x - 4) (shown); x not equal to -1/2 or 4	

Question 12

identify common denominator (x - 1)(x + 1) for all three terms	**M1**
combine numerators correctly: 2(x-1) - 3(x+1) + 4	**M1**
simplify numerator to -x - 1 (or -(x+1))	**M1**
factorise numerator and cancel common factor (x + 1) with denominator	**M1**
-1/(x - 1) oe cao, e.g. 1/(1 - x)	**A1**
Answer: -1/(x - 1)	

Question 13

(a) sets up equation 60/(x-3) - 60/x = 1 and multiplies through by x(x-3)	**M1**
(a) x^2 - 3x - 180 = 0 cso, answer printed	**A1**
(a) Answer: x^2 - 3x - 180 = 0 (shown)	
(b) factorise (x - 15)(x + 12) = 0	**M1**
(b) x = 15 and x = -12 found	**A1**
(b) reject x = -12 (speed must be positive/x > 3); x = 15 km/h cao, with units	**A1**
(b) Answer: x = 15 km/h	

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