

Topic 23 Algebraic fractions (Pre-TT) [36] MARKSCHEME

1.

(a) Evidence of expanding brackets correctly M1
eg 2x and 3x

4 correct terms seen A1
Note: Must see = x² + 5x + 6

(b) $\frac{(x+2)(x+3)}{(x+3)^2}$ M1

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

Do not ignore further working

[4]

2.

denominator $(n+3)(n-1)$ oe	1
$5(n-1)$ or $2(n+3)$ or better	1
$5n - 5 + 2n + 6 = 7n + 1$ with denominator $(n+3)(n-1)$	1 1 AO1.3b 2 AO2.2

3.

proof	M1 for any two consecutive integers expressed algebraically eg $n+1$ and n	for sight of $p^2 - q^2 = (p-q)(p+q)$
(supported)	M1 (dep) for the difference between the squares of "two consecutive integers" expressed algebraically eg $(n+1)^2 - n^2$	for deduction that $p - q = 1$
	A1 for correct expansion and simplification of difference of squares eg $2n + 1$	for linking these two statements eg substitution of 1 for $p - q$
	C1 for showing statement is correct (with supportive evidence) eg $n + n + 1 = 2n + 1$ and $(n+1)^2 - n^2 = 2n + 1$	for fully stated proof and deduction eg $p^2 - q^2 = 1 \times (p+q) = p+q$

4.

$5(x+1) + 3(x+2)$ M1
5x + 5 + 3x + 6 allow one error in expansion.

$8x + 11$ A1

Their '8x + 11' = 15 M1

0.5 *ft if both Ms awarded.* A1

[4]

5.

Factorising top or bottom	M1
$(x + 2)(x + 3)$	A1
$(3x - 5)(x + 2)$	A1
$\frac{x + 3}{3x - 5}$	A1

[4]

6.

$\frac{2x+1}{3x+5}$	M1	for $(3x \pm 5)(2x \pm 1)$ or $(2x + 1)(2x - 1)$
	M1	$\frac{1}{(3x \pm 5)(2x \pm 1)} \times (2x + 1)(2x - 1)$
	A1	

7.

$4(3x - 1) - (2x + 1)$	M1
<i>No errors – 2x + 1 must be recovered.</i>	
$(12x - 4 - 2x - 1) = 10x - 5$	A1
<i>NB if -2x + 1 used = 10x - 3</i>	
$5(2x + 1)(3x - 1)$	M1
<i>oe 5 × denominator if quadratic, e.g 5(6x² - 1)</i>	
$= 30x^2 + 5x - 5$	A1
$30x^2 - 5x = 0$ or $6x^2 - x = 0$	DM1
<i>Dependent on second M.</i>	
<i>Rearranging to form $ax^2 + bx + c = 0$ (no errors)</i>	
$x = 0$ or $\frac{1}{6}$ (0.1666...)	A1
<i>No ft</i>	
<i>Common error</i>	
$4(3x - 1) - 2x + 1 = 5(2x + 1)(3x - 1)$	MO, M1
$10x - 3 = 30x^2 + 5x - 5$	A1
$30x^2 - 5x - 2 = 0$	M1
$x = 0.35, -0.19$	A0

[6]

8.

$\frac{(x) + (x+1) + (x+2) + (x+3) + (x+4)}{5}$ $= \frac{5x + 10}{5}$ <p>= x + 2, which is the median</p>	<p>4 2 AO2.4a 1 AO3.1a 1 AO3.2</p>	<p>M1 for $x, x + 1, x + 2, x + 3, x + 4$ seen M1 for $(x) + (x + 1) + (x + 2) + (x + 3) + (x + 4)$ M1 for <i>their</i> $(5x + 10) \div 5$</p> <p>If 0 scored, allow SC2 for a numerical example of any 5 consecutive numbers with mean clearly evaluated, and median identified as the same value Or SC1 for a numerical example of any 5 consecutive numbers with mean clearly identified, or median clearly identified, or both identified with no conclusion</p>	<p>Or equivalent algebraic representation of 5 consecutive numbers</p> <p><u>Alternative</u> (non-algebraic) arguments also accepted for full marks e.g. M1 for "The numbers are the first number, 1 more, 2 more, 3 more and 4 more." M1 for "So the mean of the differences is $(1 + 2 + 3 + 4) \div 5 = 2$." M1 for "So the mean is the first number plus 2." And the final mark for concluding this with "Which is the median".</p>
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9.

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

Allow 1 error

M1

$$5x^2 + 6x - 2 = 3x^2 - 3x - 6$$

A1

$$2x^2 + 9x + 4 = 0$$

M1

$$(2x + 1)(x + 4) = 0$$

A1

$$x = -1/2, -4$$

A1

[5]