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

1.

shown	C1	for $\frac{a(b+1)-a}{(b+1)^2}$ or $\frac{a(b+1)^2-a(b+1)}{(b+1)^3}$ oe
	C1	complete chain of reasoning

2.

$(4n^2+2n+2n+1)$ $-(2n+1)=$ $4n^2+4n+1-2n-1$ $=4n^2+2n$ $=2n(2n+1)$	proof (supported)	M1	for 3 out of 4 terms correct in the expansion of $(2n+1)^2$ **or** $(2n+1)\{(2n+1)-1\}$
		P1	for $4n^2+2n$ or equivalent expression in factorised form
		C1	for convincing statement using $2n(2n+1)$ or $2(2n^2+n)$ or $4n^2+2n$ to prove the result

3.

(a) $3(x+5)$ or $3x+15$ B2

B1 for 3

B1 for $x+5$

B1 for $\frac{6x+30}{2}$

(b) $(x-3)(x+3)$ M1

$x(x+3)$ M1

$\frac{x-3}{x}$ *Do not ignore further working* A1

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4.

(a)		Any correct reason	**1** 1 AO2.4a		Exemplar responses: -1 and 1 both odd and either side of 0 Or can be divided by 2 exactly Or numbers that end in 0 are even Or zero remainder when divided by 2 Or next number in pattern of even numbers 8 6 4 2 Or added to an even number it gives even answer and added to odd number gives odd answer
(b)		e.g. $a^2 + b^2 = c^2$ $a = 2x$ and $b = 2y$ implies $c^2 = 4x^2 + 4y^2$ So c is even	**3** 1 AO2.1a 1 AO2.4b 1 AO3.2	**B1** for use of Pythagoras' theorem **M1** for even × even = even **soi**	

5.

proof	C1	starts proof eg $n(n+1)$ or $(n-1)\times n$
	C1	$n(n+1)+n+1$ or $(n-1)\times n+n$
	C1	for convincing proof including $(n+1)^2$ or n^2

6.

$3(3x + 1) - 2(2x + 5)$		M1
	Could have 6 as denominator here *Condone lack of brackets*	
$9x + 3 - 4x - 10$		A1
(their $5x - 7$) $= 6$		M1 dep
$x = 2.6$		A1
	or $2\frac{3}{5}$	

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7.

$(x \pm a)(5x \pm b)$		M1
	Give M1 *for attempt to factorise into* $(x \pm a)(5x \pm b)$ *where a, b are integers and* $ab = 3$	
$(x + 3)(5x - 1)$		A1
$(x + 3)(x - 3)$		B1
$\frac{5x-1}{x-3}$	*Do not award this B1 if candidate has given further working*	B1

[4]

8.

$3x$	M1	Factorising numerator and denominator of first fraction $\frac{3(x+2)}{(x-5)(x+2)}$ $\left(=\frac{3}{(x-5)}\right)$
	M1	Factorising denominator of second fraction $\frac{x+5}{x(x+5)(x-5)}$ $\left(=\frac{1}{x(x-5)}\right)$
	M1	Multiplication by reciprocal $\frac{3(x+2)}{(x-5)(x+2)} \times \frac{x(x+5)(x-5)}{(x+5)}$
	A1	Completing algebra to reach $3x$

9.

$3(x + 4) - (x + 5)$		M1
	or $6(x + 4) - 2(x + 5)$	
$2x + 7$		A1
	$4x + 14$	
$(x + 5)(x + 4)$		M1
$x^2 + 9x + 20$		A1
$x^2 + 5x + 6 = 0$		A1
$(x + 2)(x + 3) = 0$		A1
$x = -2$ or -3		A1

[7]