Topic X1: Indices, surds and quadratics (Post-TT A) [43] MARKSCHEME

1.

(i)	$10\sqrt{3}-4\sqrt{3}$	M1		Attempt to express both surds in terms of $\sqrt{3}$	e.g. $\sqrt{3x100}-\sqrt{3x16}$
		B1		One term correct	
	$=6\sqrt{3}$	A1	3	Fully correct (not $\pm 6\sqrt{3}$)	
(ii)	$\frac{\sqrt{5}(15+\sqrt{40})}{5}$	M1		Multiply numerator and denominator by $\sqrt{5}$ or $-\sqrt{5}$ or attempt to express both terms of numerator in terms of $\sqrt{5}$ (e.g. dividing both terms by $\sqrt{5}$)	Check both numerator and denominator have been multiplied
	$=\frac{15\sqrt{5}+10\sqrt{2}}{5}$	B1		One of a, b correctly obtained	
	$=3\sqrt{5}+2\sqrt{2}$	A1	3	Both a = 3 and b=2 correctly obtained	
			6		

2.

4(i)	$p=-1$	B1	1	$p=-1$
(ii)	$\sqrt{25k^2}=15$	M1		Attempt to square 15 or attempt to square root $25k^2$
	$25k^2=225$			
	$k^2=9$	A1		$k=3$
	$k=\pm 3$	A1	3	$k=-3$
(iii)	$\sqrt[3]{t}=2$	M1		$\frac{1}{t^{\frac{1}{3}}}=\frac{1}{2}$ or $t^{\frac{1}{3}}=2$ soi
	$t=8$	A1	2	$t=8$
			6	

3.

$[(x-6)^2-36]+1$	B1		$(x-6)^2$
$=(x-6)^2-35$	M1		$q=1-(\text{their } p)^2$
	A1	3	$q=-35$
		3	

4.

(i)	$-14\le 6x\le -5$	M1		2 equations or inequalities both dealing with all 3 terms resulting in $a\le 6x\le b$, $a\neq -9$, $b\neq 0$	**Do not ISW** after correct answer if contradictory inequality seen.
		A1		-14 and -5 seen **www**	
	$-\frac{7}{3}\le x\le -\frac{5}{6}$	A1	3	Accept as two separate inequalities provided not linked by "or" (must be $\le$)	Allow $-\frac{14}{6}\le x\le -\frac{5}{6}$
(ii)	$0<x^2-4x-12$	M1		Rearrange to collect all terms on one side	**Do not ISW** after correct answer if contradictory inequality seen.
	$(x-6)(x+2)$	M1		Correct method to find roots	
		A1		6, -2 seen	
		M1		Correct method to solve quadratic inequality i.e. $x >$ their higher root, $x <$ their lower root	
	$x>6,\ x<-2$	A1	5	(not wrapped, strict inequalities, no 'and')	e.g. for last two marks, $-2>x>6$ scores **M1 A0**
			8		

5.

$y = x^{\frac{1}{2}}$		
$2y^2 - 7y + 3 = 0$	**M1***	Use a substitution to obtain a quadratic or factorise into 2 brackets each containing $x^{\frac{1}{2}}$
$(2y-1)(y-3) = 0$	**M1dep**	Correct method to solve a quadratic
$y = \frac{1}{2}, y = 3$	**A1**	
	M1	Attempt to square to obtain x
$x = \frac{1}{4}, x = 9$	**A1**	
	SR	**If first M1 not gained and 3 and ½ given as final answers, award B1**
		5

6.

$(-30)^2 - 4 \times k \times 25k = 0$	**M1**	Attempts $b^2 - 4ac$ involving k
$900 - 100k^2 = 0$	**M1**	States their discriminant = 0
$k = 3$	**B1**	
or $k = -3$	**B1**	**4**
		4

7.

(i)		Area of tile = $4x(x + 3)$	B1	Correct expression for area of rectangle (may be unsimplified)	
		$4x(x + 3) < 112$ $4x^2 + 12x - 112 < 0$	B1 √	Correct inequality for their expression	Correct alternative forms for factorised inequality include:
		$4(x + 7)(x - 4) < 0$	M1	Correct method to solve a three term quadratic	$(x + 7)(4x - 16) < 0$
			M1	Chooses correct region for the quadratic inequality i.e. lower root < x < higher root	$(4x + 28)(x - 4) < 0$ $(2x + 14)(2x - 8) < 0$ etc.
		$-7 < x < 4$	A1	(May be implied by correct final answer)	
		$\therefore 0 < x < 4$	A1 [6]	Restricts range to positive values of x **CWO**	**Do not allow ≤ for final A mark**
(ii)		Perimeter = $4y + (y + 3) + 2y + y + 2y + 3$	M1	**Clear** attempt to add lengths of all **6** edges	**Allow < or ≤ throughout part (ii)**
			A1	Correct perimeter simplified to $10y + 6$ seen	
		$20 < 10y + 6 < 54$	B1 FT	Correct inequalities for their expression	Can still be unsimplified here
			M1	Solving 2 linear equations or inequalities dealing with all 3 terms	
		$1.4 < y < 4.8$	A1 [5]	Accept "$1.4 < y, y < 4.8$", "$1.4 < y$ ***and*** $y < 4.8$" but **NOT** "$1.4 < y$ ***or*** $y < 4.8$".	**Do not ISW** if contradictory incorrect form follows correct answer