Unit 1 Higher Tier
Mark scheme

Apart from questions where the mark scheme states otherwise, the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
1		2.745	1	B1
				Total 1 mark

Question	Working	Answer	Mark	Notes
2	$\frac{16}{3}-\frac{20}{7}$ **or** $(5)\frac{7}{21}-(2)\frac{18}{21}$ **or** $(5)\frac{7a}{21a}-(2)\frac{18a}{21a}$		3	M1 for correct improper fractions **or** fractional part of numbers written correctly over a common denominator
	$\frac{112}{21}-\frac{60}{21}$ **or** $\frac{112a}{21a}-\frac{60a}{21a}$ **or** $5\frac{7}{21}-2\frac{18}{21}=3-\frac{11}{21}$ oe **or** $5\frac{7}{21}-2\frac{18}{21}=4\frac{28}{11}-2\frac{18}{21}$			M1 for correct fractions with a common denominator with minus sign **or** mixed numbers to the stage shown
	$\frac{112}{21}-\frac{60}{21}=\frac{52}{21}=2\frac{10}{21}$ oe **or** $3-\frac{11}{21}=2\frac{10}{21}$ $5\frac{7}{21}-2\frac{18}{21}=4\frac{28}{11}-2\frac{18}{21}=2\frac{10}{21}$	Shown		A1 Dep on M2 for a correct answer from fully correct working If all 3 fractions turned into improper fractions on the first line $\frac{16}{3}-\frac{20}{7}=\frac{52}{21}$ then the student **clearly** needs to show that the LHS = $\frac{52}{21}$
				Total 3 marks

Question	Working	Answer	Mark	Notes
3	1– (0.26 + 0.18) (= 0.56) oe **or** 0.28 oe **or** $x + x = 1 – (0.26 + 0.18)$ oe		4	M1 0.28 oe may be seen in the table
	"0.28" + 0.26 (= 0.54)			M1 adding the two required probabilities
	"0.54" × 250 oe eg "0.28" × 250 + 0.26 × 250			M1 for multiplying the probabilities by 250
	Correct answer scores full marks (unless from obvious incorrect working).	135		A1
				Total 4 marks

Question		Working	Answer	Mark	Notes
4	(a)	$n^2 – 6n + 4n – 24$		2	M1 for any 3 correct terms **or** for 4 out of 4 correct terms ignoring signs **or** for $n^2 – 2n$ … **or** for …– $2n – 24$
		Correct answer scores full marks (unless from obvious incorrect working).	$n^2 – 2n – 24$		A1 oe
	(b)	$x – 12$ **or** $\frac{3}{4}x – \frac{5}{4}$ oe **or** $0.75x – 1.25$ oe		3	M1 for correct multiplication by 4 **or** separate fractions on the RHS
		$x – 3x = –5 + 12$ oe **or** $5x = 7$ oe **or** $2x – \frac{3}{4}x = –\frac{5}{4} + 3$ **or** $2x – 0.75x = –1.25 – 3$ oe			M1 ft (dep on 4 terms) for terms in x on one side of equation **and** number terms on the other
		Working required	$\frac{7}{5}$		A1 oe dep on M1 1.4 **or** $1\frac{2}{5}$ oe
					Total 5 marks

Question	Working	Answer	Mark	Notes
5	For sight of 5 hrs 24 mins = 5.4 (hrs) **or** $5\frac{24}{60}\left(=5\frac{2}{5}\right)$ oe **or** 324 (mins)		3	B1
	3980 ÷ 5.4 oe **or** $\frac{3980}{324}\times 60$			M1 For distance ÷ time that should give a speed in km/h. (SC allow 3980 ÷ 5.24 (= 759.5… **or** 760) for this mark unless mark has been awarded for 324 minutes **or** 5.4 hours oe)
	Correct answer scores full marks (unless from obvious incorrect working).	737		A1 awrt 737 (if no working shown, 738 gets SCB2)
				Total 3 marks

Question	Working	Answer	Mark	Notes
6	28 × 12 (=336) **or** 5 × 12 (= 60) **or** 18 × 12 (= 216) **or** 28 × 20 (=560) **or** $\frac{1}{2}("CD"+"18")"8"$ oe eg 72 +4*CD* [numbers in " " come from correct working] **Check diagram for areas**		4	M1 For a correct method to find the area of a rectangle (may be seen as part calculation) **or** a correct expression for the area of the trapezium with numbers substituted. Allow for other correct method to find area linked to this shape.
	"336" + 0.5 ("18"+ *CD*)"8" = 434 oe eg 4("18" + *CD*) = 98 **or** eg 0.5("18" + *CD*)"8" = "98" oe eg $\frac{1}{2}("CD"+"18")=12.25$ **or** "560" – 2(0.5(5 + *x*)"8") = 434 oe (where *x* is horizontal from *D* to perp with *AF*) [numbers in " " come from correct working]			M1 correct use of their values from correct working for an equation involving *CD* (*CD* could be labelled with any letter)
	eg $(CD=)\frac{196-144}{8}\left(=\frac{52}{8}\right)$ **or** $(CD=)\frac{98-72}{4}\left(=\frac{26}{4}\right)$ **or** $(CD=)\frac{434+152-560}{4}$ **or** (*CD* =) 2 ×12.25 – 18 **or** 98 × (= 196), "196" ÷ 8 (= 24.5), "24.5" – 18			M1 a correct process to solve a correct equation **or** a correct process to find *CD* using **correct values**
	Correct answer scores full marks (unless from obvious incorrect working).	6.5		A1 oe
				Total 4 marks

Question		Working	Answer	Mark	Notes
7	(a)		8	1	B1
	(b)		11	1	B1 accept x^{11}
	(c)		$8k^6m^{12}$	2	B2 for all correct B1 for two correct from 8 **or** k^6 **or** m^{12}
					Total 4 marks

Question	Working	Answer	Mark	Notes
8	1000 (÷60 ÷ 60) **or** ÷3600 **or** sight of 81 000 **or** 1350 **or** 0.0225		3	M1 For one of ×1000 (eg sight of 81 000) **or** (÷60 ÷ 60) **or** ÷3600 oe
	$\frac{81\times1000}{60\times60}$ oe eg $\frac{81}{3.6}$ **or** $81\times\frac{5}{18}$ oe			M1 For a fully correct method with correct use of brackets eg 81000 ÷ 60 × 60 is M1 only if not recovered
	Correct answer scores full marks (unless from obvious incorrect working).	22.5		A1 oe eg $\frac{45}{2}$
				Total 3 marks

Question		Working	Answer	Mark	Notes
9	(a)		$12a^{11}b^7$	2	B2 Fully correct (B1 for 2 correct terms in a product)
	(b)		$7x^2y^2(2y^2 + 3x)$	2	B2 (B1 for a correct factorisation with at least 2 terms outside the bracket eg $xy(14xy^3 + 21x^2y)$ **or** for the correct common factor with only one error in the bracket)
	(c)		$y = -2x + 4$	2	B2 for $y = -2x + 4$ oe (B1 for $y = -2x + c$ **or** clearly showing the gradient is -2 **or** $y = mx + 4$ **or** $-2x + 4$)
	(d)	-	$(0, -5)$	1	B1
					Total 7 marks

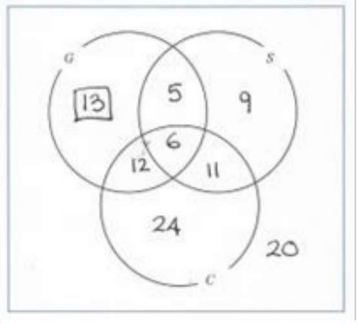
Question	Working	Answer	Mark	Notes
10 (a)	$\sqrt{7.5^2 - 6^2}$ **or** $(BAC =)\sin^{-1}\left(\frac{6}{7.5}\right)(= 53.1)$ and $\frac{6}{\tan"53.1"}$ **or** $(BCA =)\cos^{-1}\left(\frac{6}{7.5}\right)(= 36.9)$ and $6 \times \tan"36.9"$		2	M1 For a correct method to find AB
	Correct answer scores full marks (unless from obvious incorrect working).	4.5		A1 oe
(b)	(area *ABC* =) 0.5 × 6 × "4.5" (= 13.5) oe		4	M1 ft their value of *AB*
	(area *ADC* =)31.5 – "13.5"(= 18)			M1 For a method to find area *ADC*
	(*AD* =) ("18" ÷ 7.5) ÷ 0.5 oe			M1 For a complete method to find *AD*
	Correct answer scores full marks (unless from obvious incorrect working).	4.8		A1 cao
				Total 6 marks

Question	Working	Answer	Mark	Notes
11 (a)		$\frac{4}{10}, \frac{6}{10}$	1	B1 oe both probabilities correct.
(b)	$\frac{4}{11} \times \frac{3}{10}$		2	M1
		$\frac{12}{110}$		A1 oe $\frac{6}{55}$ oe eg 0.109….
(c)	$\frac{4}{11} \times \frac{7}{10}$ **or** $\frac{7}{11} \times "\frac{4}{10}"$		3	M1ft Ft their tree diagram as long as given values are less than 1
	$\frac{4}{11} \times \frac{7}{10} + \frac{7}{11} \times "\frac{4}{10}"$			M1ft
	Correct answer scores full marks (unless from obvious incorrect working).	$\frac{56}{110}$		A1oe $\frac{28}{55}$ oe eg 0.509…..
				Total 6 marks

Question	Working	Answer	Mark	Notes
12 (a)	$(3x \pm 2y)(3x \pm 2y)$ **or** $(3x)^2 - (2y)^2$		2	M1
		$(3x+2y)(3x-2y)$		A1
(b)	$\frac{7(4x)}{32x} - \frac{8(x+3)}{32x}$ oe **or** $\frac{7(4x)}{8(4x)} - \frac{8(x+3)}{8(4x)}$ oe **or** $\frac{28x}{32x} - \frac{8(x+3)}{32x}$ oe **or** $\frac{28x}{32x} - \frac{8x+24}{32x}$ oe **or** $\frac{28x-8(x+3)}{32x}$ oe **or** $\frac{7x}{8x} - \frac{2(x+3)}{8x}$ oe **or** $\frac{7x-2(x+3)}{8x}$ oe		3	M1 for two correct fractions with common denominator **or** a single correct fraction
	$\frac{28x-8x-24}{32x}$ oe **or** $\frac{20x-24}{32x}$ oe **or** $\frac{7x-2x-6}{8x}$ oe **or** $\frac{20x}{32x} - \frac{24x}{32x}$ oe **or** $\frac{28x}{32x} - \frac{8x}{32x} - \frac{24}{32x}$ oe			M1 for correct fraction(s) with bracket(s) expanded **and** dealing with the negative signs
	Correct answer scores full marks (unless from obvious incorrect working).	$\frac{5x-6}{8x}$		A1 **or** $\frac{-6+5x}{8x}$
				Total 5 marks

Question	Working	Answer	Mark	Notes
13 (a)	$(3x-1)(x+2)=3x^2+6x-x-2\left(=3x^2+5x-2\right)$ **or** $(3x-1)(3x+1)=9x^2+3x-3x-1\left(=9x^2-1\right)$ **or** $(x+2)(3x+1)=3x^2+x+6x+2\left(=3x^2+7x+2\right)$		3	M1 for a correct intention to multiply all 3 factors by multiplying 2 factors only, allow one error
	$\left[\left(3x^2+5x-2\right)(3x+1)=\right]9x^3+15x^2-6x+3x^2+5x-2$ **or** $\left[\left(9x^2-1\right)(x+2)=\right]9x^3+18x^2-x-2$ **or** $\left[\left(3x^2+7x+2\right)(3x-1)=\right]9x^3+21x^2+6x-3x^2-7x-2$			M1 (dep) ft for expanding by the third factor, allow one error
	Correct answer scores full marks (unless from obvious incorrect working).	$9x^3+18x^2-x-2$		A1
	ALTERNATIVE			
	$9x^3+3x^2+18x^2+6x-3x^2-x-6x-2$		3	M2 for a complete expansion with 8 terms present, at least 4 of which must be correct
	Correct answer scores full marks (unless from obvious incorrect working).	$9x^3+18x^2-x-2$		A1
(b)	$\left(\frac{8xy^2}{2x^5}\right)^2$ **or** $\left(\frac{x^4}{4y^2}\right)^{-2}$ **or** $\left(\frac{4x^{10}}{64x^2y^4}\right)^{-1}$		3	M1 for one of reciprocating **or** simplifying **or** squaring
	$\left(\frac{4y^2}{x^4}\right)^2$ **or** $\left(\frac{x^8}{16y^4}\right)^{-1}$ **or** $\frac{64x^2y^4}{4x^{10}}$ **or** $\frac{\frac{1}{4}x^{-10}}{\frac{1}{64}x^{-2}y^{-4}}$			M1 for two of reciprocating **or** simplifying **or** squaring
	Correct answer scores full marks (unless from obvious incorrect working).	$\frac{16y^4}{x^8}$		A1

	ALTERNATIVE			accept $16y^4x^{-8}$ **or** $\frac{16}{y^{-4}x^8}$ **or** $\frac{16x^{-8}}{y^{-4}}$ oe
			3	M2 for 2 correct terms (M1 for 1 correct term)
	Correct answer scores full marks (unless from obvious incorrect working).	$\frac{16y^4}{x^8}$		A1 accept $16y^4x^{-8}$ **or** $\frac{16}{y^{-4}x^8}$ **or** $\frac{16x^{-8}}{y^{-4}}$ oe
				Total 6 marks

Question	Working	Answer	Mark	Notes
14 (a)		Fully correct Venn diagram	3	B1 For 13 correct in G only B2 For all 7 others correct (B1 for 4, 5 **or** 6 others correct (does not need to be complete for this))
(b)(i)		36	1	B1 ft from a diagram where values are present in the required regions. If these 3 parts are given as probabilities, please mark incorrect the first time but award marks from there on if numerator is correct
(ii)		44	1	B1ft
(iii)		35	1	B1ft
(c)		$\frac{18}{53}$	2	B2 ft oe 0.33(96…) **or** 33(.96…)% ft their Venn diagram **or** (B1 for $\frac{18}{m}$ where $m > 18$ **or** $\frac{n}{53}$ where $n > 53$ **or** for 18 : 53 or other incorrect notation) **or** B1ft their Venn diagram for $\frac{"18"}{m}$ where $m >$ "18" **or** $\frac{n}{"53"}$ where $n >$ "53"
				Total 8 marks

Question	Working	Answer	Mark	Notes
15	77.5 **or** 82.5 **or** 2.65 **or** 2.75 **or** 32.5 **or** 33.5 **or** 0.95 **or** 1.05 **or** 77500 **or** 82500 **or** 159 **or** 165 **or** 32500 **or** 33500 **or** 57 **or** 63		4	B1 For a *UB* **or** *LB* for one of the distances **or** times in hours **or** in minutes
	eg 82.5 ÷ 2.65 (= 31.13...) **or** 82500 ÷ 159 (= 518.867...) **or** km/min **or** m/h			M1 for a method to find the upper bound of Martin's average speed eg $UB_K \div LB_K$ where $80 < UB_K \leq 82.5$ **and** $2.65 \leq LB_K < 2.7$ **or** use of m/min to find upper bound for Martin's average speed eg $UB_K \div LB_K$ where $80\,000 < UB_K \leq 82\,500$ **and** $159 \leq LB_K < 162$ can use km/min **or** m/h
	eg 32.5 ÷ 1.05 (= 30.95...) **or** 32500 ÷ 63 (= 515.873…...) **or** km/min **or** m/h			M1 indep for a method to find the lower bound of Lucia's average speed eg $LB_S \div UB_S$ where $32.5 < LB_S \leq 33$ **and** $1 < UB_S \leq 1.05$ **or** use of m/min to find lower bound for Lucia's average speed $LB_S \div UB_S$ where $32\,500 < UB_S \leq 33\,000$ **and** $60 < UB_S \leq 63$ can use km/min **or** m/h
	UB_K = 31132…..m/h LB_S = 30952……m/h	Shown		A1 shown with **accurate figures** in the **same units** – sufficient figures for comparison

	UB_K = 0.51886….km/min LB_S = 0.51587…km/min			(can be truncated) but must be from correct working **and** *UB* for Martin **and** *LB* for Lucia selected eg *UB* Martin = 31.13... (km/h) **and** *LB* Lucia = 30.95...(km/h) **or** *UB* Martin= 518.867...(m/min) **and** *LB* Lucia = 515.873...(m/min) (dep on correct method)
	Working required			**Total 4 marks**

Question	Working	Answer	Mark	Notes
16	10 ÷ 20 (= 0.5) **or** a correct value on the FD scale **and** no errors **or** 25 small squares = 5 children **or** 5 small squares = 1 child oe **or** 1 small square = 0.2 children oe **or** 29 oe **or** 48 oe **or** 10 (associated with 75-80 bar)		3	M1
	(10 × 2.9) + (15 × 3.2) + (5 × 2) **or** 29 + 48 + 10 **or** (5.8 + 9.6 + 2) × 5 oe **or** (145 + 240 + 50) × 0.2 oe			M1 for a fully correct method
	Correct answer scores full marks (unless from obvious incorrect working).	87		A1
				Total 3 marks

Question	Working	Answer	Mark	Notes
17	$\left(\sqrt{2}-1\right)^2 = 2-\sqrt{2}-\sqrt{2}+1\left(=3-2\sqrt{2}\right)$	$\frac{\left(3+\sqrt{8}\right)}{\left(\sqrt{2}-1\right)^2}\times\frac{\left(\sqrt{2}+1\right)^2}{\left(\sqrt{2}+1\right)^2}$	4	M1 expand the denominator (accept $2-2\sqrt{2}+1$ - must see expansion) **or** method to rationalise using $\left(\sqrt{2}+1\right)^2$
	$\frac{\left(3+\sqrt{8}\right)^2}{"\left(3-2\sqrt{2}\right)"}\times\frac{\left(3+2\sqrt{2}\right)}{\left(3+2\sqrt{2}\right)}$	$\left(\sqrt{2}-1\right)^2 = 2-\sqrt{2}-\sqrt{2}+1\left(=3-2\sqrt{2}\right)$ **or** $\left(\sqrt{2}+1\right)^2 = 2+\sqrt{2}+\sqrt{2}+1\left(=3+2\sqrt{2}\right)$ **or** $\left(\sqrt{2}+1\right)\left(\sqrt{2}-1\right) = 2-\sqrt{2}+\sqrt{2}+1\left(=1\right)$		M1 oe ft $3-2\sqrt{2}$ method to rationalise **or** expansion of $\left(\sqrt{2}-1\right)^2$ (accept $2-2\sqrt{2}+1$) **or** $\left(\sqrt{2}-1\right)^2$ (accept $2+2\sqrt{2}+1$) **or** $\left(\sqrt{2}+1\right)\left(\sqrt{2}-1\right)$
	eg $\frac{9+6\sqrt{2}+3\sqrt{8}+8}{9-6\sqrt{2}+-6\sqrt{2}-8}$ **or** $\frac{9+12\sqrt{2}+8}{9-8}$ **or** $\frac{9+6\sqrt{2}+3\sqrt{8}+8}{1}$ **or** $\frac{9+12\sqrt{2}+8}{1}$			M1 dep on 2nd M1 correct expansion of brackets
	Working required	$17+\sqrt{288}$		A1 **or** p =17, q =288 answer from fully correct working with intermediate steps of working seen
				Total 4 marks

Question	Working	Answer	Mark	Notes
18	$4x \times 2x - 2 \times \pi \times x^2$ (= 20) oe **or** $2r \times 2r - \pi \times r^2$ (= 10) oe		4	M1 oe a **correct** expression **or** a correct equation for the shaded area (must be in one unknown only but x could be r **or** other letter)
	$\sqrt{\frac{20}{8-2\pi}}(=3.413...)$ **or** $\sqrt{\frac{10}{4-\pi}}(=3.413...)$			M1 oe a correct expression for x **or** r **or** whatever letter is used
	(perimeter =) 12 × "3.413..." oe			M1 ft dep on first M1 For substituting values into a calculation for the perimeter use of **their** r **or** x
		41		A1 awrt 41
				Total 4 marks

Question	Working	Answer	Mark	Notes
19	$(AD =)\dfrac{2.2}{\tan 18}$ (= 6.77...) **or** $(EA =)\dfrac{2.2}{\sin 18}$ (= 7.11…)		4	M1 a correct method to find *AD* **or** *AE*
	$(DB =)\sqrt{"6.77"^2+6^2}$ (= 9.04...) **or** $(EB =)\sqrt{"7.11"^2+6^2}$ (9.31…) **or** $(EB =)\sqrt{6^2+"6.77"^2+2.2^2}$ (9.31…)			M1 a correct method to find *DB* **or** *EB*
	$\tan DBE = \dfrac{2.2}{"9.04..."}$ **or** $\sin DBE = \dfrac{2.2}{"9.31..."}$ **or** $\sin DBE = \dfrac{2.2\sin 90}{"9.31..."}$ $\cos DBE = \dfrac{"9.04..."}{"9.31..."}$ **or** use of cosine rule			M1 complete method to find one of tan*DBE* **or** sin*DBE* **or** cos*DBE*– NB: if using cosine, the student will need to have found *DB* **and** *EB* previously
	Correct answer scores full marks (unless from obvious incorrect working).	13.7		A1 Allow answers in range 13.59 – 13.8
				Total 4 marks

Question	Working	Answer	Mark	Notes
20	eg $-2(x^2 - 6x)$ oe		4	M1 for a correct factorisation of the expression involving the x parts
	eg $-2(x-3)^2$….. oe			M1 ft for starting the correct process to complete the square on their factorised expression – allow this mark even if the factorisation is incorrect
	eg $-2[(x-3)^2 - 9]$ ….. oe			M1 ft for a complete process of completing the square for their factorised expression.
	Correct answer scores full marks (unless from obvious incorrect working).	$a = 25$ $b = 2$ $c = 3$		A1 oe allow $25 - 2(x-3)^2$
				Total 4 marks

Question	Working	Answer	Mark	Notes
20 **ALT**	$a - bx^2 + 2bcx - bc^2$ oe **or**		4	M1 for correctly multiplying out $a - b(x-c)^2$
	$2bc = 12$ **or** $a - bc^2 = 7$ **or** $b = 2$			M1 for correctly equating coefficients
	For the correct values for 2 of a, b **or** c			M1 2 correct values from a **or** b **or** c
	Correct answer scores full marks (unless from obvious incorrect working).	$a = 25$ $b = 2$ $c = 3$		A1 oe allow $25 - 2(x-3)^2$
				Total 4 marks

Question	Working	Answer	Mark	Notes
21	eg $\frac{20}{x^2-36}-\frac{2(x+6)}{x^2-36}$ oe **or** $\frac{20}{(x-6)(x+6)}-\frac{2(x+6)}{(x-6)(x+6)}$ oe **or** $\frac{20(x-6)}{(x^2-36)(x-6)}-\frac{2(x+6)(x-6)}{(x^2-36)(x-6)}$ **or** $\frac{20-2(x+6)}{(x^2-36)(4-x)}$ oe		3	M1 for writing the first two fractions with a common denominator (may be a single denominator) **or** multiplying both fractions by $\frac{1}{4-x}$ **and** writing over a common denominator
	eg $\frac{8-2x}{x^2-36}\times\frac{1}{4-x}$ **or** $\frac{8-2x}{(x+6)(x-6)}\times\frac{1}{4-x}$ **or** $\frac{20x-2x^2-48}{(x^2-36)(x-6)}\times\frac{1}{4-x}$ oe $\frac{8-2x}{(x^2-36)(4-x)}$ oe			M1 f**or** simplifying first 2 fractions to a single fraction **and** expanding **and** simplifying numerator – must be correct, **and** showing intention to multiply by $\frac{1}{4-x}$ **or** expanding the numerator of the full solution **and** writing as a single fraction
	Working required	$\frac{2}{x^2-36}$		A1 oe eg $\frac{2}{(x+6)(x-6)}$ dep on M2
				Total 3 marks

Question	Working	Answer	Mark	Notes
22	eg $\dfrac{2\times3\times3\times\left(3^{\frac{3}{2}}\right)^{4n+5}}{2\times3\times3^{2(2n+8)}}$ **or** $\dfrac{3\times3^{\frac{3}{2}(4n+6)}}{3^{2(2n+8)}}$ $\sqrt{27}$ to be changed to a power of 3 **and** not $3\sqrt{3}$ unless recovered		3	M1 For **2** of: • writing 18 as 2×3^2 oe **and** 6 as 2×3 **or** cancelling 6 & 18 fully • writing $\sqrt{27}$ as $3^{\frac{3}{2}}$ **or** $3\times3^{\frac{3}{2}}$ **or** $\left(\sqrt{27}\right)^{4n+6}$ as $\left(3^3\right)^{2n+3}$ **or** 3^{6n+9} • writing 9 as 3^2 **or** 9^{2n+8} as $3^{2(2n+8)}$ **or** 3^{4n+16}
`	eg $\dfrac{3\times3^{6n+9}}{3^{4n+16}}$ **or** $\dfrac{3^{6n+10}}{3^{4n+16}}$ **or** $\dfrac{3\times3^{1.5(4n+6)}}{3^{2(2n+8)}}$ **or** $\dfrac{3^2\times3^{6n+9}}{3\times3^{4n+16}}$ **or** $\dfrac{3^{6n+11}}{3^{4n+17}}$ oe **or** eg $3^{6n+11}=3^x\times3^{4n+17}$ oe			M1 For a correct expression **or** equation using only powers of 3 (powers of 3 but not necessarily a single power)
	Working required	$2n-6$		A1 oe eg $2(n-3)$ dep on M1
				Total 3 marks

Question	Working	Answer	Mark	Notes
23	eg $\frac{3}{5}=\frac{7-1}{8-k}$ oe eg $24-3k=30$		6	M1 for correct equation linking the gradient to the given coordinates
	$k=-2$			A1 for $k=-2$
	$\left(\frac{"-2"+8}{2},\frac{1+7}{2}\right)$ oe **or** (3, 4)			M1 for finding the midpoint (use of their k where $k<0$)
	$\frac{3}{5}m=-1$ **or** $(m=)-\frac{5}{3}$ oe			M1 ft their gradient for use of $m_1\times m_2=-1$ Allow $-\frac{5}{3}=-1.67$ **or** better
	$"4"="-\frac{5}{3}"\times"3"+c$ **or** $c=9$ **or** $y-"4"="-\frac{5}{3}"(x-"3")$			M1 dep on M3
	Working required	$5x+3y=27$		A1 allow equation in any form where p, q **and** r are integers
				Total 6 marks