

International GCSE Maths				
Apart from question 6, 14, 21, 24 and 25, the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method				
Q	Working	Answer	Mark	Notes
1 (a)		0.45	1	B1 oe eg $\frac{9}{20}, \frac{45}{100}, 45\%$
(b)	eg $1 - (0.25 + 0.2 + 0.2) (= 0.35)$ or $1 - ("0.45" + 0.2) (= 0.35)$ or $300 \times (0.25 + 0.2 + 0.2) (= 195)$		3	M1 allow use of their "0.45" from part (a), check the table
	eg $300 \times "0.35"$ or $300 - "195"$			M1 for a complete method
		105		A1 cao (award $\frac{105}{300}$ M2 only)
				Total 4 marks

2 (a)	eg $6 \times 2.4 + 5 \times 3.5$		2	M1
		31.9		A1 oe
(b)	$(W =) 5.9n$ or $(W =) 5.9(n - 1) + 2.4$ or $(W =) 2.4n + 3.5(n - 1)$		2	M1 for $2.4n + 3.5n$ or $5.9n$ seen
		$5.9n - 3.5$		A1 oe but must be in simplest form eg $-3.5 + 5.9n$
				Total 4 marks

3	$5 \times 12 (= 60)$ or $\frac{15+7-2+23+x}{5} = 12$ oe or $\frac{x + "43"}{5} = 12$		3	M1	for a method to find the total of the 5 numbers or setting up an equation in x "43" comes from $15 + 7 - 2 + 23$
	$x + 15 + 7 - 2 + 23 = "60"$ or $x + "43" = "60"$ or $"60" - (15 + 7 - 2 + 23)$			M1	for forming an equation with their 60 or for a complete calculation to find the value of x "43" comes from $15 + 7 - 2 + 23$
		17		A1	
				Total 3 marks	

4	eg $0.45 \times 180 (= 81)$ oe OR $\frac{15}{180} \left(= \frac{1}{12} \text{ or } 0.0833... \right)$ OR $\frac{15}{180} \times 100 (= 8.3(33...) \%)$		4	M1 for a method to find the number of students studying German OR the number of students studying French as a fraction or decimal of the total students OR a method to find the percentage of students studying French 81 may be seen as part of an equation
	eg $180 - 15 - "81" (= 84)$ or $"81" + 15 (= 96)$ OR $1 - \left(\frac{1}{12} + \frac{45}{100} \right) = \left(\frac{7}{15} \text{ or } 0.466... \right)$ or $\frac{1}{12} + \frac{45}{100} = \left(\frac{8}{15} \text{ or } 0.533... \right)$ OR $100 - ("8.3" + 45) (= 46.6(66...) \text{ or } 46.7 \%)$ or $"8.3" + 45 (= 53.3(33...) \text{ or } 53.3 \%)$			M1 for a method to find the number of students studying Italian/Spanish or French/German OR a method to find the fraction or decimal of students studying Italian/Spanish or French/German OR a method to find the percentage of students studying Italian/Spanish or French/German 84 or 96 may be seen as part of an equation
	eg $\frac{"84"}{180 - "84"} (\times 100) \left(= \frac{7}{8} \text{ or } 0.875 \right)$ or $\frac{"84"}{"96"} (\times 100) \left(= \frac{7}{8} \text{ or } 0.875 \right)$ or $\frac{7}{15} " \div " \frac{8}{15} " \left(= \frac{7}{8} \text{ or } 0.875 \right)$ or $\frac{"46.6"}{"53.3"} (\times 100) (= 0.872...)$			M1 for a complete method to find the fraction or decimal or percentage of Italian/Spanish to French/German
		87.5		A1 accept 87.2 – 87.7
				Total 4 marks

5	(a)		$3c^4 + 12c^3$	2	B2 for $3c^4 + 12c^3$ (B1 for $3c^4$ or $12c^3$)
	(b)(i)			2	M1 for $(x \pm 9)(x \pm 1)$ or for $(x + a)(x + b)$ with $ab = -9$ or $a + b = 8$
			$(x + 9)(x - 1)$		A1 for correct factors
	(ii)		$-9, 1$	1	B1 ft dep on factorising in the form $(x + p)(x + q)$
					Total 5 marks

6	$\frac{8}{3}(+)\frac{15}{4}$ or $(2)\frac{8}{12}(+)(3)\frac{9}{12}$ or $(2)\frac{8a}{12a}(+)(3)\frac{9a}{12a}$		3	M1 for correct improper fractions or fractional part of numbers written correctly over a common denominator
	eg $\frac{8 \times 4 + 15 \times 3}{3 \times 4}$ or $\frac{32}{12} + \frac{45}{12}$ or $\frac{32a}{12a} + \frac{45a}{12a}$ or $2\frac{8}{12} + 3\frac{9}{12} = 5\frac{17}{12}$ oe			M1 for correct fractions with a common denominator of 12 or a multiple of 12
	$\frac{32}{12} + \frac{45}{12} = \frac{77}{12} = 6\frac{5}{12}$ or $5\frac{17}{12} = 6\frac{5}{12}$ or if shows $6\frac{5}{12} = \frac{77}{12}$ at the beginning then show that the addition comes to $\frac{77}{12}$	Shown		A1 dep on M2 for a correct answer from fully correct working or shows that $\text{RHS} = \frac{77}{12}$ and fully correct working shows $\text{LHS} = \frac{77}{12}$
				Total 3 marks

7	eg $(V=) \pi \times \left(\frac{18}{2}\right)^2 \times 3.5$ (= 890.(64...)) or $\frac{567}{2} \pi$		3	M1	correct method to calculate volume
	eg $(7.04 \times 1000) \div \text{"890.64"}$			M1	correct method to calculate density (if volume is incorrect, their value can be used if clearly labelled) accept use of 7.04 or an incorrect conversion from kg to g for mass
		7.9		A1	accept 7.9 – 7.92
				Total 3 marks	

8	18000 $\times$ 0.15 (= 2700) oe or 18000 $\times$ 0.85 (= 15 300) oe		3	M1	for finding 15% or 85% of 18 000	M2 for 18000 $\times$ 0.85 ⁴ oe or 18000 $\times$ 0.85 ⁵ (= 7986.(69...)) oe
	eg 18000 $\times$ 0.85 ⁴ oe or "15300" $\times$ 0.85 $\times$ 0.85 $\times$ 0.85 oe or "15300" $\times$ 0.85 (= 13005) oe and "13005" $\times$ 0.85 (= 11054.25) oe and "11054.25" $\times$ 0.85 oe			M1	(dep) for a complete method	
		9396		A1	awrt 9396	
				If no marks awarded, award SCB1 for or 18000 $\times$ 0.85 ² (= 13 005) oe or 18000 $\times$ 0.85 ³ (= 11 054.(25)) oe or 18 000 $\times$ 0.4 (= 7200) oe or 18 000 $\times$ 1.15 (= 20700) oe or 18 000 $\times$ 1.15 ⁴ (= 31482.(1125)) oe		
				Total 3 marks		

9	$-4x \leq 11 - 3$ or $-4x \leq 8$ or $-x \leq 2$ or $3 - 11 \leq 4x$ or $-8 \leq 4x$		2	M1 allow equals sign or condone incorrect inequality sign for M1 only
		$x \geq -2$		A1 allow $-2 \leq x$ SCB1 for x and -2 with an incorrect sign between them or -2 as an answer
				Total 2 marks

10	$3 \div 2 (=1.5 \text{ or } \frac{3}{2})$ or eg $\frac{5 - -1}{4(-0)}$ or $c = -1$		3	M1 for correct method to find gradient or the correct value of c for gradient, may see a correct calculation or $\frac{3}{2}$ oe or $1.5x (+c)$ oe for value of c , allow $c = -1$, $y = -1$, ($L =$) $mx - 1$ oe
	$y = "1.5"x (+c)$ or $y = mx - 1$ or eg $y - 5 = m(x - 4)$			M1 for use of $y = mx + c$ with either m or c correct (NB: $m \neq 0$) or for ($L =$) $1.5x - 1$ oe
		$y = \frac{3}{2}x - 1$		A1 oe eg $y = 1.5x - 1$
				Total 3 marks

11	$(AB^2 =) 7.5^2 - 6^2 (= 20.25)$ or eg $(BAC =) \sin^{-1}\left(\frac{6}{7.5}\right) (= 53.1\dots)$ or $\cos(BCA) = \frac{6}{7.5} (= 0.8)$		6	M1	for a correct first step to find AB or a complete method to find angle BAC or a correct first step to find angle BCA
	$(AB =) \sqrt{7.5^2 - 6^2} (= 4.5)$ or $(AB =) \frac{6}{\tan 53.1^\circ} (= 4.5\dots)$ or $(AB =) 7.5 \cos 53.1^\circ (= 4.5\dots)$ or $(BCA =) \cos^{-1}\left(\frac{6}{7.5}\right) (= 36.8\dots)$			M1	for a complete method to find AB or angle BCA
	$(\text{Area } ABC =) \frac{1}{2} \times 6 \times 4.5 (= 13.5)$ or $(\text{Area } ABC =) \frac{1}{2} \times 6 \times 7.5 \times \sin(36.8^\circ) (= 13.47\dots \text{ or } 13.5)$			M1	ft [their labelled AB] or [their labelled BCA] eg for $\frac{1}{2} \times 6 \times$ [their labelled AB] or $\frac{1}{2} \times 6 \times 7.5 \times \sin$ [their labelled BCA]
	$(\text{Area } DAC =) 31.5 - "13.5" (= 18)$ or $"13.5" + 0.5 \times 7.5 \times AD = 31.5$ oe			M1	ft (dep on previous M1) allow $31.5 -$ [their area]
	$(AD =) ("18" \div 7.5) \div 0.5$ oe			M1	for a complete method to find AD , dependent on correct working
		4.8		A1	accept 4.78 – 4.81
				Total 6 marks	

12	(a)	$3^2 \times 5 \times 7$	1	B1	accept $3 \times 3 \times 5 \times 7$ oe or 315
	(b)	$3^{11} \times 5^7 \times 7^5$	2	B2	fully correct answer (allow $x = 11, y = 7, z = 5$) (B1 for an answer in the form $3^p \times 5^q \times 7^r$ where one or two of p, q or r are correct)
				Total 3 marks	

13	12 (-) 3		2	M1 for both values unambiguously identified
		9		A1
				Total 2 marks

14	Elimination eg $9x - 15y = 75$ $20x + 15y = 70 +$ $(29x = 145)$ or $12x - 20y = 100$ $12x + 9y = 42 -$ $(-29y = 58)$	Substitution eg $4\left(\frac{25+5y}{3}\right) + 3y = 14$ or $4x + 3\left(\frac{25-3x}{-5}\right) = 14$ or $3\left(\frac{14-3y}{4}\right) - 5y = 25$ or $3x - 5\left(\frac{14-4x}{3}\right) = 25$		4	M1 for a correct method to eliminate x or y : coefficients of x or y the same and correct operation to eliminate selected variable (condone 1 arithmetical error) or for correctly writing x or y in terms of the other variable and correctly substituting
					A1 dep on M1 for $x = 5$ or $y = -2$
	eg $3x - 5 \times "-2" = 25$ or $4x + 3 \times "-2" = 14$ or $3 \times "5" - 5y = 25$ or $4 \times "5" + 3y = 14$				M1 dep on M1 for substitution of found variable or repeating the steps in first M1 for the second variable
		$x = 5$ $y = -2$			A1 cao, dep on M1 a correct answer without working scores no marks
					Total 4 marks

15	$PRS = 90$ or $PQS = 90$ or $PSR = 180 - 136 (= 44)$		3	M1	may be seen on diagram. Must be labelled on diagram or identified using 3 letter notation.
	$RPS = 180 - 90 - "44"$ oe or $RQS = 136 - 90 (= 46)$			M1	for a complete method
		46		A1	
				Total 3 marks	

16	(a)	$(3x-1)(x+2) = 3x^2 + 6x - x - 2 (= 3x^2 + 5x - 2)$ or $(3x-1)(3x+1) = 9x^2 + 3x - 3x - 1 (= 9x^2 - 1)$ or $(x+2)(3x+1) = 3x^2 + x + 6x + 2 (= 3x^2 + 7x + 2)$		3	M1	for a correct intention to multiply all 3 factors by multiplying 2 factors only, allow one error
		$[(3x^2 + 5x - 2)(3x + 1) =] 9x^3 + 15x^2 - 6x + 3x^2 + 5x - 2$ or $[(9x^2 - 1)(x + 2) =] 9x^3 + 18x^2 - x - 2$ or $[(3x^2 + 7x + 2)(3x - 1) =] 9x^3 + 21x^2 + 6x - 3x^2 - 7x - 2$			M1	(dep)ft for expanding by the third factor, allow one error
			$9x^3 + 18x^2 - x - 2$		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
			$9x^3 + 18x^2 - x - 2$		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
			$\frac{16y^4}{x^8}$		A1	accept $16y^4x^{-8}$ or $\frac{16}{y^{-4}x^8}$ or $\frac{16x^{-8}}{y^{-4}}$ oe
		ALTERNATIVE				
				3	M2	for 2 correct terms (M1 for 1 correct term)
			$\frac{16y^4}{x^8}$		A1	accept $16y^4x^{-8}$ or $\frac{16}{y^{-4}x^8}$ or $\frac{16x^{-8}}{y^{-4}}$ oe
					Total 6 marks	

17	$(\text{area } PQS =) \frac{1}{2} \times 6.1 \times 3.8 \times \sin P = 9$ or $(\text{area } PQRS =) 6.1 \times 3.8 \times \sin P = 18$	$\frac{1}{2} \times 6.1 \times SX = 9$ or $(SX =) \frac{9}{\frac{1}{2} \times 6.1} (= 2.95...)$ or $6.1 \times SX = 18$ or $(SX =) 18 \div 6.1 (= 2.95...)$		5	M1 correct equation for the area of the triangle or parallelogram or a calculation to find the height of the parallelogram (where X is the point vertically below S on PQ)
	$\text{eg } (\sin P =) \frac{9}{\frac{1}{2} \times 6.1 \times 3.8} (= 0.776... \text{ or } \frac{900}{1159})$ or $(\sin P =) \frac{18}{6.1 \times 3.8} (= 0.776... \text{ or } \frac{900}{1159})$	$(PX^2 =) 3.8^2 - "2.95..."^2 (= 5.73...)$ or $(PX =) \sqrt{3.8^2 - "2.95..."^2} (= 2.39...)$			M1 correct expression for $\sin P$ OR for start of Pythagoras method to find length of PX (where X is the point vertically below S on PQ)
	$(P =) \sin^{-1} "0.776..." (= 50.9...)$	$(QX =) 6.1 - \sqrt{"5.73"} (= 3.70...)$ or $(QX =) 6.1 - "2.39" (= 3.70...)$			M1 for complete method to find angle P OR for method to find length of QX
	$(QS^2 =) 3.8^2 + 6.1^2 - 2 \times 3.8 \times 6.1 \times \cos("50.9") (= 22.4...)$ or $(QS =) \sqrt{3.8^2 + 6.1^2 - 2 \times 3.8 \times 6.1 \times \cos("50.9")}$	$(QS^2 =) "2.95..."^2 + "3.70..."^2 (= 22.4...)$ or $(QS =) \sqrt{"2.95..."^2 + "3.70..."^2}$			M1 correct expression for QS^2 (or QS)
			4.74		A1 accept 4.73 – 4.74
					Total 5 marks

18	eg $(BV^2 =) 3^2 + 6^2 (= 45)$ or $(CT^2 =) 3^2 + 6^2 (= 45)$ or $(DH^2 =) 6^2 + 6^2 (= 72)$ or $(MV^2 =) 3^2 + 3^2 (= 18)$		4	M1 a correct expression for eg BV^2 or CT^2 or DH^2 or MV^2 where M is the midpoint of DC or a correct expression for [length] ² for any length in the cube using Pythagoras	M3 for $(VT =) \sqrt{6^2 + 3^2 + 3^2}$ $(= 3\sqrt{6} \text{ or } 7.34...)$ (M2 for $(VT^2 =)$ $6^2 + 3^2 + 3^2 (= 54)$)
	eg $(BV =) \sqrt{3^2 + 6^2} (= \sqrt{45} \text{ or } 3\sqrt{5} \text{ or } 6.70...)$ or $(CT =) \sqrt{3^2 + 6^2} (= \sqrt{45} \text{ or } 3\sqrt{5} \text{ or } 6.70...)$ or $(DH =) \sqrt{6^2 + 6^2} (= \sqrt{72} \text{ or } 6\sqrt{2} \text{ or } 8.48...)$ or $(MV =) \sqrt{3^2 + 3^2} (= \sqrt{18} \text{ or } 3\sqrt{2} \text{ or } 4.24...)$			M1 for a complete method for eg BV or CT or DH or MV or any length in the cube using Pythagoras	
	$(VT =) \sqrt{"45" + 3^2}$ or $\sqrt{\left(\frac{"\sqrt{72}"^2}{2}\right) + 6^2}$ or $\sqrt{"18" + 6^2}$ or $3\sqrt{6}$ or $7.34...$			M1 for a correct expression for VT (condone missing brackets around $3\sqrt{5}$ or $3\sqrt{2}$ or $\frac{\sqrt{72}}{2}$)	
		$\sqrt{54}$		A1 if $\sqrt{54}$ seen and answer then given as $3\sqrt{6}$ isw and award full marks	
				Total 4 marks	

19	eg $(7.5+2.5) - 6 = 4$ large squares represents 8 trees or $5 \times 37.5 + 5 \times 12.5 - 10 \times 15 = 100$ small squares represents 8 trees $200 - 250 = 10$ $250 - 300 = 8$ $300 - 400 = 12$ $400 - 450 = 15$ $450 - 600 = 15$ (or $450 - 500 = 5$ or $500 - 600 = 10$) $600 - 800 = 4$		3	M1	oe eg 1 large square represents 2 trees or 12.5 small squares represents 1 tree or a frequency density axis scale where one large square vertically is FD of 0.04 with no contradictions or a correct frequency for any bar (could be seen on the diagram)
	$5 \times 2 + 2 \times 2$ or $\frac{10 \times 12.5 + 20 \times 2.5}{100} \times 8$ oe or $100 \times 0.1 + 200 \times 0.02$			M1	for a correct method to find the total number of trees greater than 500 cm.
		14		A1	
				Total 3 marks	

20	(Length sf =) $\sqrt[3]{0.8}$ (= 0.928...) or $\sqrt[3]{1.25}$ (= 1.07...) or $\sqrt[3]{4}:\sqrt[3]{5}$ oe		4	M1 for a correct linear scale factor
	(Area sf =) $\left(\sqrt[3]{0.8}\right)^2$ (= 0.861...) or 86.1...(%) or $\left(\sqrt[3]{1.25}\right)^2$ (= 1.16...) or 116...(%) or $\left(\sqrt[3]{4}\right)^2:\left(\sqrt[3]{5}\right)^2$ oe			M1 for a correct area scale factor
	eg (k =) $(1 - "0.861...") \times 100$ or $(100 - "86.1...")$ or $100 - \frac{100}{"1.16"}$ or $100 - \frac{100}{"116"} \times 100$ or $100 - 100 \times \frac{\left(\sqrt[3]{4}\right)^2}{\left(\sqrt[3]{5}\right)^2}$			M1 for a method to find the percentage reduction
		13.8		A1 accept 13.7 – 13.9
				Total 4 marks

21	$(\sqrt{2}-1)^2 = 2 - \sqrt{2} - \sqrt{2} + 1 (= 3 - 2\sqrt{2})$	$\frac{(3+\sqrt{8})}{(\sqrt{2}-1)^2} \times \frac{(\sqrt{2}+1)^2}{(\sqrt{2}+1)^2}$		4	M1 expand the denominator (accept $2 - 2\sqrt{2} + 1$ - must see expansion) OR method to rationalise using $(\sqrt{2}+1)^2$
	$\frac{(3+\sqrt{8})}{(3-2\sqrt{2})} \times \frac{(3+2\sqrt{2})}{(3+2\sqrt{2})}$	$(\sqrt{2}-1)^2 = 2 - \sqrt{2} - \sqrt{2} + 1 (= 3 - 2\sqrt{2})$ or $(\sqrt{2}+1)^2 = 2 + \sqrt{2} + \sqrt{2} + 1 (= 3 + 2\sqrt{2})$ or $(\sqrt{2}-1)(\sqrt{2}+1) = 2 - \sqrt{2} + \sqrt{2} - 1 (= 1)$			M1 oe ft $3 - 2\sqrt{2}$ method to rationalise OR expansion of $(\sqrt{2}-1)^2$ (accept $2 - 2\sqrt{2} + 1$) or $(\sqrt{2}+1)^2$ (accept $2 + 2\sqrt{2} + 1$) or $(\sqrt{2}-1)(\sqrt{2}+1)$
	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
			$17 + \sqrt{288}$		A1 or $p = 17, q = 288$ answer from fully correct working with intermediate steps of working seen
					Total 4 marks

22	(a)	$\left(\frac{dy}{dx} = \right) 2x + px^{-2}$ oe		4	M2 Both terms correct (M1 for one term correct)
		$2(-3) + p(-3)^{-2} (= 0)$			M1 (dep on M1) substitute -3 into a derivative of the form $ax + bx^{-2}$
			54		A1
	(b)	$\left(\frac{dy}{dx} = \right) 2x + 16x^{-2} = 0$		3	M1 set $\frac{dy}{dx} = 0$, at least one term correct
		eg $2x^3 + 16 = 0$ or $2x^3 = -16$ or $x^3 = -8$ or $x = \sqrt[3]{-8}$ or $x = -2$			M1 rearrangement of the correct equation to remove the negative power of x
			12		A1
					Total 7 marks

23	(a)	$2(x^2 - 6x) + 3$ or $2(x^2 - 6x + \frac{3}{2})$		3	M1 or for one of a , b or c correct OR expanding $a(x^2 + 2bx + b^2) + c$
		$2\left[(x-3)^2 - 9\right] + 3$ or $2\left[(x-3)^2 - 3^2 + \frac{3}{2}\right]$ oe			M1 or for two of a , b or c correct OR $-12 = 2ab$ or $3 = ab^2 + c$
			$2(x-3)^2 - 15$		A1 accept $a = 2$, $b = -3$, $c = -15$
	(b)		$(-1, -15)$	2	B2ft eg accept [their $-b - 4$] for the x -coordinate or [their c] for the y -coordinate (B1 ft for one correct coordinate)
					Total 5 marks

24	$\frac{5}{x} \times \frac{(x-4)}{x}$ oe or $\frac{(x-5)}{x} \times \frac{6}{x}$ oe		5	M1	for a correct expression for P(R,G) or P(G,R)
	$\frac{5}{x} \times \frac{(x-4)}{x} + \frac{(x-5)}{x} \times \frac{6}{x}$ oe			M1	for a correct expression for P(R,G) + P(G,R)
	$19x^2 - 352x + 1600 (= 0)$ oe or $19x^2 - 352x = -1600$ oe			M1	for a correct equation in the form $ax^2 + bx + c (= 0)$ oe or $ax^2 + bx = -c$ oe
	$(x - 8)(19x - 200) (= 0)$ or $(x =) \frac{- -352 \pm \sqrt{(-352)^2 - (4 \times 19 \times 1600)}}{2 \times 19}$ or $19 \left[\left(x - \frac{176}{19} \right)^2 - \left(\frac{176}{19} \right)^2 \right] + 1600 (= 0)$			M1	for solving their 3-term quadratic equation using any correct method - if factorising, allow brackets which expanded give 2 out of 3 terms correct (if using formula or completing the square allow one sign error and some simplification – allow as far as $\frac{352 \pm \sqrt{123904 - 121600}}{38}$ oe or $19 \left(x - \frac{176}{19} \right)^2 - \frac{576}{19} (= 0)$ oe)
		8		A1	cao, dep on M2. Do not award if non-integer solution also given. 8 must come from correct working.
				Total 5 marks	

25	$(S_{10} =) \frac{10}{2}(2a + 9d)$ or $(S_5 =) \frac{5}{2}(2a + 4d)$ oe or $a + 7d = 45$		5	M1	for a correct expression for the sum of the first 10 terms (S_{10}) or the first 5 terms (S_5) or a correct equation for the 8 th term Take 9 as their 10 – 1 and 4 as their 5 – 1 and 7 as their 8 – 1
	$\frac{10}{2}(2a + 9d) = 4 \times \frac{5}{2}(2a + 4d)$ oe			M1	for a correct equation relating S_{10} and S_5
	eg $d = 2a$ oe or $a = \frac{d}{2}$ oe or $a + 7d = 45$ oe and eg $10a - 5d = 0$ oe or eg $\frac{10}{2}(2(45 - 7d) + 9d) = 4 \times \frac{5}{2}(2(45 - 7d) + 4d)$ oe or $5d = 10(45 - 7d)$ oe			M1	(dep on M1) for d in terms of a , or vice-versa (must be correct) or for $a + 7d = 45$ oe and correctly reducing the equation relating S_{10} and S_5 to an equation with one term in a and one term in d eg $10a - 5d = 0$ oe or substituting a correct expression into their correct equation to obtain an equation in just d
	eg $a + 7(2a) = 45$ or $d = 6$ or eg $70a - 35d = 0$ or $10a - 5d = 0$ $5a + 35d = 225$ + $10a + 70d = 450$ – $(75a = 225)$ $(-75d = -450)$			M1	(dep on M2) for a correct equation in just a or for $d = 6$ or for a correct method to eliminate a or d : coefficients of a or d the same and correct operation to eliminate selected variable (condone 1 arithmetical error)
		3		A1	Dep on M3
					Total 5 marks