Question			Answer	Marks	Part Marks and Guidance	
1	**(a**		$p = 12$ $r = 9$	2	**B1** each	
	(b)		$5c - cn = 9d - 6d$ [or $= 3d$] $c(5 - n) = 9d - 6d$ [or $= 3d$] or FT $[c =]\dfrac{3d}{5-n}$ oe	M1 M1 A1	For collecting c terms on one side, non-c terms on the other; condone one error For factorising; may be implied by final answer Numerator must be simplified	

2	**(a**		$p = \dfrac{t+3}{2}$	2	**Oe final answer** **M1** for $t + 3 = 2p$ oe or $\dfrac{t}{2} = p - \dfrac{3}{2}$ or $\dfrac{t+3}{2}$ Or **SC1** for final answer $p = \dfrac{t}{2} +$ or $p = \dfrac{t-3}{2}$ or $p = t + \dfrac{3}{2}$ oe or $p = t + 3 \div 2$ or $p = \dfrac{-t-3}{2}$ oe	
	(b)		$x = 2$ $y = 5$	2	**B1** for $x = 2$ or $y = 5$ or for $x = 5$ and $y = 2$ Or **M1** for attempt to add/subtract equations	Answers reversed With 2 of the 3 terms correct

3		$C + 5p = aC - ap$	**M1**	Expanding brackets	
		$5p + ap = aC - C$ oe	**M1**	Collecting *p* terms on one side, remaining terms on other, dep on having an *ap* term	Each **M1** is for a correct constructive step, FT previous error if of equivalent difficulty
		$p(5 + a) = aC - C$ oe	**M1**	Factorising *p* terms (may be implied by FT correct division); dep on having an *np* term and an *ap* term	
		$[p =]\dfrac{aC - C}{5 + a}$ or $\dfrac{C(a-1)}{5+a}$ oe	**M1**	Final division by factor Allow **B4** for $[p =]\dfrac{aC - C}{5 + a}$ or $\dfrac{C(a-1)}{5+a}$ oe	For **M4**, answer must be fully correct Making C the subject instead of p can earn at most **M1M1M0M1**

4	(a)		$5a + 5b$ [$= 2ab$]	**M1**	for expanding brackets correctly	
			$5b = 2ab - 5a$ oe	**M1**	for collecting *a* terms correctly on one side, non-*a* terms on the other, FT	[no ft for remaining Ms from rhs = $2a + b$ oe resulting in one *a* term when rearranged]
			[$5b =$] $a(2b - 5)$ oe	**M1**	for factorising correctly FT; may be implied by final answer	condone no equation
			$[a =]\dfrac{5b}{2b-5}$ oe	**M1**	for correct division FT by *their* two-term factor	award 4 marks only for correct work; withhold last M1 if further work such as incorrect cancelling
			Or for those who divide first:	**Or**		
			$a + b = \dfrac{2ab}{5}$	**M1**	oe for each mark	
			$a - \dfrac{2ab}{5} = -b$	**M1**	[apply equivalent FTs as above]	
			$a(1 - \dfrac{2b}{5}) = -b$ or $\dfrac{a}{5}(5 - 2b) = -b$	**M1**		
			$a = \dfrac{-5b}{5 - 2b}$	**M1**	M0 for triple-decker fraction in final answer	
	(b)	(i)	2	**1**		
		(ii)	$6x + 3$ as final answer	**2**	**M1** for $2(3x + 4) - 5$	

5	**(a)**		5 and -5	3	**B2** for one of these Or **M1** for $x^2 = 25$ Or **B1** each for embedded answers	
	(b)		$[a =][\pm]\sqrt{\frac{S}{2} - 2bc}$ or $\sqrt{\frac{S-4bc}{2}}$ oe as final answer	3	nfww **M1** for $2a^2 = S - 4bc$ or for $\frac{S}{2} = 2bc + a^2$ **M1** for $\frac{S}{2} - 2bc = a^2$ or $\frac{S-4bc}{2} = a^2$ or FT **M1** for $[a =][\pm]\sqrt{\frac{S}{2} - 2bc}$ oe or FT ; award last **M1** at stage of final answer <u>Or</u> **M2** for complete correct inverse flow diagram and **M1** for final answer **SC1** if no working, and final answer appears with just one error	**M1** for each of FT correct, constructive steps leading to answer, eg last **M1** FT *their* a^2 = ... The square root symbol must extend to include at least the start of the second term, if there is one, and below the fraction line For mixture of fractions and decimals or triple decker fractions etc, award **M0** where they first occur (unless they sort them later) then ft

6	**(a)**		$a = 6$ $b = 20$	1 2	 **M1** for $b = 2 + 3a$ seen Or **B1** for *their* answer FT $2 + 3 \times$ *their* a	
	(b)		$[p =]\sqrt[3]{\dfrac{cH^2}{10}}$ oe	4	nfww **M1** for $H^2 = \dfrac{10p^3}{c}$ **M1** for $cH^2 = 10p^3$ or FT *their* expression for H^2 **M1** for $p^3 = \dfrac{cH^2}{10}$ or FT **M1FT** for cube root of *their* expression for p^3; cube root symbol must extend below fraction line	ie **M1** for correct squaring **M1** for dealing correctly with denominator of fraction after squaring **M1** for dealing correctly with result to get p^3 as subject **M1** for correctly finding cube root of *their* expression for p^3 (middle two **M**s may be earned for a combined step) Award full marks only if fully correct

7	(a)		15 1	1+1		
	(b)		$2.5x + 2 = x - 1$ or $5x + 4 = 2x - 2$ $1.5x = {}^-3$ or $3x = {}^-6$ $[x =]\ {}^-2$	M1 M1 M1	For correctly dealing with 2 in denominator and expanding brackets if necessary For correctly collecting x terms on one side and numbers on the other, FT *their* equation; must have a single term on each side For final answer FT *their* $ax = b$ or $ax - b = 0$, with $a \neq \pm 1$ and $b \neq 0$ Allow **B3** for $[x =]\ {}^-2$ as answer from trials	Allow **M**s for combined steps if next equation is correct FT If FT is not an integer answer, accept fractions and ignore subsequent conversions eg to decimals; for recurring decimals eg allow 0.16 to 0.17 for 1/6 for the last **M1FT** if no fraction seen Common errors: **M0M1M1**for $5x + 4 = 2x - 1$; $5x + 4 = x - 2$ $3x = {}^-5$; $4x = {}^-6$ $x = {}^-5/3$; $x = {}^-1.5$ Combined steps: eg $5x + 4 = x - 2$ **M0** $4x + 6 = 0$ **M0** not far enough $x = {}^-1.5$ **M1M1FT**
	(c)		9 and $^-9$	1+1	Condo embedded	

	(d)		$H^2 = 10p + c$	M1	Allow **SC1** or first **M1** for $c = H^2 - 10p$ as final answer	
			$H^2 - c = 10p$ oe or FT	M1		
			$\frac{H^2 - c}{10}[= p]$ oe or FT as final answer	M1	or $\frac{H^2}{10} = p + \frac{c}{10}$ oe Allow **M3** for correct final answer nfww Allow **M2** for correct answer seen and then spoiled	

8	**(a)**		± 3	3	Both required **B2** for one solution or for $x = \pm\sqrt{9}$ or for $2x = \pm 6$ Or **B1** for $x^2 = 9$ oe or $x = \sqrt{\frac{36}{4}}$ or for $2x = 6$ OR **SC1** for $3^2 = 9$ or $4 \times 3^2 = 36$ **SC1** for $(^-3)^2 = 9$ or $4 \times (^-3)^2 = 36$	ie **2** marks if one step away from full marks, **1** mark if two steps away
	(b)		$[A =]\ 6c^2$	2	nfww Accept unsimplified eg **2** for $A = 6 \times c^2$ **M1** for $c^2 = \frac{A}{6}$ or for $A = kc^2$ with $k \neq 6$ or for correct unsimplified expression for A eg $[A =](c\sqrt{6})^2$	Condone *a* instead of *A*

9	**(a)**		± 4	3	**B2** for one solution Or **M1** for $y^2 = 16$	
	(b)		$4a - ac = 6 + 3c$ $a(4 - c) = 6 + 3c$ or FT $[a =]\dfrac{6+3c}{4-c}$ or $\dfrac{-3c-6}{c-4}$ *or* FT as final answer	M2 M1 M1	oe; for correctly collecting *a* terms on one side, non-*a* terms on the other; M1 if one sign error For correct factorising; may be implied by final answer; FT if at least M1 gained oe with numerator factorised; FT if at least M2 gained	 may be done earlier

10	**(a)**		Height of triangle = $h - e$ oe Tan $a = \dfrac{h-e}{d}$ or $h - e = d \times \tan a$	1 1	May be on diagram If **0** in question, allow **SC1** for clear attempt to use tan a = opp/adj with adj = d even if opp = h	eg y shown on diagram and $h = y + e$ used
	(b)		17.3(...) or 17	2	**M1** for 1.7 + 25 × tan 32	
	(c)		$[a =] \tan^{-1}\left(\dfrac{h-e}{d}\right)$ oe	3	Accept invtan, arctan, condone lack of brackets **M1** for $h - e = d \times \tan a$ **M1** for $\tan a = \dfrac{h-e}{d}$ If **0**, allow **SC1** for [a =] $\tan^{-1}$(*their* expression for tan a)	eg after first step of $\tan a = \dfrac{h}{e+d}$ allow **SC1** for $a = \tan^{-1}\left(\dfrac{h}{e+d}\right)$

11	**(a**		[$11a + 5c =$] $6d + 2cd$ $5c - 2cd = 6d - 11a$ $c(5 - 2d) = 6d - 11a$ $[c =]\dfrac{6d-11a}{5-2d}$ oe	**M1** **M1** **M1** **M1**	Expanding brackets Collecting *c* terms on one side, remaining terms on other, dep on having a *cd* term Factorising *c* terms (may be implied by correct division); dep on having an *nc* term and a *cd* term Final division by factor allow **B4** for $[c =]\dfrac{6d-11a}{5-2d}$ oe	condone *d*6 etc Each **M1** is for a correct constructive step, FT previous error if of equivalent difficulty for M4, answer must be fully correct
	(b)	**(i)**	8	**1**	mark final answer	
		(ii)	$5x - 7$	**2**	mark final answer **M1** for $5(x + 1) - 12$ soi	

12	(a)		$r = [\pm]\sqrt{\dfrac{S}{4\pi}}$ oe as final answer	3	nfww For all 3 marks, 'r = 'must be stated; allow **SC2** if rhs is correct OR **M1** for $\dfrac{S}{4\pi} = r^2$ or $\sqrt{S} = \sqrt{4\pi}\, r$ oe **M1** for taking square root correctly FT *their* r^2 = ... or $4r^2$ = ... oe or for $\dfrac{\sqrt{S}}{k}$ oe ft *their* $\sqrt{S} = kr$ If **M0**, allow **B1** for $[r] = \dfrac{\sqrt{S}}{4\pi}$ Or allow **B1** for correctly finding r as the subject FT a wrong first step	Allow 'triple decker' fractions for Ms but not for 3 marks eg 2 for $r = \sqrt{\dfrac{S \div 4}{\pi}}$ (square root symbol must extend below fraction line) **M0** if r is on both sides Allow **M1** for complete correct reverse flowchart
	(b)	(	$\dfrac{3}{10}$ oe	1		
		(ii)	0 found as denominator without further wrong working/comment	1	Accept denominator = 0 oe or 'cannot calculate 3/0' or '3/0 = error'	0 for 3/0 = 0 or for 3/0 = 3 etc or 'you can't divide 0 by 3'