				5.86	M1	C : 22 AB	
1				3.00	141	for $\sin 23 = \frac{AB}{15}$ NB Allow any alternative equivalent methods.	nod to form an equation in AB
					A1		
					_	-	
		_					
2				32.3	P1	for using Pythagoras to find length of third s	ide of triangle, eg 7.5 ² – 6 ²
						or $6^2 + x^2 = 7.5^2$	
						or uses trigonometry to find angle in triangle	e, eg sin $A = \frac{6}{7.5}$ or cos $B = \frac{6}{7.5}$
					P1	(dep P1) for complete process to find length	_
						eg $\sqrt{7.5^2 - 6^2}$ or $\sqrt{56.25 - 36}$ or $\sqrt{20.2}$	5 (= 4.5)
				or uses trigonometry to find base length of		riangle, eg 7.5 × cos "A"	
						or 7.5 × sin "B" or $\frac{6}{\tan^{n}A^{n}}$	
					D1	(4 D2) f 24 10 "45" (- 05)	
					P1	(dep P2) for 24 – 10 – "4.5" (= 9.5)	
					P1	(indep) for process to find angle CDA, eg tar	$1 CDA = \frac{6}{1000}$ from right- angled triangle
					A1	for answer in the range 32.2 to 32.3	base - C C
					. 7		
	(a)	50.5	M1		7 (0.55		Must be a complete statement for cos, sin
3	. ,			for $\cos ABC = \frac{1}{1}$	_ (0.63)) oe	or tan with all three elements present.
			A1	for answer in the	e range 50.	4 to 50.51	If an answer is in the range 50.4 to 50.51
							is given in the working space then incorrectly rounded, award full marks.
	(b)	Increase (supported)	C1	States increase v			If figures are given they must be correct (truncated or rounded).
		(supported)		eg " $\frac{7}{10}$ is great	ter than $\frac{\prime}{11}$	23	(durants of rountes).
				" 0.636 is les			
				"cos increase "decreasing t		nator increases the value of the fraction"	
				"angle is now	v 45.6" (ac	cept 45.5 – 45.6)	
		-	-				
		1 5	D1	for process to de	entre an en	aution in v	-
4		5 3	P1	for process to de $\frac{x}{eg} = \frac{6x+5}{12-x+2}$	erive an eq	uation in x ,	
4		5 3		$eg \frac{x}{4x-1} = \frac{6x+5}{12x+31}$	erive an eq	uation in x ,	
4		5 3	P1	$eg \frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete pro	ocess to rer	move fractions,	Must be correct use of brackets
4		5 3		$\operatorname{eg} \frac{x}{4x-1} = \frac{6x+5}{12x+31}$	ocess to rer	move fractions,	Must be correct use of brackets
4		5 3		$eg \frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete pro $eg x(12x+31) = \frac{6x+5}{12x+31}$ for process to re	ocess to reaction $6x + 5$)(4)	move fractions,	Must be correct use of brackets Award for correct LHS only.
4		5 3	P1	$eg^{\frac{x}{4x-1}} = \frac{6x+5}{12x+31}$ for complete pro $eg x(12x+31) =$	ocess to reaction $6x + 5$)(4)	move fractions, $4x-1$)	
4		5 3	P1	$eg \frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete process to re eg $x(12x+31) = \frac{1}{2}$ for process to re eg $x(12x^2-17x-1)$	ocess to ref = $(6x + 5)(4$ educe to a 6 - $5 = 0$	move fractions, $4x-1$)	Award for correct LHS only. Award for correct LHS only.
4		5 3	P1	$\operatorname{eg} \frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete profeg $x(12x+31) = \frac{6x+5}{12x+31}$ for process to refer to	ocess to ref = $(6x + 5)(4$ educe to a 6 - $5 = 0$ obly the quala,	move fractions, $4x-1$) quadratic equation,	Award for correct LHS only.
4		5 3	P1	eg $\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete pro- eg $x(12x+31) =$ for process to re- eg $12x^2 - 17x -$ for process to so- quadratic formu-	ocess to ref = $(6x + 5)(4$ educe to a 6 - $5 = 0$ obly the quala,	move fractions, $4x-1$) quadratic equation,	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula;
4		5 3	P1	$eg \frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete pro- $eg x(12x+31) = 6x + 6x$	ocess to ref = $(6x + 5)(4$ educe to a 6 - $5 = 0$ obly the quala,	move fractions, $4x-1$) quadratic equation,	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67
4		5 3	P1 P1 P1	eg $\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete progent eg $x(12x+31) = \frac{6x+5}{12x+31}$ for process to refer eg $12x^2 - 17x - \frac{6x+5}{12x+31}$ for process to se quadratic formula eg $(4x+1)(3x-1)$	ocess to ref = $(6x + 5)(4$ educe to a 6 - $5 = 0$ obly the quala,	move fractions, $4x-1$) quadratic equation,	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$
4		5 3	P1 P1 P1	eg $\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete progent eg $x(12x+31) = \frac{6x+5}{12x+31}$ for process to refer eg $12x^2 - 17x - \frac{6x+5}{12x+31}$ for process to se quadratic formula eg $(4x+1)(3x-1)$	ocess to ref = $(6x + 5)(4$ educe to a 6 - $5 = 0$ obly the quala,	move fractions, $4x-1$) quadratic equation,	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67
	(a)	5 3	P1 P1 P1	eg $\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete progent eg $x(12x+31) = \frac{6x+5}{12x+31}$ for process to refer eg $12x^2 - 17x - \frac{6x+5}{12x+31}$ for process to se quadratic formula eg $(4x+1)(3x-1)$	ocess to ref = $(6x + 5)(4$ educe to a 6 - $5 = 0$ obly the quala,	move fractions, $4x-1$) quadratic equation,	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67
5	-	1	P1 P1 P1 A1	eg $\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete pro- eg $x(12x+31) =$ for process to re- eg $12x^2 - 17x -$ for process to so quadratic formul- eg $(4x+1)(3x-1)$	occess to rerection of the control	move fractions, $\{x-1\}$ quadratic equation, adratic equation by factorisation or use of	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
	(a) (b)		P1 P1 P1 A1	eg $\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete pro- eg $x(12x+31) =$ for process to re- eg $12x^2 - 17x -$ for process to so quadratic formul- eg $(4x+1)(3x-1)$	occess to rerection of the control	move fractions, $4x-1$) quadratic equation, adratic equation by factorisation or use of or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
	-	1	P1 P1 P1 A1	eg $\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete proge $x(12x+31) = \frac{6x+5}{12x+31}$ for process to rege $x(12x^2-17x-1)$ for process to sequadratic formula eg $(4x+1)(3x-1)$ for $\frac{5}{3}$ oe	occess to rerection of the second of the se	move fractions, $4x-1$) quadratic equation, adratic equation by factorisation or use of or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
	-	1	P1 P1 P1 A1	eg $\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete pro- eg $x(12x+31) =$ for process to re- eg $12x^2 - 17x -$ for process to so quadratic formul- eg $(4x+1)(3x-1)$	occess to rerection of the second of the se	move fractions, $4x-1$) quadratic equation, adratic equation by factorisation or use of or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
	-	1	P1 P1 A1 B1 M1	$eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete process to refer to process to refer to process to so quadratic formulation eg $(4x+1)(3x-1)$ for $\frac{5}{3}$ oe cao starts process, eg control or $\frac{\sin 30}{4} = \frac{\sin 90}{x}$	occess to rerection of the second of the se	move fractions, $4x-1$) quadratic equation, adratic equation by factorisation or use of or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
	-	1	P1 P1 A1 B1 M1	$eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete process to refer to process to refer to process to so quadratic formulation eg $(4x+1)(3x-1)$ for $\frac{5}{3}$ oe cao starts process, eg control or $\frac{\sin 30}{4} = \frac{\sin 90}{x}$	occess to rerection of the second of the se	move fractions, $4x-1$) quadratic equation, adratic equation by factorisation or use of or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
	-	1	P1 P1 A1 B1 M1	$eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete process to refer to process to refer to process to so quadratic formulation eg $(4x+1)(3x-1)$ for $\frac{5}{3}$ oe cao starts process, eg control or $\frac{\sin 30}{4} = \frac{\sin 90}{x}$	occess to rerection of the second of the se	move fractions, $4x-1$) quadratic equation, adratic equation by factorisation or use of or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
	-	1 8	P1 P1 A1 B1 M1	$eg \frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete process to refer to the form of the process to so the form of the	occess to rer = $(6x + 5)(4 +$	move fractions, $(4x-1)$ quadratic equation, adratic equation by factorisation or use of or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
	-	1	P1 P1 A1 B1 M1	$eg \frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete process to refer to the form of the process to so the form of the	occess to rer = $(6x + 5)(4 +$	move fractions, $(4x-1)$ quadratic equation, adratic equation by factorisation or use of or $0.5 = \frac{4}{x}$ oe or $\sin 30 = \frac{4}{x}$	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
5	-	1 8	P1 P1 A1 B1 M1	$eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete profeg $x(12x+31) = \frac{6x+5}{12x+31}$ for process to refer to process to so quadratic forming eg $(4x+1)(3x-6)$ for $\frac{5}{3}$ oe $eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for process to refer to process to so quadratic forming eg $(4x+1)(3x-6)$ for $\frac{5}{3}$ oe $eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for $\frac{5}{3}$ or $\frac{5}{3}$ or $\frac{5}{3}$	occess to rer = $(6x + 5)(4$ occess to rer =	move fractions, $(4x-1)$ quadratic equation, adratic equation by factorisation or use of	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
5	-	1 8	P1 P1 A1 B1 M1	$eg \frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete process to refer to the form of the process to so the form of the	occess to rer = $(6x + 5)(4$ occess to rer =	move fractions, $(4x-1)$ quadratic equation, adratic equation by factorisation or use of	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
5	-	1 8	P1 P1 A1 B1 M1	$eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete profeg $x(12x+31) = \frac{6x+5}{12x+31}$ for process to refer to process to so quadratic forming eg $(4x+1)(3x-1)$ for $\frac{5}{3}$ oe $eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for process to refer to process to so quadratic forming eg $(4x+1)(3x-1)$ for $\frac{5}{3}$ oe $eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for process to so quadratic forming eg $(4x+1)(3x-1)$ for $\frac{5}{3}$ oe $eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for $\frac{5}{3}$ or $\frac{5}{3}$ or $\frac{5}{3}$ OR $\frac{1}{3}$	occess to rer = $(6x + 5)(4$ occess to rer =	move fractions, $(4x-1)$ quadratic equation, adratic equation by factorisation or use of	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent
5	-	1 8	P1 P1 P1 A1 M1	$eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for complete profeg $x(12x+31) = \frac{6x+5}{12x+31}$ for process to refer to process to so quadratic forming eg $(4x+1)(3x-6)$ for $\frac{5}{3}$ oe $eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for process to refer to process to so quadratic forming eg $(4x+1)(3x-6)$ for $\frac{5}{3}$ oe $eg\frac{x}{4x-1} = \frac{6x+5}{12x+31}$ for $\frac{5}{3}$ or $\frac{5}{3}$ or $\frac{5}{3}$	occess to rer = $(6x + 5)(4$ occess to rer =	move fractions, $(4x-1)$ quadratic equation, adratic equation by factorisation or use of	Award for correct LHS only. Award for correct LHS only. Accept substitution into the formula; $\frac{-17\pm\sqrt{(-17)^2-4\times12\times-5}}{2\times12}$ Accept answers in the range 1.66 to 1.67 as equivalent

_	0.05	3.55	AR	
7	9.85	M1	for $\sin(38) = \frac{AB}{16}$ oe	
			or alternative method to find AB	
		A1	for an answer in the range 9.76 to 9.92	
	+	-	1	-
	2.5	P1	use of $\sin 30 = \frac{1}{2}$ to find $OA = 8$ or $OAB = 90^\circ$	
8			use of $\sin 30 = \frac{1}{2}$ to find OA (= 8) or $OAB = 90^{\circ}$ eg $OA = 16\sin 30^{\circ}$ or right angle marked on diagram	
		P1	recognition that equation of circle is $x^2 + y^2 = r^2$	Accept $3p^2 + p^2 = r^2$ for the award of this mark
		P1	Correct substitution of p, 3p and r in $x^2 + y^2 = r^2$	Do not accept $3p^2 + p^2 = 8^2$ for the award of this
			eg $9p^2 + p^2 = OA^2$ or $(3p)^2 + p^2 = "8^2"$	mark
		A1	for answer in the range 2.5 to 2.53	Accept $\sqrt{6.4}$ or $\frac{4\sqrt{10}}{5}$
				If an answer within the given range is seen in
				working and rounded incorrectly award full marks.
				Award 0 marks for the answer without
				supportive working.
	+		1	
	32.1	P1	DB	Accept values rounded or truncated to 2 dp.
9			starts process, eg $\sin 40 = \frac{DB}{8.6}$ oe or for $8.6 \times \sin 40 \ (=5.52797)$	·
		P1	complete process to find ED, eg (8.6 × sin40) ÷ 2 (=2.76)	
		P1	process to find angle <i>EAD</i> , eg tan ⁻¹ $\left(\frac{"2.76"}{4.4}\right)$ or tan ⁻¹ $("0.628")$	
			4.4) of tall (0.026)	
		A1	answer in range 32.09 to 32.2	If an answer in the range is seen in working and then incorrectly rounded award full marks
10	99.5	M1	for $\sin (34) = \frac{x}{178}$ oe	
10				
			or alternative method to find x	
		A1	for answer in range 99.5 to 99.7	If an answer in the range 99.5 to 99.7 is given
				in the working space then incorrectly rounded, award full marks
(2)	17.8	M1		For any alternative method candidates must
11 (a)	17.0	IVII	for $\tan 56 = \frac{x}{12}$ or $(BC) = 12 \times \tan 56$ oe	arrive at an equation with BC as the only
			or alternative method to find BC	unknown
		A1	for an answer in the range 17.7 to 17.8	If an answer in the range 17.7 to 17.8 is given in
				the working space then incorrectly rounded, award full marks.
(b)	33.6	M1	15 , 15	For any alternative method candidates must
.,			for $\cos x = \frac{15}{18}$ or $\cos x = 0.83$ or $x = \cos^{-1} \frac{15}{18}$	arrive at an equation with x as the only unknown
			or alternative method to find x	
		A1	for an answer in the range 33.5 to 33.91	If an answer in the range 33.5 to 33.91 is given in the working space then incorrectly rounded, award full marks.