Trigonometry Calculator A/B Grade

[SQA] 1. Solve the equation $3\cos 2x^\circ + \cos x^\circ = -1$ in the interval $0 \leq x \leq 360$. **5**

Part	Marks	Level	Calc.	Content	Answer	U2 OC3
	5	A/B	CR	T10	60, 131·8, 228·2, 300	2000 P2 Q5

•1 ss: know to use $\cos 2x = 2\cos^2 x - 1$	•1 $3(2\cos^2 x^\circ - 1)$
•2 pd: process	•2 $6\cos^2 x^\circ + \cos x^\circ - 2 = 0$
•3 ss: know to/and factorise quadratic	•3 $(2\cos x^\circ - 1)(3\cos x^\circ + 2)$
•4 pd: process	•4 $\cos x^\circ = \frac{1}{2}$, $x = 60, 30$
•5 pd: process	•5 $\cos x^\circ = -\frac{2}{3}$, $x = 132, 228$

[SQA] 2. Solve the equation $\cos 2x^\circ + 5\cos x^\circ - 2 = 0$, $0 \leq x < 360$. **5**

Part	Marks	Level	Calc.	Content	Answer	U2 OC3
	1	C	CR	T10		1994 P1 Q15
	4	A/B	CR	T10		

•1 Replacing $\cos 2x$ by $2\cos^2 x - 1$	•5 300° **and** no extraneous solutions **and** no solution for $\cos x = -3$ indicated. [If a reason is given, it must be valid].
•2 $2\cos^2 x + 5\cos x - 3 = 0$	
•3 $(2\cos x - 1)(\cos x + 3) = 0$	
•4 60°	

[SQA] 3. Solve the equation $\cos 2x^\circ + \cos x^\circ = 0$, $0 \leq x < 360$. **5**

Part	Marks	Level	Calc.	Content	Answer	U2 OC3
	5	A/B	CR	T10		1995 P1 Q15

•1 substitute $2\cos^2 x^\circ - 1$ for $\cos 2x^\circ$

•2 $(2\cos x^\circ - 1)(\cos x^\circ + 1) = 0$

•3 $\cos x^\circ = \frac{1}{2}$, $\cos x^\circ = -1$

•4 $x = 60, 300$

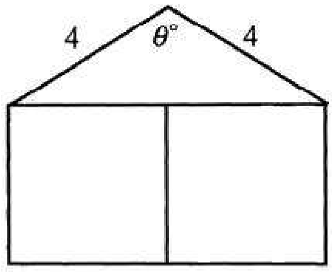
•5 $x = 180$

4. Solve $2\cos 2x - 5\cos x - 4 = 0$ for $0 \leq x < 2\pi$. **5**

Part	Marks	Level	Calc.	Content	Answer	U2 OC3
	5	B	CN	T10, T7	$x = 2{\cdot}419, 3{\cdot}864$	2010 P2 Q4

•[1] ss: know to use double angle formula	•[1] $2 \times (2\cos^2 x - 1)\cdots$
•[2] ic: express as quadratic in $\cos x$	•[2] $4\cos^2 x - 5\cos x - 6 = 0$
•[3] ss: start to solve	•[3] $(4\cos x + 3)(\cos x - 2) = 0$
•[4] pd: reduce to equations in $\cos x$ only	•[4] $\cos x = -\frac{3}{4}$ and $\cos x = 2$
•[5] pd: complete solutions to include only one where $\cos x = k$ with $\lvert k \rvert > 1$	•[5] 2·419, 3·864 and no solution.

[SQA] 5. A builder has obtained a large supply of 4 metre rafters. He wishes to use them to build some holiday chalets. The planning department insists that the gable end of each chalet should be in the form of an isosceles triangle surmounting two squares, as shown in the diagram.



(*a*) If $\theta°$ is the angle shown in the diagram and A is the area (in square metres) of the gable end , show that $A = 8\left(2 + \sin\theta° - 2\cos\theta°\right)$. **(5)**

(*b*) Express $8\sin\theta° - 16\cos\theta°$ in the form $k\sin(\theta - \alpha)°$. **(4)**

(*c*) Find algebraically the value of θ for which the area of the gable end is 30 square metres. **(4)**

Part	Marks	Level	Calc.	Content	Answer	U3 OC4
(*a*)	1	C	CR	CGD		1993 P2 Q9
(*a*)	4	A/B	CR	CGD		
(*b*)	4	C	CR	T13		
(*c*)	1	C	CR	T16		
(*c*)	3	A/B	CR	T16		

(a) •1 area of triangle = $\frac{1}{2} \times 4 \times 4\sin\theta$ *or* $2 \times \frac{1}{2} \times 4\sin\frac{\theta}{2} \times 4\cos\frac{\theta}{2}$

•2 strategy for finding length of side of square or rectangle

•3 for length of side or (length of side)^2 of square/rectangle

•4 area of rectangle

•5 simplifying

(b) •6 strategy including expansion of $k\sin(\theta - \alpha)$

•7 $k\cos\alpha = 8$ & $k\sin\alpha = 16$

•8 $k = 8\sqrt{5}$ or equiv.

•9 $\tan\alpha = 2 \Rightarrow \alpha = 63\cdot4$

(c) •10 $8(2 + \sin\theta - 2\cos\theta) = 30$

•11 $8\sqrt{5}\sin(\theta - 63\cdot4)° = 14$

•12 $\sin(\theta - 63\cdot4)° = 0\cdot783$

•13 $\theta = 51\cdot5 + 63\cdot4 = 114\cdot9$

Note : For •3 various forms of the length are

square: $4\sin\frac{\theta}{2}, \frac{2\sin\theta}{\sin\left(90 - \frac{\theta}{2}\right)}, \sqrt{16 - 16\cos^2\frac{\theta}{2}}$

rect: $\frac{4\sin\theta}{\sin\left(90 - \frac{\theta}{2}\right)}, \sqrt{32 - 32\cos\theta}$

[END OF QUESTIONS]