

The links for the Assignment number take you to the pdf of the assignment. For more information on each one, and links to the solutions documents go to https://maths.org/step/assignments.

Warm-ups are often proof or derivations of results needed for the STEP question (or just for interest).

Warm downs often have famous historical maths problems, and introductions to other areas of maths.

		CTED O		
	warm up	SIEPQ	Q 2 and 3 content	warm down
<u>FA1</u>	Surd manipulation	2005 S1	Solutions of fractional	Area between
		Q3	equations/repeated roots	two circles
			quadratics	
<u>FA2</u>	Algebraic simplification	1999 S1	Max and min of $bx + a$ and $cx^2 + a$	Logic puzzle
		Q6	bx + a	
FA3	Introduction to sigma,	2004 S1	Floor function, and integrals as	Diophantine
	and sum of GP	Q2	area under graph. Use of GP sum	equations
				(<u>Monkeys and</u>
EA4	Proof angle at contro	1005 51	Cubic inequality and inequality in	Logic puzzlos
<u>FA4</u>	of circle is twice angle	1993 31	two variables $(x^3, 4x^2x, xx^2)$	Logic puzzies
	of circle is twice angle	QI	two variables $(x^2 - 4x^2y - xy^2 + 4x^3)$	
	at edge		$4y^{\circ} \ge 0$	
<u>FA5</u>	Derivation of cosine	2006 S1	Volume of a tetrahedron (vectors,	Drawer of red
	rule	Q8	and be careful with names of	and blue socks
			sides!) Uses cosine rule	
FA6	Simplifying fraction,	2005 S1	Arrangements (examples in Q5).	Conditional
	and solving 3x3 sim	Q1	How many 5 digit numbers where	probability (If
	equations		digit sum if 39?	+ve test, what
				prob have it?)
<u>FA7</u>	Graph sketching, and	2002 S1	Roots of equations/solving a	Bachet's
	solving ineqs	Q5	quartic	Weights
				Problem
				(connection to
				binary/ternary)
FA8	Derivation of AM-GM	2002 S1	Circle passing through intersection	Socks – three
	for 2, 4 and 3 values	Q1	of 2 ellipses	colours now.
FA9	Proof of base angles	1993 S1	Sketch of cubic and how conditions	"Bridge of
	isos tri, area of a tri	Q7	on the coefficients affect number	donkeys" Euclid
	and sine rule. $sin(2a)$		of roots	proof of base
				angles
FA10	Derivation of $sin(A +$	2005 S2	Euler totient function – includes	Questions from
<u></u>	B) and $cos(A + B)$	02	discussion and examples of "if"	1858 UCLES
		~~~	and "only if" and "iff"	naper
<b>ΕΔ11</b>	Recursive sequence	2013 51	Using substitutions to solve	Faultions with
1711	and sketching a	01	equations (and being careful about	indices
	neriodic function	Q1	added roque solutions from	
			squaring)	1





<u>FA12</u>	Divisibility	2011 S1	Probability (equally likely	Bellringing
	(of $n^3 - n, n^5 - n^3$ )	Q12	outcomes)	problem (prime
				factorization!)
<u>FA13</u>	Convex/concave/points	2012 S1	Curve sketching and numbers of	linear
	of inflection (including	Q2	roots (vertical translations of	Diophantine
	non-stationary)		graph)	equation
<u>FA14</u>	Sum and difference of	2010 S2	Fibonacci numbers explicit	<u>Kirkman's</u>
	two cubes	Q3	formula. Involves surd	<u>schoolgirl</u>
			manipulation, rationalizing	<u>problem</u>
			denominator and inf GP sum	
<u>FA15</u>	Solving a quartic,	2006 S2	Periodicity of sequences, and limits	Crossing the
	product notation	Q1	of convergent ones	desert with a
				limited amount
				of fuel
<u>FA16</u>	Functions (including	2015 S1	Solving a cubic through trig	"Proof" that all
	some of two variables)	Q2	identities – those from FA10	triangles are
				isosceles
<u>FA1/</u>	Modular arithmetic	2003 S1	Sums of squares and cubes	Modular
		Q1		arithmetic and
5440		2014.04		divisibility
<u>FA18</u>	Curve Sketching	2014 S1	Integral equation and conditions	Koch snowflake
5410	Device the set of secol	Q3	on limits	
<u>FA19</u>	Derivation of small	2005 51	Loci of a point (some extended	2 probability
	angle trig	Q6	algebra)	questions.
FA20		1006 62	Droof by induction:	Coomotru
<u>FA2U</u>	derivatives of sin x cos	1990.32	1996 S2 O2: Eibonacci	triangle question
	v In v	2006 \$3	2006 S3 O8: Polynomial	thangle question
	A, III A	2000 33	differentiation	
F421	Introduction to	1999 51	Modulus granh sketching (also	2 geometry
17721	hyperbolics (sudo-	04	uses translations of graphs)	problems, 2 nd
	hyperbolic functions)	~ '		uses similar tris
FA22	Derivation of product	2015 S1	Curve sketching, roots and graph	Euler's
	rule (diff), and	Q1	of f(x^2)	polyhedra
	derivative of $e^x$			formula
FA23	Derivation of chain rule	2009 S1	Lines touching circle, and equation	Blue eyed
	(diff)	Q8	of the incircle	islander
				induction
				problem
FA24	"anti-differentiation"	1998 S2	Recursive integral $(I_n)$	Basel Problem –
	and integration by	Q4		sum of $\frac{1}{3}$
	parts			n ²
FA25	Integration by	1994 S1	Integration questions	More integration
	substitution	Q8		("tricks")





## **Mixed Pure Questions**

2012 S1 Q4: Tangents and normal to curve and where they meet
2012 S1 Q8: Solving differential equations with a substitution
2010 S1 Q5: Binomial expansions
2014 S1 Q1: Number theory/proof
2005 S1 Q4: Solving Trig equations
2013 S1 Q3: Vectors and a binary operation. Point on a line
2008 S1 Q4: Convex functions (differentiation, product rule)
2013 S1 Q7: Solving differential equations by substitution

## **Mixed Statistics Questions**

2010 S1 Q12: Expectation (penguins in cereal boxes)
2009 S1 Q13: Probability and arrangements, and expectation
1995 S1 Q12: Arrangements and probability
1999 S2 Q12: Conditional probability and Bayes theorem
2006 S2 Q13: Probability of choosing the biggest ice cream
2008 S2 Q13: Black and white counters in a bag
2015 S2 Q12: Coin tossing game

## **Mixed Statistics Questions**

2012 S1 Q11: Pulley problem, with two slopes
2010 S1 Q10: Particle moving in two dimensions, velocity and acceleration
1993 S1 Q11: Centre of mass of a wire shape
2006 S2 Q11: Projectile, with wind resistance
2008 S2 Q11: Particle on a wedge. Wedge can move as particle slides down

