

Higher Tier Paper 3 – Calculator

Question	Working	Answer	Mark	AO	Notes
1		€48 or £42.86	P P A	3.1c 3.1c 1.3a	P1 for a correct process, using the lower rate, to find the amount by changing their money separately, e.g. $300 \times 1.04 \times 2$ (= 624) P1 for a correct process, using the higher rate, to find the amount by changing their money together, e.g. $300 \times 2 \times 1.12$ (= 672) resulting in two values to compare A1 for 48 euros or £42.85 or £42.86 if converted to sterling, units must be clear
2	(i) (ii) (iii)	$\frac{1}{6}$ $\frac{5}{36}$ $\frac{25}{36}$	B B M A	1.2 1.3a 1.3b 1.3b	B1 oe B1 oe M1 for $1 - \frac{1}{6} - \frac{5}{36}$ or $\left(1 - \frac{1}{6}\right) \times \left(1 - \frac{1}{6}\right)$ A1 oe OR M1 for $1 - \text{“(i)”} - \text{“(ii)”}$ A1 ft provided answer is less than 1

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3 (a)	$4x = 3x + 6$ $x = 6$ 4×6	24 (cm)	P P A	3.1b 3.2 1.3b	P1 for translating the problem into an algebraic equation, e.g. $x + x + x + x = x + 2 + x + 2 + x + 2$ oe P1 for collecting terms and solving for x oe A1 24 cao
3 (b)	$y^2 = 6^2 + 6^2$ $y = \sqrt{72}$ $z^2 = 8^2 - 4^2$ $z = \sqrt{48}$	$y > z$ with reason	P M M C	2.3a 1.3b 1.3b 2.1a	P1 for interpreting information, e.g. numerical values for sides on square and triangle M1 for a correct method to find y or z M1 for a correct method to find y and z C1 conclusion based on at least P1 consistent with candidate's figures for y and z or y^2 and z^2
4		38p	P P P P A	3.1d 3.1d 3.1d 3.1d 1.3b	P1 for a correct first step, e.g. 140×6 (= 840 eggs per week) P1 for a correct process to find the weight of feed per week, e.g. $100 \times 140 \times 7$ (= 98000g or 98 kg) P1 for a correct method to find the weekly cost, e.g. $6.75 \div 25 \times "98"$ (= £26.46) P1 for completing the process to find the cost of feed required for 12 eggs, e.g. $(2646 \div 840) \times 12 = 37.8p$ A1 for 37.8p or 38p oe

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5		£5242.88	P	3.1d	P1 for a correct first step in the process, e.g. $5000 \times 0.03 (= 150)$ or $3 \times 0.8 = 2.4\%$
			P	3.1d	P1 for a correct process in finding the effect of the 20% tax on interest (i.e. "150"), e.g. $"150" \times 0.8 (= 120)$ or 5000×1.024
			P	3.1d	P1 (dependent on previous P marks) for a fully complete and correct process to find balance after 2 years, e.g. $(5000 + "120") + (5000 + "120") \times 0.03 \times 0.8$ or $5000 \times (1.024)^2$
			A	1.3b	A1 cao
6		A correct right-angled triangle constructed	P	2.3a	P1 for a construction of a right angle at C or D (construction arcs must be seen)
			P	2.3b	P1 (indep) for the correct height of the triangle drawn or shown
			P	2.3b	P1 for a fully correct constructed triangle

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7		26°	P P A	3.1b 3.1b 1.3b	P1 for a correct process that leads to angle <i>EDC</i> , e.g. $(180^\circ - 116^\circ) \div 2$ P1 for a correct process that leads to angle <i>MCE</i> , e.g. $(58^\circ - 32^\circ)$ A1 cao
8 (a) (i)		611.2	M	1.3a	M1 for $16 \times (42 - 3.8)$
(ii)		40.3 m	A M A	1.3a 1.3b 1.3b	A1 for 611 (accept 611.2) M1 for a fully correct method to find distance by applying the correct inverse operations in the correct order A1 for 40.3 m
8 (b) (i)		26.5	M A	1.3b 1.3b	M1 for a fully correct method to find Time by applying the correct inverse operations in the correct order A1 for 26.5
(ii)		42.5 seconds with correct reason	P C	3.1c 2.4a	P1 for a recognition that $42.5 - T \geq 0$ C1 for 42.5 and a statement that this will lead to an increasing number of points the slower you get oe

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9	$9.3 \times \sin 48^\circ$	6.911 cm	P M A	2.3a 1.3a 1.3a	P1 for process to decide which trig function to use from description M1 $9.3 \times \sin 48^\circ$ A1 awrt 6.91cm
10 (a)		$2n - 1$	P A	2.1a 1.3a	P1 for process to deduce nth term from information given, e.g. $2n + k$ oe A1 for $k = -1$
10 (b)		$2n^2 - 2n + 1$	P P A	2.3a 2.2 1.3b	P1 starts process for at least first 3 pattern numbers by looking for sums of squares, e.g. 1st: $1 = 0 + 1$, 2nd: $5 = 4 + 1$ 3rd: $13 = 9 + 4$ or begins to make a difference table at least as far as second differences P1 for process that leads to identification of n^2 and $(n - 1)^2$ or to identification of $2n^2$ from a difference table A1 $2n^2 - 2n + 1$
10 (c)		No with a clear correct reason given	P C	2.4a 2.4a	P1 for an attempt to solve the equation $2n^2 - 2n - 230 = 0$ or evaluating $2n^2 - 2n + 1$ when $n = 11$ and 12 C1 for No and evidence, e.g. 11.2... or 221 and 265

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10 (d)		Complete explanation	P C	2.4a 2.4a	P1 for an argument in words or using symbols, e.g. in any two consecutive numbers one is even and one is odd and the square of an even number is even and the square of an odd number is odd The sum of an odd and an even number is odd C1 conclusion with a correct complete argument
11 (a)	$2500 = P \times 1.20^5$ $P = 2500 \div 1.20^5 = 1004.69$	1005	P M A	3.1c 1.3a 1.3a	P1 for process to translate problem into algebraic form, e.g. $2500 = P \times 1.20^5$ M1 $P = 2500 \div 1.20^5$ A1 1005
11 (b)		Correct explanation	C	3.5	C1 for an explanation eg the original population size will be greater
12	Let h and w be the dimensions of the original rectangle $h + 2w = 50$ $2h + w = 64$ $w = 12, h = 26$ Perimeter = $2 \times 12 + 2 \times 26$	76 cm	P P P A	3.2 3.1d 3.1d 3.1d 1.3b	P1 for correct process to set up equations, e.g. $\frac{h}{2} + \frac{h}{2} + w + w = 50$ and $\frac{w}{2} + \frac{w}{2} + h + h = 64$ P1 for correct process to find value of one variable P1 for correct process to find value of other variable P1 for correct process to find numerical value of perimeter, e.g. $2 \times ('12' + '26')$ A1 cao

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13 (a)	L _v	9	<div>2013</div>		P	2.3a	P1 for process to interpret diagram, e.g. identify any quartile P1 for further interpretation in order to draw box plot with at least three correct from L _v , L _q , M, U _q , U _v C1 for fully correct box plot	
	L _q	16						
	M	24						
	U _q	30						
	U _v	39						
13 (b)				Correct comparisons	C C	2.3b 2.3b	C1 ft for a correct comparison in context of central tendency C1 ft for a correct comparison in context of any measure of spread	
14 (a)	$H = atI^2 - b$ $\frac{H + b}{at} = I^2$			$I = \sqrt{\frac{H + b}{at}}$	M	1.3b	M1 $\frac{H + b}{at} = I^2$ A1 cao (accept ±)	
					A	1.3b		
(b)(i)	$\frac{80 - 32}{800}$			0.06°C/second	P	3.1a	P1 for process to use graph to find gradient, e.g. $\frac{80 - 32}{0 - 800}$	
(ii)	Draw a tangent to the curve with a gradient of −0.06 (see diagram at the end)			350 seconds	A	1.3a	A1 accept −0.06°C/second	
					P	2.3a	P1 for process to interpret parallel lines on diagram	
					A	1.3a	A1 340 – 360	

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15	(a)	$x = 0.\dot{1}\dot{5}$ $100x = 15.\dot{1}\dot{5} \quad \therefore 99x = 15$ $\therefore x = \frac{15}{99} = \frac{5}{33}$	Shown	M	1.3b	M1 for a complete method
				A	1.3b	A1 fully correct working
15	(b)	$\frac{1}{2^{183} \times 5^{180}} = \frac{1}{8} \times \frac{1}{10^{180}}$ $= 0.125 \times 10^{-180}$	Shown	P	2.2	P1 for a correct process to find that 180 comes from 2^{180} and 5^{180}
				P	2.2	P1 for complete process with correct working to show that the number of zeros is 180
15	(c)		Reasons	P	2.5a	C1 He has not shown that the period is 3
				P	2.5a	C1 He has omitted to show that 37 is neither a factor of $10^2 - 1$ nor of $10^1 - 1$
16			40	P	3.1d	P1 for identifying probabilities, e.g. prob of '1' = $\frac{x}{360}$, prob of '2' = $\frac{2x}{360}$, prob '3' = $1 - \frac{3x}{360}$
				P	3.1d	P1 for a correct process to set up a quadratic equation, e.g. $2 \times \frac{x}{360} \times \left(1 - \frac{3x}{360}\right) + \left(\frac{2x}{360}\right)^2 = \frac{16}{81}$

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				P	3.1d	P1 for a correct process that leads to a 3-term quadratic, e.g. $2x^2 - 720x + 25600 = 0$
				M	1.3b	M1 for a correct method to solve the quadratic equation, e.g. $(2x - 80)(x - 320) (=0)$
				P	3.3	P1 selection of $x = 40$ (from solutions $x = 40$ or $x = 320$)

Question 14 (b)(ii)

