5540H/4Higher Calculator					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	180÷2	90g	2	M1 180÷2 **OR** 180÷6×3 oe A1 cao
	(b)	160 × 2.5	400m*l*	2	M1 160 × 2.5 **OR** 160÷6×15 **OR** 160÷2×5 oe A1 cao SC: B1 an answer of 399 to 405 inclusive
2	(a)	$\sqrt{\frac{21.6\times15.8}{3.8}}=$	9.476841579	2	M1 for 89.81052 …. or 341.28 or 4.86151… or $\frac{8532}{95}$ *or* $\frac{8532}{25}$ A1 for 9.47684..... SC : B1 for 9.476841579… truncated or rounded to at least 1 decimal place
	(b)	$\sqrt{89.81052632}$	9.48	1	B1 ft from (a) with at least 4 significant figures
3		$240\times\frac{117.5}{100}$ **or** 240 + 24 + 12 + 6	£282	3	B1 for 117.5 or 1.175 M1 for $240\times\frac{117.5}{100}$ oe A1 cao **OR** M1 for $240\times\frac{17.5}{100}$ **OR** 24 + 12 + 6 oe **OR** 42 M1(dep) for 240 + "42" **OR** 240 + 24 + 12 + 6 A1 cao

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4 (a)		$4x - 12$	1	B1 cao
(b)	$4t = 18$	4.5	2	M1 for subtracting 1 from both sides seen or implied or division of all 3 terms by 4 A1 4.5 oe
5	5, 13, 29, 53, **85, 125**	**(85)**	2	M1 for correct evaluation of at least 3 odd cases **OR** sequence of 5, (8), 13, (20), 29… seen **OR** the expression with $n = 9$ or 11 or 19 or 21 or … substituted but not evaluated A1 for 85 or 125 or 365 or 445 or … identified
6	$\pi \times 6^2$ $12^2 - \pi \times 6^2$	30.9	4	M1 for 12^2 or 144 seen M1 for $\pi \times 6^2$ or 113(….) seen M1 (dep on both previous M1's) for "12^2"- "$\pi \times 6^2$" A1 30.88 – 31inclusive
7 (a)(i)		110	2	B1 cao
(ii)		Corresponding angles		B1 (dep on B1 in (i)) for corresponding angles **or** F angles
(b)	180 – 70 – 75	35	2	M1 180 – (180-110) – 75 or 110 - 75 A1 cao
8 (a)		3 plotted correctly	1	B1 to l square
(b)		Positive	1	B1 Positive (correlation)
(c)		LOBF	1	B1 within guidelines; line goes from between (2,18) and (2,32) to between (16,78) and (16,90)
(d)		62 – 67	1	B1 for 62 – 67 inclusive or ft from a single straight line graph with positive gradient ± 1 square

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Question	**Working**	**Answer**	**Mark**	**Notes**
9	$3000\times\frac{4}{100}+3000=3120$ $3120\times\frac{4}{100}+3120=3244.80$ **or** $3000\times\left(\frac{104}{100}\right)^2$	3244.80	3	M1 for $3000\times\frac{4}{100}$ **or** 120 **or** 240 **or** 3240 **or** 3120 **or** 1.04 × 3000 **or** 2880 **or** 2760 M1(dep) for (3000+'120')$\times\frac{4}{100}$ **or** 124.8(0) **or** "3120"×1.04 A1 £3244.8(0) **OR** M2 $3000\times\left(\frac{104}{100}\right)^2$ **or** $3000\times\left(\frac{104}{100}\right)^3$ A1 £3244.8(0) NB : If correct answer seen then ignore subsequent years
10		30	2	M1 finds the middle value **or** answer an indication of 0, 29, 29.5, 30.5, 31, 31.5, 32 or 10th value oe A1 cao

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Question	**Working**	**Answer**	**Mark**	**Notes**
11 (a)	<table><tr><td>x</td><td>–1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>**3**</td><td>–2</td><td>–5</td><td>**–6**</td><td>**–5**</td><td>–2</td><td>3</td></tr></table>	3,–6, –5	2	B2 cao all 3 (B1 any 1 or 2 correct)
(b)		Quadratic graph	2	B2 for fully correct graph **OR** B1 all 7 points ft on (a) plotted correctly ± 1 square B1 smooth curve through all 7 of their plotted points depending on at least B1 in (a)
(c)	Draw $y = -3$	0.3, 3.7	2	B1 for 0.2 – 0.4 or ft from graph ± 1 square B1 for 3.6 – 3.8 or ft from graph ± 1 square (SC: If no marks earned then B1 for line $y = -3$ drawn) NB: If line at y = -3 will intersect graph more than twice award B1 for one correct value, B2 for all correct values given.
12 (a)		Within guide	2	B2 for line at least 2cm long within inner guideline B1 for line at least 2cm long completely or partially outside inner guidelines but within outer guidelines **or** line within inner guidelines of length less than 2cm or at least 3 relevant points within inner guidelines **or** 2 pairs of relevant intersecting arcs within inner guidelines. NB : Ignore any additional lines or drawings
(b)		Within guide	2	B2 for fully correct shape within or touching guidelines (B1 two correct parallel lines within or touching guidelines allow **or** two correct semicircles at ends within or touching guidelines allow **or** correct shape outside guidelines) NB : Accept dotted lines. Ignore any additional lines or drawings eg. Full circles drawn at ends

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13	24 48 72 36 72	72	2	M1 lists at least 1 multiple of 24 and 1 multiple of 36 (not including 24, 36) A1 cao **OR** M1 for 2,2,2,3 (prime factors of 24) **OR** 2,2,3,3 (prime factors of 36) (may be seen in factor tree or in repeated division) A1 cao
14 (a)		$13x + 17$	2	M1 for $3\times x + 3\times 4$ **OR** $5\times 2x + 5\times 1$ A1 cao
(b)		t^{10}	1	B1 cao
(c)		p^3	1	B1 cao
(d)		x^{12}	1	B1 cao
15	$1 - (0.15+0.05+0.20+0.25)$	0.35	2	M1 $1 - (0.15+0.05+0.20+0.25)$ oe A1 for 0.35 oe
16	$BC^2 = 20^2 + 10^2 = 500$	22.4cm	4	M1 for $(BC^2 =)\ 20^2 + 10^2$ or 400 + 100 or 500 or $20^2 + 10^2 - 2\times 20\times 10\times \cos 90$ oe M1 for $\sqrt{"400+100"}$ or $\sqrt{"500"}$ where it is clear that the 20 and 10 have been squared (could be implied by either 400 or 100 seen) A1 for any answer in 22.36 – 22.4 inclusive B1 (indep)cm

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Question	**Working**	**Answer**	**Mark**	**Notes**
17	$(0\times 0)+1\times 8+2\times 12+3\times 6+4\times 4+5\times 2$ =76 $76\div((0)+8+12+6+4+2)$	2.375	3	M1 for 1×8 and 2×12 and 3×6 and 4×4 and 5×2 condone one error **or** sight of 76. M1(dep on 1st M1) for $\sum fx\div\sum f$ A1 for 2.375 **or** 2.37 **or** 2.38 **or** 2.4
18	65% of orig value = £5460 1% of orig value = $\frac{£5460}{65}$ Orig value = $\frac{£5460}{65}\times 100$	£8400	3	M1 65% (of orig value) = £5460 **or** (100% - 35%) × orig price = 5460 **or** 0.65 **or** 65% seen M1 $\frac{£5460}{65}\times 100$ **or** $\frac{5460}{0.65}$ A1 £8400

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Question	**Working**	**Answer**	**Mark**	**Notes**
19 (a)	$x(2x+1)+x\times 5$ $2x^2+6x$	As given	3	M1 $x(2x+1)$ and $x\times 5$ OR $x(x+5)$ and $x(x+1)$ condone missing brackets. M1 $2x^2+x+5x$ OR x^2+5x+x^2+x (can imply first M1) A1 $2x^2+6x=95$ AG
(b)	$x=\dfrac{-6\pm\sqrt{6^2-4\times 2\times(-95)}}{4}$ $x=\dfrac{-6\pm\sqrt{796}}{4}$ **or** $x^2+3x-47.5=0$ $(x+1.5)^2-1.5^2-47.5=0$ $x=-1.5\pm\sqrt{49.75}$	5.55, –8.55	3	M1 for correct substitution in formula of 2, 6 and ± 95 M1 for reduction to $\dfrac{-6\pm\sqrt{796}}{4}$ A1 5.55 to 5.555 inclusive **and** –8.55 to –8.555 inclusive **OR** M1 $(x+1.5)^2-1.5^2-47.5=0$ M1 $x=-1.5\pm\sqrt{49.75}$ A1 5.55 to 5.555 and –8.55 to –8.555 [SC: B1 for one answer correct with or without working]

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Question	**Working**	**Answer**	**Mark**	**Notes**
20 (a)		Add on 2	1	B1 'even numbers go up in twos' or 'even numbers are 2 apart' oe
(b)		$2n + 4$	1	B1 $2n + 4$ oe
(c)	$2n + 2n + 2 + 2n + 4 = 6n+6$ $= 6(n +1)$		3	M1 for $2n$ (+) $2n + 2$ (+) '$2n + 4$' or any 3 consecutive even numbers written as expressions; any variable may be used A1 for "6n + 6" A1 for "$6(n+1)$" or stating there is a factor of 6 oe SC : B1 for $n + n + 2 + n + 4$
21	$\tan QPR = \frac{4}{10}$ $QPR = \tan^{-1}\left(\frac{4}{10}\right) = 21.8^o$ **or** $QP = \sqrt{4^2 + 10^2}$ $\sin QPR = \frac{4}{\sqrt{4^2 + 10^2}}$ $QPR = \sin^{-1}\left(\frac{4}{\sqrt{4^2 + 10^2}}\right)$	21.8	3	M1 $\tan(QPR =)\frac{4}{10}$ M1 $\tan^{-1}\frac{4}{10}$ **or** $\tan^{-1}0.4$ A1 21.8^o - 21.81^o inclusive **OR** [$QP = \sqrt{4^2 + 10^2}$ (=10.77…)] M1 $\sin(QPR =)\frac{4}{\sqrt{4^2 + 10^2}}$ **or** $\cos(QPR =)\frac{10}{\sqrt{4^2 + 10^2}}$ M1 $\sin^{-1}\frac{4}{\sqrt{4^2 + 10^2}}$ **or** $\cos^{-1}\frac{10}{\sqrt{4^2 + 10^2}}$ A1 21.8^o - 21.81^o inclusive SC: B2 for 24.2(237…..) or 0.380(5….)

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Question	**Working**	**Answer**	**Mark**	**Notes**
22	$D = kS^2$ $900 = k \times 20^2$ $k = \frac{900}{400}$ $D = \frac{900}{400} \times 25^2 = 1406.25$	1406.25	4	M1 $D = kS^2$ M1 $900 = k \times 20^2$ (can imply first M1) A1 $k = \frac{900}{20^2}$ (= 2.25) A1 for 1406.25 or $\frac{5625}{4}$
23 (i)		9.75	3	B1 cao
(ii)	$\frac{24.45^2}{2 \times 9.75}$ $= \frac{597.8025}{19.5}$ = 30.6565 …	30.7		M1 for $\frac{V_{UB}{}^2}{2 \times g_{LB}}$ where $24.4 < V_{UB} \leq 24.45$ and $9.75 \leq g < 9.8$ **or** $\frac{V_{UB}{}^2}{2 \times '9.75'}$ (= 30.6565…) A1 for 30.7 or 30.66 or 30.657 or 30.6565 or 30.65654 or better coming from 30.6565384…

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Question	**Working**	**Answer**	**Mark**	**Notes**
24 (a)	$V_c = \pi \times 3^2 \times 30$ $V_h = \frac{2}{3} \times \pi \times 3^3$ $V_c + V_h = 288\pi$	905	3	M1 $V_c = \pi \times 3^2 \times 30$ (= 848.2…) **or** $V_h = \frac{2}{3} \times \pi \times 3^3$ (=56.54...) M1 (dep) $V_c + V_h$ (may be implied) A1 904 – 905 inclusive
(b)	$\frac{4}{3} \times \pi \times R^3 = 500$ $R^3 = \frac{500 \times 3}{4 \times \pi}$	4.92	3	M1 for $\frac{4}{3} \times \pi \times R^3 = 500$ M1 for correct process to reach $R^3 = \frac{500 \times 3}{4 \times \pi}$ oe (= 119.3…) **or** $\sqrt[3]{\frac{500 \times 3}{4 \times \pi}}$ (implies 1st M1) A1 4.915-4.925
25	$\frac{399}{399 + 602 + 252 + 198} \times 70$ =19.24	19	3	M1 for $\frac{399}{399 + 602 + 252 + 198}$ or $\frac{399}{1451}$ or "$\frac{70}{1451}$" or "$\frac{1451}{70}$" or "$\frac{1451}{399}$" M1 "$\frac{399}{1451}$" $\times 70$ or $\frac{70}{\text{"1451"}} \times 399$ or $399 \div \frac{\text{"1451"}}{70}$ (=19.2487…) A1 for 19

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Question	**Working**	**Answer**	**Mark**	**Notes**
26 (a)	$4\mathbf{a} + 3\mathbf{b} - (2\mathbf{a} + \mathbf{b})$	$2\mathbf{a} + 2\mathbf{b}$	2	M1 ($\vec{OX} + \vec{XY} = \vec{OY}$) or $4\mathbf{a} + 3\mathbf{b} - (2\mathbf{a} + \mathbf{b})$ oe **or** an intention to do $\vec{XO} + \vec{OY}$ eg. $-2\mathbf{a} + \mathbf{b} + 4\mathbf{a} + 3\mathbf{b}$ A1 cao
(b)	$\vec{YZ} = 3\mathbf{a} + 3\mathbf{b}$ or $\vec{XZ} = 5\mathbf{a} + 5\mathbf{b}$ $\vec{OZ} = \vec{OX} + \vec{XZ} = 2\mathbf{a} + \mathbf{b} + 5\mathbf{a} + 5\mathbf{b}$	$7\mathbf{a} + 6\mathbf{b}$	3	M1 for $\vec{OZ} = \vec{OX} + \vec{XZ}$ oe **or** $\vec{OZ} = \vec{OY} + \vec{YZ}$ oe (may be given in terms of **a** and **b**) M1(indep) for $(YZ =) \frac{3}{2}(\text{"}2\mathbf{a} + 2\mathbf{b}\text{"})$ $(=3\mathbf{a} + 3\mathbf{b})$ **or** $(\vec{XZ} =) \frac{5}{2}$ (“$2\mathbf{a} + 2\mathbf{b}$”) $(=5\mathbf{a} + 5\mathbf{b})$ A1 cao SC : B2 for $7\mathbf{a} + 9\mathbf{b}$ or $7\mathbf{a} + 11\mathbf{b}$
27	$1 = a \times b^{0.5}$, $8 = a \times b^2$ $\frac{a \times b^2}{a \times b^{0.5}} = \frac{8}{1}$ $b^{\frac{3}{2}} = 8$, $b = 4$ $a = \frac{1}{2}$ $c = \frac{1}{2} \times 4^{-\frac{1}{2}}$	$k = \frac{1}{4}$	4	M1 for $1 = a \times b^{0.5}$, $8 = a \times b^2$ M1 for correct method to eliminate either *a* or *b* could be implied by $\frac{a \times b^2}{a \times b^{0.5}} = \frac{8}{1}$ or $\frac{b^2}{b^{0.5}} = 8$ or $8 = a(\frac{1}{a^2})^2$ oe A1 for $b = 4$ $a = \frac{1}{2}$ A1 for $k = \frac{1}{4}$ oe