MARK SCHEME 5506				
Number	Working	Answer	Mark	Notes
1	$7.91 - \sqrt[3]{81} = 3.583251$ 3.583251…… _ 4.32 = 15.47964.…. 6.23 + 1.491 = 7.721 15.47964…÷7.721 =	2.00	3	B3 for 2 to 2.005 **or** B1 for 3.58(3251) (_ 4.32) or 15.5 or better B1 for 7.721 seen
2	π n _ $4^2 \times 15$ = 753.6	754 cm³	3	M1 for $\pi \times 4^2 \times 15$ A1 for 753.6 to 754.1 B1 (indep) for cm³
3	$1.7^2 + 3.2^2 = 2.89 + 10.24 = 13.13$ $\sqrt{13.13}$	3.6	3	M1 for $1.7^2 + 3.2^2$ M1 for $\sqrt{1.7^2 + 3.2^2}$ A1 for 3.62 to 3.624
4 (a) (b)	$6x - 3 - 4x + 6 = 2x + 3$	$2x + 3$ $y(y+1)$	2 1	B1 for either $6x - 3$ or $-4x + 6$ B1 cao B1 cao
5 (a) (b)	 (5 _ 14) + (15 _ 13) + (25 _ 8) + (35 _ 4) + (45 _ 2) = 70 + 195 + 200 + 140 + 90 = 695 695 ÷ 41 =	10< L ≤ 20 16.95	2 4	M1 for use of cumulative frequency to find the 20.5th or 21st value A1 cao for the correct range – any form M1 $\sum fx$ using values within intervals (including ends), at least 4 consistently M1 (dep) $\sum fx$ using midpoints M1 (dep on 1st M1) "695"÷41 A1 for 16.95 – 17 years or 17.45 – 17.5 years
6 (a) (b)	 (2.4 _ 10^9) ÷ (1.44 _ 10^6)	1.44 _ 10^6 1667	1 3	B1 cao M1 for 2.4 _ 10^9 ÷ "1.44 _ 10^6" oe A1 for 1666 or 1666.6… or 1666.7 A1 (dep) for 1667 cao

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7 (a)		5, -1	2	B1 for each correct answer
(b)			2	B1 ft for all 7 points plotted correctly B1 ft for smooth curve through 7 points (dep on B1 in (a))
(c)		–1.25	1	B1 ft ± ½ square – must have single minimum from a curve through 6 points
(d)			3	B1 for line $y = 2x - 4$ drawn correctly. B1 + B1 ft (dep on line of gradient 2, or intercept of – 4) for each correct answer. Answers are 3.62 and 1.38 OR B1 $y = x^2 - 5x + 5$ seen and attempt to plot B1 values (1, 1) (2, –1) (3, –1) (4, 1) B1 ft for 2 solutions
8 (a) (i)	$3x < 6$	$x < 2$	2	M1 for $3x < 6$ A1 cao
(ii)	Clear circle around 2, and solid line leading to left of diagram up to –5 or arrow		1	B1 cao
(b)		–2, –1, 0, 1	3	B3 cao (–1 for every extra or missing integer, min zero) NB. B0 if any non-integers included
9 (a)	$\tan ACB = \frac{12.8}{6.8}$ $x = \tan^{-1}(1.88)$	62.0°	3	M1 for $\tan C = \frac{12.8}{6.8}$ M1 (dep) for $x = \tan^{-1}$ (“1.88”) A1 for 62° to 62.021° For methods using the sine rule, a fully correct Pythagoras followed by the sine rule to get $\sin C = \frac{12.8}{14.49}$ is needed for M1
(b)	$BD = \frac{12.8}{\sin 42}$	19.1m	3	M1 for correct use of sin, $\sin 42° = \frac{12.8}{BD}$ M1 for $\frac{12.8}{\sin 42°}$ A1 for 19.1 to 19.13

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10 (i)	$8 \times \frac{5}{4}$	10	5	B1 for sight of $\frac{5}{4}$ or $\frac{4}{5}$ or 2 or $\frac{1}{2}$ oe M1 for 8 _ 1.25 oe A1 cao
(ii)	$6 \times \frac{4}{5}$	4.8		M1 for 6 _ 0.8 oe A1 cao
11	$4x + 6y = -6$ $6x + 9y = -9$ $9x - 6y = 84$ $6x - 4y = 56$ $13x = 78$, $x = 6$ $13y = -65y = -5$ $12 + 3y = -3$ $6x - 45 = -9$ $3y = -15$ $6x = 36$	$x = 6$, $y = -5$	4	M1 for a correct method leading to an equation in x or y (Allow one accuracy error) A1 $x = 6$ (or $y = -5$) M1 (dep) for substituting found value of x or y in one of the equations A1 for $y = -5$ (or $x = 6$)
12(a)	½ _ 11.7 _ 28.3 _ sin 67	152	2	M1 for ½ _ 11.7 _ 28.3 _ sin 67 A1 152 to 152.4
(b)	$AC^2 = 11.7^2 + 28.3^2 - 2$ _ 11.7 _ 28.3 _ cos 67 $AC^2 = 937.8 - 258.7 = 679.(03)$	26.1	3	M1 for correct substitution into cosine rule M1 (dep) for correct order of evaluation A1 26.05 – 26.1
13 (a)	Frequency densities of 8 ÷ 10 = 0.8 16 ÷ 10 = 1.6, 15 ÷ 5 = 3, 12 ÷ 5 = 2.4 6 ÷ 20 = 0.3		3	B1+ B1 + B1 for each correct column shown on histogram If B0, then M1 for clear attempt to use frequency density or area
(b)	1.8 _ 10 = 18, 2.8 _ 5 = 14, 2 _ 5 = 10, 0.4 _ 20 =8	18, 14, 10, 8	2	B2 all correct B1 2 or 3 correct 5 □ 5 = $\frac{25}{80}$ = 2.5 birds
14	Either $(n^2 + 2n + 1) - (n^2 - 2n + 1) = 4n$ or (n + 1 + n – 1) (n + 1 – (n – 1)) = 2n _ 2 = 4n		3	B1 + B1 for $n^2 + 2n + 1 - (n^2 - 2n + 1)$ must have brackets for the 2nd B1 B1 for $4n$ **Or** B1 for either $(n + 1 + n - 1)$ or $(n + 1 - (n - 1))$ B1 for $(n + 1 + n - 1)(n + 1 - (n - 1))$ B1 for $4n$

				SC: $n^2 + 2n + 1 - n^2 - 2n + 1 = 4n$ is 2/3

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15 (a)	$x(x - 15) = 199.75$ $x^2 - 15x = 199.75$ $x^2 - 15x - 199.75 = 0$		3	B1 for sight of $x - 15$ or $\frac{199.75}{x}$ B1 for $x(x - 15) = 199.75$ B1 for $x^2 - 15x - 199.75 = 0$ following correct algebra SC: $x \times x - 15 = 199.75$ => $x^2 - 15x - 199.75 = 0$ is 1/3
(b)	$\frac{15 \pm \sqrt{225 - 4 \times 1 \times -199.75}}{2}$ **Or** $(x - 7.5)^2 - 56.25 = 199.75$ $x - 7.5 = \pm\sqrt{256}$	23.5 or –8.5	3	M1 for correct substitution into formula, allow sign errors A1 for 23.5 A1 for – 8.5 **Or** M1 for $(x - 7.5)^2 - 56.25$ A1 for 23.5 A1 for –8.5 **Or** $4x - 60x - 799 = 0$ $(2x - 4)(2x + 17) = 0$ x =23.5 or –8.5 M1 for attempt A1 A1 Trial and error: 1 solution B1 Other solution B2

Number	Working	Answer	Mark	Notes
16 (a)		1.75 1.65 31.05 30.95	4	B2 all correct Or B1 for 2 or 3 correct
(b)	"30.95" – 1.75	29.2	1	B1 ft on values in (a)
(c)	Minimum volume of bigger sphere = $\frac{4}{3} \times \pi \times$ "30.95³" = ….. Maximum volume of smaller sphere = $\frac{4}{3} \times \pi \times$ "1.75³" =	5531	4	M1 for correct substitution of his/her "30.95" or "1.75" into $\frac{4\pi}{3} r^3$ A1 for either 124122 – 124201 or 22.4379 – 22.4542 M1 (dep) for his/her min big vol ÷ his/her max little vol A1 cao
17 (a)		$(3x-1)^2$	2	B1 for $(3x – 1)(..x….)$ cao B2 for $(3x – 1)^2$ cao
(b)	$\frac{(3x-1)(2x+3)}{(3x-1)^2} = \frac{(2x+3)}{(3x-1)}$	$\frac{2x+3}{3x-1}$		B1 for correct factorisation of numerator M1 for cancelling of common factors A1 cao
18			3	$OY = OX$ (radii) $OM = OM$ or OM is common $OMX = OMY = 90°$ B1 for any one line B1 for remaining two lines B1 (dep on 2 previous Bs) for $\triangle OMY \equiv \triangle OMX$ RHS and conclusion

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19	$\frac{6}{15}\times\frac{3}{12}+\frac{6}{15}\times\frac{5}{12}=\frac{48}{180}$ $\frac{4}{15}\times\frac{4}{12}+\frac{4}{15}\times\frac{5}{12}=\frac{36}{180}$ $\frac{5}{15}\times\frac{4}{12}+\frac{5}{15}\times\frac{3}{12}=\frac{35}{180}$ ***Or*** $1-\left[\frac{6}{15}\times\frac{4}{12}+\frac{4}{15}\times\frac{3}{12}+\frac{5}{15}\times\frac{5}{12}\right]$ $=1-\frac{61}{180}$	$\frac{119}{180}$	4	M1 for sight of any 2 correct uses of the 6 cases M1 for sight of remaining 4 correct uses of the 6 cases M1 (dep on at least 3 correct terms) for adding 5 or 6 correct terms A1 cao M1 for use of complimentary event M1 for sight of any 2 correct terms M1 for $1-\left[\frac{6}{15}\times\frac{4}{12}+\frac{4}{15}\times\frac{3}{12}+\frac{5}{15}\times\frac{5}{12}\right]$ A1 cao
20	$(x+3)^2+x^2=29$ $x^2+6x+9+x^2=29$ $2x^2+6x+9=29$ $2x^2+6x-20=0$ $2(x-2)(x+5)=0$	x^2+6x+9 $x=2$ and $y=5$ or $x=-5$ and $y=-2$	7	M1 for rearranging to $y=x+3$ M1 for correct substitution for their y to give $(ax+b)^2+x^2=(29)$ A1 (√) for correct exp of $(ax+b)^2$ seen M1 for reduction to a 3 term quadratic = 0 M1 (dep on 3rd M1) for correct factorisation (√) or correct use of formula (√) or completing the square (√) A1 for at least 2 correct values of x or y A1 cao, values must be paired
21	$3.5=5.5+A\sin30(3-k)$ $3.5=5.5\pm A$	$A=\pm2$ $k=6$	4	M1 for $3.5=5.5+A\sin\ 30(3-k)$ B1 for one of max/min value of sin = +1/−1 A1 for $A=2$ or -2 A1 for k = any multiple of 6 consistent with A $A=2$, $k=6$ etc $A=2$, $k=6(2n+1)$ $A=-2$, $k=12n$