1.	a)	$x \le 1$	A1	
	b)	$x = 3$ or -3	A1A1	
	c)	$\frac{x}{2} + \frac{x}{3} = 2$ ×6	M1	
		$3x + 2x = 12$ $5x = 12$ $x = 12/5 = 2.4$	A1	
	d)	$\frac{x+1}{2} + \frac{x}{3} = 1$ ×6	M1	
		$3x+3 + 2x = 6$ $5x = 3$ $x = 3/5 = 0.6$	A1	7 marks
2.	a)	i) 1, 5, 9, 13, **17**, **21**	A1	
		ii) 2, 5, 10, 17, 26, **37**, **50**	A1	
	b)	i) 4n – 3	A1	
		ii) $n^2 + 1$	A1	
	c)	$100 \times 2 + 2 = 202$	A1	
	d)	2**n** + 2	A1	6 marks
3.	a)	J = area (ii)	A1	
	b)	K = length (i)	A1	2 marks
4.	a)	$120 = 2 \times 2 \times 2 \times 3 \times 5$	A1	
	b)	0.00001234	A1	
	c)	$\frac{13.8 \times 0.022}{133} \approx \frac{10 \times 0.02}{100}$ numerator/denominator	B1 or appropriate rounding	
	≈	$\frac{0.2}{100} = 0.002$ accept 0.002 – 0.0028	A1	4 marks
5.	a)	Construction marks, correct ±0.5mm	B1A1	
	b)	Within 3cm AB, Bisector of angle B to give nearer AB than BC	B1B1	4 marks
6.	a)	1 + 3 = 4		
		1 + 4 = 5		
		L.C.M. of 4 and 5 is 20	M1	
		Therefore 20 balls	A1	
	b)	tree diagram with probs 1/5 and 4/5 twice	A1	
		calculating probs at end of tree by **multiplication**	B1	
		1/4×1/5 = 1/20 and 3/4×4/5 = 12/20	A1 for either	
		adding probs to give 13/20	A1	6 marks
7.	$^{3}/_{7} \times \boldsymbol{x} \le 100$		M1	
	$x = 233.333^{r} = 233$ complete panels		A1	2 marks
8.	a)	Values– calculating a moving average	M1	
		£2.00, £2.05, £2.10, £2.15, £2.20 **A1 any two correct**	A1 all correct	
	b)	The moving average **steadily increases** by £0.05 a quarter	A1	4 marks
9.	a)	1.5cm^2	A1	
	b)	$V = 1.5 \times 4 = 6\text{cm}^3$	A1	
	c)	scale factor = 12/4= 3	M1	
		$x = 3 \times 3 = 9$cm	A1	
	d)	slanted length $\sqrt{10}$	A1	
		$2 \times 1.5 + 12 + 4 + 4\sqrt{10} = 19 + 4\sqrt{10}$ (a = 19, b = 4, c = 10)	A1A1	7 marks

10. a) bigger square has side $x+1$ — B1

change in Area = biggest – smallest — M1

$= (x+1)^2 - x^2$ — M1 — Allow reverse order

$= x^2 + 2x + 1 - x^2 = 2x + 1$ — A1

b) Let smaller square have side length = y

$x^2 - y^2 = 6x - 9$ — M1 — Allow LHS=$y^2 - x^2$

$\therefore\ y^2 = x^2 - 6x + 9$

$\therefore\ y = \sqrt{(x^2 - 6x + 9)}$ — M1

$\therefore\ y = x - 3$ (ignoring $3 - x$) — A1

$\therefore$ perimeter $= 4x - 12$ — A1 — 8 marks

11. a) $(1-4)^{-2} = 1/(-3)^2 = 1/9$ — M1A1

b) $8^{4/3} = 2^4$ or 16 — A1

c) $100^{-1/2} = 1/10$ — A1 — 4 marks

12. Let $x = 0.93939393^r$

$100x = 93.93939393$ — M1

$99x = 93$ — M1

$x = 93/99 = 31/33$ — A1 — 3 marks

13. a) **c–b** — A1

b) $-\frac{1}{2}\mathbf{a} + \mathbf{b} + \frac{1}{2}(\mathbf{c} - \mathbf{b}) = -\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b} + \frac{1}{2}\mathbf{c}$ — M1A1 — 3 marks

14. a) $2/6 \times 2/6 \times 2/6 = 1/27$ (multiply same fraction) — M1A1

b) $4/6 \times 4/6 \times 4/6 = 8/27$ — A1 — 3 marks

15. a) $x^2 + 4x - 5 = (x+2)^2 - 9.$ — A1A1

b) $(x+2)^2 - 9 = 0$ — M1

$(x+2)^2 = 9$

$x + 2 = \pm 3$ — M1A1

$x = -2 \pm 3 = 1$ or -5. (answers MUST be achieved by completing the square, o.w. zero! marks) — A1A1

c) Shift up 5 units. — A1

d) **Stretch** *scale factor 2* **in the y direction**. — *A1***A1** — 10 marks

16. Using mid-points of the second table — B1

Increase in Height in cm mid-point	Frequency	mid-point times Frequency
1	10	10
3	20	60
5	10	50
7	10	70
9	50	450
TOTAL	100	640

average estimated increase = 640/100 = 6.4cm — A1

estimate of height is **65.1cm**+6.4cm = 71.5cm — A1 — 3 marks

using an estimate from the first table when the exact answer is known would be incorrect!

17. a) i) $\angle$ CAF = $\angle$ ABC or $\angle$ ADC — A1

ii) Prove the alternate segment theorem.

$\angle$ABC = $\angle$ADC (angles in the same segment) — B1

$\angle$ACD = 90° (AD diameter) — B1

$\angle$CAF = 90° – $\angle$DAC — B1

$\angle$CAF = 90° – (180 – 90 – $\angle$ADC) = $\angle$ADC

$\angle$ CAF = $\angle$ ADC — B1

	b)	i)	$\mathbf{x}$ = 180 –103 = 77°	A1	
			$\mathbf{y}$ = 25° (alternate segment theorem)	A1	
		ii)	AOC = 2 × 103= 206° obtuse = 360–206=154°	M1A1	
			[or 2×$\mathbf{x}$ = 154° (ft!) M1A1]		9 marks
18.	a)		$f = \dfrac{k}{d^3}$	M1	
			$4 = k/2^3$	M1	
			$k = 32$	B1	
			$f = 32/4^3$	M1	
			f = 0.5N	A1	
	b)		$16 = 32/d^3$	M1	
			$d^3 = 2$ d = $\sqrt[3]{2}$	A1	7 marks
19.	a)		$x^2 - 14x + 16 = (x-7)^2 - 49 + 16 = \mathbf{(x-7)^2} - 33$	**A1***A1*	
	b)		double translation	A1	
			f(x) translated **7 units LEFT** and (translated) *33 units up*.	A1A1ft	5 marks
20.	$\sqrt{3L} = \dfrac{V}{2\pi}$			M1	
	$3L = \dfrac{V^2}{4\pi^2}$			M1	
	$L = \dfrac{V^2}{12\pi^2}$			A1	3 marks